Total No. of Questions : 8]

SEAT No. :

P1790

[Total No. of Pages : 2

[4265] - 123

M.E. (E & T/C) (Microwave)

ADVANCED DIGITAL SIGNAL PROCESSING

(2002 Course)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Define the following :
i) Random process ii) Mean ergodic process. **[4]**

b) Perform circular convolution of the two sequences.
$x_1(n) = \{\underset{\uparrow}{2}, 1, 2, 1\}$ $x_2(n) = \{\underset{\uparrow}{1}, 2, 3, 4\}$ **[6]**

c) Explain the time domain sampling of analog signals. **[4]**

d) Explain how DFT can be used for linear filtering. **[4]**

Q2) a) Explain polyphase filters for sampling rate conversion. **[5]**

b) Explain in detail method adopted for interfacing digital systems with different sampling rates. Where do you need it? **[5]**

c) Explain the concept of sub band coding of speech signals. **[6]**

Q3) a) Compare AR, ARMA and MA process. **[5]**

b) Explain with block diagram backward linear prediction. **[5]**

c) Explain AR lattice structure. **[6]**

P.T.O.

Q4) a) Explain the concept of upsampling and downsampling with the help of block diagram. **[5]**

b) A signal is down sampled by a factor of 3. Then it is upsampled by a factor of 4. Draw the output and explain the result. **[4]**

c) Explain IIR Wiener filter. **[7]**

SECTION - II

Q5) a) Explain the difference between parametric and non parametric method of PSE. **[6]**

b) Explain any one method of parametric and non parametric method of PSE. **[10]**

Q6) a) Explain the architecture of DSP processor with block diagram. Explain the difference between Microprocessor and DSP architecture. **[8]**

b) Explain Levinson Durbin algorithm for solution of normal equation. **[8]**

Q7) a) What is system modelling and identification? **[4]**

b) Explain system identification based on All pole system (AR) systems, all zero system (MA) systems and pole zero (ARMA) system. **[12]**

Q8) Write short notes on any three: **[18]**

a) Split Radix FFT.

b) Eigen analysis algorithm for spectral estimation.

c) Radar signal processing.

d) DTMF.

■■■

Total No. of Questions : 8]

SEAT No. :

P1506

[Total No. of Pages : 2

[4265] - 147

M.E.(Electronics) (Digital Systems)

IMAGE PROCESSING AND PATTERN RECOGNITION

(2002 Course) (Elective - I (b))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each Section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Use of scientific calculator is allowed.***
4) ***Assume suitable data, wherever required.***
5) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Explain any one gray scale transformation in detail. **[8]**

b) Explain the spatial domain representation of an image. Explain the procedure for applying a low pass filter mask on the image. What is edge enhancement? **[10]**

Q2) a) What is edge detection? Explain use of Sobel edge operator. How will you find the direction of the edge? **[8]**

b) Explain the advantage of double derivative for edge detection. Why zero crossing is used for detecting the edge? **[8]**

Q3) a) What is a histogram? Explain using a simple example. Draw the nature of histogram in case of low contrast image. **[8]**

b) What is bit plane slicing? What is the application for bit plane slicing? **[8]**

Q4) a) What is image segmentation? Explain use of image segmentation for object recognition. **[8]**

b) Explain the algorithm for detection of boarders in the image. **[8]**

P.T.O.

SECTION - II

Q5) a) What is Hough transform? Explain the use of Hough transform for line detection. **[8]**

b) What are different image segmentation methods? Explain any one method for region based segmentation. **[8]**

Q6) a) Explain the procedure to obtain the signature for a square. What is the application of finding signature for any curve? What are Fourier descriptors? **[8]**

b) Explain any one method for statistical pattern recognition. **[8]**

Q7) a) What is fuzzy logic? Can you use fuzzy logic for edge detection? **[8]**

b) Explain the concept of image understanding with a suitable example. **[10]**

Q8) a) What is the use of neural network in image analysis? **[8]**

b) How will you detect the object in the image? Explain any one method for object recognition. **[8]**

■■■

Total No. of Questions : 8]

SEAT No. :

P1792

[Total No. of Pages : 2

[4265] - 152

M.E. (Electronics) (Digital Systems)

NETWORK SECURITY SYSTEMS

(2002 Course)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer three questions from Section - I and three questions from Section - II .***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the security attacks briefly. **[4]**

b) What is CIA in network Security? Explain Briefly. **[4]**

c) Draw and explain the model for Internet security. **[4]**

d) Explain the concept of key distribution in cryptography. **[4]**

Q2) a) Explain the application and architecture of SNMP protocol. **[4]**

b) Explain the protocol “SET” in web security. **[4]**

c) Explain the RSA algorithm in detail. **[4]**

d) Explain the IPSec in detail. **[4]**

Q3) a) What are the different Hash function requirements? Explain Secure Hash function in detail. **[6]**

b) What is concept of "Trusted system"? **[4]**

c) Justify how proxy server acts as Application layer firewall. **[6]**

P.T.O.

Q4) Write short note on any three : **[18]**

a) PGP service

b) TLS security

c) Key management

d) Kerberos

SECTION - II

Q5) a) Explain the X. 509 formats briefly. **[4]**

b) Explain the following in detail. **[6]**

i) Properties of Digital Signatures

ii) Requirements for Digital Signatures

c) Explain IDEA symmetric key algorithm briefly and list the applications. **[6]**

Q6) a) What is intrusion? How virus infection mechanism works? **[6]**

b) Explain Diffie-Hellman algorithm in detail. **[6]**

c) Explain the AAA service properties with suitable example. **[4]**

Q7) a) Explain the DES algorithm in detail. **[6]**

b) Explain HMAC Briefly. **[6]**

c) Explain Denial of service attack briefly. **[4]**

Q8) Write short note on any three: **[18]**

a) S/MIME

b) SSL security

c) AES algorithm

d) Substitution and Transposition cipher.

■■■

Total No. of Questions : 8]

SEAT No. :

P1660

[Total No. of Pages : 2

[4265] - 162

M.E. (Electronics) (Computer)

COMPILER CONSTRUCTION

(2002 Course) (Elective - II (a))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each Section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Define and differentiate the following : **[10]**

i) Inherited and Synthesized Attributes.

ii) Syntax Directed definition and Translation Schemes.

iii) S-attributed and L-attributed grammars.

iv) Local and Global optimizations.

v) Front and Back end of a compiler.

b) Explain in brief various mechanisms used for error recovery. **[6]**

Q2) a) Construct a DFA for the following regular expression. **[8]**
(p | q)*qpp

b) Write Lex specification to identify the tokens found in a C program. **[8]**

Q3) a) Compare static, stack and heap strategies used for storage management. **[6]**

b) With suitable examples, discuss static and dynamic scope. **[6]**

c) With suitable examples, discuss various parameter passing methods. **[6]**

Q4) a) Explain any code generation algorithm you know. **[10]**

b) What is peephole optimization? Illustrate with suitable examples. **[6]**

P.T.O.

SECTION - II

Q5) a) Draw a neat diagram showing various phases of a compiler. What do you mean by a pass and the phase of compilation? **[8]**

b) Define the following : **[8]**

i) Cross Compiler.

ii) Incremental Compiler.

iii) Bootstrap Compiler.

iv) Interpreter.

Q6) Consider the following source language statement. **[16]**

```
j = 0;
while (j ++ < 10)
        A[j] = A[j] + B[A[j]][j];
```

a) Assuming suitable syntax direction scheme, write the generated three address code.

b) Represent the three address code using triples, indirect triples and quadruples.

Q7) For the following CFG G = (N, T, S, P), where N = {E} is the set of non-terminal symbols, T = {'+', '*', '(', ')', 'id'} is the set of terminal symbols, S = E, is the start symbol and

P = {E $\rightarrow$ E + E | E * E | (E) | id } is the set of productions.

a) The grammar is ambiguous. Write an equivalent unambiguous grammar.

b) Computer first and follow sets of grammar symbols.

c) Construct LL(1) Parser Table. Is the grammar LL(1)?

d) Using any Error recovery scheme you know, modify the LL(1) table to add synchronizing entries. **[18]**

Q8) a) Discuss the problems with top-down parsers. How they are overcome? **[8]**

b) What mechanism is provided in YACC for resolving conflicts in the LR parsers? Explain with suitable illustrations. **[8]**

■■■

Total No. of Questions : 8]

SEAT No. :

P1510

[Total No. of Pages : 3

[4265] - 227

M.E. (Petroleum)

WELL CONTROL

(2002 Course) (Elective - I (a))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Q. 1 and Q. 5 are compulsory. Out of the remaining attempt two questions from Section - I and two questions from Section - II.***
4) ***Use of cm scale graph paper is allowed.***
5) ***Figures to the right indicate full marks.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain Underbalanced drilling technique and it's applications. **[12]**

b) While pulling out driller forgot to fill the hole and 22 stands of drill pipes were pulled out dry. Use following data and calculate reduction in bottom hole pressure. **[6]**
Well depth = 8000 ft. (TVD), Casing shoe depth = 4500 ft. (TVD) Mud weight = 13 ppg., Open hole capacity = 0.1482 bbl/ft.
Casing capacity = 0.1611 bbl/ft., Drill pipe metal displacement = 0.0076 bbl/ft., Length of one stand = 93 ft.

Q2) a) Explain types of flow regimes through pipe. **[4]**

b) Draw the neat graph of gas kick circulation. **[4]**

c) A well is being drilled with 11.8 ppg mud. How much barite is required to increase the mud density to 13 ppg.? **[4]**
Hole volume = 659 bbl. Surface volume = 333 bbl
Barite density is 35.4 ppg

d) Determine the height in feet of the influx using following data. **[4]**
Pit gain = 23 bbl Hole size = 8.5 in Drill collar OD = 6.5 in Drill collar length = 488 ft.
Drill pipe OD = 5.0 in

P.T.O.

Q3) What is well head equipment? Draw the neat schematic sketch of it show all the components and write their functions. **[16]**

Q4) Write short notes on : **[16]**

a) Hole problems

b) Offshore challenges in well control job

c) Drill stem testing

d) Repeat formation Testing

SECTION - II

Q5) Use the following data and design well control plan : **[18]**

A kick was observed after closing the surface BOP. Fill out a kill sheet. Prepare step down plan on graph paper for drillers method.

Data : Original mud weight = 10 ppg,

Measured depth = 9,800 ft.,

Kill rate pressure @ 45 SPM = 980 psi

Kill rate pressure @ 28 SPM = 650 psi

Drill string-drill pipe 5.0 in.-19.5 lb/ft. capacity is 0.017 bbl/ft.

HWDP 5.0 in. 50.3 lb/ft., capacity = 0.00883 bbl/ft., length = 240 ft.

Drill collars - 8.0 in 0.D.- 3.0 in ID, capacity is 0.0087 bbl/ft.,

length = 386 ft.

Annulus - Hole size = $12\frac{1}{4}$ in. drill collar/open hole capacity = 0.0836 bbl/ft ., drill pipe/open hole capacity = 0.12 bbl/ft., Drill pipe/casing capacity = 0.1303 bbl/ft.

Mud pump (7 in. X 12 in. triplex @ 95% eff.) = 0.14 bbl/stk.

Leak of test with 9.6 ppg mud = 1130 psi

Casing setting depth = 4500 ft.

Shut in drill pipe pressure = 480 psi, Shut in casing pressure = 500 psi, Pit volume gain = 25 bbl, True vertical depth = 9000 ft.

Q6) a) Explain different possibilities of well kick during drilling operations. **[6]**

b) Write a note on : **[10]**

i) Well control during completion

ii) Types of drilling fluids

Q7) a) Draw appropriate graphs and explain any two methods of well control. **[10]**

b) Determine the type of influx using following data. **[6]**

SICP = 1000 psi

SIDPP = 600 psi

Height of influx = 400 ft.

Mud weight = 14 ppg.

Q8) a) Explain BOP accumulator and hydro-pneumatic well control system. **[8]**

b) Draw schematic sketches of various types of blowout preventors. **[8]**

■■■

Total No. of Questions : 8]

SEAT No. :

P1796

[Total No. of Pages : 2

[4265] - 238

M.E. (Instrumentation) (Process & Biomedical)

TRANSDUCERS DESIGN

(2002 Course)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, electronic pocket calculator and steam table is allowed.***
6) ***Your answer will be valued as a whole***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) It is require to measure the temperature of 1300°C. Suggest suitable sensors. Compare them and suggest best option and justify the answer. **[16]**

Q2) A flow measuring system employing ultrasonic technique is to installed on a 1 mtr. diameter pipeline carrying water from reservoir of a dam to filtration tank of pune municipality. Discuss the scheme, with recording and monitoring system. **[16]**

Q3) A liquid in a tank having height of 10 meter and diameter of 3 meter is required to measure. It is desired that a the error in level measurement be ± 0.1 meter. Suggest suitable sensors for this application. Design a Signal conditioning circuit for sensor which you think most suitable for this application if load variation of the tank in from 5% to 90% of tank capacity. **[18]**

Q4) Design a weighing machine signal conditioner by referring following data
Load Cell: 10 kg.
Sensitivity of Load Cell: 2m V/V
Full Scale Indication Range: 0 – 10 kg with least count of 10 gm
Display : 31 = 2 digit with 200 mV.
Power Supply : + / – 5V. **[16]**

P.T.O.

SECTION - II

Q5) A thickness of a metal sheet is required to measure using LVDT. The thickness of sheet is 2 mm. The resolution demands 0.001 m and accuracy should be 0.01%. Discuss the specification of LVDT, signal conditioner circuit and display system. **[16]**

Q6) A pressure monitoring system is to be installed in a process plant. The pressures upto 200 Bar. Discuss suitable transducer & control system for this range of pressure monitoring. **[16]**

Q7) The Torque sensor is to be selected for measuring torque of a car axels. Suggest transducer to measure torque in motion of the vehicle. The test set up is available to measure the torque & also to keep car in motion. Selection of torque sensor alongwith signal conditioning & display system with recording facility be described. Max. torque expected is 1000 N.m. with fluctuations of order of 200 Hz. **[18]**

Q8) In a temple it is required to measure the total number of people visited. Suggest suitable sensor and design the system that will display the count on the display. **[16]**

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Total No. of Questions : 8]

SEAT No. :

P1442

[Total No. of Pages : 2

[4265] - 297

M.E. (Chemical Engineering)

FLUIDIZATION ENGINEERING

(2002 Course) (Elective - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each Section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answers will be valued as a whole.***
6) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Define fluidized state and discuss the hydrodynamics of fluidization system. **[8]**

b) What are the industrial applications of fluidization? **[8]**

Q2) a) Discuss the operating models for fluidization system. **[8]**

b) Explain the pressure drop across the fluidized column versus fluid velocity. Draw a neat sketch. **[8]**

Q3) Enlist the different flow models. Discuss the generalized wake model and Davidson model. **[18]**

Q4) Explain the following in detail - **[16]**

a) Incipient fluidization

b) Pressure fluidization

P.T.O.

SECTION - II

Q5) Derive the kinetic model for conversion of shrinking and growing particle in fluidization . **[16]**

Q6) Discuss the following with equations. **[16]**

a) 2 phase & 3 phase inverse fluidized bed.

b) Immersed horizontal cylinder-to-bed heat transfer.

Q7) Explain in details about. **[18]**

a) Modeling by bed collapsing

b) Semi fluidized bed system

Q8) Write short notes on : **[16]**

a) Conical fluidized bed

b) Geldart's classification for power assessment.

■■■

Total No. of Questions : 8]

SEAT No. :

P1443

[Total No. of Pages : 2

[4265] - 403

M.E. (Civil) (Construction Management)

CONSTRUCTION TECHNOLOGY

(2008 Course) (Semester - I)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Solve any three questions from Section - I and three questions from Section - II.***
2) ***Answers to the two sections must be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) A bored pile of 1000 mm dia. and 12 m. long was constructed by using Direct Mud Circulation Technique using Bentonite slurry with concrete mix of M 200. Explain with labeled sketches the sequence of construction of the pile including giving detail specifications of the concrete used. **[9]**

b) Compare and give advantages of large diameter bored piles against small diameter piles. **[9]**

Q2) a) A circular cofferdam of 11 m diameter was proposed for a bridge pier, wherein following options were considered for method of construction.

i) R.C.C. diaphragm wall 60 cms. thick

ii) Interlocking circular piles of 800 mm dia.

iii) Interlocking steel sheet piles.

Select any **one** of the above giving its advantages over the other. **[6]**

b) Explain in details with neat sketches the sequence of operations involved for completing the cofferdam and its removal after completing the pier foundation for the method of construction selected by you in (a) above. **[10]**

P.T.O.

Q3) a) Explain with labeled sketches in details "Construction of Micropile" used in Underpinning works for foundations. **[8]**

b) Explain with labeled sketches in details method of construction of 'Pneumatic caissons'. **[8]**

Q4) Write short notes on <u>any four</u> of the following : **[16]**

a) Properties of grout mixes used for structural and geotechnical works.
b) Jet Grouting technique
c) Precautions in use of Concrete pumps.
d) Merits and demerits of R.M.C. (Ready mix concrete).
e) Advantages and disadvantages of 'Well point system' of dewatering.
f) Slip form shuttering in 'High rise buildings'.

SECTION - II

Q5) a) List out and explain activities involved with labeled sketches in Hard Rock Tunneling using "Full face Tunnel Boring Machine". **[10]**

b) List out and explain different methods of "Tunnel Lining" used, and how it affects "Rate of Advance" of the tunnel. **[8]**

Q6) Explain in details factors which affects 'Efficiency of R.M.C. plant" and precautionary measures you will take avoid same. **[16]**

Q7) a) Explain with sketches method of construction of "Diaphragm wall" using Bentonite slurry for underground section of a Metro Railway project. **[8]**

b) Explain with sketches use of "Two stage well point system" used for dewatering in a construction of a Turbo Generator foundation to lower the water table from 1.0 m. to 4.0 m below existing ground level. The general stratification consists of 'silty sand' up to 15m Depth. T.G. foundation is to be laid at 3.00 m below ground level. **[8]**

Q8) Write short notes on any four of the following : **[16]**

a) Accelerated curing methods used in high-rise buildings.
b) Chemical grouting and its applications.
c) Burn cut and Pyramid cut in Rock tunneling
d) Single acting hammers in Driven piles
e) Limitations of Under reamed piles
f) Geo-technical problems in Tunneling

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Total No. of Questions : 8]

SEAT No. :

P1811

[Total No. of Pages : 4

[4265] - 414

M.E. (Civil) (Construction & Management)

OPERATION RESEARCH

(2002 & 2008 Course) (Semester - II)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer three questions from section - I and three questions from section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Write a detail note on "Operations Research" with the help of following points : **[8]**

i) Definition

ii) Scope of OR

iii) Applications of various OR techniques

iv) Types of OR models

b) Two RMC plants are owned by a company with capacity 75 cu.m and 100 cu.m per day respectively. It supplies concrete to three sites with requirement 50 cu. m, 60 cu. m and 65 cu. m per day respectively. Costs of transportation of concrete per cu.m. from each plant to the sites are as given below **[8]**

		sites 1	2	3	supply
plants	A	25	30	35	75
	B	15	28	40	100
demand		50	60	65	

Formulate LP model to minimise transportation cost (Do not solve)

P.T.O.

Q2) a) Describe transportation model and assignment model. How is Assignment model differs from transportation model? Give applications of each by giving examples. **[7]**

b) Solve the following Transportation model using: **[9]**

i) North west corner method

ii) Column minima method

iii) Row minima method

	D_1	D_2	D_3	D_4	
O_1	4	8	6	5	200
O_2	6	10	9	7	50
O_3	8	5	9	8	150
	100	100	100	100	

Q3) a) Solve the following Assignment model to minimise cost **[8]**

	1	2	3	4	5
A	4	5	8	9	7
B	6	8	10	12	11
C	9	10	6	8	5
D	10	11	15	12	11
E	12	13	9	8	3

b) Explain the procedure to be followed to solve following types of problems in transportation model by giving suitable example. **[8]**

i) Unbalanced Transportation problem

ii) Maximisation problem

Q4) a) Use method of Lagrangian multipliers to solve the following : **[8]**

Minimise $Z = 2x_1^2 + x_2^2 + 3x_3^2 + 10x_1 + 8x_2 + 6x_3 - 100$

Subject to $x_1 + x_2 + x_3 = 20$

$x_1, x_2, x_3 \geq 0$

b) Write the Kuhn - Tucker conditions for the following problem & obtain optimal solution. **[10]**

Maximise $Z = -x_1^2 - x_2^2 - x_3^2 + 4x_1 + 6x_2$

Subject to $x_1 + x_2 \leq 2$

$2x_1 + 3x_2 \leq 12$

$x_1, x_2 \geq 0$

SECTION - II

Q5) a) Describe the steps to be followed in solving equation using Dichotomous search and Fibonacci method. **[8]**

b) Solve the following sequencing problem to find minimum elapsed time for completion of all the jobs. Each job is processed in the same order C-A-B. Entries given are the time in hours on the machines **[10]**

jobs		1	2	3	4	5	6	7	8
Times in	A	4	6	7	4	5	3	6	2
Machines	B	8	10	7	8	11	8	9	13
	C	5	6	2	3	4	9	15	11

Also find idle time of each machine

Q6) a) What is Dynamic Programming? What sort of problems can be solved by it? State Bellman's principle of optimality. **[8]**

b) Explain NPV Analysis used for investment model by giving suitable example. **[4]**

c) A firm has following budget for a particular year. **[4]**

Sales : 1,20,000 units @ Rs. 25

Variable Cost : 1,20,000 units @ Rs. 15

Fixed Cost : Rs. 6,00,000

What shall be the impact on firms profit if

i) Increase in price : 15%

ii) Decrease in sales volume : 10%

iii) Increase in variable cost : 10%

iv) Increase in fixed cost : 6%

Q7) a) What are the seven main elements of a queuing system? Explain with neat sketch. **[8]**

b) Solve the following game: **[8]**

		B		
	1	7	2	4
A	0	3	7	8
	5	2	6	10

Q8) a) The arrival of customers & service times of customers are having following distribution. **[8]**

Arrival time (min)	Probability	Service time (min)	Probability
4	0.10	6	0.15
5	0.35	7	0.35
6	0.45	8	0.40
7	0.10	9	0.10

Simulate this queuing system for 10 periods by using following random numbers & calculate mean waiting time.

Random numbers for arrivals

48, 36, 82, 14, 14, 62, 92, 10, 55, 20

Random numbers for services

35, 62, 30, 75, 88, 90, 58, 19, 45, 40

b) A fleet owner finds from his past records that the costs / year of running a truck whose purchase price is Rs. 60,00,000 are as given below: **[8]**

Year	:	1	2	3	4	5	6	7
(Running cost in Lacs of Rs.)	:	10	12	14	18	23	28	34
Resale values (in Lacs of Rs.)	:	40	20	10	6	5	5	4

Determine at what age is the replacement due?

■■■

Total No. of Questions : 8]

SEAT No. :

P1844

[Total No. of Pages : 2

[4265] - 418

M.E. (Civil) (Const. & Mgmt.)

TRUST AREAS IN PROJECT MANAGEMENT

(2008 Course) (Elective - IV (a)) (Sem. - II)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Attempt any three questions from section - I and three quetsions from section - II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, wherever necessary.***

SECTION - I

Q1) What is PDRI? Under which heads it is classified? Are the parameters same for Residential and Industrial buildings? What is the utility of PDRI? Explain above questions in detail. **[18]**

Q2) a) Explain the permutation combinations possible in SWOT matrices with examples and explain the importance of using these matrices with application to the construction sector. **[8]**

b) Explain process of competency mapping with examples. What is the importance of this mapping in HR development ? Explain. **[8]**

Q3) Discuss 4 types of human relationships which are classified, between client and contractors on construction Projects. Which relationship is best suited for project partnering? Explain. Discuss advantages of Project partnering on construction Projects. **[16]**

Q4) Explain the following : **[16]**

a) John Mullions 7 point test.

b) ISO 9001:2008.

c) Modern roofing systems.

d) Flow diagram of Project Pre-planning.

P.T.O.

SECTION - II

Q5) What is SCM? In which different areas of project management SCM can be applied? Discuss advantages of using SCM tool on construction projects. **[16]**

Q6) Discuss 3 types of leadership styles and 2 types of motivation in detail. How you would apply all the above to construction projects? Elaborate. **[16]**

Q7) a) Explain principles of fast track construction with the help of a sketch only. **[8]**

b) Enlist advantages and limitations of MIVAN technology. **[8]**

Q8) Answer the following : **[18]**

a) Strategic planning.

b) Pre-Engineered construction.

c) IQ, EQ, SQ importance.

d) Covey Habits.

e) MBO in MR.

f) Lean Construction.

■■■

Total No. of Questions : 8]

SEAT No. :

P1797

[Total No. of Pages : 2

[4265] - 439
M.E. (Civil - Hydraulics)
FLUID MECHANICS
(2008 Course) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer booklet.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answer will be valued as a whole.***
6) ***Use of electronic pocket calculator is allowed.***
7) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) Derive 3-D continuity equation in cylindrical polar coordinate system. **[10]**

b) A source of strength 10 m^2/s located at (–1, 0) is combined with a sink of strength 14 m^2/s located at (1, 0). Find the stream function and velocity potential. **[8]**

Q2) a) For laminar flow between two fixed parallel plates prove that the velocity profile is parabolic and the average velocity is two third of the maximum velocity starting with the Navier-Stokes equation. **[8]**

b) Oil with density 900 kg/m^3 and viscosity 0.18 $N\text{-}s/m^2$ flows between two horizontal parallel plates 10 mm apart. A constant pressure gradient of -1000 Pa/m drives the flow. The upper plate is moving with a uniform speed, while the lower one is kept stationary. Find the velocity of the upper plate so that (i) the flow rate is zero (ii) the shear stress at the upper plate is zero. **[8]**

P.T.O.

Q3) a) Derive Von-Karman's integral momentum equation for boundary layer starting with Boundary Layer equations. **[10]**

b) Explain Boundary Layer Separation describing causes, effects and methods to reduce the thickness. **[6]**

Q4) Write short notes on (any four) : **[16]**

a) Conformal Mapping

b) Relaxation technique

c) Hydrodynamically smooth and rough boundaries

d) Creeping flow

e) Boundary layer over a flat plate

SECTION - II

Q5) a) For steady 2-D turbulent flow between parallel plates kept at a 'h' apart derive equation for Boundary shear starting with Reynold's equation. **[10]**

b) Water at $20^{o}C$ is flowing through a Hydrodynamically smooth pipe of diameter 20 cm at the rate of 80 lit/s. The average height of roughness projections on the pipe surface is 0.2 mm. Determine the (i) friction factor (ii) shear stress at the pipe surface (iii) shear velocity (iv) maximum velocity. The density and kinematic viscosity of water at $20^{o}C$ are 1000 kg/m^3 and 1×10^{-6} m^2/s respectively. **[8]**

Q6) a) Discuss Reynold's rules of averages. **[8]**

b) Write short note on probability density function and distribution function of a continuous random variable. **[8]**

Q7) a) Discuss Isothermal and adiabatic processes. Derive equations for Bulk modulus of elasticity in each case. **[8]**

b) Derive equation for stagnation temperature in compressible flow. **[8]**

Q8) a) Derive energy equation for compressible flow. **[8]**

b) Define Mach angle, transonic flow, hypersonic flow, shock wave. **[8]**

■■■

Total No. of Questions : 6]

SEAT No. :

P1447

[Total No. of Pages : 3

[4265] - 460

M.E. (Civil) (Structures)

STRUCTURAL DESIGN OF STEEL BRIDGES

(2008 Course) (Elective - II(b)) (Semester - I)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Attempt any two questions from Section - I and Section - II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams should be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***If necessary, assume suitable data and mention clearly.***
6) ***Use of nonprogrammable electronic pocket calculator, relevant IS codes and steel table are allowed.***

SECTION - I

Q1) a) Explain the various load combinations used in the design of railway bridges. **[8]**

b) Explain the longitudinal forces acting on a bridge. How is it calculated. **[9]**

c) Explain coefficient of dynamic augmentation. **[8]**

Q2) a) With neat sketches explain stringers, cross-girders in a through type railway bridge. **[8]**

b) A through type plate girder railway bridge carries a single line broad gauge track. The span of the bridge is 24 m. The plate girders are provided at 5 m c/c. The stringers are provided at 2 m c/c along the center line. The cross-girders are provided at 3 m c/c. The EUDL for BM is 490 kN and for SF is 662 kN and, CDA = 1.0. Design the stringers and the cross-girders. **[17]**

P.T.O.

Q3) a) Explain the functions of top lateral bracings and bottom lateral bracings. **[10]**

b) Determine the forces in the various members of the portal bracing system shown in Fig. 1 and plot the shear force, bending moment and axial force diagram for the member AB. **[15]**

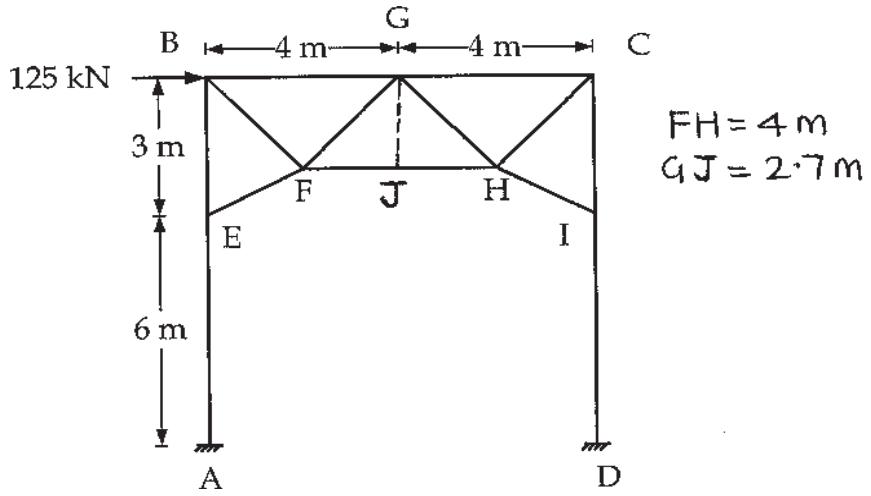


Fig. 1

SECTION - II

Q4) Design the maximum section of the plate girder for the highway bridge having an effective span of 20 m. The bridge carries a carriageway of 7.5 m with two footpaths of 1.5 m on either side. The deck slab is 300 mm thick. The thickness of wearing coat is 80 mm. The bridge is to be supported on 4 number of plate girders spaced at equidistance. The bridge is to be designed for IRC class AA tracked loading as shown in Fig .2 **[25]**

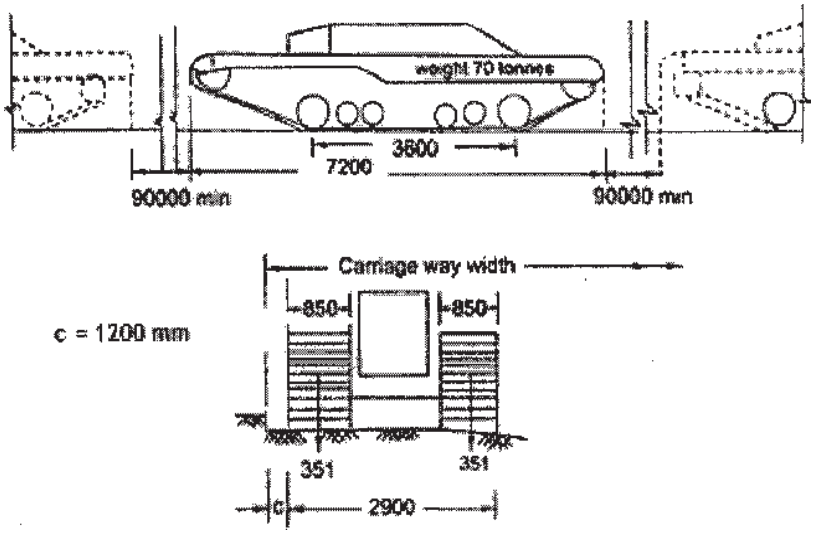


Fig. 2

Q5) The effective span of the through type highway bridge shown in Fig. 3 is 40 m. The c/c spacing of the truss is 11.50 m. The bridge has a carriage way of 7.5 m along with two footpaths of 1.5 m on either side. The thickness of the deck slab is 300 mm. The thickness of wearing coat is 80 mm. The bridge is required to carry IRC class A loading as shown in Fig. 4. **[25]**

Design the member $U_1 L_0$; U_1L_1; U_1L_2 and U_1U_2. Design the joint at U_1 and sketch the details of the connections.

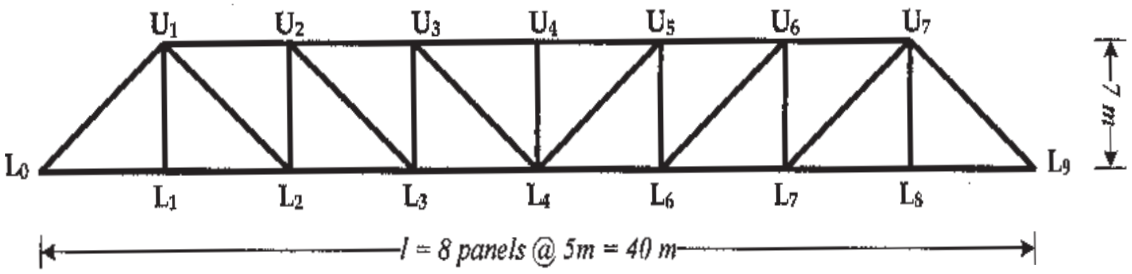


Fig. 3

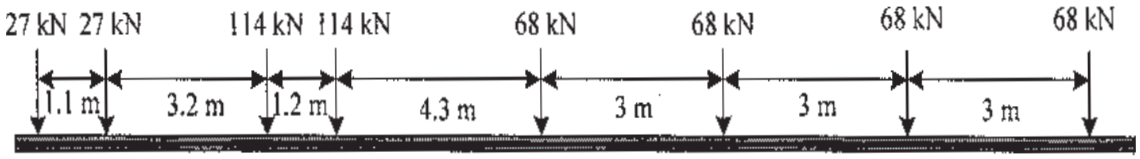


Fig. 4

Q6) a) Explain the various types of end bearings used in steel bridges. **[10]**

b) Explain the factors on which the selection of bearings is made. **[15]**

■■■

Total No. of Questions : 6]

SEAT No. :

P1448

[Total No. of Pages : 2

[4265] - 470

M.E. (Civil - Structures)

BIO MECHANICS & BIO MATERIALS

(2008 Course) (Elective - IV) (Semester - II)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Solve any two questions from each section.***
2) ***Questions to the two sections should be written in two separate answer books.***
3) ***Neat sketches should be drawn wherever required.***
4) ***Your answers will be valued as a whole.***
5) ***Use of non pragrammable calculator is allowed.***

SECTION - I

Q1) a) Classify the bio materials & give example of each & its application. **[6]**

b) Differential Hookean & Non Hookean material with application to bio materials. **[6]**

c) Explain properties of hard tissue (Bone) as bio material from engineering point of view. Also state how hard tissue can be replaced. By artificial bio material. Give suitable illustration. **[7]**

d) What are fixation devices, explain. **[6]**

Q2) a) Explain utility of stainless steel, cromium cobalt & titanium alloyes as bio materials. **[7]**

b) Differentiate Bioinert and Bio degradable ceramics. **[6]**

c) Explain surface reactive ceramics. **[6]**

d) Write a note on deterioration of ceramic. **[6]**

P.T.O.

Q3) a) List the polymeric Bio materials & explain composite bio materials. **[8]**

b) Explain use of ultra high molecular weight polyethelene replacement material for hard tissue.

Comment on its stability in bio active environment. **[8]**

c) Explain particulate composite, fibrous composite and porous composite with reference to utility as bio material. **[9]**

SECTION - II

Q4) a) Explain the importance of the bones is human skeletal body. **[7]**

b) Mention various joints in the human body stating their functions. **[8]**

c) Write down the mechanical properties of bones. **[10]**

Q5) a) Write notes on articular cartilage and the mechanical properties of cartilage. **[9]**

b) Explain the device used for cartilage wear study in vitro. **[9]**

c) Explain functions of skeletal muscles. **[7]**

Q6) a) Draw a neat figure of hip-joint and explain the mechanics of the same. **[11]**

b) What is gait analysis? **[4]**

c) State various technologies used for measurement of body-motion. **[10]**

■■■

Total No. of Questions : 6]

SEAT No. :

P1845

[Total No. of Pages : 2

[4265] - 471-A

M.E. (Civil) (Structures)

THEORY OF PLASTICITY

(2008 Course) (Elective - IV) (Semester - II)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***All questions carry equal marks.***
6) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Derive six compatibility conditions in-terms of strain and check, whether the strain field given by following displacement field is compatible. **[10]**

$u = 0.015x^2y + 0.03$

$v = 0.005y^2 + 0.03xy$

$w = 0.003x^2 + 0.001yz + 0.005$

b) A beam of narrow rectangular cross section of unit width simply supported at the ends loaded by its own weight. Find expressions for displacement component *u* and *v*. **[15]**

Q2) a) Explain uniqueness and stability postulates. **[15]**

b) Explain development of Tressca's yield criteria. **[10]**

Q3) a) The state of stress at a point is given by, $\sigma_x = 0.67 \times 10^3$ kg/cm^2; $\sigma_y = 1.33$ kg/cm^2 and $\tau_{xy} = 0.33$ kg/cm^2. If the yield strength of the material is 1.33 kg/cm^2 in a uniaxial tensile test, determine whether yielding will occur according to Tresca's and Von-Mises yield condition or not. **[10]**

b) Explain plastic deformation of metal by slip and twinning. **[15]**

P.T.O.

SECTION - II

Q4) a) Explain initial and subsequent yield surfaces in tension. **[10]**

b) State and explain theorems of limit analysis. **[15]**

Q5) a) Derive the shape factor for bending of wide plate. **[10]**

b) A rectangular beam 6 *cm* wide and 8 *cm* deep is 1.5 *m* long and is simply supported at the ends. The yield strength for the beam material is 250 *MPa*. Determine the value of concentrated load applied at the beam midspan if

i) The outermost fibre of the beam just starts yielding.

ii) The outer shell upto 2 *cm* depth yields.

iii) Whole of the beam yields. Assume linear stress strain idealized curve for the beam material. **[15]**

Q6) a) Explain Tressca's yield condition in plane stress and plane strain. **[10]**

b) Explain the finite element models for plasticity problems. **[15]**

■■■

Total No. of Questions :6]

SEAT No. :

P1449

[Total No. of Pages : 2

[4265] - 471

M.E. (Civil Structures)

MECHANICS OF MODERN MATERIALS

(2008 Course) (Elective - IV) (Semester - II)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams should be drawn wherever necessary.***
4) ***Use of electronic pocket calculater is allowed.***
5) ***Assume suitable data, if required.***
6) ***Paper will evaluated as a whole.***

SECTION - I

Q1) a) Explain with suitable illustration advantages & disadvantages of FRPC over R.C.C . **[8]**

b) Explain advances and uses of FRPC for commercial & industrial applications. **[8]**

c) Explain in details with classification the materials used in FRC. **[9]**

Q2) a) Explain orthotropy & anisotropy of FRP. Give appropriate elasticity equations. **[9]**

b) Write stiffness matrix for plane stress condition in case of orthotropic material. **[8]**

c) Explain stress - strain behaviour in details for fiber reinforced composite material. **[8]**

Q3) a) Explain stress strain relationship for fiber reinforced laminate. **[10]**

b) Explain theories of failure applicable to fibre reinforced concrete composite. **[15]**

P.T.O.

SECTION - II

Q4) a) Explain with suitable sketch example

i) Orthotropic laminate & Anisotropic laminate.

ii) Symmetric & Balanced laminate.

iii) Ani symmetric cross ply laminate. **[15]**

b) Obtain expression for Naviers equation for orthotropic laminate with two opposite side simply supported. **[10]**

Q5) a) What are factors affecting mechanical behaviour of composite laminate. Explain in details. **[10]**

b) Find the coefficient of thermal expansion for a $[\pm 45^{o}]$ laminate with following properties.

$E_1 = 140$ Gpa $E_2 = 10$ Gpa $E_3 = 7$ Gpa

$v_{12} = 0.29$ $v_{21} = 0.22$

$\alpha_1 = 0.9 \times 10^{-6} / C^{o}$ $\alpha_2 = 27 \times 10^{-6} / C^{o}$ **[15]**

Q6) a) Explain manufacturing process of composite lamina. **[8]**

b) What are the test carries out on composite to establish its mechanical properties. **[9]**

c) Explain high performance composite materials. Its advantages & applications. **[8]**

■■■

Total No. of Questions : 6]

SEAT No. :

P1671

[Total No. of Pages : 3

[4265] - 472

M.E. (Civil) (Structural)

OPTIMIZATION TECHNIQUES

(2008 Course) (Elective - IV) (Sem. - II)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates:

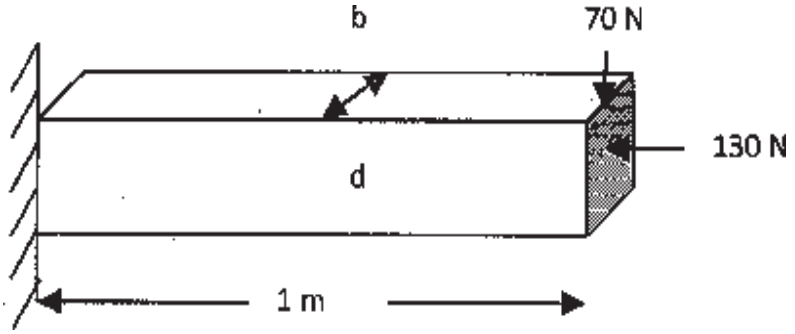
1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answers will be valued as a whole.***
6) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain various engineering applications of optimization. **[6]**

b) Find the maxima and minima of the function. **[6]**
$f(x) = \lambda^3 - 10\lambda - 2\lambda^2 + 10$

c) A beam column of rectangular section is required to carry an axial load of 130 N and a transverse load of 70 N acting as shown in figure. It is to be designed to avoid possibility of yielding and buckling and for minimum weight. Formulate the optimization problem by assuming that the beam column can bend only in vertical plane. The material is of steel with specific weight of 80 kN/m^3, elastic modulus of 2×10^7 kN per square meter and yield stress of 2×10^4 kN/m^2. The width of the beam is required to be at least 1.5 cm and not greater than twice the depth. **[13]**



P.T.O.

Q2) a) Explain Post Optimality Analysis and Bounded Variable Method. **[5]**

b) Minimize the following function with linear programming. **[10]**

$f(x_1, x_2) = 3\,x_1 - 5\,x_2$

s.t. $x_1 + x_2 \leq -2$

$4\,x_1 + x_2 \geq -5$

$x_1 \geq 0$, x_2 – un restricted in sign.

c) Maximize $Z = 15\,x_1 + 6\,x_2 + 9\,x_3 + 2\,x_4$ **[10]**

s.t. $10\,x_1 + 5\,x_2 + 25\,x_3 + 3\,x_4 \leq 50$

$12\,x_1 + 4\,x_2 + 12\,x_3 + x_4 \leq 48$

$7\,x_1 + x_4 \leq 35$

$x_i \geq 0, \qquad i = 1, 2, 3, 4.$

Use revised simplex method.

Q3) a) Find the dimensions of a cylindrical tin (with top & bottom) made up of sheet metal to maximize its volume such that the total surface area is equal to $A_0 = 24\,\pi$. **[9]**

b) Find the value of x in the interval (0, 1) which minimizes the function $f = x\,(x - 1.5)$ to within $\pm$ 0.05 by Fibonacci method. **[8]**

c) Use Golden section method to minimize $z = 10 + x^3 - 2\,x$ in the range (– 5, 5). **[8]**

SECTION - II

Q4) a) Formulate an optimization problem for minimum weight and minimum cost to design a steel beam with a constraint on deflection criteria. **[12]**

b) Minimize $f = 2\,(x_2 - x_1^2)^2 + (1 - x_1)^2$

if a base simplex is defined by the vertices $x_1 = \{0, 0\}$ $x_2 = \{1, 0\}$ $x_3 = \{0, 1\}$. Find a sequence of four improved vectors using reflection, expansion and /or contraction. **[13]**

Q5) a) Minimize $f = 2(x_1^2 + x_2 - 11)^2 + (x_1 + x_2^2 - 7)^2$

s.t. $(x_1 - 5)^2 + x_2^2 - 26 \geq 0$

$x_1, x_2 \geq 0$

Use the interior penalty function method. **[13]**

b) Carry out first three iterations for minimization of the following problem using steepest descent method. Assume $X_0 = 0$,

$f(x) = x_1 - x_2 + x_1^2 - x_1 x_2$ **[12]**

Q6) a) Explain Back-propagation neural network with suitable example of civil engineering. **[10]**

b) What are the basic operations in Genetic Algorithm (GA)? Explain fitness function. **[10]**

c) Write a short note on "Activation Function in ANN". **[5]**

■■■

Total No. of Questions : 8]

SEAT No. :

P1450

[Total No. of Pages : 3

[4265] - 475

M.E. (Civil) (Environmental Engineering)

PHYSICO-CHEMICAL PROCESS FOR WATER AND WASTE WATER TREATMENT

(2010 Course) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from Section - I and Section - II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator and steam table is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Explain water quality index. Discuss the significance of drinking water quality criteria and its importance in the design of drinking water quality standards. **[18]**

Q2) A community discharges 20 MLD of wastewater. Draw a conventional flow diagram for treating this wastewater. Discuss the concepts on which the design of the proposed treatment units is based. **[16]**

Q3) a) Discuss the double layer theory of particle destabilization. **[8]**

b) Comment on following.

i) Tube settler is a high rate clarifier. **[2]**

ii) The efficiency of particle removal in clarifier depends on SOR and is independent of depth or detention time. **[3]**

iii) Detention time and flow through period are same for an ideal settling tank. **[3]**

P.T.O.

Q4) a) Explain the chemical reactions when ferrous sulphate (copperas) is used as a coagulant for raw water **[6]**

i) Containing no natural alkalinity

ii) Containing natural alkalinity, and

iii) Added with lime in the absence of natural alkalinity.

b) A flocculation chamber has dimensions 30 m × 12 m × 4.5 m and receives a flow of 75000 m^3/d at water temperature 20°C ($\mu = 10^{-3}$ N –s/m^2 and p = 1000kg/m^3). It is equipped with 12m long, 0.30 m wide paddles supported to and moved by four horizontal shafts which rotate at a speed of 2.5 rpm. The centerline of the paddles is 1.8 m from the shaft which is at mid- depth of the tank. Two paddles are mounted on each shaft, one opposite to another. If the mean velocity of water is $\frac{1}{4^{th}}$ of velocity of paddles, calculate **[10]**

i) power consumption,

ii) time of flocculation and

iii) Value of velocity gradient.

SECTION - II

Q5) a) How do you determine the loss of head in a filter having stratified bed of nonuniform medium? **[6]**

b) A bed of filter sand 0.75 m deep is composed of uniform particles with diameter 0.5 mm, specific gravity 2.64, and shape factor 0.90. The porosity of packed bed is 0.45. **[10]**

Determine:

i) The backwash velocity at which the filter bed will just begin to fluidize and

ii) Backwash rate and the resulting expanded depth if the filter medium is to be expanded to a porosity of 0.70 by hydraulic backwash.

Q6) a) Explain the relationship between activated sludge settleability and operating food to microorganism ratio for various types of activated sludge processes. **[6]**

b) The municipal sewage flow for a town is 2.5 MLD with an average BOD_5 of 270 mg/L. Assuming 35% BOD removal in primary settling tank and a recirculation ratio of 1:4, calculate the size required for one single stage 2m deep high rate trickling filter to achieve effluent BOD_5 of 30 mg/L. Calculate recirculation required for a hydraulic loading of 125 MLD/Hect. Also determine BOD removal efficiency. **[12]**

Q7) a) Describe the characteristics of a good disinfectant. **[8]**

b) Explain with neat sketch the various zones of settling occurring in a secondary settling tank of activated sludge process. **[8]**

Q8) Discuss the principle of suspended growth process and attached growth process for waste water treatment. Explain in brief various operational problems commonly encountered in activated sludge treatment plants and discuss suitable remedial measures for the same. **[16]**

■■■

Total No. of Questions :10]

SEAT No. :

P1451

[Total No. of Pages : 2

[4265] - 483

M.E. (Civil) (Environmental Engineering)

ENVIRONMENTAL CHEMISTRY & MICROBIOLOGY

(2008 Course) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the importance of Electrical Conductivity, different types of solids and pH of the wastewater in the wastewater treatment and management with suitable example. **[10]**

b) What is Zeta Potential? Explain how it can be used to assess the effectiveness of various coagulation strategies. **[8]**

Q2) Explain the nature of radiation, its impact of human health and uses of isotopes and tracers widely used in environmental engineering? **[16]**

Q3) State the principle and explain Fluorometry with sketch and explain Spectro photometry and its application in environmental analysis? **[16]**

Q4) Explain in detail High Performance Liquid Chromatography and give its limitations. How this limitation been overcome by Gas Chromatography?**[16]**

Q5) Give basic concept of Atomic Absorption Spectrophotometer (AAS) with sketch. Explain Flame photometer in detail with sketch? **[16]**

P.T.O.

SECTION - II

Q6) List out the various enzymes and metabolic reactions and what is their role in the field of environmental microbiology? Explain facultative respiration in wastewater treatment? **[16]**

Q7) Explain principle and application of Microscopy and Micrometry used in Environmental Engineering? Explain isolation of microorganisms. **[16]**

Q8) Explain Culture, Media and Techniques of Staining and Enumeration of microorganism used in wastewater treatments? **[16]**

Q9) Explain in details Biological process (aerobic, anaerobic and natural system) of wastewater and how treatment can be done. **[16]**

Q10) a) How you can treat industrial wastewater and explain industrial microbiology. **[9]**

b) Explain microbiology of soil and air and how it helps in treating different kinds of waste and wastewater which keeps clean environment. **[9]**

■■■

Total No. of Questions : 8]

SEAT No. :

P1531

[Total No. of Pages : 3

[4265] - 504

M.E. (Mechanical) (Heat Power)

PERFORMANCE ASSESSMENT OF MECHANICAL EQUIPMENTS

(2008 Course) (Elective - I(a)) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any two questions from Q. 1 to Q. 3, Q. 4 from Section - I is compulsory.***
2) ***Answer any two questions from Q. 5 to Q. 7, Q. 8 from Section - II is compulsory.***
3) ***Answers to the two sections should be written in separate answer books.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Assume suitable data, if necessary and mention it clearly.***
7) ***Use of logarithmic tables, slide rule, mollier charts, non programmable electronic pocket calculator is allowed.***

SECTION - I

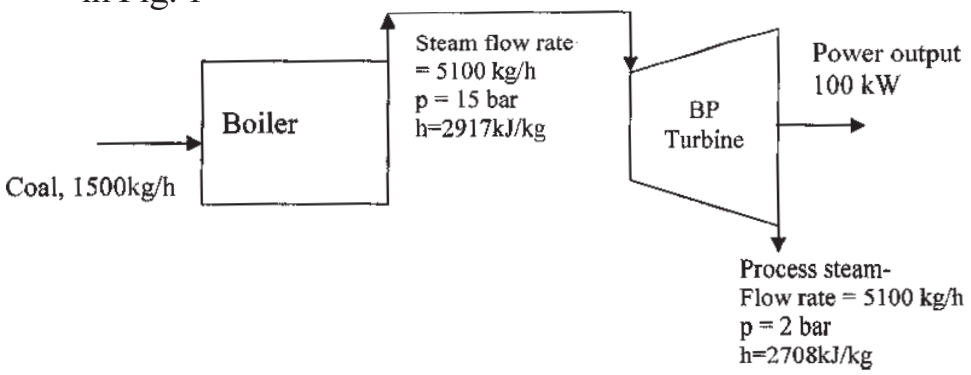
Q1) a) What is the direct method of boiler testing? Explain with suitable example. List its merits and demerits. **[10]**

b) List and explain the factors affecting the boiler performance. **[6]**

Q2) a) Classify the cogeneration system in detail and with neat schematic explain the gas turbine cogeneration system. **[10]**

b) What are the various steam traps? Give its selection criteria. **[6]**

Q3) a) A distillery plant having an average production of 40 KL of ethanol is having a cogeneration system with a back pressure turbine. The plant steam and electrical demand are 5.1 TPH and 100 kW respectively. Gross calorific value of coal is 16700 kJ/kg. The process flow diagram is shown in Fig. 1 **[5]**



P.T.O.

Estimate turbine efficiency and overall plant fuel rate including boiler, if efficiency of turbo alternator, alternator and gear transmission are 34%, 92% and 98% respectively.

b) Discuss the various waste heat qualities with its applications. **[8]**

c) List advantages and disadvantages of combined cycle cogeneration over others. **[3]**

Q4) Estimate the boiler efficiency using indirect method for coal fired boiler. Use the following data. **[18]**

Fuel firing rate	=	5600 kg/hr
Steam generation rate	=	22000 kg/hr
Steam pressure	=	45 bar
Steam temperature	=	377°C
Feed water temperature	=	96°C
%CO_2 in Flue gas	=	14
%CO in flue gas	=	0.55
Average flue gas temperature	=	190°C
Ambient temperature	=	31°C
Humidity in ambient air	=	0.0204 kg/kg dry air
Surface temperature of boiler	=	70°C
Wind velocity around the boiler	=	3.5 m/s
Total surface area of boiler	=	90 m^2
GCV of Bottom ash	=	3350 kJ/kg
GCV of fly ash	=	1890 kJ/kg
Ratio of bottom ash to fly ash	=	90:10
<u>Fuel Analysis (in %)</u>		
Ash content in fuel	=	8.63
Moisture in coal	=	31.6
Carbon content	=	41.65
Hydrogen content	=	2.0413
Nitrogen content	=	1.6
Oxygen content	=	14.48
GCV of Coal	=	14600 kJ/kg

SECTION - II

Q5) a) State the various types of fans used in ventilation systems. Explain their characteristics with their applications. **[8]**

b) Discuss the energy conservation opportunities in compressed air system. **[8]**

Q6) a) Explain in detail the flow control strategies in fan and blower system. **[6]**

b) Explain the procedure for energy performance assessment of DG sets. **[6]**

c) With neat schematic explain compressed air system components. **[4]**

Q7) Write short note on : **[16]**

a) Heat pipe as waste heat recovery device

b) Fuel economy measures in furnaces

c) Energy conservation opportunities in pumping systems

Q8) a) Calculate the flow rate of fan for the following data: **[5]**
Diameter of duct: 0.5 m,
differential pressure: 100mmH_2O,
Density of air at 32°C: 1.293 kg/m^3,
Temperature of air in the duct: 100°C,
Pitot coefficient: 0.85

b) What are the various factors that affect the efficiency of compressed air system? **[6]**

c) Explain: Field testing of fans **[7]**

■■■

Total No. of Questions : 8]

SEAT No. :

P1875

[Total No. of Pages : 3

[4265] - 507

M.E. (Mechanical) (Heat Power)

CONVECTIVE HEAT TRANSFER ANALYSIS

(2008 Course) (Elective - I (d)) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Question no. 1 & 5 are compulsory. Out of remaining, attempt any two Questions from section - I and two questions from section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Experimental tests on a portion of the turbine blade indicates a heat flux to the blade of q" = 95000 w/m^2. To maintain a steady state surface temperature of 800°C heat transferred to the blade is removed by circulating a coolant inside the blade. **[10]**

i) Determine the heat flux to the blade if its temperature is reduced to 700°C by increasing the coolant flow.

ii) Determine heat flux at the same dimensionless location for a similar turbine blade having a chord length L = 80 mm, when the blade operates in an airflow at T_∞ = 1150°C and V = 80 m/s with T_s = 800°C.

b) Define any four dimensionless terms: Gratez number, Jacob number, Grashof number, Peclet no, Reynols no., Colburn facor. **[8]**

Q2) a) Write note on Navier Stoke's equation. **[6]**

b) q Derive the generalized differential equation of convection in cartesian co-ordinates for steady flow. **[10]**

P.T.O.

Q3) Write detailed notes on: **[16]**

a) Combined Convection

b) Convective heat transfer through porous media.

Q4) a) Explain hydrodynamic boundary layer and thermal boundary layer. **[6]**

b) Air at pressure of 6 kN/m^2 and a temperature of 300^{o}C flows with a velocity of 10 m/s over a flat plate 0.5 m long. Estimate the cooling rate per unit width of the plate needed to maintain it at a surface temperature of 27^{o}C. For air $T_f = 437$ K, p = 1 atm, $\gamma = 30.84 \times 10^{-4}$ m^2/s, k = 36.4×10^{-3} W/m, Pr = 0.687. Properties such as k, Pr, μ may be assumed to be independent of pressure and γ depends on density and pressure. Approximate correlation is given as $\overline{N}_u = 0.664 R_e^{1/2} P_r^{1/3}$. **[10]**

SECTION - II

Q5) Discuss in detail the problem of Natural Convection Heat Transfer from a heated vertical plate. Using either the exact solution approach or Integral Method approach, obtain the expression for local and average Nusselt number. List the assumptions made. **[18]**

Q6) a) A glass door firescreen used to reduce exfiltration of room air through a chimney, has a height of 0.71 m and width of 1.02 m and reaches a temperature of 232°C. If the room temperature is 23°C. Estimate the convective heat from the fireplace to room. $T_f = 400$ K, k = 33.8×10^{-3} w/m.k $\upsilon = 26.4 \times 10^{-6}$ m^2/s, $\alpha = 38.3 \times 10^{-6}$ m^2/s, Pr = 0.690, $\beta = (1/T_f) = 0.0025 k^{-1}$ Use the correlation given as : **[10]**

$$\overline{Nu}_L = \left\{ 0.825 + \frac{0.387 Ra_L^{\frac{1}{6}}}{\left[1 + \left(\frac{0.49}{Pr} \right)^{\frac{9}{16}} \right]^{\frac{8}{27}}} \right\}^2$$

b) Discuss the problem of turbulent flow over a flat plate and associated heat transfer problem. **[6]**

Q7) Write detailed notes on : **[16]**

a) Combined Convection.

b) Convective heat transfer through porous media.

Q8) a) Explain Nusselt theory of film condensation, write a note on film wise and drop wise condensation. **[7]**

b) Explain with neat sketches, three typical practical examples of condensation heat transfer. **[9]**

■■■

Total No. of Questions : 8]

SEAT No. :

P1789

[Total No. of Pages : 2

[4265] - 50

M.E. (Mech-Heat Power Engg.)

ADVANCED THERMODYNAMICS

(2002 Course)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) Write notes on : **[10]**

i) Reduced properties & compressibility chart.

ii) Vander Waal's equation & its significance

b) Find the value of compressibility factor (Z) for steam in the following conditions: **[8]**

i) Steam at 20 bar and 300°C

ii) Steam at 100 bar and 500°C

Q2) a) 900 kg of flue gases per hour are used to heat the feed water at 45°C at the rate 600 kg per hour Hot gases are cooled from 410°C to 265°C. Find the loss of availability during the process. Take specific heats for gases and water as 1.1 kJ/kgk and 4.18 kJ/kgk, respectively surroundings are at 20°C. **[10]**

b) Explain : **[6]**

i) availability of closed system

ii) second law efficiency.

P.T.O.

Q3) a) Discuss Max well relations & its significance. **[8]**

b) Derive the clausius - clayperon equation from fundamentals and state its significance. **[8]**

Q4) Write short notes on (any three) : **[16]**

a) P-V-T surface of water

b) Inversion curve

c) Gibb's phase rule

d) Third law of thermodynamics

SECTION - II

Q5) Discuss the followings : **[16]**

a) Fugacity & activity

b) Adiabatic flame temperature

c) Mass fraction and mole fraction

d) Equilibrium constant

Q6) a) Describe the concept of heat of reaction. When it is positive & negative? **[6]**

b) Explain the following : **[10]**

i) Actual and stoichiometric Air-fuel ratio.

ii) Law of mass action.

Q7) a) Octane is burned with 300 percent theoretical air. Determine the volumetric & gravimetric analysis of products. **[10]**

b) Explain : **[6]**

i) Amagat's law

ii) Dalton's law of partial pressure

Q8) Write short notes on (any three) : **[18]**

a) Fermi-Dirac statistics

b) Bose-Einstein statistics

c) Degree of dissociation

d) Statistical interpretation of IInd law.

■■■

Total No. of Questions : 8]

SEAT No. :

P1534

[Total No. of Pages : 3

[4265] - 514

M.E. (Mechanical) (Heat Power Engineering)

ADVANCED FLUID MECHANICS

(2008 Course) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer three questions from Section - I and three questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is ideal flow? Explain in detail the concept of ideal fluid flow. Give 2 examples of ideal fluid flow used in practice. **[6]**

b) Explain the concept of stress tensor . Comment on to the properties of the stress tensor in the context of expressing stresses in terms of velocity components. **[6]**

c) Derive the expression for the substantial derivative $\frac{Du}{Dt}$. **[6]**

Q2) a) For steady incompressible flow with negligible viscosity, show that the Navier-stokes equation reduce to the condition,

$$\frac{P}{\rho} + \frac{v^2}{2} + gh = \text{constant}$$

along a streamline of the flow, where h denotes the height of the fluid particle above a horizontal datum. **[8]**

P.T.O.

b) The flat plate is moving at a velocity of U = 5 m/s on top of a 10mm thick oil film. The density of the oil is $\rho = 920$ kg/m^3 and dynamic viscosity $\mu = 0.4$ kg/m-s. Also there is a favorable pressure gradient of $dp/dx = -2\mu U/h^2$. Calculate the average and maximum forward velocity of the oil film, the flow rate, the force required to pull the upper plate (per 1m^2). '*h*' is the distance between moving plate and stationary plate. Assume laminar flow between the plates. **[8]**

Q3) An infinite, incompressible fluid is resting on a flat horizontal plate located at $y = 0$ and stretching to infinity in each direction. At time $t = 0$ the plate is given a velocity U_0. Show that Navier-stokes *x* momentum equation reduces to

$\frac{\partial u}{\partial t} = \gamma \frac{\partial^2 u}{\partial y^2}$ (Assume $\partial P / \partial x = 0$) and that the velocity at any point in the fluid at time t is given by $u(y, t) = U_0 - \frac{2U_0}{\sqrt{\pi}} \int_0^n e^{-\eta^2} d\eta$ where $\eta = \frac{y}{2\sqrt{\gamma t}}$ **[16]**

Q4) a) Using Blasius flow over a flat plate, derive Falkner-skan equation and calculate wall shear stress for wedge flows. **[10]**

b) A thin plate, 3m long and 1m wide, is towed through a viscous liquid with a speed of 200mm/s. The force required to tow the plate is 30N. Estimate the viscosity of the liquid if the flow remains laminar. ($\rho = 750$ kg/m^3) **[6]**

SECTION - II

Q5) a) Convert Navier-Stokes continuity and momentum equations into mean motion of Turbulent flow. **[8]**

b) Water is flowing through a rough pipe, 800mm in diameter, at the rate of 2m^3/s. Calculate the power loss in overcoming friction per km length of the pipe, if the roughness element height $\varepsilon = 0.5$ mm. Also, calculate the maximum velocity. **[8]**

Given -

friction factor = $f = \left[2 \log_{10} \frac{R}{\varepsilon} + 1.74\right]^{-2}$

$$\frac{u_{max}}{u_*} = 8.5 + 2.5 \log_e \frac{R}{\varepsilon}$$

Where, $u_* = \sqrt{\frac{\tau_{wall}}{\rho}}$, R = Radius of pipe

Q6) a) Explain in brief 'Prandtl's Mixing length hypothesis'. **[8]**

b) A wind tunnel has a cross-section of 1m × 1m at its inlet and a length of 10m. Air enters the tunnel at a uniform velocity of 15m/s. Determine the cross-sectional dimensions at the end of the test section which results in zero Pressure gradient along the length. Assume $1/7^{th}$ power law velocity distribution in turbulent boundary layer and take kinematic viscosity of air as 1.53×10^{-5} m^2/s. **[8]**

Q7) a) Explain the difference between wall turbulence and free turbulent shear flow. Give two examples of each. **[6]**

b) List any 4 assumptions of the boundary layer theory. **[6]**

c) Explain k - epsilon model in turbulent flow. **[6]**

Q8) a) What do you mean by 'chocking in nozzle'. **[4]**

b) Construct an infinitesimal control volume across a shock. Perform mass, momentum and energy balance across the same. **[8]**

c) Derive expressions for $\frac{T_0}{T}$ and $\frac{P_0}{P}$ for compressible flow, where T_0 and P_0 are the stagnation temperature and Pressure respectively. **[4]**

■■■

Total No. of Questions : 8]

SEAT No. :

P1761

[Total No. of Pages : 2

[4265] - 519

M.E. (Mechanical - Heat Power Engg.)

COMPUTATIONAL FLUID DYNAMICS

(2008 Course) (Elective - IV (b)) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary and mention it clearly.***

SECTION - I

Q1) a) Elaborate the CFD simulation process and the use of CFD technique in modern research. **[10]**

b) Discuss conservation & non conservation form of equations in CFD**.[6]**

Q2) a) Classify following equations : **[6]**

i) $\frac{\partial^2 f}{\partial x^2}+\frac{\partial^2 f}{\partial y^2}=0$ ii) $\frac{\partial f}{\partial t}=\frac{\partial^2 f}{\partial x^2}$

iii) $a^2\frac{\partial f}{\partial x^2}-\frac{\partial^2 f}{\partial t^2}=0$

b) Discuss the behaviour of hyperbolic equations in 2 D & 3 D by suitable sketches of characteristic lines. **[12]**

Q3) a) Explain the polynomial approach to obtain finite difference at the boundary. **[10]**

b) Discuss advantages & disadvantages of explicit & implicit approach.**[6]**

P.T.O.

Q4) a) Obtain the stability criterion for the first order linear wave equation

$$\partial u / \partial t + c \frac{\partial u}{\partial x} = 0$$ Where c = Constant >0 **[10]**

b) What is adaptive grid state its usefulness. **[6]**

SECTION - II

Q5) Consider thermally developing flow and hydrodynamically fully developed flow inside a 2D channel. **[16]**

a) Write governing equation with boundary conditions.

b) Write equation in discretised form.

c) Present the solution method.

Q6) Explain in detail the Finite volume method for the solution of 1D steady state diffusion equation. **[16]**

$$\frac{d}{dx}\left(\Gamma \frac{d\phi}{dx}\right) + S = 0$$

Where Γ = is diffusion coefficient, k = thermal conductivity ans S = source term. Take ϕ_a and ϕ_b as boundary conditions.

Q7) a) Write down the Navier Stokes equations for incompressible flow. Develop the solution algorithm for the same. **[12]**

b) State the Artificial viscosity of numerical scheme and its significance. **[4]**

Q8) Write short notes on any two : **[18]**

a) SIMPLE algorithm.

b) Types of Grids & Grid generation process.

c) ADI Technique

■■■

Total No. of Questions : 10]

SEAT No. :

P1716

[Total No. of Pages : 4

[4265] - 522

M.E. (Mechanical - Design Engineering)

ADVANCED STRESS ANALYSIS

(2008 Course) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Derive the compatibility equation in Cartesian co-ordinate system. **[8]**

b) Investigate what problem of plane stress is represented by the function.

$$\phi = \frac{3f}{4h}\left(xy - \frac{xy^3}{3h^2} \right) + \frac{p}{2}y^2$$

where, h is half depth of the beam; and f as the concentrated load. **[9]**

Q2) a) A shaft of elliptical section is subjected to torque of 2.5 kN-m. If the maximum shear stress in the shaft is not to exceed 80 MN/m^2; determine:

i) The major and minor axis, if major axis = 1.5 minor axis.

ii) The angular twist per metre length. Take G = 80 GN/m^2. **[7]**

b) Load P = 2000 N acts at the end 'A' of a structure shown in Fig. 1. Calculate the vertical and horizontal deflection of end 'A' ; if cross section area of member AB and BC is 20 mm × 20 mm; L_1 = 600 mm and L_2 = 400 mm; Take E = 2.1 × 10^5 N/mm^2 . Use castigliano's theorem. **[10]**

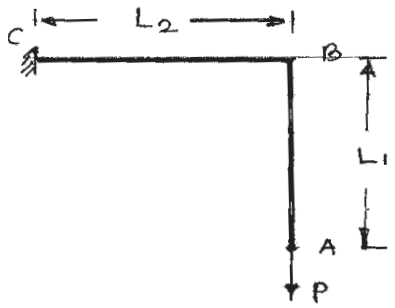


Fig. 1.

P.T.O.

Q3) The three tubular section A, B, C as shown in Fig. 2; all have same wall thickness 't' and made of same width of the plate, i.e. they have same circumference. Length of all tube is same. Neglecting stress concentration find the ratio of shear stresses for the three sections if;

i) all are subjected to same twisting moment.

ii) all have equal angle of twist. **[16]**

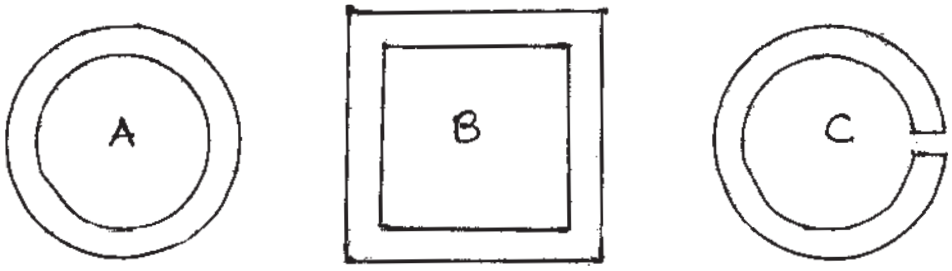


Fig. 2.

Q4) The following data refers for two surfaces of semi circular discs at the point of contact. **[16]**

$R_1 = 60$ mm; $R_1' = 130$ mm

$R_2 = 80$ mm; $R_2' = 200$ mm,

Where, R and R′ are minimum & maximum radii of curvature; subscripts 1 and 2 denote contacting bodies 1 and 2.

The angle α between the planes of minimum curvature is 60^o. If a load of P = 4.5 kN is applied, determine the maximum principal stress, maximum shearing stress and locate the point where each of these stresses occur. Also calculate the distance that the two discs move towards each other because of load 'P' . Take $E_1 = E_2 = 200$ GPa; and $\upsilon_1 = \upsilon_2 = 0.29$. Use the following relations;

- $\Delta = 2\dfrac{\left(1-\upsilon^2\right)}{E}$
- The coefficients '*m*' and '*n*' are constants depends on the ratio (B –A) /(B + A) where A & B are the constants depends upon the principal radii of curvature of the two bodies at the point of contact.
- $\text{Cos}\,\theta = B - A \big/ B + A$
- Table 1 – Values of *m* and *n*

θ	65°	75°	80°	85°	90°
m	1.378	1.202	1.128	1.061	1.000
n	0.759	0.846	0.893	0.944	1.000

Q5) Explain the importance of bending axis and shear center for thin walled section elements. Derive an expression and locate shear center for c channel section shown in Fig. 3. **[16]**

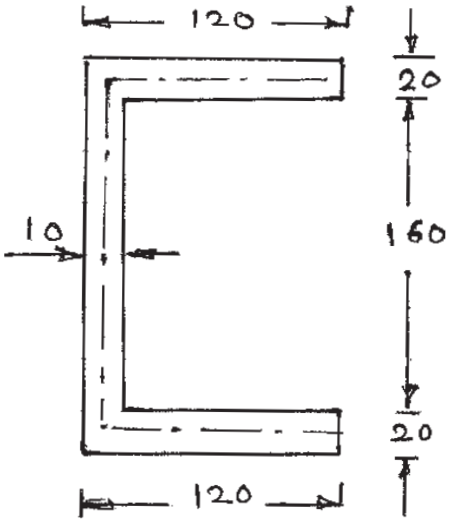


Fig. 3. All dimensions are in mm

SECTION - II

Q6) Derive the governing equations for evaluation of stresses and deflections in circular plate with edge simply supported and subjected to central force 'P'. State any assumptions made while deriving the equation and explain limitations. **[16]**

Q7) a) A tube of 96 mm diameter is used to reinforce a tube of 48 mm internal diameter and of 72 mm outer diameter. The compound tube is made to with stand an internal pressure of 600 MPa. The shrinkage allowance is such that the final maximum stress in each tube is the same. Determine the stress and plot a diagram to show the variation of Hoop's stress in the two tubes.

(Take E = 208 GPa) **[10]**

b) Explain disc with variable thickness considering suitable example. **[7]**

Q8) a) Laminate of composite has fracture toughness of K_{IS} = 35 MPa-$m^{1/2}$ and tensile strength 550 MPa. A 25 mm width. (b) Structural element made from this Material has an edge crack at length. (a) of 3 mm. Find the critical tensile stress that would cause unstable propagation of the crack. For the geometry this specimen stress intensity factor is, **[8]**

$K_{IS} = f(a/b)\sigma\sqrt{\pi a}$, where

$f(a/b) = 1.12 - 0.231\ (a/b) + 10.55\ (a/b)^2$.

b) Explain different modes of fracture and write equations for stress at a point in front of crack tip. **[8]**

Q9) a) Explain the terms isoclinics and isochromatics in photo elasticity. **[5]**

b) Explain desirable properties of strain gauge material. **[4]**

c) A 120 ohm metallic strain gauge having gauge factor of 2.0 is mounted on steel member having yield strength 200 MPa and modulus of elasticity 2.1×10^5 MPa. What maximum change of resistance of strain gauge do you expect? How the Poisson's ratio and transverse sensitivity affect this change? **[8]**

Q10) a) Explain the principle and working of circular polariscope. **[6]**

b) What is the importance of shape factor. **[2]**

c) Determine the shape factor of a T-section beam of dimensions $120 \times 160 \times 12$ mm as shown in fig. No. 4. **[8]**

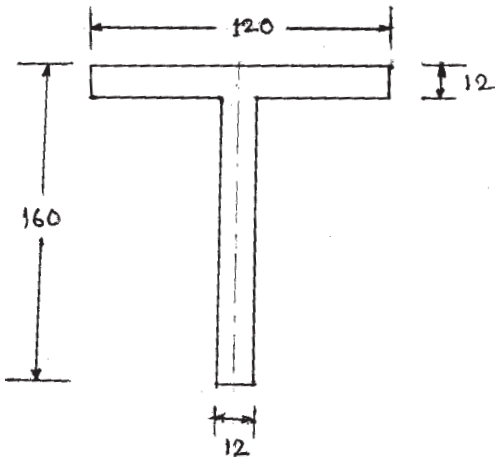


Fig. 4.

■■■

Total No. of Questions : 10]

SEAT No. :

P1536

[Total No. of Pages : 2

[4265] - 532

M.E. (Mechanical) (Design Engineering)

ANALYSIS AND SYNTHESIS OF MECHANISMS

(2008 Course) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer three questions from Section - I and three questions from Section - II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rules and electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is Kutzbach's criterion for degree of freedom of plane mechanisms? In what way Gruebler's criterion is different from it? **[8]**

b) Explain Grubbler criterian for spatial mechanism and reduce the form to apply for planer mechanism. **[8]**

Q2) In the mechanism as shown in fig.1 ω_2 = 10 rad/s anticlockwise constant. Determine ω_4, ω_6 and α_6 using method of normal acceleration. Link lengths are O_2A = 75 mm, AB = 50 mm, BC = 75 mm, O_5C = 75 mm, BD = 50 mm, CD = 100 mm, O_6D = 50 mm and O_2O_5 = 75 mm. **[16]**

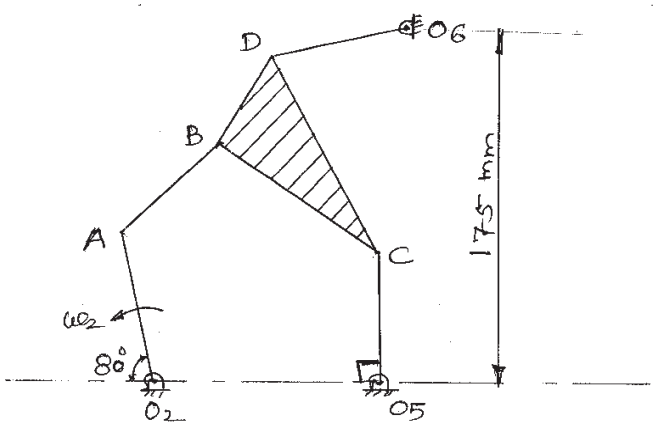


Fig.1

P.T.O.

Q3) a) Derive the Euler - Savary equation. **[8]**
b) Explain dynamics of mechanism with elastic links. **[8]**

Q4) a) Explain fixed centrode and moving centrode with suitable example. **[8]**
b) State and prove the condition to be satisfied by four bar mechanism, so that the coupler curve is symmetric. **[8]**

Q5) Write short notes on (any three) : **[18]**
a) Analysis of mechanism by matrix method.
b) Cubic of stationary curvature.
c) Bobillier construction.
d) Auxiliary point method for analysis of complex mechanisms.

SECTION - II

Q6) a) What do you mean by Function generation, Path generation and body guidance. **[6]**
b) Using Freudenstein equation, design a four bar mechanism to generate the function $y = x^{1.4}$ for an interval in x from 1 to 4. The input link is to start from 30^o and is to have a range of 90^o, the output link is to start from 90^o and is to have a range of 90^o. Use three point Chebychev spacing. Take the length of fixed link AD as 50 mm. **[10]**

Q7) a) What do you mean by Dyad? How it is used in synthesis. **[6]**
b) Determine the link lengths of a four bar linkage using Freudenstein's equation that satisfies following specifications in one of its position.
$\theta_2 = 60^o$, $\omega_2 = 5$ rad / s, $\alpha_2 = 2$ rad / s^2.
$\theta_4 = 90^o$, $\omega_4 = 2$ rad / s, $\alpha_4 = 7$ rad / s^2. **[10]**

Q8) a) Explain the complex number method of synthesis. **[8]**
b) Derive expressions for the link lengths of a four bar mechanism which would satisfy prescribed values of angular velocities and accelerations of its moving links. **[8]**

Q9) a) Explain with the neat sketch the D-H parameters for the pair of link of spatial mechanism. **[8]**
b) State and prove the 'Robert - Chebychev' theorem. **[8]**

Q10) Write short notes on (any three) : **[18]**
a) Bermester point;
b) Synthesis of dwell mechanism.
c) Centre point and circle point curves.
d) Branch and order defects.

■■■

Total No. of Questions : 10]

SEAT No. :

P1537

[Total No. of Pages : 4

[4265] - 533

M.E. (Mechanical) (Design Engineering)

RELIABILITY ENGINEERING

(2008 Course) (Elective - III (a)) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Use non-programmable electronic calculators is allowed.***

SECTION - I

Q1) a) What is mean by failure density & Hazard Rate? Calculate failure density, Hazard Rate and reliability for the survival data of 200 components tested simultaneously for 100 hrs. Plot the functions against time. **[10]**

Operating Time (hours)	0	10	20	30	40	50	60	70	80	90	100
Number of surviving Components	200	180	170	145	130	105	95	80	72	66	50

b) Calculate the reliability of the system shown in Fig. 1 in which the numbers in the blocks shows reliability of individual element. **[8]**

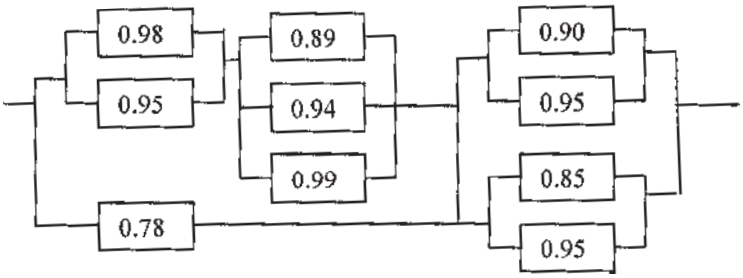


Fig. 1

P.T.O.

Q2) a) A component has normal distribution of failure times with $\mu = 25000$ cycles and $\sigma = 2500$ cycles. Find the reliability of the component and the hazard function at 22500 cycles. **[8]**

Z	–0.5	0.5
Φ(Z)	0.3521	0.69146

b) In a truncated time test 35 hours has been taken as the time limit. Assuming three parameter Weibull distributions with a location factor as 5 hour and scale factor 20. Find out the variation of reliability against time if shape factor is taken as 1. **[8]**

Q3) a) What is meant by Redundancy in a system? Explain the significant difference between active, partially active and passive redundancy. **[6]**

b) Find the reliability of system shown in Fig. 2 using conditional probability method. The values in the blocks show reliabilities of each element.**[10]**

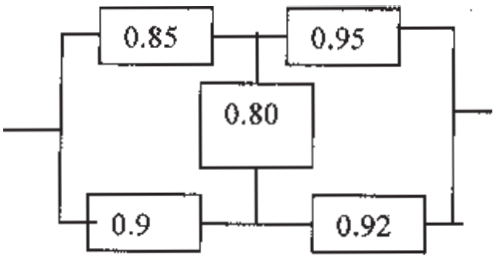


Fig. 2

Q4) a) Explain the difference between Predictive Preventive Maintenance and Periodic Preventive maintenance. **[8]**

b) If in a system we need at least one out of 3 units to operate for the successful working of the system, then prove that the system reliability can be written as:

$Rs(t) = 3\ e^{-\lambda t} - 3\ e^{-2\lambda t} + e^{-3\lambda t}$

Where λ-constant failure and t-mission time. **[8]**

Q5) Write short notes on (any three) : **[18]**

a) Probability Distributions

b) Life characteristic phases.

c) Availability & its type

d) MTBF & Reliability relationship

e) Markov chain analysis.

SECTION - II

Q6) a) A Logic gate diagram for FMEA study has been shown in Fig. 3. The basic failure modes of A,B and C have failure rates 0.002, 0.003 and 0.004 per hour resp. Find out the failure rate of T_0. Assume mission time of 100 hrs. **[10]**

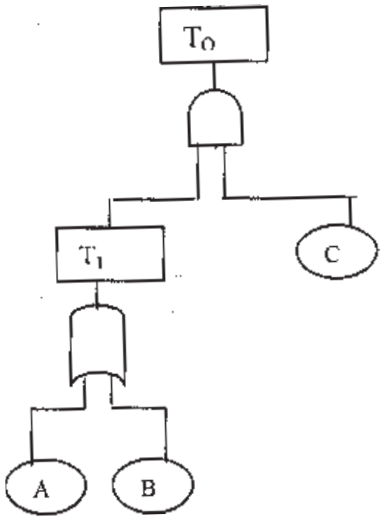


Fig. 3

b) Explain ARINC method of reliability allocation. **[8]**

Q7) a) The stress developed in an engine component is known to be normally distributed with a mean of 350 MPa and std. deviation of 35 MPa. The material strength distribution based on the expected temperature range and various other factors, is known to be normal with a mean of 820 MPa and std. deviation of 80MPa. Calculate factor of safety and Reliability of component.
If poor heat treatment and larger variation in environmental temperatures cause the std. deviation for the strength of the component to increase to 150 MPa, calculate the reliability. **[8]**

b) The following data refer to predicted reliability of six components in series. In case the desired reliability of the system is not fall below 0.85 find the reliability goal for individual components. **[8]**

Components	1	2	3	4	5	6
Predicted reliability	0.994	0.998	0.990	0.996	0.990	0.980

Q8) a) An aircraft consists of three engines-independent, active and identical. At least one engine must operate successful for the aircraft to fly successfully. The average failure rate of each engine is 0.009 failures/ hour. Compute reliability of the aircraft for an 10-hour flying mission. **[8]**

b) A system consists of 5 sub-systems in series. The system reliability goal is 0.98 for 20 hours mission time. Each sub-system consists of some number of modules. The following data are available. **[8]**

Subsystem (i)	Number of Modules (Ni)	Importance factor (Wi)	Operating Time (ti) hours
1	25	1.00	20
2	80	0.97	18
3	45	1.00	20
4	60	0.93	18
5	70	1.00	20

Find the individual reliabilities of the sub-systems.

Q9) a) Explain briefly the various methods of assessing reliability of a component through accelerated tests. **[8]**

b) Explain Tie Set & Cut Set method of reliability evaluation. **[8]**

Q10) Write short notes on (any three) : **[18]**

a) Minimum Effort method

b) Ishikawa Diagram

c) FMECA

d) Reliability Growth Testing

e) Safety Factor & Safety Margin

■■■

Total No. of Questions : 10]

SEAT No. :

P1820

[Total No. of Pages : 2

[4265] - 538

M.E. (Mechanical) (Design Engg.)

COMPUTER AIDED ENGINEERING (OPEN (SELF STUDY))

(2008 Course) (Elective - IV (c)) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any THREE questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Justify modeling and simulation as a design procedure with simple example. **[8]**

b) Enlist data exchange issue related to analysis and simulation. **[8]**

Q2) a) Explain the setup procedure required by the system before constructing the geometric model? Enlist the corresponding command sequence. **[8]**

b) Explain the requirements for the development of successful design project using CAE software. **[8]**

Q3) a) Explain the typical common observations made by CAE engineer before start meshing. **[8]**

b) Explain the importance of convergence criteria used in finite element analysis. **[8]**

Q4) a) Explain typical issues in contact analysis in FEA software's. **[8]**

b) Differentiate between static, dynamic and fatigue analysis used in FEA. **[8]**

P.T.O.

Q5) Write short notes on:

a) Topology optimization in FEA Software. **[6]**

b) Assembly modeling approaches. **[6]**

c) Analytical techniques for structural systems. **[6]**

SECTION - II

Q6) a) Explain various descretization techniques used in CFD analysis. **[8]**

b) Explain some of the quality checks used for checking 2D mesh. **[8]**

Q7) a) Discuss the conditions that are required to satisfy approximate functions used in variational methods of approximation. **[8]**

b) Enlist general considerations used during mesh generation related to discretization and generation of finite element data. **[8]**

Q8) a) Explain general procedure for transient response analysis used in FEA. **[8]**

b) Discuss the criteria used for the selecting the element type for meshing. **[8]**

Q9) a) Explain finite volume method used in CFD and how it is different from FEM. **[8]**

b) Explain different types of grids used in CFD. **[8]**

Q10) Write short notes on :

a) Uniform and compressed grids used in CFD. **[6]**

b) Checks for Tetra 3D meshing techniques. **[6]**

c) Thermal analysis in CAE. **[6]**

■■■

Total No. of Questions : 8]

SEAT No. :

P1765

[Total No. of Pages : 2

[4265] - 553

M.E. (Mechanical) (Mechatronics)

EMBEDDED SYSTEMS

(2008 Course) (Elective - IV (a)) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answers to the two sections must be written in separate answer books.***
2) ***Answer any three questions from each section.***
3) ***Figure to the right indicates full marks.***

SECTION - I

Q1) a) Compare embedded operating system and conventional operating system. **[8]**

b) Define embedded system? List important characteristics of an embedded system. **[8]**

Q2) a) What are functional and nonfunctional requirements during development of embedded systems? **[8]**

b) Explain hardware architecture of embedded system. **[8]**

Q3) a) Describe different types of memories in context of embedded system. **[8]**

b) Explain different factors to be considered while selecting memory for an embedded system with examples. **[8]**

Q4) Write short notes on : **[18]**

a) Design Metrics

b) Protocol architecture of bluetooth.

c) CAN bus protocol.

P.T.O.

SECTION - II

Q5) a) With suitable example. Explain how shared data problem can be solved using semaphores. **[8]**

b) Explain the necessity of code optimisation in Embedded System design. Explain important code optimisation guidelines? **[8]**

Q6) a) Explain I2C bus protocol with its timing diagram and list out its features. **[8]**

b) Explain the software architecture of Embedded System. **[8]**

Q7) a) With the help of block diagram explain design of digital camera. **[8]**

b) Explain round robin architecture. What are its disadvantages? **[8]**

Q8) Write short notes on : **[18]**

a) Adaptive Cruise Control

b) Smart Card

c) RTOS

■■■

Total No. of Questions : 10]

SEAT No. :

P1721

[Total No. of Pages : 3

[4265] - 557

M.E. (Mechanical) (Automotive Engineering)

AUTOMOTIVE ENGINE DESIGN

(2008 Course) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of design data handbook, logarithmic tables, slide rule, and non-programmable electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) The following observations were recorded during a trial on a 4-stroke diesel engine:

- Power absorbed by non-firing engine when Driven by an electric motor = 10 kW
- Speed of the engine = 1750 rpm
- Brake torque = 327.4 Nm
- Fuel used = 15 kg/hr.
- Calorific value of fuel = 42000 kJ/kg
- Air supplied = 4.75 kg/min.
- Cooling water circulated = 16 kg/min.
- Outlet temperature of cooling water = 65.8^{o}C
- Temperature of exhaust gas = 400^{o}C
- Room temperature = 20.8^{o}C
- Specific heat of water = 4.19 kJ/kg.K
- Specific heat of exhaust gas = 1.25 kJ/kg.K

Determine :

i) bp,

ii) Mechanical efficiency,

iii) bsfc,

iv) Draw up heat balance sheet on kW basis. **[16]**

P.T.O.

OR

Q2) a) Explain the operating variables that affect performance of CI engine. **[8]**

b) A four-cylinder automotive spark-ignition square engine is being designed to provide a maximum brake torque of 115 N-m in the mid-speed range (= 4000 rev/min). Estimate the required engine displacement, bore and stroke, and the maximum brake power the engine will deliver. Assume bmep at the maximum engine torque point is 950 kPa and maximum mean piston speed, 14.5 m/s. **[8]**

Q3) a) A multi-cylinder engine is to run at a constant load at a speed of 3000 rpm. Dimensions of the cast iron flywheel rim are, breadth = 120 mm, radial thickness = 60 mm and mass is 105 kg. The density of cast iron is 7355 kg/m^3, and its allowable stress in tension is 95 MPa. Find factor of safety considering stress due to centrifugal force. **[8]**

b) Describe the type of forces acting on crankshaft. **[8]**

OR

Q4) Stresses recorded at a highly stressed point on crankshaft undergoing cyclic loading are σ_{max} = 415 MPa and σ_{min} = –135 MPa. For the material, S_{ut} = 550 MPa, S_y = 455 MPa, a fully corrected endurance limit, Se = 275 MPa, and f = 0.89. Estimate the number of cycles to a fatigue failure using:

a) Modified Goodman criterion.

b) Gerber criterion. **[16]**

Q5) Write short notes on : **[18]**

a) Equivalent conditions and properties of theoretically similar engines.

b) Fatigue life estimation of crank shaft.

c) Forces acting on connecting rod.

SECTION - II

Q6) The design diagram of a camshaft can be considered as a free two-support beam loaded where the follower exerts maximum force of 2.5 kN on the cam at distance of 3 cm from left support. Length of camshaft span in 10 cm, outer diameter of camshaft is 3.5 cm. Find the inner diameter of the camshaft for permissible deflection of 0.00028 mm. Take E = 210 GPa. **[16]**

OR

Q7) a) Explain the causes of torsional vibrations in crankshaft and methods to reduce it. **[8]**

b) Why balancing of the crankshaft is necessary? Explain how the balancing is done with neat sketch. **[8]**

Q8) A 4-cylinder engine and flywheel coupled to a propeller are approximated to a 3-rotor system in which the engine is equivalent to a rotor of moment of inertia 815 kg-m^2, the flywheel to a second rotor of 315 kg-m^2 and the propeller to a third rotor of 22 kg-m^2. The first and the second rotors being connected by 45 mm diameter and 2 m long shaft and the second and the third rotors connected by a 40 mm diameter and 2 m long shaft. Neglecting the inertia of the shaft and taking its modulus of rigidity as 83 GPa, determine

a) natural frequencies of torsional oscillation and

b) the positions of the nodes. **[16]**

OR

Q9) A four cylinder vertical engine has cranks 135 mm long. The planes of rotation of the first, second and fourth cranks are 300 mm, 150 mm and 150 mm respectively from the third crank and their reciprocating masses are 55 kg, 65 kg and 55 kg respectively. Find the mass of the reciprocating parts for the third cylinder and the relative angular positions of the cranks in order that the engine to be in complete primary balance. **[16]**

Q10) Write short notes on : **[18]**

a) Design requirements of CI engine combustion chamber

b) Design requirements of Intake Manifold

c) Fuel injection system in SI engine

■■■

Total No. of Questions : 9]

SEAT No. :

P1544

[Total No. of Pages : 3

[4265] - 560

M.E. (Mechanical) (Automotive Engineering)

FINITE ELEMENT METHOD

(2008 Course) (Elective - I (b)) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

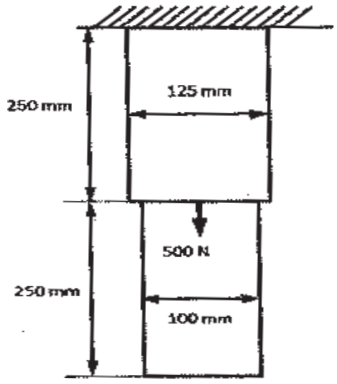
Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answer three questions from Section - I and three questions from Section - II.***
3) ***Answers to the two sections should be written in separate books.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Write a short note on Procedure of FEM. **[6]**

b) The thin plate of uniform thickness 25 mm is as shown in Figure. In addition to the self weight, the plate is subjected to a point load of 500N at mid-depth. The Young's modulus $E = 2 \times 10^5$ N/mm^2 and unit weight $\rho = 8 \times 10^{-4}$ N/mm^2. Analyse the plate after modelling it with two elements and find thestresses in each element. **[10]**



Q2) a) Write short notes on: Effect of element aspect ratio on accuracy. **[6]**

b) What is meant by Panelty Approach and Elimination Approach? **[6]**

c) What is difference between Finite Difference Method & Finite Element Method? **[6]**

P.T.O.

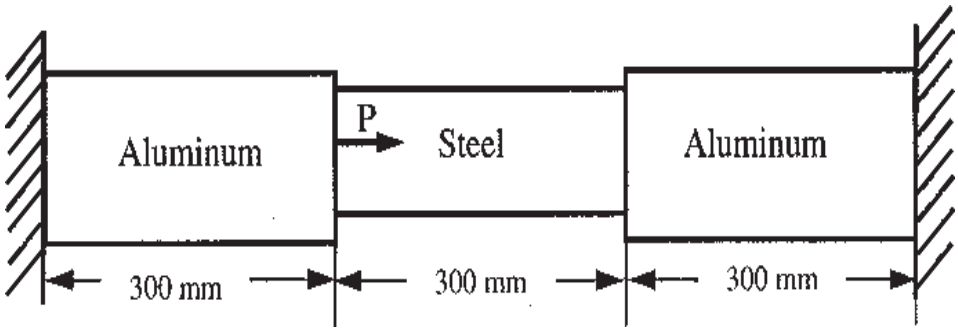
Q3) a) Determine the nodal displacements at all node, stresses in each material and support reactions in the bar shown in Figure, due to applied force $P = 200 \times 10^3$ N and temperature rise of 50°C. Given: **[10]**

$A_1 = 2400$ mm^2 $A_2 = 1200$ mm^2 $A_3 = 1200$ mm^2

$l_1 = 300$ mm $l_2 = 300$ mm, $l_3 = 300$ mm

$E_1 = 0.7 \times 10^5$ N/mm^2 $E_2 = 2 \times 10^5$ N/mm^2

$\alpha_1 = 22 \times 10^{-6}$ /°C, $\alpha_2 = 12 \times 10^{-6}$/°$C$



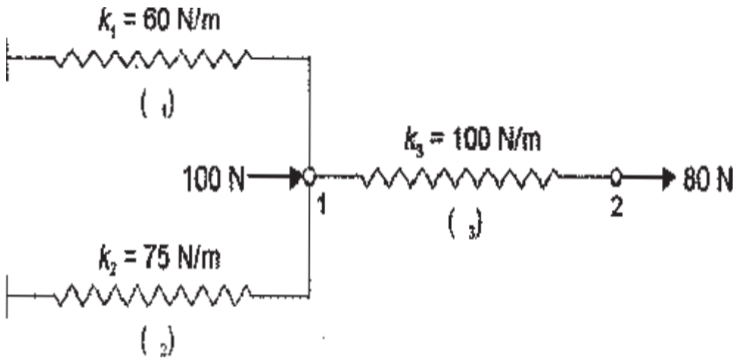
b) Explain the following terms clearly. **[6]**

i) Local coordinates and global coordinates.

ii) Higher order elements and lower order elements.

Q4) a) Explain terms Plane Stress and Plane Strain and its significance in FEA.**[8]**

b) Determine the displacements of nodes 1 and 2 in the spring system shown in Figure. Use minimum of potential energy principle to assemble equations of equilibrium. **[10]**



SECTION - II

Q5) a) Differentiate between a bar element and a truss element. **[4]**

b) Briefly explain various attempts made to reduce memory requirement in storing stiffness matrix. **[6]**

c) Explain different Storage and Solution Techniques used in FEA Analysis. **[6]**

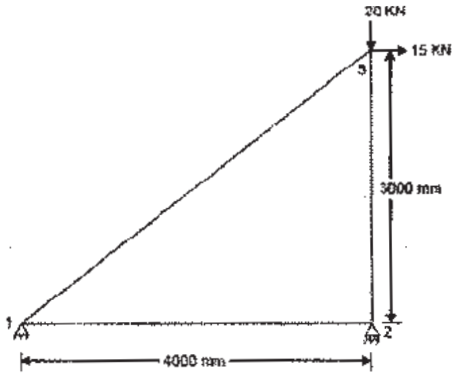
Q6) a) Explain the different types of non-linearities encountered in structural analysis. **[8]**

b) Explain "Higher order element Vs Refined Mesh". **[8]**

Q7) a) Derive the expressions for natural coordinates for a two noded element. In terms of, when range is –1 to 1. **[8]**

b) Explain the term 'Shape Functions'. Why polynomial terms are preferred for shape functions in finite element method? **[8]**

Q8) a) Obtain the forces in the plane truss shown in Figure and determine the support reactions also. **[10]**
Use finite element method. Take $E = 215\text{GPa}$ and $A = 2000\ \text{mm}^2$.



b) What is Axis Symmetric Element? And explain with suitable example. **[6]**

Q9) Attempt any three : **[18]**

a) Explain the iso-parametric concept in finite element analysis.

b) Write short notes on Triangular plate bending elements.

c) Write a short note on FEA Packages.

d) Derive Elemental Equations for Linear Spring Element?

■■■

Total No. of Questions : 8]

SEAT No. :

P1824

[Total No. of Pages : 2

[4265] - 563

M.E. (Mechanical) (Automotive Engineering)

AUTOMOTIVE SAFETY AND REGULATIONS

(2008 Course) (Elective - II(b)) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answers three questions from section - I and three questions from section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Describe in detail various considerations that should be kept in mind when designing a passenger vehicle for safety. What is meant by Active safety and passive safety? Explain. **[8]**

b) What do you meant by crashworthiness? What are important structural characteristics of vehicle for it ? Explain **[8]**

Q2) a) Explain role of ergonomics in automobile safety. Describe with suitable example. **[8]**

b) Explain 'Injury measurement and criteria' for human body undergone with impact during accident. What is injury rating? Explain. **[8]**

Q3) a) What are the design requirements of automotive seat? Explain. **[8]**

b) Describe Head-Restraint geometry for horizontal and vertical measurement between head and restraint with neat sketch. **[8]**

Q4) Write short note on the following (Any three) : **[18]**

a) Types of crash.

b) Crash dummies.

c) Pedestrian safety.

d) Safety glass and requirement.

P.T.O.

SECTION - II

Q5) a) Describe the role of side door intrusion beam in providing safety in case of side impacts. **[8]**

b) What are various types of rear view mirrors? Explain in brief principal involved there in. **[8]**

Q6) a) Explain asymmetrical beam used in head lamp. What are merits and demerits of plastics head lamps? **[8]**

b) What is the role of proper lighting and reflecting devices in automobile safety? Name different types of lighting and signaling devices used in modern automobile. **[8]**

Q7) a) As per CMVR describe the following procedure, **[8]**

i) Registration of motor vehicle.

ii) Insurance of motor vehicle against third part risk.

b) Explain with neat sketch any four Mandatory signs on road schedule of the Motor Vehicles Act 1988. **[8]**

Q8) Write short note on the following (any three) : **[18]**

a) Luminance meter and its principle.

b) Adoptive front lighting system.

c) Testing track for vehicle.

d) Testing of Head lamp.

■■■

Total No. of Questions :10]

SEAT No. :

P1453

[Total No. of Pages : 2

[4265] - 568

M.E. (Mech.) (Automotive)

NOISE, VIBRATIONS AND HARSHNESS

(2008 Course) (Elective - III (a)) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the Ride dynamic system? **[8]**

b) Explain the different techniques used to noise control? **[8]**

Q2) The tone from a tuning fork is 440 Hz and has a measured sound pressure level of 54 dB at a radial distance of 10 m. Assuming the sound waves are radiating uniformly in all directions (spherically), What is the power level of the source? What is the sound pressure level at 20 m? **[16]**

Q3) a) The sound pressure level measured at a particular location in a factory with a noisy machine operating nearby is 92.0 dB (A). When the machine is turned off, the sound pressure level measured at the same location is 88.0 dB (A). What is the sound pressure level due to the machine alone. **[4]**

b) Explain Sound power level? **[6]**

c) Explain sound intensity level? **[6]**

Q4) a) Explain effect of noise on human beings and what are noise specifications for generator sets, fire crackers and household articles. **[8]**

b) Why signal conditioning is require and explain in detail Digital Signal Processing? **[8]**

P.T.O.

Q5) Write short notes on any three of the following : **[18]**

a) Elastomeric isolators

b) Loudness

c) Noise Dose Meter

d) Interior noise of vehicles

SECTION - II

Q6) a) Explain in detail different sound fields and state its significance. **[8]**

b) What do you mean by sound intensity and sound power mapping? **[8]**

Q7) A wall with a transmission loss of 40 dB at 500 Hz separates two food packaging areas. A window with a transmission loss of 20 dB at 500Hz is to be installed which will occupy 10% of the wall. Calculate the resultant Composite transmission loss of the wall at 500 Hz. **[16]**

Q8) a) What do mean by FRF and what is the use of FRF in modal analysis. **[8]**

b) Explain the experimental modal technique with help of basic component of modal test setup. **[8]**

Q9) a) Explain the working of Helmholtz resonator type Muffler. **[8]**

b) Define: **[8]**

i) Noise Reduction Coefficient

ii) Normal Incidence sound absorption coefficient

iii) Sound Transmission loss

iv) Mass law

Q10) Write short notes on any three of the following : **[18]**

a) Structure and Air borne noise

b) Acoustic Holography

c) Pass-by Noise measurement

d) Sound Intensity Probe (Face-Face)

■■■

Total No. of Questions : 8]

SEAT No. :

P1766

[Total No. of Pages : 2

[4265] - 571

M.E. (Mechanical - Automotive Engg.)

COMPUTATIONAL FLUID DYNAMICS

(2008 Course) (Elective - IV(a)) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary and mention if clearly.***

SECTION - I

Q1) a) Derive the continuity equation in differential conservation form for an infinitesimally small control volume, of size *dx, dy*, and *dz*, when fixed in space. **[10]**

b) List the two types of errors encountered in numerical methods and indicate how the error occurs? **[6]**

Q2) a) What is divergence of velocity? Explain its physical meaning. **[6]**

b) Find the forward difference approximation of $\left(\frac{\partial^3 f}{\partial x^3}\right)$ of the order of (Δx) for evenly grid spaced points using : **[10]**

i) Using Taylor series expansion

ii) Forward difference recurrence formula

Q3) a) Write general second order PDE and explain with suitable example of each; **[12]**

i) elliptic PDE

ii) parabolic PDE

iii) hyperbolic PDE

iv) conservative form of PDE

b) Explain convergence and stability of numerical solution. **[4]**

P.T.O.

Q4) a) Explain explicit and implicit method for the solution of PDEs with suitable example. State its advantages and limitation over each other. **[12]**

b) Explain the Thomas algorithm for solution of 4×4 tridiagonal systems. **[6]**

SECTION - II

Q5) a) Consider the model equation: **[10]**

$$a\frac{\partial u}{\partial x} = v\frac{\partial^2 u}{\partial y^2}$$

Define $v/a = K$.

i) Write an explicit formulation using a first-order forward differencing in x and a second-order central differencing in y.

ii) Use von Neumann stability analysis to determine the stability requirement of the scheme.

b) Explain the procedure of CFD simulation. **[6]**

Q6) Consider the quasi one dimensional compressible flow in a converging diverging nozzle. **[16]**

a) derive mass conservation equation and energy equation in differential form.

b) write the above equations in descritised form.

Q7) a) Write step by step the procedure for SIMPLE algorithm. **[10]**

b) What is CFL condition? State its importance. **[6]**

Q8) Write short note on : **[18]**

a) Navier Stokes equations

b) Relaxation technique

c) Finite volume method

■■■

Total No. of Questions : 8]

SEAT No. :

P1505

[Total No. of Pages : 3

[4265] - 59

M.E.(Mechanical - Heat Power Engg.)

ADVANCED AIR CONDITIONING, HEATING AND VENTILATION

(2002 Course) (Elective - II(c))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary and mention it clearly.***
6) ***Use of logarithmic tables, slide rule, mollier charts, non programmable electronic pocket calculator is allowed.***

SECTION - I

Q1) a) Explain the following : **[6]**

i) Humidity ratio

ii) Degree of saturation

iii) Relative humidity

b) Air at 25°C dbt and 20% RH is passed through the heater and humidifier. The air condition at the exit was found to be 40°C dbt and 30% RH. Find the amount of heat added and moisture added during this process. Use pshychrometric chart. **[7]**

c) Explain the importance of infiltration load in cooling load calculation. **[3]**

Q2) a) 700 m^3/min air at 22°C dbt and 11°C dpt is mixed with 400 m^3/min air at 28°C dbt and 50% RH. Evaluate the mixture condition-dbt, RH, specific humidity and enthalpy. Plot this process on pshychrometric chart. **[6]**

b) Explain working of Air washer. Give its applications in detail. **[4]**

c) Air at 42°C dbt and 20% RH is required to be cooled to 24°C dbt and 90% RH. Suggest the process to achieve this condition. Estimate air volume flow rate and moisture removed per hr for cooling capacity of 3 kW. **[6]**

P.T.O.

Q3) Consider a multiplex for air conditioning, with appropriate assumptions **[16]**

a) Do the cooling load calculation selecting indoor and outdoor conditions

b) Select the type of air conditioning system

c) Select/calculate the air flow rates and supply conditions

d) Draw the layout for the system

Q4) Write a short note on any three: **[18]**

a) Air conditioning for automobile

b) HVAC controls

c) VAV systems

d) ASHRAE Comfort chart

SECTION - II

Q5) a) Explain the different types of fans and their characteristics used in air conditioning. **[8]**

b) Discuss direct and indirect evaporative cooling. **[6]**

c) What is thermal lag? **[2]**

Q6) a) Explain step by step, the procedure of duct design using static regain methods. **[8]**

b) A rectangular duct of 400mm × 300 mm size carries 1.25 m^3/s of air having density of 1.15 kg/m^3. Determine the equivalent diameter of a circular duct if same quantity of air is carried with same pressure drop. Derive the expression you use. **[8]**

Q7) a) Explain: **[10]**

i) Thermostat

ii) Sources of noise and noise prevention in AC plant.

b) What are the various types of cooling coils? Discuss the selection procedure of cooling coil for air conditioning plant with cooling capacity of 500kW. **[6]**

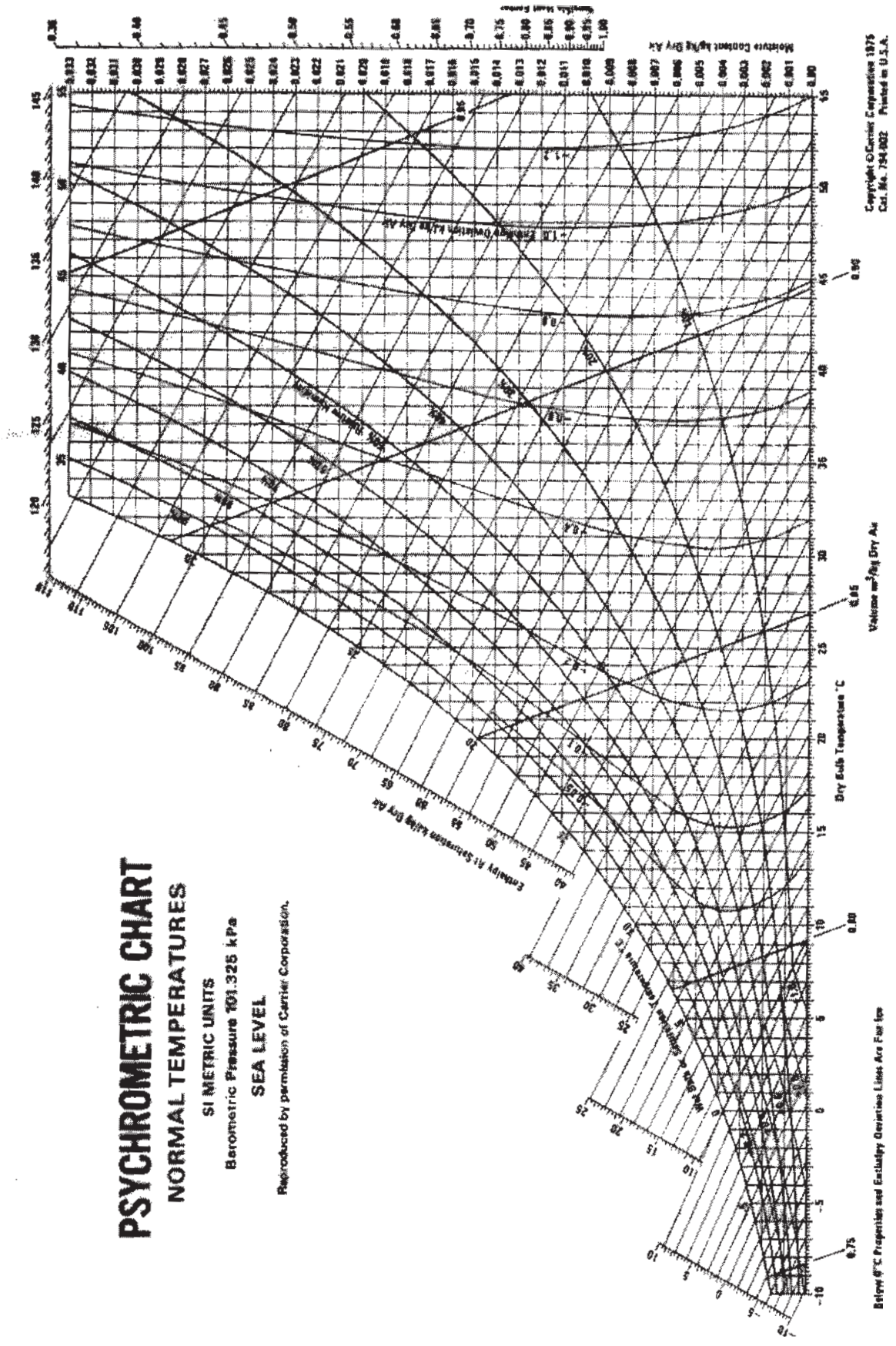
Q8) Write a short note on any three : **[18]**

a) HEPA Filter

b) Equal friction method

c) Air locks, air curtains, and air showers

d) Air-water system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Total No. of Questions : 12]

SEAT No. :

P1769

[Total No. of Pages : 3

[4265] - 606

M.E. (Electrical) (Control System)

INTELLIGENT CONTROL

(2008 Course) (Elective - IV (a)) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) *Answer three questions from Section - I and three questions from Section - II.*
2) *Answers to the two sections should be written in separate books.*
3) *Neat diagrams must be drawn wherever necessary.*
4) *Figures to the right indicate full marks.*
5) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) Given a three input neuron with the following parameters: **[9]**
$B = 0.5$, $W = [1\ 1.2\ 1.5]$, $P = [-2\ 1\ 3]^T$
Calculate the neuron output for the following Transfer functions.
i) A symmetrical Hard limit Transfer function.
ii) A saturating linear Transfer function.
iii) A hyperbolic tangent sigmoid Transfer function.

b) Write short notes on performance of computer Vs Biological neural network with neat sketch. **[9]**

OR

Q2) a) Generate the output of logic OR function by McCulloch - Pitts neuron model. **[9]**

b) The network shown in Figure is trained to recognize the characters H and T as shown below: **[9]**

If the following pattern was given, what would be the output of the network?

P.T.O.

Q3) a) Discuss on the 'Multilayer Perceptron' with the example of pattern classification. **[8]**

b) State the Delta Rule. Apply Delta Rule for single output unit. **[8]**

OR

Q4) a) Explain Perceptron convergence theorem. **[6]**

b) Consider the following prototype vectors. **[10]**

$P_1 = [1\ 1]^T \quad P_2 = [-\ 1\ 1]^T$

Design a Hopefield network to recognize these patterns.

Q5) a) What is the basic concept behind Adaptive resonance Theory? **[8]**

b) Discuss memory based learning in detail. **[8]**

OR

Q6) a) Realize a Hebb net for the AND function with bipolar inputs and targets. **[8]**

b) What is the effect of vigilance parameter in ART Network? **[8]**

SECTION - II

Q7) a) Elaborate fuzzy Vs crisp logic. **[8]**

b) Explain with neat sketch membership functions of fuzzy set. **[8]**

OR

Q8) a) Give various operations on fuzzy relations. **[8]**

b) Compare ANN and fuzzy tool and its limitations as per application point of view. **[8]**

Q9) a) Consider the fuzzy set A and B defined on the interval X = [0, 5] of real numbers, by the membership grade functions $\mu_A(x) = \frac{x}{x+1}$ and $\mu_B(x) = 2^{-x}$ Determine the mathematical formulae and graphs of the membership grade functions of each of following set **[12]**

i) A^c, B^c

ii) $A \cup B$

iii) $A \cap B$

iv) $(A \cup B)^c$

b) Give the interpretation of Predicate logic formula **[6]**

OR

Q10) a) Explain fuzzy rule based system. **[8]**

b) Explain fuzzy quantifier and fuzzy inference and hence explain Mamdani inference in detail. **[10]**

Q11) Develop an artificial neural network to planning and load forecasting of a power system, Give proper inputs to ANN and apply proper activation function. Which learning and training methodology you will employ? Discuss in detail. **[16]**

OR

Q12) a) Write the Perceptron training algorithm for several output classes. **[6]**

b) Apply fuzzy logic to Air conditioner controller. **[10]**

■■■

Total No. of Questions : 12]

SEAT No. :

P1853

[Total No. of Pages : 3

[4265] - 607

M.E. (Electrical) (Control System)

ADVANCED DRIVES & CONTROL

(2008 Course) (Elective - IV (b)) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, and electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) State and explain the factors affecting the starting time and energy during starting of the electric drive system. **[6]**

b) Write a note on 'Thermal Model' of the motor. State and explain its importance in the heating and cooling cycle followed in the industrial application like heavy-press-machine. **[6]**

c) Write a note on "Matching of Power- electronics Controller and the electric motor to drive its load. **[6]**

OR

Q2) a) The induction motor is used to drive the fan at its quarter, half as well as full load speed. Suggest cost-effective suitable solid-state-controller. Comment how to acheive the three desired settings. With the help of W-T characteristics of load and motor indicate the various operating points for three settings, mentioning their stability operation or otherwise. **[12]**

b) Can the above type of controller be used for the same motor if it drives the load which demands constant torque at variable speed below normal. Justify your statement. **[6]**

P.T.O.

Q3) The armature of a separately excited d.c. motor is supplied from the solid state controllers. Write in detail the note on the following:

a) Torque pulsation. **[8]**

b) Ripple factor in the armature current. **[8]**

OR

Q4) a) Develop the system model and the transfer function of the converter- fed separately excited d.c. motor. **[8]**

b) Justify giving technical reasons, the insertion of the additional inductance in series with the armature, to result wide variations down upto low values of speeds, in TRC choppers supplying d.c. motor. **[8]**

Q5) Write detail note on any two of the following : **[16]**

a) Necessity of derating of induction motor fed from inverter.

b) Current source Inverter supplying induction motor.

c) P.W.M. inverter.

OR

Q6) A three-phase, six-step, inverter is supplying the induction motor. With reference to space distribution of stator MMF comment on the space harmonics, harmonic frequency, amplitude.
Explain the development of the torque pulsation. State and explain the methods of reduction of production and effect of torque pulsation.
Explain the role of equivalent circuit of induction motor in determining the magnitude of harmonic torque. **[16]**

SECTION - II

Q7) a) On the basis of slip power recovery, explain the KRAMER DRIVE and the speed control method of induction motor, with the help of circuit diagram and block diagram. **[8]**

b) Write a detail note on Direct Torque control scheme of the induction motor. **[8]**

OR

Q8) Explain the following to achieve speed control of induction motor :

a) Scaler control. **[5]**

b) Direct vector control. **[5]**

c) Indirect vector control. **[6]**

Q9) In connection with the control of synchronous motor Drive, explain the construction, working and the performance of

a) Permanent Magnet Motors employing solid state controller. **[8]**

b) Wound field synchronous machine drive. **[8]**

OR

Q10) a) Explain the switched reluctance motor drive. **[8]**

b) Using "Rotating Frame- Equivalent Circuit", show that torque developed by synchronous reluctance motor is

$$T_e = \frac{3}{2}\left(\frac{P}{2}\right)\left(x_{ds}\, i_{qs} - x_{qs} i_{ds}\right)$$ **[8]**

Q11) For the closed drive system, explain the performance of the following with the help of simplified diagram

a) Proportional control. **[3]**

b) Derivative control and Delay time derivative constant. **[5]**

c) Integral control and integral gain constant. **[5]**

d) PID control. **[5]**

OR

Q12) Considering closed loop control of electric drive, explain in detail, the following

a) Micro computer control. **[6]**

b) Phase Locked Loop (PLL) control. **[6]**

c) Industrial application of PID controller. **[6]**

■■■

Total No. of Questions : 6]

SEAT No. :

P1802

[Total No. of Pages : 2

[4265] - 611

M.E. (Electrical) (Power Systems)

POWER SYSTEM MODELLING

(2008 Course) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections must be written on separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data if necessary and state clearly the same.***

SECTION - I

Q1) a) Develop the mathematical model for a tap-changing transformer. **[10]**

b) Derive the classical transfer function of a hydraulic turbine. State clearly all the assumptions made. **[15]**

Q2) a) Write the machine equations in dqO variables of a P - pole, 3 -phase, 50 Hz salient pole synchronous machine, obtain these equations in per unit form, making necessary assumptions. **[15]**

b) The reactances x_d and x_q of a salient pole generator are 1 p.u. and 0.6 p.u. respectively. Compute the excitation emf and load angle when the generator delivers rated MVA at 0.8 p.f, lagging current and rated voltage. **[10]**

Q3) Write short notes on the following :

a) modelling of 3-phase induction motor; **[9]**

b) D.C. Excitation systems for alternators; **[8]**

c) modelling of a static var compensator. **[8]**

P.T.O.

SECTION - II

Q4) a) Derive the transfer function of a steam vessel. State the assumptions made. **[10]**

b) What are the requirements of Excitation Systems? Discuss these requirements in detail. **[15]**

Q5) a) Obtain the equivalent circuits of a salient pole alternator in the d - and q - axes of the machine. Draw the equivalent circuits with appropriate values for the elements. **[15]**

b) What is a model? What are the different types of models used in practice? Explain the procedure used for the development of a model. **[10]**

Q6) Write short notes on the following :

a) Tools for simulation of models; **[8]**

b) Modelling of a 3-phase transmission line; **[8]**

c) Steady state analysis of salient -pole alternator. **[9]**

■■■

Total No. of Questions : 6]

SEAT No. :

P1803

[Total No. of Pages : 2

[4265] - 618

M.E. (Electrical) (Power Systems)

HIGH VOLTAGE POWER TRANSMISSION

(2008 Course) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written on separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary and state clearly the same.***

SECTION - I

Q1) a) Draw the schematic diagram of control of an HVDC system. Discuss the voltage-current characteristics of the converters with compounding and explain the methods of control. **[15]**

b) A h.v.d.c. link connects two a.c. systems via converters, the line voltages at the transformer- converter junctions being 100 kV and 90 kV. At the 100 kV end converter operates with a delay angle of 10^o and at the 90 kV end the converter operates with an extinction angle of 15^o. The effective reactance/phase of each converter is 15Ω and d.c. link resistance is 10Ω. Determine the magnitude and direction of power delivered if the inverter operates at constant extinction angle control. Both converters consist of six SCRS in bridge connection. **[10]**

Q2) a) Describe the types and configurations of multi-terminal HVDC systems. Bring out clearly the advantages and disadvantages of each type. **[15]**

b) Discuss the different types of HVDC links used in practice. Explain the advantages of each type of link. **[10]**

Q3) a) It is required to obtain a d.c. voltage of 100 kV from a bridge connected rectifier operating with $\alpha = 30^o$ and $\mu = 15^o$. Calculate the necessary line secondary voltage of the rectifier transformer which is nominally rated at 345 kV /150 kV; calculate the tap-ratio required. If the rectifier delivers 800 A d.c. calculate the commutation reactance per phase. **[10]**

P.T.O.

b) Write short notes on the following:

i) Advantages of HVDC power transmission over EHVAC transmission. **[8]**

ii) Operation of 12 pulse HVDC converter using a cascade of two, 6 pulse, 3-phase bridges. **[7]**

SECTION - II

Q4) a) Discuss the different types of overvoltages generated in high voltage transmission (a.c.) systems? What protective measures are taken against such overvoltage surges? **[15]**

b) A system consists of the following elements in series: a long line of surge impedance 500Ω ; a cable of surge impedance 50Ω ; a short line of surge impedance 500Ω ; a cable of surge impedance 50Ω ; and a long line of surge impedance 500Ω. The cables are equal in length of '*l*' km. The length of short line is 0.5 *l* km. A surge takes 1μS to traverse each cable and 0.5μS to traverse the short line connecting the cables. Determine the p.u. voltage of the junction of the cable and long line if the surge originates in the remote long line. **[10]**

Q5) Write short notes on the following :

a) Shunt and series compensation of hvac lines; **[8]**

b) Biological effects of electric field; and **[8]**

c) Corona and its effects. **[9]**

Q6) a) Using the standing wave concept, determine the response of an opencircuited line energised from the sending end. Neglect line losses. If the losses and attenuation are included, how the response will be modified? **[12]**

b) Derive the expressions for reflection and transmission coefficients for voltage and current of a loss-free line which is short-circuited at receiving end. **[13]**

■■■

Total No. of Questions : 6]

SEAT No. :

P1559

[Total No. of Pages : 2

[4265] - 634

M.E.(Electrical) (Power Electronics and Drives)

DESIGN OF POWER ELECTRONIC SYSTEMS

(2008 Course) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any two questions from Section - I and any two questions from Section - II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Use of electronic calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the procedure to heat sink. What are different factors taken into account while designing. **[10]**

b) Find the heat sink ambient thermal resistance for the following data, surface temperature $T_s = 120^oC$, ambient temperature $T_a = 20^oC$, dimensions of heat sink $A_1 = 0.075 \times 0.063$ m, $A_2 = 0.075 \times 0.115$ m. **[15]**

Q2) a) Discuss different magnetic materials available and what are their selection criterion for different applications? **[12]**

b) Derive expression for specific eddy current loss. **[13]**

Q3) a) Design an inductor for L = 300 mH, peak current = 5.6 A, frequency= 100kHz, $T_s = 100^oC$ and $T_a = 40^oC$. **[15]**

b) Write short note on thermal resistance and its components. **[10]**

P.T.O.

SECTION - II

Q4) a) Design a single phase transformer with following data Vpri = 300 V (rms), Irms = 4A turns ratio = 4, operating frequency f = 100 kHz, $T_s = 100^oC$, $T_a = 40\ ^oC$. Assume suitable data if required. **[15]**

b) Explain procedural steps to design a single phase transformer flow chart. **[10]**

Q5) a) Explain the need of soft switching and its concepts with VI characteristics. **[13]**

b) Derive transfer function of voltage control SMPS. **[12]**

Q6) a) Explain procedure for design of converter. What are different factors and assumption taken into account while designing. **[13]**

b) Write short note on design of inverter. **[12]**

■■■

Total No. of Questions : 6]

SEAT No. :

P1462

[Total No. of Pages : 2

[4265] - 639

M.E. (Electrical) (Power Electronics & Drives)

SPECIAL TOPICS IN POWER ELECTRONICS & DRIVES

(2008 Course) (Elective - IV (b)) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any two questions from Section - I and any two questions from Section - II.***
2) ***Answers to the two sections should be written in separate answer sheet.***
3) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Explain working of three phase inverter. Explain difference between six step inverter and SPWM. How SPWM control is achieved. **[15]**

b) What is SMPS? Explain need of SMPS ? Explain its working. **[10]**

Q2) a) What are the methods of voltage control within inverter Explain any one method in detail. **[10]**

b) Explain selective harmonic elimination indetail. **[15]**

Q3) a) Explain current regulated PWM. Draw circuit diagram and output voltage, current waveform. **[10]**

b) What are 4 basic types of switch mode regulators explain any two in detail. **[15]**

SECTION - II

Q4) a) Explain how harmonics are generated in power electronic equipments. **[10]**

b) Explain Harmonic pollution standard and define THD, HF and displacement PF in relation to harmonics. **[15]**

P.T.O.

Q5) a) Explain vector control operation of three phase IM with block diagram and function of each block. **[15]**

b) What is MRAS how it is used for IM control. **[10]**

Q6) a) What is sensorless control of synchronous Motor How it is achieved explain in detail. **[15]**

b) Describe working and operation of 1- phase APF with PWM inverter as voltage source controller. **[10]**

■■■

Total No. of Questions : 8]

SEAT No. :

P1828

[Total No. of Pages : 2

[4265] - 647

M.E. (E &TC) (Microwave)

SMART ANTENNAS

(2008 Course) (Elective - II (a)) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answers will be valued as a whole.***
6) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are the key benefits of the smart Antenna technology that overcome the problems in mobile communication system. Explain each benefit with justification. **[8]**

b) What are the different types of Array Geometrics. Derive the array factor for linear array. **[10]**

Q2) Explain the following factors with relevance to smart antennas with illustrative figures. **[16]**

a) Reduction in Hand off Rate.

b) Transmission efficiency.

c) Delay spread.

d) Fading channel.

Q3) a) Derive the mathematical expression to show that the range can be extended using Smart Antennas. **[12]**

b) Explain beam forming using arrays. **[4]**

P.T.O.

Q4) What do you mean by diversity combining? What are the various types, structures of diversity combining? Give illustrative diagrams. **[16]**

SECTION - II

Q5) a) Differentiate between Adaptive and Switched beam antenna systems. **[8]**

b) Derive the steering vector for linear array with relevant structure. **[8]**

Q6) Derive the expression for weight vector by minimum mean square error approach for a Linear Array of M-elements. **[16]**

Q7) Discuss the structure, radiation pattern advantages and disadvantages of following beam forming processors. **[16]**

a) General beam-space processor.

b) Narrow-band beam former using Reference Signal.

Q8) Write short notes on : **[18]**

a) Coherent and Non-coherent Receivers.

b) SNR improvement using Smart Antenna.

c) RLS Algorithm.

d) SMA Algorithm.

e) Application of SA in Satellite Mobile Systems.

f) Application of SA in Base-Mobile System.

■■■

Total No. of Questions : 8]

SEAT No. :

P1804

[Total No. of Pages : 2

[4265] - 657

M.E. (E & TC) (Microwave)

DIGITAL SIGNAL COMPRESSION

(2008 Course) (Elective - IV (b)) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rules, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Compare Huffman coding with Arithmetic coding. **[8]**

b) A source emits letters from an alphabet A = $\{a_1, a_2, a_3, a_4, a_5\}$ with probabilities $P(a_1) = 0.15$, $P(a_2) = 0.04$, $P(a_3) = 0.26$, $P(a_4) = 0.05$, $P(a_5) = 0.5$ **[10]**

i) Calculate the entropy of this source.

ii) Find Huffman code for this source.

iii) Find the average length of the code in ii) and its redundancy.

Q2) a) Consider a source with symbol probabilities $P(a_1) = 0.7$, $P(a_2) = 0.02$ & $P(a_3) = 0.28$. Find the tag using arithmetic coding for a sequence a_1, a_3, a_2, a_1. Use the midpoint of the interval as tag. **[10]**

b) Explain with suitable the term lossy and lossless compression. **[6]**

Q3) a) Explain the forward and backward adaptive quantization with the help of block diagram. **[8]**

b) Explain what do you mean by subband coding of signals. Explain how subband coding can be used in speech. **[8]**

P.T.O.

Q4) a) Explain A-law and μ-law companding. How to realize these companding curves in practice? **[8]**

b) Explain characteristics of audio signals? Why non uniform Quantizers are useful for audio signals. **[8]**

SECTION - II

Q5) a) Explain the use of DCT for image coding. How to quantize the DCT coefficients? Explain how it leads to compression of the data. **[8]**

b) What is a wavelet? Explain the method of decomposition using Haar wavelet. What is the advantage of using wavelet packet decomposition? **[8]**

Q6) a) What is a zero tree? How EZW charts are used for coding after wavelet decomposition. **[8]**

b) What is streaming video? How is it achieved? **[8]**

Q7) a) Explain how motion vector can be estimated in video coding. Explain any one method for video compression . **[8]**

b) What are the advantages of ADPCM over PCM? Explain both the techniques with block schematic. **[8]**

Q8) Write short notes on any three : **[18]**

a) MIDI

b) Rate-distortion theory

c) LPC of speech

d) SPIHT charts

■■■

Total No. of Questions : 8]

SEAT No. :

P1805

[Total No. of Pages : 2

[4265] - 676

M.E. (Information Technology) (Common to (E & TC) (VLSI Embedded System))

HIGH PERFORMANCE COMPUTER NETWORKS

(2008 Course) (Elective - IV (c)) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answers will be valued as a whole.***
6) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain architecture of a High Performance Computer Network. Discuss various design issues of this architecture? **[8]**

b) Differentiate between 10, 100 and 1000 Mbps networks based on their MAC characteristics. **[8]**

Q2) a) Explain the DSL and ADSL technology in detail with suitable example. **[8]**

b) Explain with diagram which modulation technique is used in DSL &ADSL technologies? **[8]**

Q3) a) Discuss various functions supported by ISDN functional groupings. **[8]**

b) Differentiate between Frame Relay and ATM. **[8]**

Q4) Write short notes on (Any Three) : **[18]**

a) SONET

b) DWDM

c) Wi-Max

d) EDGE technology

P.T.O.

SECTION - II

Q5) a) Differentiate between Wi-Fi and Wi-Max. **[8]**

b) Explain SRS authentication protocol in detail with suitable example. **[8]**

Q6) a) Explain architecture of ISDN. **[8]**

b) Explain various techniques for traffic management in ATM. **[8]**

Q7) a) List the various channels involved in ISDN? Explain function of each channel with their data rate. **[8]**

b) Explain in detail the SDH standard with example. **[8]**

Q8) Write short notes on (any three) : **[18]**

a) QoS in HPCN

b) GSM architecture

c) Functional architecture of B-ISDN

d) SAN architecture

■■■

[4265] – 685

Seat No.	

M.E. (E&Tc) (Signal Processing) Examination, 2012
(2008 Course)
STATISTICAL SIGNAL PROCESSING

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **any 3** questions from **each** Section.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) **Black** figures to the right indicate **full** marks.*
*5) Assume **suitable** data, **if necessary**.*

SECTION – I

1. a) Differentiate between Pade's Method and Prony's Method with the help of examples. **6**

   b) A third order all-pole Pade's approximation to a signal x(n) has been found to be $H(z) = \frac{1}{1+2z^{-1}+z^{-2}+3z^{-3}}$. What information about x(n) can be obtained from this model ? **6**

   c) What is MYWE for ARMA (p, q) model ? How is it modified for AR(p)s MA(q) processes ? **6**

2. a) Given the signal x(n) consisting of a single pulse of length N, i.e.

   $$x(n) = \begin{cases} 1 \; ; \; n = 0, 1, \ldots N-1 \\ 0 \;\; \text{else} \end{cases}$$

   Use Prony's method to find x(n) as unit sample response of a linear shift-invariant filter having one pole and one zero. **8**

   b) Explain Levinson Durbin recursion. How is it modified to step-down recursion ? **8**

3. a) Given that $r_x(0) = 1$, and the first three reflection coefficients are $\lceil 1 = 0.5$, $\lceil 2 = 0.5$ and $\lceil 3 = 0.25$. Find the corresponding sequence $r_x(1)$, $r_x(2)$ and $r_x(3)$. **8**

   b) State the important properties of the reflection coefficient sequence that is generated by Levinson Durbin recursion. Explain the autocorrelation property in detail. **8**

P.T.O.

4. a) With the help of lattice filter structure explain Schur Recursion. Give its application. **8**

   b) Given that autocorrelation sequence $r_x(0) = 1$, $r_x(1) = 0.8$, $r_x(2) = 0.5$ and $r_x(3) = 0.1$. Using Levinson Durbin Algorithm find the reflection coefficients Γ_j, the model parameters $a_j(k)$ and the modeling error E_j, for $j = 1, 2, 3$. **8**

SECTION – II

5. a) Enlist the different applications of Wiener Filter. Explain FIR Wiener Filtering application in detail. **10**

   b) Let d(n) be an AR(1) process with an autocorrelation sequence $r_d(k) = \alpha^{|k|}$. d(n) is observed in the presence of uncorrelated white noise v(n), that has a variance of σ_v^2. Design a first order FIR filter (Wiener) to reduce the noise in x(n), when $\alpha = 0.8$ and $\sigma_v^2 = 1$. **8**

6. a) With the help of a suitable block diagram explain Wiener filter application for noise cancellation. **8**

   b) What are limitations of causal Wiener Filter ? How are they overcome using Kalman Filter ? **8**

7. a) What are the different methods for spectrum classification ? Explain Periodogram in detail. **8**

   b) Discuss Periodogram properties in detail. **8**

8. a) Differentiate between Bartlett's method and Welch's method. **8**

   b) Bartletts method is used to estimate the power spectrum of a process from a sequence of N = 2000 samples.

      i) What is the minimum Length L that may be used for each sequence if a resolution $\Delta f = 0.005$ is needed ?

      ii) Determine the minimum number of data samples 'N' that are necessary to achieve a resolution of $\Delta f = 0.005$ and a quality factor that is five times larger than that of the periodogram. **8**

Total No. of Questions : 8]

SEAT No. :

P1812

[Total No. of Pages : 3

[4265] - 687

M.E. (E & T/C) (Signal Processing)

VLSI IN SIGNAL PROCESSING

(2008 Course) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the Longest Path Matrix algorithm for computation of iteration bound of a DFG. **[8]**

b) Describe briefly the algorithm used to convert Multi-rate DFG into single-rate DFGs. Draw the single-rate equivalent DFG for the given MRDFG in Fig.1(b). **[10]**

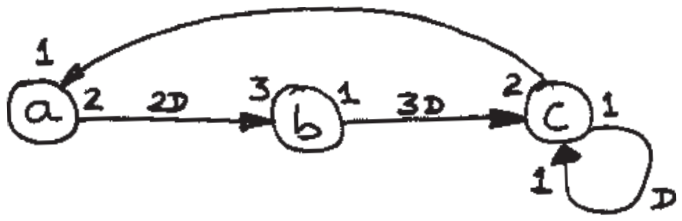

Fig. 1(b)

Q2) a) With the help of an example explain the advantages and disadvantages of Pipelining architectures. **[8]**

b) Consider the recursive filter $x(n) = ax(n-2) + u(n)$ for VLSI implementation. Explain all the possible ways to increase the throughput of the architecture to be implemented. **[8]**

P.T.O.

Q3) a) Consider the DFG shown in the Fig. 3(a), where the number at each node denotes its execution time. What is the maximum sample rate of this DFG? Manually retime this DFG to minimize the clock period. **[8]**

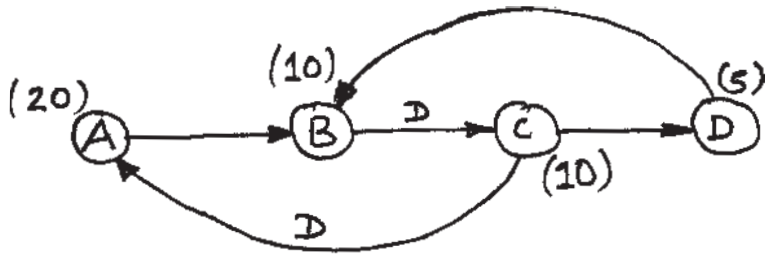

Fig. 3(a)

b) What are the properties of retiming? Can we apply the retiming techniques after unfolding a DFG? Justify your answer and mention the conditions to do so. **[8]**

Q4) a) Draw the low level implementation and space time representation of Design R1 with vectors $\mathbf{d}^T = (1\ -1)$, $\mathbf{p}^T = (1\ 1)$ and $\mathbf{s}^T = (1\ -1)$. Comment on the hardware utilization efficiency of the implementation. **[10]**

b) Explain the selection of scheduling vector based on scheduling inequalities for a systolic array implementation of FIR filter. **[6]**

SECTION - II

Q5) a) Explain parallel carry-save and carry-ripple array multipliers with sign bit extension. Draw the dependence graph for each of the multiplier. **[10]**

b) Explain the canonic singed digit arithmetic representation and its properties. **[8]**

Q6) a) What is the clock distribution strategies applied for the SoC designs? Explain each briefly with schematics. **[8]**

b) For a typical DSP algorithm to be implemented on an FPGA, what are the specific requirements expected from the FPGA architecture? You may consider any example to justify your answer. **[8]**

Q7) a) With the help of neat diagrams, explain the IOB and CLB slice architecture of any FPGA. **[8]**

b) Explain the routing resources available on a FPGA architecture. **[8]**

Q8) Write short notes on any two : **[16]**

a) Hybrid radix -2 substractor architecture

b) Bit serial IIR filter

c) Folding of a DFG

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[4265] – 69

Seat No.	

M.E. (Mechanical) (Design Engineering) Examination, 2012
PROCESS EQUIPMENT DESIGN
(2002 Course) (Elective – I)

Time : 3 Hours Max. Marks : 100

Instructions *: 1) Answer* ***any 3*** *questions from* ***each*** *Section.*
2) Answers to the ***two*** *Sections should be written in* ***separate*** *books.*
3) ***Neat*** *diagrams must be drawn* ***wherever*** *necessary.*
4) Black figures to the ***right*** *indicate* ***full*** *marks.*
5) Assume suitable data, if ***necessary****.*

SECTION – I

1. a) Explain various types of roofs used for storage vessels. **6**
   b) Discuss the main design considerations of process equipment. **6**
   c) Explain design of pressure vessel subjected to external pressure. **4**

2. a) What type of stresses are induced in the column shell ? How will you account for them in the design of shell ? **6**
   b) Calculate the thickness of torisperical head for a vessel having a internal diameter of 2500 mm. Design pressure is 4.5 kg/cm^2. Knuckle radius and Crown radius are 20 mm and 275 mm. Permissible stress is 1195 kg/mm^2, welded joint efficiency is 80%. **6**
   c) Explain design of thick walled high pressure vessel. **4**

3. a) Explain the functions of evaporators, crystallisers and dryers. Give classification of each in brief. **6**
   b) Explain in detailed design procedure for design of cylindrical storage vessel with cone roof. **6**
   c) What are the design consideration in skirt support design ? **4**

P.T.O.

4. a) Describe the working of a cyclone separator. State its function and field of application. **6**
   b) Name various standards used in Process Equipment Design. **4**
   c) Explain what are the various methods for mixing solids. **6**

5. Write short note on the following (**any 3**) : **18**
   a) Floating roof type storage tank
   b) Protective coatings and applications
   c) Reinforcement of nozzles
   d) Centrifuges
   e) Materials for high and low pressure vessels.

SECTION – II

6. a) Explain in detail main design consideration in design of any one type of heat exchanger. **10**
   b) Explain in brief different types of baffles used in heat exchanger. **6**

7. a) What are the thermal consideration in the design of fired vessels ? **8**
   b) Explain the sources of hazards in process industries. Also suggest suitable measures. **8**

8. a) What is power curve ? Explain use of power curves in design of agitator. **8**
   b) What are distillation columns ? Explain following terms related to it :
      i) Bottom product
      ii) Reboiler
      iii) Stripping. **8**

9. a) Explain in detail any one metering pump. **8**
   b) Explain in brief integral, fabricated and formed nozzles. **8**

10. Write short note on the following (**any three**) : **18**
    i) Design of saddle support.
    ii) Testing and inspection of pressure vessels.
    iii) Process flow diagrams.
    iv) Optimisation techniques.

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Total No. of Questions : 8]

SEAT No. :

P1467

[Total No. of Pages : 2

[4265] - 711

M.E.(E&TC) (Communication Networks)

CODING & MODULATION TECHNIQUES

(2010 Course) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each Section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, in necessary.***

SECTION - I

Q1) a) Writes the step for Huffman source coding Algorithm. Apply Huffman coding for following message ensemble using binary digits for source code. **[8]**

[x]	X1	X2	X3	X4	X5	X6	X7	X8
[p]	1/4	1/4	1/16	1/16	1/8	1/8	1/16	1/16

b) Explain in detail quantization process in image compression. **[8]**

Q2) a) An ideal communication system with average power limitation is having AWGN of bandwidth 1 MHz and signal-to-noise ratio 10. **[10]**

i) Find channel capacity.

ii) If signal-to-noise ratio drops to 5, what bandwidth will be required for the same capacity?

iii) If bandwidth is decreased to 0.5 MHz, what S/N ratio is required to maintain the same channel capacity?

b) Explain transform based lossy coding. **[6]**

P.T.O.

Q3) a) Writes the step for Shannon-Fano source coding Algorithm. Apply Shannon-Fano coding for following source encoder for find the source code. **[8]**

[x]	X1	X2	X3	X4
[p]	0.250	0.125	0.500	0.125

b) Explain Rayleigh fading. How to calculate the following term in Rayleigh fading. **[8]**

i) PDF
ii) Variance
iii) Median value

Q4) Write short notes (any two) : **[18]**

a) Video compression

b) TDMA and FDMA

c) Capacity improvement in multipath environment

SECTION - II

Q5) a) Consider 3 base stations, station A, B, C which transmit bit 0, no signal, and bit 1 resp. Assign sequence number to that stations. Explain how to generate and detect CDMA code at these stations. Draw labeled diagram. **[8]**

b) Explain and provide the path of modulation scheme migration considering the BPSK and QPSK with the support of relevant diagrams. **[8]**

Q6) Enlist receive spatial antenna diversity techniques and explain any two in detail. **[16]**

Q7) a) Explain the coherent detection technique and costas loop receiver model. **[10]**

b) Explain path loss model in wireless communication. **[6]**

Q8) Write short notes (any two) : **[18]**

a) Propagation model

b) Wideband Rake Receiver

c) OFDM

■■■

[4265] – 73

Seat No.	

M.E. (Mechanical-Design Engineering) Examination, 2012
(2002 Course)
TRIBOLOGY
(Elective – II)

Time : 3 Hours Max. Marks : 100

Instructions *: 1) Answer* ***any 3*** *questions from* ***each*** *Section.*
2) Answers to the ***two*** *Sections should be written in* ***separate*** *books.*
3) ***Neat diagrams*** *must be drawn* ***wherever*** *necessary.*
4) Black figures to the ***right*** *indicate* ***full*** *marks.*
5) Your answers will be valued as a whole.
6) Assume suitable data, if ***necessary****.*

SECTION – I

1. a) Give modified adhesion theory of friction. **12**
   b) List factors affecting erosive wear. **4**

2. a) Explain any four tribological properties of lubricants. **8**
   b) Explain ploughing in case of wear in detail. **8**

3. a) Derive Petroff's equation for power loss in lightly loaded infinitely long bearings. Also give assumptions made. **10**
   b) With the help of Stribeck Curve explain different lubrication regin in detail. **6**

4. a) Obtain an equation of pressure distribution in an infinitely short journal bearing. **8**
   b) Derive the Reynold's equation in 2D for journal bearings. State assumptions made. **10**

5. a) Obtain an equation for pressure distribution and load carrying capacity in a hydrostatic step bearing. **12**
   b) What are porous bearings ? Give their applications. **4**

P.T.O.

SECTION – II

6. a) A hydrostatic thrust bearing has following data :
   i) Supply pressure = 5 MPa
   ii) Shaft speed = 1000 r.p.m.
   iii) Shaft dia = 500 mm
   iv) Recess dia = 300 mm
   v) Viscosity of lubricant = 35 CP
   vi) Specific gravity of lubricant = 0.86
   vii) Specific heat of lub. = 2 kJ/Kg °C

   Find :
   i) Load carrying capacity
   ii) Optimum oil-film thickness
   iii) Flow rate of lubricant
   iv) Total power loss
   v) Temp. rise **10**

   b) Explain the lubrication in the piston pin. **8**

7. a) Obtain the equation for max. pressure and average pressure when a rectangular plate approaches a plane. **10**

   b) Explain two applications of squeeze film lubrication in industrial environment. **6**

8. a) Obtain Ertel-Grubin equation for elastohydrodynamic lubrication. **12**

   b) Explain pressure viscosity terms in Reynold's equation. **4**

9. a) What are compressibility numbers in gas bearings ? Give one of such numbers. **8**

   b) Explain construction and working of gas lubricated hydrostatic journal brg with one of its applications. **8**

10. Write short notes on **any two** below : **16**
    a) Tilting pad bearings (Gas)
    b) Tribological aspects of wheel on rail contact.
    c) Tribological aspects in metal working processes.

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Total No. of Questions : 10]

SEAT No. :

P1595

[Total No. of Pages : 2

[4265] - 746

M.E. (Production Engg.)

OPTIMIZATION TECHNIQUES

(2008 Course) (Elective - IV (a)) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Use non-programmable electronic calculators is allowed.***

SECTION - I

Q1) a) What is meant by Optimization? Explain the application of optimization in Design Engineering. **[10]**

b) Give classification of optimization methods. Explain any one in detail. **[6]**

Q2) a) Explain the methodology of Golden Section Search Method. **[8]**

b) Using Golden Section Search method determine the maximum value of $f(x) = 2\sin x - 0.1x^2$. **[8]**

Q3) a) State the types of direct search methods. State advantages of Random search methods. **[8]**

b) Explain gradient search method using suitable figure and Grid with pi = 4. **[8]**

Q4) a) Draw the flowchart for Powell's Model. **[8]**

b) Explain features of steepest descent method. **[8]**

P.T.O.

Q5) Write short note on following (any three) : **[18]**

a) Evolutionary optimization method.

b) Secant method.

c) Fabbonci search method.

d) Newton's method in multivariable programming.

SECTION - II

Q6) a) Explain the generalized reduced gradient method using suitable data. **[8]**

b) Discuss the methods of handling the constraints. **[8]**

Q7) a) Explain the method of feasible directions. **[8]**

b) How gradient projection method is implemented in solving constrained optimization problems. **[8]**

Q8) a) Explain the geometric programming method for solving nonlinear programming problems. **[8]**

b) Explain with suitable example methodology of integer programming. **[8]**

Q9) a) Explain the structure of simulated annealing algorithm. **[8]**

b) Explain the similarities between GA and traditional methods. **[8]**

Q10) Write short note on following (any two) : **[18]**

a) Applications of Genetic Algorithm in optimization.

b) Specialized algorithms.

c) Role of constraints in geometric modeling.

■■■

Total No. of Questions : 6]

SEAT No. :

P1830

[Total No. of Pages : 2

[4265] - 749

M.E. (Production)

ENERGY MANAGEMENT

(2008 Course) (Elective - IV (d)) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Use of steam tables and nonprogrammable calculators permitted.***

SECTION - I

Q1) a) i) Give indicative data on energy availability and energy consumption. **[6]**

ii) Explain the importance of demand side management in the Indian context. **[3]**

b) i) Explain the drawback of simple pay pack period. Explain how Net Present value method overcomes this drawback. **[5]**

ii) Write a note on Energy labeling. **[4]**

Q2) a) i) List various energy audit instruments and the parameters they measure. **[4]**

ii) Discuss the use of combustion analyzer in energy audit. **[4]**

b) Write a note on insulation and refractories giving examples. **[8]**

Q3) a) Discuss the losses in furnace. How efficiency is calculated by for a coalfired steel furnace. **[8]**

b) What is a steam trap? List the various types of steam traps. Discuss with neat labeled diagram any thermostatic type steam trap. **[8]**

P.T.O.

SECTION - II

Q4) a) What are energy efficient motors? Explain how motor losses are overcome. **[9]**

b) What is luminous efficacy and colour rendering index. List the various illumination devices. **[9]**

Q5) a) List the energy saving opportunities in compressed air systems. **[8]**

b) Discuss the energy saving opportunities in refrigeration and air-conditioning systems. **[8]**

Q6) a) Discuss the need of waste heat recovery through combined heating and power systems. Sketch various combinations with gas turbine and steam turbine as prime mover. **[8]**

b) Write a note on waste heat based vapour absorption system with neat sketch. **[8]**

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Total No. of Questions : 8]

SEAT No. :

P1831

[Total No. of Pages : 2

[4265] - 758

M.E. (Production) (CAD/CAM)

RAPID PROTOTYPING

(2008 Course) (Elective - II (b)) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answer three questions from Section - I and three questions from Section - II.***
3) ***Answers to the two sections should be written in separate books.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Assume suitable data, if necessary.***
6) ***Figures to the right indicate full marks.***
7) ***Your answers will be valued as a whole.***
8) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***

SECTION - I

Q1) a) Explain in brief. STL file generation, file verification and Repair in RP. **[8]**

b) What are RP process strengths and limitations. **[8]**

Q2) a) Explain principle of 3D printer in detail. **[8]**

b) Explain Laser Powder forming with its benefits and Limitations. **[8]**

Q3) a) What is stability in RP processes ? Explain. **[8]**

b) Explain operational properties in RP. **[8]**

Q4) Write short notes (on any three) : **[18]**

a) Overview of RP.

b) Enterprise Prototyping centers.

c) Dimentional Accuracy in RP.

d) Selective Laser Sintering

P.T.O.

SECTION - II

Q5) a) How RP is used in Poleontology & Forensic Science? Explain. **[8]**

b) Briefly explain difference between conventional tooling and Rapid Tooling. **[8]**

Q6) a) Explain the working curved equation in detail. **[8]**

b) Describe bilateral exposure of thin sample. **[8]**

Q7) a) Describe with neat sketch Additive Laser Point-by-Point method. **[8]**

b) What is alternative approach to RP? Explain the concept in brief. **[8]**

Q8) Write short notes (on any three) : **[18]**

a) Economic analysis in RPT.

b) CAD Data Verification.

c) The photomodulus model.

d) Additive-Non laser Point-by-Point fabrication.

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Total No. of Questions : 8]

SEAT No. :

P1690

[Total No. of Pages : 3

[4265] - 762

M.E. (Production) (CAD/CAM)

FINITE ELEMENT ANALYSIS

(2010 Course) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer three questions from Section - I and three questions from Section - II.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Use of electronic pocket calculator is allowed.***
4) ***Assumptions made should be clearly stated and justified.***

SECTION - I

Q1) a) Briefly explain the steps to be followed in manually carrying out the finite element solution to a physical problem. **[8]**

b) Consider the assemblage of three springs as shown in fig. 1. Calculate the displacement of nodal points 2 and 3 **[10]**

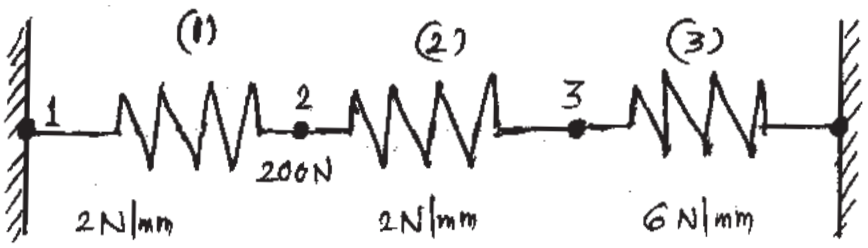


Fig. 1. System of two springs showing various forces and displacements

Q2) a) What are the assumptions made while using the beam element. **[6]**

b) Write condensed equation for unknown press and flows for hydraulic pipe network. **[10]**

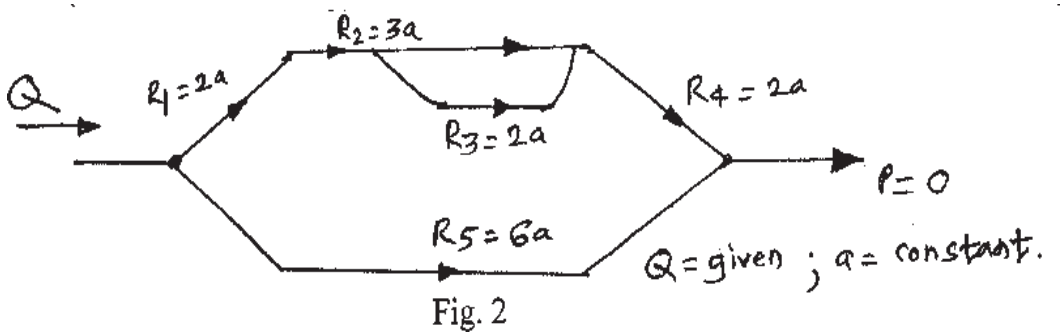


Fig. 2

P.T.O.

Q3) a) What are the conditions under which linear static analysis is carried? **[4]**

b) A tapering round bar is fixed at one end & tensile load of 1000 N is applied at the other end as shown in fig. 3. Find the Global Stiffness Matrix and displacement considering it as 4 elements. **[12]**

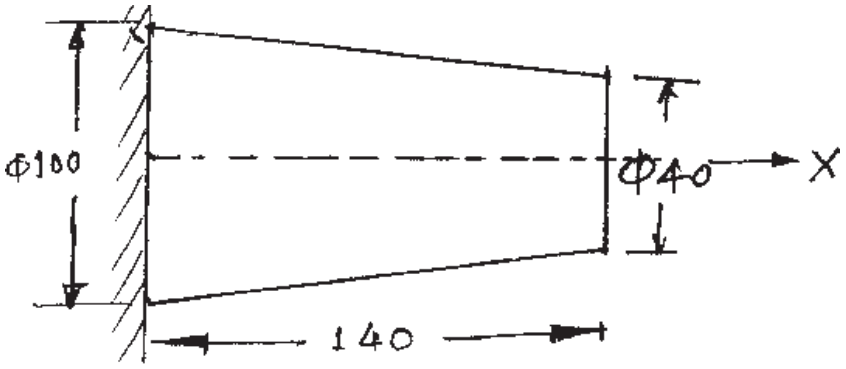


Fig 3.

Q4) a) Explain the principle of "minimum Potential energy". How it can be used to determine stiffness matrix of an element? **[8]**

b) Write short notes on (any two) : **[8]**

i) Lagrange's Shape function and Hermite shape function

ii) Transient analysis used in FEA.

iii) Sources of error in FEA analysis.

iv) Connectivity conditions.

SECTION - II

Q5) a) Solve the Differential equation by using any two methods. **[10]**

$$\frac{d^2u}{dx^2} + 9u + x^2 = 0 \qquad u(0) \quad u(2) = 0$$

b) Find the deflection of free end of a cantilever subjected to concentrated load at free end assuming deflection curve to be a cosine curve. **[8]**

Q6) a) Discuss plane stress problem using CST element. **[6]**

b) Analyze the plane truss completely. $E = 160 \times 10^3$ N/mm^2, $A = 40$ mm^2 Refer Fig. 4. **[10]**

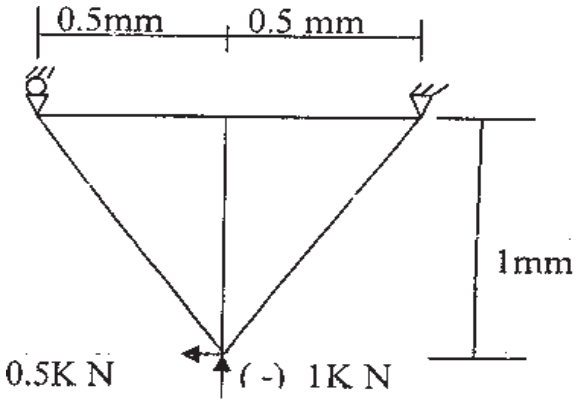


Fig.4

Q7) a) State Hamilton's principle and derive an expression for equilibrium. **[8]**

b) Using Rayleigh-Ritz method, determine the expressions for displacement and stress in a fixed bar subject to axial force P as shows in Fig. 5. Draw the displacement and stress variation diagram. Take 3 terms in displacement function. **[8]**

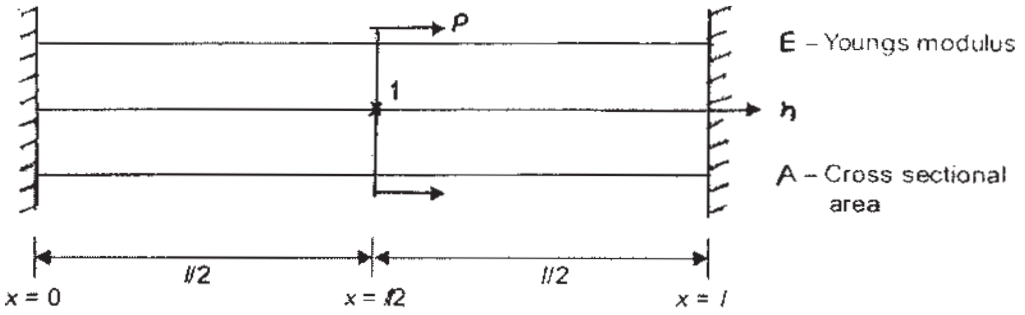


Fig. 5.

Q8) Attempt any two : **[16]**

a) Error analysis

b) CAD system in conjunction with FEA software

c) Iso-parametric analysis

d) Choice of elements in FEM modeling.

■■■

Total No. of Questions : 8]

SEAT No. :

P1692

[Total No. of Pages : 2

[4265] - 764

M.E. (Production) (CAD/CAM)

PRODUCT LIFE CYCLE MANAGEMENT

(2010 Course) (Elective - III (a)) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each Section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are the principles of PLM strategies ? And How are they Prepared? **[8]**

b) Explain PLM vision. And what are the factors that are considered to prepared PLM vision? **[10]**

Q2) a) Explain integrated product development process. **[8]**

b) Explain in short Modular design and concurrent engineering. **[8]**

Q3) a) Explain PDM system architecture. **[8]**

b) What are the different types of product models. **[8]**

Q4) a) Why PLM is important for todays industries. Explain it. **[8]**

b) Explain in short bottom up design and top down design. **[8]**

P.T.O.

SECTION - II

Q5) Write short note on : **[18]**

a) FMEA - Failure Mode Effect Analysis

b) QFD

c) Taguchi Method for design of experiment

Q6) a) What are the terminology and benefites of PDM. **[8]**

b) How PDM is acquisited and implemented. **[8]**

Q7) a) What is intelligent information system? Explain it. **[8]**

b) How advanced data base system is used for integrated manufacturing? **[8]**

Q8) a) How design for manufacturing is implemented to machining, casting & metal Forming processes? Explain with suitable example. **[10]**

b) What rules are considered to reduced the cost of assembly? **[6]**

■■■

Total No. of Questions : 10]

SEAT No. :

P1694

[Total No. of Pages : 3

[4265] - 768

M.E. (Production) (CAD/CAM)

COMPUTER AIDED PRODUCTION PLANNING

(2010 Course) (Elective - IV (a)) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in two separate books.***
3) ***Neat diagram must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Define forecasting. Discuss the applications of forecasting. What are factors affecting forecasting? **[8]**

b) Find the equation of the regression line which describe the relation between x and y? Hence estimate the value of y at $x = 24$.

x	2	4	6	8	10	12	14	16	18	20
y	13	17	24	27	28	33	35	41	43	51

[8]

Q2) a) Discuss the computerized relationship layout planning (CORELAP) for facility planning. **[8]**

b) Discuss use of quadratic assignment model adding new machines to existing facility. **[8]**

Q3) a) Explain the mathematical model for machine-component cell formation. **[8]**

b) Four machines will constitute a GT cell. The from-to data for the machine is as follows :

To → ↓From	1	2	3	4
1	0	5	0	45
2	0	0	0	0
3	50	0	0	0
4	0	45	0	0

P.T.O.

Determine the most logical sequence of machines for these data according to/ from ratios by Hollier's method. **[8]**

Q4) a) Explain the operation of a typical computer aided process planning software. **[8]**

b) Explain non-contact inspection methods. **[8]**

Q5) Write short note on any three of following : **[18]**

a) Delphi method

b) ALDEP

c) Group layout

d) Computer aided testing

e) Generative process planning

SECTION - II

Q6) a) Describe various approaches of ERP to Manufacturing? **[8]**

b) What is master production schedule? Why it is essential for MRP? **[8]**

Q7) a) How capacity planning is done? **[8]**

b) An item has beginning inventory of 30 units and projected requirements as shown in table. The carrying cost per unit per week is ₹ 2.50. The cost per setup is ₹ 250. The lead time to assemble the item is one week.

Period	0	1	2	3	4	5	6	7	8	9	10	11	12
Projected requirement	-	30	50	40	-	15	20	20	-	10	-	15	50

Find MRP solution using POQMethod. (Assume 52 weeks per year)**[8]**

Q8) a) Discuss ERP implementation issues. **[8]**

b) A engineer has one machine shop with one milling machine, one drilling machine and order of six jobs for machining. The durations required (in hrs) for milling and drilling are given below:

Job	1	2	3	4	5	6
Milling time (Hrs)	30	120	50	20	90	110
Drilling time Hrs)	80	100	90	60	30	10

In what order should the jobs be selected so as to minimize the total duration to machine all the jobs. In how much time will the milling and drilling of all the jobs be completed? **[8]**

Q9) a) Describe the procedure for simulation using a simulation package. **[8]**

b) How does automotive industry use simulation to design manufacturing systems? **[8]**

Q10) Write notes on any three of following : **[18]**

a) MRP II

b) Random number generation

c) Automatic data collection system

d) Proof of concept approach of ERP

e) Simulation software for manufacturing applications.

■■■

Total No. of Questions : 11]

SEAT No. :

P1599

[Total No. of Pages : 2

[4265] - 770

M.E. (Production) (CAD / CAM)

DESIGN OF EXPERIMENTS AND RESEARCH METHODOLOGY

(2010 Course) (Elective - IV (c)) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Answers any two sections should be written in separate books.***
3) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain different types of research. **[8]**

b) Explain the steps and significance of each Research methods. **[8]**

OR

Q2) a) What is hypothesis? Explain qualities of good hypothesis. **[8]**

b) What is different Review? **[8]**

Q3) a) What are the techniques of interpretation? **[8]**

b) Explain formulating research problem? **[8]**

OR

Q4) Write short notes on following : **[16]**

i) Motivation in Research

ii) Delphi method

iii) Criteria of good research

Q5) a) Explain process of simulation. With steps and features and validation process. **[8]**

b) Explain Data consideration and testing of models. **[10]**

OR

P.T.O.

Q6) a) Explain use of analogy; data consideration and model testing. **[8]**

b) Explain simulation in terms of meaning, Applications, classification of models. **[10]**

SECTION - II

Q7) a) Explain factorial experimental design. **[8]**

b) What are the steps in design of experimentation? **[8]**

OR

Q8) a) What are the objectives of experimentation? **[8]**

b) What are the steps in design of experimentation? **[8]**

Q9) a) Explain Taguchi approach to parameter design. **[8]**

b) Explain Applications of experimental design. **[8]**

OR

Q10) a) How Analysis of research is carried out? **[8]**

b) Explain layout of research report. **[8]**

Q11) Write short notes (any three) : **[18]**

a) Univariate Analysis

b) Hypothesis Testing.

c) Parameteric Approach.

d) Precautions while writing Research Report.

■■■

Total No. of Questions : 8]

SEAT No. :

P1840

[Total No. of Pages : 2

[4265] - 807

M.E. (Chemical)

ADVANCED SEPARATION PROCESSES

(2008 Course) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Describe cross flow electrofiltration and briefly mention about equipment used in cross flow filtration. **[8]**

b) Briefly explain different types of conventional separation processes and Enlist various advantages of advanced separation processes along with suitable industrial applications. **[8]**

Q2) a) Describe the classification of various membrane separation techniques and briefly mention about preparation of microfiltration membranes.**[9]**

b) With suitable diagram explain pervaporation techniques along with it's advantages & disadvantages ? Also enlist various industrial applications of pervaporation tehniques. **[9]**

Q3) a) What are different adsorption isotherm? Briefly explain Langmair adsorption isotherm. **[8]**

b) Describe spiral wound module with suitable diagram and compare various module configuration based on properties. **[8]**

P.T.O.

Q4) a) What is basic principle of reverse osmosis techniques? Explain the process and derive an equation for flux. **[8]**

b) What is nanofiltration membrane process? Describe it's mechanism, advantages & disadvantages along with recent industrial applications.**[8]**

SECTION - II

Q5) a) An ultrafiltration membrane has pure water flax of 210 lit/m^2. min at 3 bars, when oil-water emulsion is concentrated at 4.5 bar, the flux reduces to 30 due to emulsion layer. The viscosity of fluid is same as that of water. $r_c = 2.5 \times 10^8/m^2$. Calculate the thickness of cake? **[10]**

b) Describe supercritical fluid extraction techniques with suitable diagram and briefly discuss various properties of supercritial fluids? **[8]**

Q6) a) What are different chromatographic separation techniques. What is basic principle of ion exchange chromatographic techniques & it's mechanism of separation? Enlist various applications of thin layer chromatographic separation process. **[10]**

b) What is liquid membrane? Describe various types and mechanism of liquid membrane process. **[6]**

Q7) a) Describe zone electrophoresis process along with it's industrial applications. **[8]**

b) What is Darcy's law? Describe the flow of liquid through a porous bed of solid. **[8]**

Q8) a) What is zone melting? Describe process along with it's limitation? **[8]**

b) What is crystallization? Describe principle and mechanism of addluctive crystallization along with it's applications? **[8]**

■■■

Total No. of Questions : 8]

SEAT No. :

P1699

[Total No. of Pages : 2

[4265] - 817

M.E. (Chemical Engg.)

ADVANCED TRANSPORT PHENOMENA

(2008 Course) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answer three questions from Section - I and three questions from Section - II.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Verify the relation :

$[u \times [v \times w]] = \mathrm{V}(u.w) - \mathrm{W}(u.v)$ **[8]**

b) Find the r-component of $(\nabla.\mathrm{r})$ in spherical coordinates. **[8]**

Q2) a) Derive the equation of motion for cylindrical co-ordinate system and hence show that it obeys Newton's second law of motion. **[10]**

b) What are the semi-empirial expressions for the turbulent energy flux? **[6]**

Q3) Derive the expression for flow of falling ft-film and find the relationships for

a) Momentum flux

b) Maximum velocity

c) Average velocity

d) Volumetric flow rate

e) Film thickness **[18]**

P.T.O.

Q4) A oak pole having an initial uniform moisture content of 45wt% is placed in a drying klin where it's surface moisture is maintained at 15wt%. Under the specified drying conditions, the drying was controlled by internal diffusion of liquid water to the surface. If the maximum moisture content of the pole is set at 25wt%; how long must the 10-cm diameter by 45-cm length pole be dried when the ends of poles are sealed with vapour barrier? In comparision, how long must the same cylinder be dried if the cylinder surface is sealed with vapour barrier and the ends are exposed? The diffusively of moisture through the oak is 1.04×10^{-5} cm^2/s under the specified drying conditions? **[16]**

SECTION - II

Q5) a) Derive an expression for velocity distribution with more than one independent variables. **[12]**

b) Describe the concept of boundary layer theory . **[4]**

Q6) a) How can you estimate the Lennard -Jones potential for a binary mixture, if you know the parameters for the two components of the mixture. **[8]**

b) What is Reynolds analogy and briefly discuss its significance. **[8]**

Q7) A square pan with its bottom surface maintained at 350 K is exposed to water vapour at 1 atm pressure and 373 K. The pan has a lip all around, so the condensate that forms cannot flow away. How deep will the condensate film be after 10 min have elapsed at this conditions? Assume pseudo steady-state approaches to slove this problem? **[16]**

Q8) Write a note on : **[18]**

a) Stream function and potential flow

b) Time smoothened equation

c) Analogies of momentum, heat and mass transfer.

■■■

Total No. of Questions : 8]

SEAT No. :

P1615

[Total No. of Pages : 3

[4265] - 818

M.E. (Chemical)

ADVANCED PROCESS CONTROL

(2008 Course) (Semester - II)

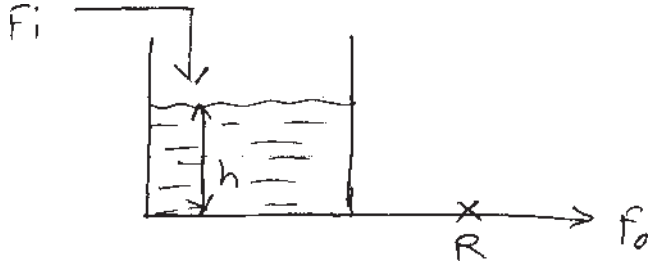
Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) *Answer three questions from Section - I and three questions from Section - II.*
2) *Neat diagrams must be drawn wherever necessary.*
3) *Figures to the right indicate full marks.*
4) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
5) *Assume suitable data, if necessary.*

SECTION - I

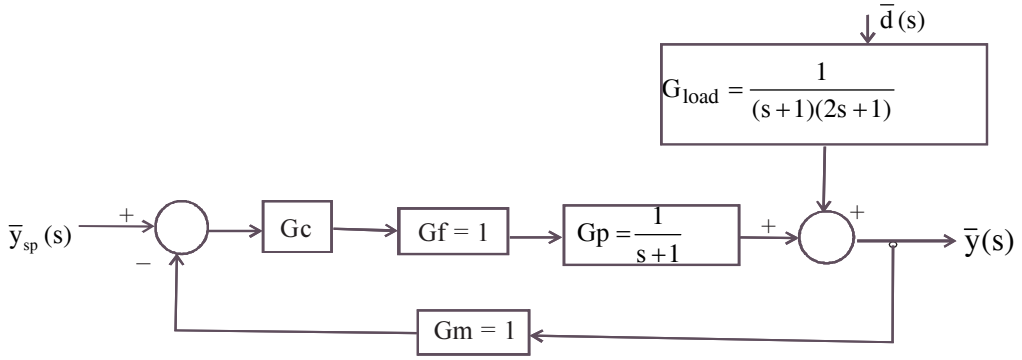
Q1) a) Derive the transfer function for the process shown in figure assuming that outflow resistance R is linear. **[6]**



b) Derive response of height 'h' of liquid for step change in input flow rate sketch the response graphically. **[6]**

c) If liquid outflow F_o is related to height h by relation $F_o = \beta\sqrt{h}$, then linearize the model equation and derive the transfer function. **[6]**

Q2)



a) Derive servo and regulator transfer functions for feedback control system shown in figure. **[4]**

P.T.O.

b) If P- controller having gain = 3 is used, derive the servo response and calculate offset produced. **[4]**

c) If PI - controller having $K_c = 3$, $\tau_I = 1$ is used, derive the servo response and calculate offset if any. **[4]**

d) If PID - controller having $K_c = 3$, $\tau_I = 1$, $\tau_D = 1$ is used, derive servo response. Sketch the servo response curves for P, PI, and PID controllers. **[4]**

Q3) a) Sketch Bode plot for feedback control system having the following transfer functions of dynamic components **[8]**

$$Gp(s) = \frac{5e^{-0.2s}}{(2s+1)(s+1)}, \quad Gm(s) = \frac{2}{0.5s+1}$$

$$Gf(s) = \frac{10}{0.1s+1}, \quad Gc(s) = 4\left(1 + \frac{1}{0.25s}\right)$$

b) Find PM, GM and comment on stability of system. **[8]**

Q4) a) Sketch and explain single -loop feedback control system for maintaining temperature of reacting mixture inside CSTR by manipulating flow rate of coolant through jacket. **[8]**

b) Sketch and explain cascade control strategy for maintaining temperature of reacting mixture inside CSTR by using temperature of coolant circulated through jacket as secondary variable. **[8]**

SECTION - II

Q5) a) Calculate RGA for a process having the following input-output relationship

$$\bar{y}_1 = \frac{1}{s+1}\bar{m}_1 + \frac{1}{0.1s+1}\bar{m}_2$$

$$\bar{y}_2 = \frac{-0.2}{0.5s+1}\bar{m}_1 + \frac{0.8}{s+1}\bar{m}_2$$

Recommend best pairing of variables that will result in control loops with minimum interactions. **[8]**

b) Design decouplers D1 & D2 so as to get non-interacting control loops. Sketch the resulting loops with decouplers. **[8]**

Q6) A 3×3 process is modeled as $\dot{X} = AX + BU, Y = CX$ **[16]**

Where $A = \begin{bmatrix} -2 & 0 & 1 \\ 1 & -2 & 0 \\ 1 & 1 & -1 \end{bmatrix}$, $B = \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}$, $C = \begin{bmatrix} 2 \\ 1 \\ -1 \end{bmatrix}^T$

a) Test controllability of system.

b) Test observability of system.

Q7) Describe the following direct synthesis (DS) controllers. **[16]**

a) Dahlin's method

b) Vogel-Edgar method.

Q8) Write short notes on the following : **[18]**

a) Model predictive control

b) Statistical process control

c) Batch control systems

■■■

Total No. of Questions : 8]

SEAT No. :

P1616

[Total No. of Pages : 2

[4265] - 820

M.E. (Chemical)

ADVANCED REACTION ENGINEERING

(2008 Course) (Semester - II) (Elective - III (b))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Solve any three questions from each section.***
2) ***Figures to the right indicate full marks.***

SECTION - I

Q1) What is a rate limiting step? What is a surface reaction controlled phenomenon? Give proper example with model equations involved? **[16]**

Q2) The exothermic reaction

$$A \rightarrow B + C$$

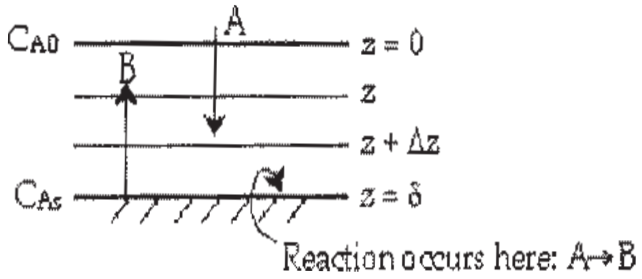
was carried out adiabatically and the following data recorded:

X	0	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	0.95
$-r_A$ (mol/dm^3. min)	1.0	1.67	5.5	5.5	5.5	5.5	1.50	1.01	0.98	0.92

The entering molar flow rate of A was 500 mol/min.

(a) What is the PFR volume necessary to achieve 60% conversion? **[16]**

Q3) A gas A (Ammonia) diffuses through a stagnant gas B (Air). The gas A diffuses ($D_{AB} = 3.85 \times 10^{-5}$ m^2/s) through a planar geometry (with thickness of 2 mm) as shown in the following figure. Derive a general expression for the molar flux of A, W_A, and the mass flux of A, m_A and concentration profile through the stationary frame at steady state. Also plot the concentration profile of A across the film thickness.



[16]

P.T.O.

Q4) Write short note on any THREE : **[18]**

a) Catalyst properties

b) Analysis of non ideal reactor

c) Deactivation kinetics

d) Thiele Modulus

SECTION - II

Q5) For a series of n tanks in series, each one behaving as an ideal CSTR derive expression for E(t) for a first order reaction from the first principles. $C_{a(n-1)}$ = Incoming concentration to the n^{th} reactor, $C_{a(n)}$ = Leaving concentration to the n^{th} reactor. All reactors are having equal volumes. Assume the rest of the data. **[16]**

Q6) Explain the significance of the Mear's criterion for external diffusion and derive an expression for conversion in packed bed reactor. **[16]**

Q7) From the first principle derive the equation in dimensionless form for the diffusion of reactant molecules through porous catalyst and surface catalytic reaction, Also write expression for Thiele modulus. **[16]**

Q8) Write short note on any THREE : **[18]**

a) Sintering Kinetics

b) Two parameter Model

c) Coking as Catalyst deactivation

d) Surface Reaction Rate

■■■

Total No. of Questions : 8]

SEAT No. :

P1808

[Total No. of Pages : 2

[4265] - 821

M.E. (Chemical)

MATHEMATICAL METHODS IN CHEMICAL ENGG.

(2008 Course) (Elective - III (c)) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Attempt any three out of four from each section.***

2) ***Assume suitable data, wherever necessary.***

SECTION - I

Q1) a) Define Tensor and explain its applications in chemical engg. **[6]**

b) Write short note on following with suitable example. **[12]**

i) Scalar product of two tensors

ii) Tensor product of two tensors

iii) Vector product of tensor with vector

Q2) Find currents I_1 (+) and I_2 (+) in network shown in foll. Figure assuming that all charges and currents are zero at $t = 0$, the instant when the switch is closed. **[16]**

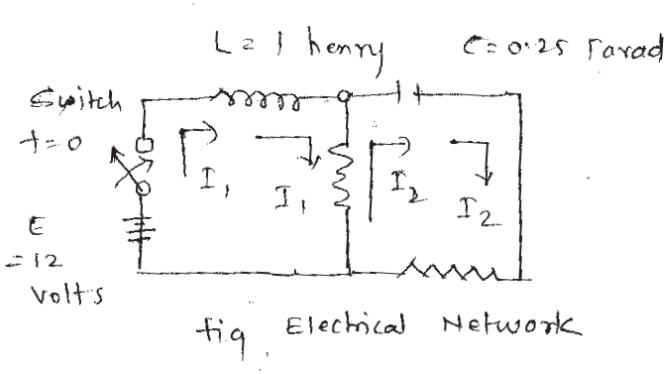


fig. Electrical Network

Model equations are $I_1' = -4I_1 + 4I_2 + 12$

$$I_2' = -1.6I_1 + 1.2I_2 + 4.8$$

P.T.O.

Q3) Determine the type and stability of critical points. Then find real general soln. Finally sketch or plot some trajectories in phase plane. **[16]**

a) $y_1' = y_1$

$y_2' = 2y_2$

b) $y_1' = 2y_1 + y_2$

$y_2' = 5y_1 - 2y_2$

Q4) a) Solve following examples using power series method . **[8]**

i) $y' - y = 0$

ii) $y' = 2xy$

b) What are various types of critical points. Explain each in detail with neat diagram. **[10]**

SECTION - II

Q5) Use crank Nicolson method to solve for temp. distribution of a long, thin rod with length of 10 cm and following values. k′ = 0.49 cal/s.cm°C, Δx = 2cm, Δt = 0.1s. At t = 0 the temp. of the rod is zero and boundry conditions are fixed for all times at T(0) = 100°C and T(10) = 50°C. Note that the rod is of aluminium with C = 0.2174 cal/g°C and ρ = 2.7 g/cm^3 and λ = 0.020875. **[18]**

Q6) a) Differentiate between finite element and finite difference methods used for solving partial differential equations. **[8]**

b) Classify linear second order partial differential equations and explain each type with suitable examples in chemical Engineering. **[8]**

Q7) a) Explain the procedure of finite element method for one dimension applied to solve partial differential equations in detail. **[8]**

b) Write short note on : **[8]**

i) Singular Perturbation

ii) Regular Perturbation

Q8) Use fixed point iteration and Newton Raphson method to determine the root of following equations. **[16]**

$x^2 + xy - 10 = 0$

$y + 3xy^2 - 57 = 0$

■■■

Total No. of Questions : 8]

SEAT No. :

P1835

[Total No. of Pages : 2

[4265] - 826

M.E. (Chemical)

INDUSTRIAL POLLUTION CONTROL

(2008 Course) (Elective - IV (d)) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Before installation of an electrostatic precipitator, the stack gas of a power plant contained 6 gm particulates per m^3 of gas. The gas flow rate is 350 m^3/min and the new precipitator can remove 2500 kg particulates/day.

i) What is the emission rate of particulates before and after pollution control in kg/day.

ii) What is the efficiency of the ESP.

iii) Will the new system meet an emission standard of 0.7 gm /m^3. **[8]**

b) Explain lapse rate and stability of an environment . **[8]**

Q2) a) A 1000 MW power plant burns 10,000 metric tons of 1.5% sulphur coal per day. The flue gases are emitted into the atmosphere through a stack whose height is 200 m. The diameter of the stack at the plume exit is 5 m. The velocity and the temperature of the plume at the exit are 10 m/s and 120°C respectively. What is the downwind SO_2 concentration in the plume centreline on the ground at a distance of 5 km on a thin overcast night when the environmental lapse rate is equal to zero? Assume that the ambient air temperature is 15°C and the wind speed at the stack altitude is 6 m/s. Atmospheric pressure = 1000 mb, α = 0.28, A = 0.098, B = 0.373, P = 0.587. **[10]**

b) Explain various air pollution control methods. **[8]**

P.T.O.

Q3) Explain in brief the pollution caused by petroleum and petrochemical industries and discuss the methods and equipments which are used for controlling the same. **[16]**

Q4) a) Write a note on effects of global warming. **[8]**

b) Explain the elements of conceptual process design for designing an waste treatment plant. **[8]**

SECTION - II

Q5) An organic waste having a soluble BOD_5 of 250 mg/L is to be treated with a complete mix activated sludge process. The effluent BOD_5 is to be equal to or less than 20 mg/L. Design the reactor assuming that the temperature is 20°C. The flow rate is 5 Mgal /d and following conditions apply.

a) Return sludge concentration
= 10000 mg/L suspended solids.
= 800 mg/L volatile suspended solids.

b) MLVSS = 3500 mg/L = 0.8 × Total MLSS.

c) Mean cell residence time = 10 days.

d) Y = 0.65 lb cells/lb BOD_5 utilized.

e) Kd = 0.06 d^{-1}

f) Effluent will contain about 20 mg/L of biological solids of which 80 % is volatile and 65 % is biodegradable. Assume that the biodegradable biological solids can be converted from ultimate BOD demand to a BOD_5 demand using the factor 0.68 BOD K value = 0.1 d^{-1} (base10). **[16]**

Q6) a) Derive an expression for finding the concentration of micro organisms in the effluent in a complete mix reactor without recycle. **[8]**

b) Explain any advanced oxidation process for wastewater treatment with neat sketch. **[8]**

Q7) a) Explain gasification and pyrolysis as a method of solid waste disposal. **[10]**

b) Explain the classification of solid waste. **[6]**

Q8) Write short notes on the following : **[18]**

a) Nuclear waste disposal.

b) Waste disposal by incineration

c) Waste minimisation and its necessity.

■■■

Total No. of Questions : 8]

SEAT No. :

P1836

[Total No. of Pages : 2

[4265] - 841

M.E. (Chemical) (Environmental Engineering)

INDUSTRIAL WASTE TREATMENT

(2008 Course) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Attempt any three questions from each Section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Discuss about the industrial water quality requirements. **[8]**

b) Explain the reuse and recycling concept in water management. **[8]**

Q2) Explain the treatment techniques for removal of the following pollutants From Industrial waste; **[18]**

a) Heavy Metal

b) Fluoride,

c) Calcium

Q3) a) Give the distinction between clean up and cleaner technologies. **[8]**

b) Focus on water budgeting. **[8]**

Q4) The BOD results given below are observed on a sample of wastewater. **[16]**

t, days	1	2	4	6	8	10
BOD, mg/lit	6.5	11	18	22	24	26

a) Plot BOD curve.

b) Calculate parameters K_1 & Lu.

P.T.O.

SECTION - II

Q5) Draw a flowsheet for the treatment of paper Industry Wastewater and explain it in detail. **[16]**

Q6) Explain the concept, objective, design and cost-benefit analysis of common effluent treatment plant. **[16]**

Q7) Draw the flow sheet for treatment of sugar waste and focus on its Cost-benefit analysis with all details. **[16]**

Q8) Suggest the design for treatment of Industrial waste of the following : **[18]**

a) Dairy Industry

b) Distilleries.

■■■

Total No. of Questions : 8]

SEAT No. :

P1863

[Total No. of Pages : 3

[4265] - 846

M.E. (Chemical) (Environmental Engg.)

GROUNDWATER CONTAMINATION & POLLUTION CONTROL

(2008 Course) (Elective - IV) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) With a neat sketch of hydrologic cycle, explain the formation of groundwater in alluvial & hard rock terrain. Explain the principle feature that differentiate groundwater from surface water body. **[6]**

b) Distinguish & explain clearly the source of contamination of surface & groundwater. **[6]**

c) Discuss the various geological formation favourable for ground water formation. **[6]**

Q2) a) Explain clearly the distinguishing features of **[4]**

i) Homogenous & hetrogenous geological formation.

ii) Isotropic & anisotropic geological formation.

b) What are the factors that affect permeability of formation? What are the different methods for determining Permeability of soil & discuss any one laboratory method for determining permeability of soil formation. **[6]**

P.T.O.

c) What are the usefulness of flownet? **[2]**

In a homogenous, Isotropic confined aquifer of 20 m constant thickness, effective porosity 20%, permeability 15 m/day, two observation wells 1200 m apart indicate piezometric heads of 5.4 m & 3.0 m respectively, above M.S.L. Assuming uniform flow, average grain diameter of sand 1mm & kinematic viscosity of water $\upsilon = 0.01$ cm^2/ sec, state.

i) Whether Darcy's law is applicable?

ii) What is the average flow velocity in pores?

[4]

Q3) a) Explain the method for determining groundwater flow direction with suitable example. **[6]**

b) Derive the tangent law of refraction of groundwater flow in hetrogenous medium. **[4]**

c) Discuss the effect of compressibility on stressess developed in a porous medium. **[6]**

Q4) a) What are the different methods for obtaining solution to groundwater flow equation? Explain finite difference method for solving 1-D ground water flow equation considering explicit & implicit approximation. **[10]**

b) Answer any two of the following : **[6]**

i) Graphical solution of flownet

ii) Daray law & its limitation

iii) Transmissivity & storativity.

SECTION - II

Q5) a) What are point source pollutants & explain industry as a point source pollutant . **[6]**

b) Explain leaching & leaching requirement. **[4]**

c) Discuss briefly the underground travel phemenon of ground water contaminants. **[6]**

Q6) a) What is artificial recharge of ground water & what are the different types of recharge? under what condition a line of parallel wells to stream is suitable for induced recharge & derive the equation for ground water table slope in such condition. **[8]**

b) What is sea water intrusion? Explain the Mechanism of salt water intrusion into aquifer Discuss any one method of controlling intrusion. **[6]**

c) What are the different types of trace metals that contribute groundwater contamination. Explain transportation of trace Metal in ground water. **[4]**

Q7) a) Give a brief account of composition of urban solid waste. **[4]**

b) Discuss any 3 leachate control strategies. **[6]**

c) With a neat sketch explain plume contamination generated from
i) a spill & ii) continuous source **[6]**

Q8) a) Answer any three of the following briefly. **[12]**
i) Groundwater contamination models.
ii) Dual permeability approach for ground water contamination flow.
iii) Groundwater pollution control by sheet piling.
iv) Role of adsorption in organic chemical transfer into soil.

b) Explain dispersion in fractured rock. **[4]**

■■■

Total No. of Questions : 12]

SEAT No. :

P1788

[Total No. of Pages : 2

[4265] - 869

M.E. (IT)

SOFTWARE ENGINEERING METHODOLOGIES

(2008 Course) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer books.***
2) ***From Section - I answer Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6 and answer Q. 7 or Q. 8, Q. 9 or Q. 10, Q. 11 or Q. 12 from Section - II.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) Explain how iterative development will be useful for developing software for managing the theory examination of undergraduate engineering students of Pune University. Clearly indicate the iterations and the deliverables at the end of every iteration. Elaborate your answer for four iterations. **[18]**

OR

Q2) a) Write short note on agile software process model. **[10]**

b) State one application for using spiral software process model and justify for the selection of the model. **[8]**

Q3) a) What is the significance of use case diagrams? What do the keywords actor, include, extend and generalization mean in the context of use case diagrams? Elaborate with a relevant example. **[10]**

b) Write the relevance of any one of following diagrams with the context of UML 2.0 **[6]**

i) Composite Structure diagram

ii) Component diagram

OR

Q4) a) Explain the meaning and show the representation (UML. 2.0) of expansion region, input/output pin and 2D swim lanes in the context of activity diagram. **[8]**

b) What is OCL? Show the usage for the keywords invariant, precondition post condition, and self in the context of OCL using suitable examples. **[8]**

P.T.O.

Q5) a) Explain the relevance of deployment diagram and list down the meaning of the keywords. **[8]**

b) Explain interaction overview diagram in brief. **[8]**

OR

Q6) a) Write short note on CORBA : **[8]**

b) What is requirement elicitation for functional and non functional requirements? Explain in brief. **[8]**

SECTION - II

Q7) a) Explain the software design concepts modularity and cohesion. **[8]**

b) Illustrate, with examples the following relationships present in the context of class diagram of UML 2.0 **[10]**

i) dependency
ii) generalization
iii) aggregation
iv) composite
v) realization

OR

Q8) a) Explain the lifecycle of designing a system from Object oriented perspective. **[10]**

b) Explain the steps involved in user interface design. **[8]**

Q9) a) What is code complexity testing? **[4]**

b) What is state based testing? Explain in brief. **[6]**

c) What is regression testing? Explain in brief. **[6]**

OR

Q10) a) What is stress testing and smoke testing? Explain. **[8]**

b) What is use case based software estimation? Explain in brief. **[8]**

Q11) a) Explain Ishikawa's seven tools for quality in brief. **[10]**

b) What is structural testing? **[6]**

OR

Q12) a) Explain software debugging. **[8]**

b) State the salient features of process assessment model CMMI. **[8]**

■■■

Total No. of Questions : 8]

SEAT No. :

P1837

[Total No. of Pages : 2

[4265] - 913

M.E. (Instrumentation & Control) (Process & Biomedical Instrumentation)

INDUSTRIAL AUTOMATION

(2008 Course) (Elective - I (a)) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from section - I and section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) List and define the various major types of PLC analog inputs and outputs. Describe the data flow and number conversions involved in PLC analog operation. **[10]**

b) Explain with suitable block schematic Model Predictive Control. **[8]**

Q2) What is SCADA? Explain in brief overview of the project management of SCADA Projects. **[16]**

Q3) Enlist main zones in steel plant. Suggest and design suitable automation strategy for the steel plant. Clearly show your steps. **[16]**

Q4) Write notes on : **[16]**

a) Components of the DCS.

b) Role of each layer in Automation Pyramid.

P.T.O.

SECTION - II

Q5) Explain in brief the role of SPC tools for managing processes, and to determine and monitor the quality of the outputs of an organization. Also list its applications. **[16]**

Q6) a) With the help of block diagram explain the architecture of DCS from any make. **[8]**

b) Develop a programmable ladder diagram for the given process: There are three mixing devices on a processing line: P, Q and R. After the process begins P is to be started after 9 seconds elapse. Next, mixer Q is to start 5 seconds after P. Mixer R is to start 3 seconds after Q. All then remain on for 15 seconds. After then product is to be removed through drain valve. This sequence is to be repeated for 5 times and then the process is halted. **[8]**

Q7) What is OPC? How end-user companies actually deploy OPC in their process and manufacturing environments. **[16]**

Q8) Design Fuzzy Logic Controller for water heating system. It should include: **[18]**

a) Hardware circuit design.

b) Temperature sensor calibration.

c) Software design.

d) Tuning for FLC.

Assume Suitable data if necessary.

■■■

Total No. of Questions : 8]

SEAT No. :

P1701

[Total No. of Pages : 2

[4265] - 916

M.E. (Instru. & Control) (Process Instru. & Biomedical Instru.)

Biomedical Instrumentation

FUNDAMENTALS OF BIOMEDICAL INSTRUMENTATION

(2008 Course) (Elective - I (a)) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each Section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Figures to right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Draw an arterial pressure wave indicating systole and diastole. Explain blood pressure measurement system based on korotkoff sound that is popular in clinical practice. **[10]**

b) Explain the basic types of bio electrodes with their materials. What is importance of Electrolytic Jelly in the biopotential measurement? **[8]**

Q2) a) Explain the function of the following in the cell : **[8]**

i) Mitochondria ii) Endoplasmic reticulum

iii) DNA iv) Golgi Apparatus

b) Discuss coulter counter method for counting of various blood cells associated with blood. **[8]**

Q3) a) Draw neat labeled spirogram. Draw and explain inverted bell spiro meter for respiratory measurement. **[10]**

b) Explain phonocardiograph and also mentioned transducers used in the same machine. **[6]**

Q4) a) What is ECG machine? Explain the preamplifier in ECG machine. **[8]**

b) What is fibrillation state of Heart? Draw and explain circuit diagram of machine used to correct the same problem. Also list out various electrodes used with it . **[8]**

P.T.O.

SECTION - II

Q5) a) Explain electromagnetic blood flow measurement with neat diagram. How the transformer voltage problem is tackled in the same?. **[10]**

b) Write functions of following: **[8]**

i) Cerebellum

ii) Pons

iii) Medulla oblongata

iv) Spinal cord

Q6) a) What is EEG? Discuss various waveforms in EEG with their significance and frequency. **[8]**

b) Explain the EEG 10-20 montage system. Discuss various waveforms in EEG with their significance and frequency. **[8]**

Q7) a) Define a "Hearing threshold". Explain the speech audiometer and pure tone audiometer. **[10]**

b) Explain the various vision errors in human vision system and also explain the way of elimination of the same. **[6]**

Q8) a) Define the followings : **[8]**

i) Gross shock

ii) Micro current shock

iii) Let go current

iv) Hold on current.

b) Draw structure of nephron and explain the process of urine formation. **[8]**

■■■

Total No. of Questions : 10]

SEAT No. :

P1704

[Total No. of Pages : 2

[4265] - 940

M.E. (Polymer)

MOULD AND DIE DESIGN

(2008 Course) (Elective - II(b)) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answers to Section - I and Section - II should be written on separate answer book.***
2) ***Question 1 from Section - I and Question 6 from Section - II are complusory.***
3) ***Solve any 2 questions from Section - I and any 2 questions from Section - II from remaining.***
4) ***Neat diagrams should be drawn whenever necessary.***
5) ***Figures to right indicate full marks.***
6) ***Assume suitable data, if necessary.***
7) ***Use of electronic pocket calculator is allowed.***

SECTION - I

Q1) Answer any two : **[20]**

a) Explain with neat sketch any 2 methods used for ejection of internally threaded component.

b) Explain with neat sketch any 2 types of secondary nozzles used in hot runner moulds.

c) With neat sketch explain the principle and working of finger cam actuation for split cavity.

Q2) a) Explain electrodischarge machining (EDM) with a neat sketch. Explain the requirement for tool material. **[9]**

b) Write a short note on Sleeve ejection. **[6]**

Q3) Draw a neat labeled sketch of an in -line pipe die. Explain the constructional features . **[15]**

Q4) a) Explain constructional features of standard guide pillar and guide bush with neat figure. **[8]**

b) Explain constructional features of flat seating and spherical seating sprue bush. **[7]**

P.T.O.

Q5) a) Explain angled hole and baffled hole cooling system for cores with a neat figure. **[8]**

b) Explain the various runner cross-sectional shapes used with neat figures. Explain the term runner efficiency and calculate the same for the various cross-sections used. **[7]**

SECTION - II

Q6) Answer any two : **[20]**

a) Explain the constructional features of a fish-tail die used for flat film extrusion.

b) Explain the constructional features of a rectangular manifold used in hot runner moulds.

c) Explain winkle type and subsurface gate with neat figure.

Q7) Write a stepwise procedure alongwith the relevant design formulae to determine pressure drop and die gap for a blown film die. **[15]**

Q8) a) Write a note on gate balancing. **[5]**

b) Discuss the types of material of construction used for fabrication of core, cavity, and guide pillar and guide bush. **[10]**

Q9) a) With neat sketches indicate the collapse of collapsible core to relieve internal threads. **[10]**

b) Write a short note on stack moulds. **[5]**

Q10) a) Bring out difference in the design of hot runner moulds and three plate moulds. **[6]**

b) Explain overlap gate, fan gate and film gate with neat diagrams. **[9]**

■■■

Total No. of Questions : 6]

SEAT No. :

P1838

[Total No. of Pages : 1

[4265] - 957

M.E. (Printing)

DIGITAL PRINTING

(2008 Course) (Elective - II (a)) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instruction to the candidates:

Solve any three questions from each section.

SECTION - I

Q1) Define Digital printing. Explain Piezo electric technology and compare With Thermal Inkjet. **[18]**

OR

Discuss technological advantage of inkjet technology over electrostatic.

Q2) Explain in detail PDF workflow and PDF-X flavors. **[16]**

OR

Explain Postscript levels and prepress configurations.

Q3) State in detail SWOP/GRACoL Certification for proofing systems. **[16]**

OR

Discuss Digital Proofing systems and color matching techniques.

SECTION - II

Q4) State ISO standardization for Digital Print Process. **[18]**

OR

Explain Colorimetric and Visual quality evaluation system.

Q5) Explain VDP & POD in detail. **[16]**

OR

Explain 3D Printing technology and applications.

Q6) Discuss latest trends in electrostatic printing technology. **[16]**

OR

Discuss HP Indigo system and advantages.

■■■

Total No. of Questions : 6]

SEAT No. :

P1839

[Total No. of Pages : 1

[4265] - 958

M.E. (Printing)

ENTREPRENEURSHIP IN PRINTING & ALLIED FIELDS

(2008 Course) (Elective - II (b)) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

Solve any three questions from each section.

SECTION - I

Q1) Define entrepreneurship and application in Printing. **[18]**

OR

Explain Managerial and Supervisor structure in a Printing plant.

Q2) Explain functional and planning aspects in running a Press. **[16]**

OR

Discuss Laws related to publications.

Q3) Describe procedure for costing and estimating a print job. **[16]**

OR

Explain workflow and material management in a print house.

SECTION - II

Q4) Explain methods to maintain standards in a production firm. **[18]**

OR

Discuss Database management systems and importance.

Q5) Explain customer relations and sourcing systems. **[16]**

OR

Discuss global business cultures.

Q6) Discuss contract and negotiations laws. **[16]**

OR

Discuss Excise and customs related to printing industry.

■■■

[4265] – 437

Seat No.	

M.E. (Civil-Hydraulics) Examination, 2012
(2008 Course)
COMPUTATIONAL METHODS IN HYDRAULICS

Time : 3 Hours Max. Marks : 100

Instructions *: 1) Answer* ***any three*** *questions from* ***each*** *Section.*
2) Answers to the ***two*** *Sections should be written in* ***separate*** *books.*
3) Neat diagrams must be drawn ***wherever*** *necessary.*
4) Black figures to the ***right*** *indicate* ***full*** *marks.*
5) ***Use*** *of logarithmic tables slide rule and non-programmable electronic pocket calculator is* ***allowed****.*
6) ***Assume*** *suitable data,* ***if*** *necessary.*

SECTION – I

1. a) Write down the finite difference analogue of the equation, $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$. **4**

   b) Solve $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ subject to the initial condition, $u = \sin \pi x$ at $t = 0$ or $0 \le x \le 1$ and $u = 0$ at $t = 0$ and $x = 1$ for $t > 0$ by the Gauss-Seidel method. **12**

2. a) Given the differential equation, $\frac{dy}{dx} = \frac{x^2}{y^2 + 1}$ with the initial condition, $y = 0$ when $x = 0$, use Runge-Kutta second and fourth order formula to obtain y for $x = 0.25$ and 0.5 correct to four decimal places. **8**

   b) Solve the boundary value problem $\frac{\partial^2 y}{\partial x^2} = y$ with $y(0) = 0$ and $y(2) = 3.627$. **8**

   c) Given $\frac{dy}{dx} - 1 = xy$ and $y(0)=1$, obtain the Taylor series for $y(x)$. **2**

P.T.O.

3. a) Define Markov process and Markov chain and specify the state in a Markov chain. **4**

   b) Discuss linear and multiple linear regression analysis by giving suitable examples in Hydraulics Engineering. **6**

   c) A random variable has lognormal distribution with $\mu_n = 6.5$ and $\sigma_n = 0.6$. What are the mean and standard deviation of this variable ? What is the probability that the random variable exceeds 450 ? **6**

4. a) Explain under what conditions does a random variable follow : **4**
      i) Normal distribution
      ii) Lognormal distribution
      iii) Gumbel's distribution and
      iv) Weibull's distribution.

   b) Explain in brief **any three** of the following : **12**
      i) Chi square test
      ii) Correlation coefficient
      iii) Normal distribution
      iv) Poisson distribution.

SECTION – II

5. a) State and explain the applications in Hydraulic Engineering where numerical integration process is required to be used. State the various formulae used to carry out numerical integration. **8**

   b) Following are the bihourly measurements of flow through a moderate size stream due to short duration rainfall, flow being recorded at a gauging station for a total period of 24 hours :

Time (hours)	0	2	4	6	8	10	12	14	16	18	20	22	24
Flow (m^3/sec)	4	14	22	28	33	36	39	43	38	29	20	13	5

   Obtain the average rate of flow through the stream. Use trapezoidal rule. **8**

6. a) State the basic theorem on Schwarz-Christoffel transformation. Explain how this transformation is used to map the semi-infinite strip enclosed by real axis and the lines $u = \pm 1$ of the w-plane on to an upper half of the z-plane. **10**

   b) Use Simpson's $\frac{1}{3}^{rd}$ rule to evaluate the integral $\int_0^{\pi} \frac{\sin x}{2 + 3\sin x}\, dx$. Divide the domain into six equal parts. **8**

7. a) Explain conformal mapping in detail. **6**

   b) For the flow pattern $w = 3z^2$ determine the magnitude and direction of velocity vector at the point (3, 5). **4**

   c) Using two-point Gauss quadrature evaluate the integral $\int_0^{1} \frac{dx}{1 + x}$. Compare the result with the exact solution and comment on the error involved. **6**

8. Write short notes on **any four** of the following : **16**

   a) Joukowski transformation

   b) Simpson's $\frac{3}{8}^{th}$ rule

   c) Complex integration

   d) Relaxation technique

   e) Taylor's expansion.

[4265] – 446

Seat No.	

M.E. (Civil-Hydraulics) Examination, 2012
(2008 Course)
OPEN CHANNEL HYDRAULICS

Time : 3 Hours Max. Marks : 100

Instructions *: 1) Answer* ***any three*** *questions from* ***each*** *Section.*
2) Answers to the ***two*** *Sections should be written in* ***separate*** *books.*
3) ***Neat*** *diagrams must be* ***drawn wherever*** *necessary.*
4) Black figures to the ***right*** *indicate* ***full*** *marks.*
5) ***Use*** *of logarithmic tables slide rule and Non-programmable Electronic Pocket calculator is* ***allowed****.*
6) Assume ***suitable*** *data,* ***if*** *necessary.*

SECTION – I

1. a) A circular channel 2.5 m in diameter is made of concrete having Manning's n = 0.014 and is laid on a slope of 1 in 200.

   Calculate:

   i) discharge if the normal depth is 1.5 m and

   ii) depth of flow for a discharge of 15 m^3/s. **8**

   b) Classify the following open channel flow situations :

   i) Flow from a sluice gate

   ii) A river during flood.

   iii) Flow in a sewer

   iv) Flow over a spillway

   v) Breaking of a dam.

   vi) Sudden opening of a sluice gate.

   vii) Flow in a main irrigation canal.

   viii) Spreading of irrigation water on a field. **8**

2. a) Explain the energy variation in a short hydraulic jump using specific energy equation. For a constant specific energy of 1.8 N-m/N. Calculate the maximum discharge that may occur in a rectangular channel 5 m wide. **12**

   b) Discuss characteristics of jumps on a slopping floor. **4**

3. a) Sketch the GVF profiles produced on the upstream and downstream of a sluice gate introduced in a

      i) steep slope

      ii) mild slope and

      iii) horizontal bed channel. **6**

   b) A river 90 m wide and 2.5 m deep has an average bed slope of 0.0005. Estimate the length of the gradually varied flow profile produced by a low weir which raises the water surface just upstream of it by 1.25 m. Assume Manning's n = 0.035. **12**

4. Write short notes on **any four** : **16**

      i) Most efficient channel sections.

      ii) Velocity distribution in a jump.

      iii) Methods of computation of gradually varied flow.

      iv) Channel transitions.

      v) Uniform flow formulae.

SECTION – II

5. a) Derive the dynamic equation of spatially varied flow with decreasing discharge. **6**

   b) A lateral spillway channel of rectangular section with base width of 5 m, Manning's roughness co-efficient of 0.021 and bed slope 0.16 is 125 m long. If the lateral inflow rate is 1.75 $m^3/s/m$, find the critical depth and its location. Assume β = 1.3. **12**

6. a) Obtain the continuity equation for unsteady flow in an open channel in the following form :

$$A\frac{\partial v}{\partial x} + vT\frac{\partial y}{\partial x} + T\frac{\partial y}{\partial t} - q + v\left(\frac{\partial A}{\partial x}\right)_y = 0$$

Notations have usual meanings. **6**

b) A rectangular channel 4 m wide carries a discharge of 6 m^3/sec with a velocity of 1 m/sec. If a sudden release of additional flow at the upstream end of the channel causes the depth to increase by 50%, determine the absolute velocity of the resulting surge and the net flow rate. **10**

7. a) What is flood routing ? Explain the Method of characteristics solution of flood routing problem. **7**

b) Explain the following with neat sketches :

i) Standing and progressive waves,

ii) Positive and negative surges,

iii) Dam break problem. **9**

8. Write short notes on **any four** of the following :

a) Stratified flow,

b) Exchange co-efficients,

c) Profile computations for spatially varied flow,

d) Group velocity,

e) Channel routing,

f) Solitary wave. **16**

[4265] – 474

Seat No.	

M.E. (Civil) Environmental Engineering Examination, 2012
AIR POLLUTION & CONTROL – (2010 Course)

Time : 3 Hours | Max. Marks : 100

Instructions : *1) Answer **any three** questions from **each** Section.*
*2) Answer to the **two** Sections should be written in **separate** book.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Your answer will be **valued** as a **whole**.*
*5) **Use** of Logarithmic tables, slide rules, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*6) Assume suitable data, **if necessary**.*

SECTION – I

1. a) State the adverse effects of air pollution on Human health, Vegetation and Materials. **9**

   b) Explain the sources and classification of air pollutants. **9**

2. a) Discuss in detail about the Lapse rate of temperature and Vertical stability. **9**

   b) Explain in brief about plume behavior. **7**

3. a) What factors affect the plume rise and therefore effective stack height ? **7**

   b) Explain the Gaussian model. **9**

4. Briefly explain the following : **16**

   1) Global effects of air pollution

   2) Meteorological factors influencing air pollution

   3) Photochemical smog

   4) Dispersion of air pollutants.

P.T.O.

SECTION – II

5. a) What are the importance of following in achieving the air quality standards ?

   1) Air quality control regions

   2) State implementation plans

   3) Emission standards. **9**

   b) Discuss about the stack sampling techniques. **7**

6. a) State the methods of control of gaseous contaminants and describe any one of them in detail. **8**

   b) What are the various approaches to minimize pollution due to automobile ? **8**

7. a) How the short term air pollution survey is conducted in a city like Pune ? **9**

   b) State in brief about the Environmental (Protection) Act, 1986. **7**

8. Briefly explain the following : **18**

   1) Electrostatic precipitators to control particulate pollution.

   2) Recent development in automobile industries to reduce air pollution.

   3) Air Acts in India.

[4265] – 537

Seat No.	

M.E. Mech. (Design Engg.) Examination, 2012
INDUSTRIAL TRIBOLOGY
(Elective – IV)

Time : 3 Hours Max. Marks : 100

Instructions *: 1) Answer* ***any 3*** *questions from* ***each*** *Section.*
2) Answers to the ***two*** *Sections should be written in* ***separate*** *books.*
3) ***Neat*** *diagrams must be drawn* ***wherever*** *necessary.*
4) Black figures to the ***right*** *indicate* ***full*** *marks.*
5) ***Use*** *of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is* ***allowed****.*
6) Assume suitable data, ***if necessary****.*

SECTION – I

1. a) Explain the Plaughing theory of wear and obtain an equation of prediction of wear by this theory. **10**

   b) Discuss the factors affecting wear. **6**

2. a) List methods of wear prevention and a practical example of each. **8**

   b) Obtain Petroffs equation for friction coefficient and power lost in lightly loaded bearings. Also state the assumptions made. **10**

3. a) Obtain an equation of pressure distribution in flat plate thrust bearing (Tapered pad bearing). **12**

   b) Write assumptions made while deriving Reynold's equation and limitations of Reynold's equation. **6**

4. Write short notes on **any two** of the following : **16**
   i) Tribological properties of bearing materials and lubricants.
   ii) Methods of calculating heat in bearings.
   iii) Solution of Reynold's equation and Sommerfeld conditions.

P.T.O.

SECTION – II

5. a) Obtain an equation for time required for a circular plate to reduce film thickness from h_1 to h_2 while it approaches a fixed plane. **12**

   b) Explain any four situations where hydrostatic squeeze film exists. **4**

6. a) A rectangular plate having 50 mm length and infinite width is approaching a fixed plane surface. Initially oil film thickness is 0.035 mm and viscosity of oil is 75 Cp load supported per unit width of plate is 30 KN/m

   Calculate :

   i) The time required to squeeze the film to 0.008 mm.

   ii) The maximum pressure.

   iii) Average pressure. **10**

   b) Explain the mechanism of elastohydrodynamic lubrication. **6**

7. Two cylinders of radius R_1 and R_2 and length L are rotating against each other and transmitting load 'W'. The cylinders are made of same material with modulus of elasticity 'E' and Poisson's ratio 'M'. Find width of contact. **16**

8. Write short notes on **any three** below. **18**

   a) Tribological aspects of wheel on rail contact.

   b) Mechanics of tyre rode interaction.

   c) Pressure viscosity terms in Reynold's equation.

   d) Merits and demerits of Gas lubricated bearings.

Total No. of Questions : 6]

SEAT No. :

P1444

[Total No. of Pages : 2

[4265] - 445

M.E. (Civil - Hydraulics)

HYDROPOWER

(2008 Course) (Elective - II (c)) (Sem. - I)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) State and explain the advantages of hydropower as against thermal power. **[10]**

b) A run - of - stream station with an installed capacity of 15000 kw operates at 15% load factor when it serves as a peak load station. What should be the lowest discharge in the stream so that the station may serve as the base load station? It is given that the plant efficiency is 75% when working under a head of 20 m. Also calculate the maximum load factor of the plant when the discharge in the stream rises to 20 cumec. **[8]**

c) Write a short note on 'Load Prediction'. **[7]**

Q2) a) State and explain various components of 'Run-of-River' plants. **[10]**

b) Explain the economics of pumped storage plants. **[10]**

c) Write a short note on peak load plants. **[5]**

Q3) a) With the help of a case study briefly explain 'Lake Tapping'. **[12]**

b) State merits and demerits of underground power house. **[8]**

c) Write a short note on 'Selection of type of power house'. **[5]**

P.T.O.

SECTION - II

Q4) a) What is meant by 'Economic Diameter of a Penstock'? State the various methods of determining the economic diameter of a penstock and explain the graphical method. **[8]**

b) A 1.5 m diameter, 2000 m long steel pipe having a wall thickness of 12.5 mm carries water to a turbine at the rate of 3.6 m^3/sec. Determine the rise of pressure head when a valve at the end of the pipe is closed in 04 seconds. Take the modulus of elasticity for steel as 2.07×10^{11} N/m^2 and the bulk modulus of elasticity for water as 2.08×10^9 N/m^2. What will be the rise of pressure if the valve is closed in 25 seconds? **[9]**

c) A simple surge tank 8 m in diameter is provided on a conduit of 2 m diameter at a distance of 2.5 km from the reservoir. If the discharge passing through the conduit is 20 m^3/sec. Calculate the maximum upsurge and the time required to attain it. Neglect friction and assume complete and rapid closure of the penstock valve. What should be the height of surge tank to be provided? **[8]**

Q5) a) Explain the norms for the choice of hydraulic turbines in a hydro-electric power plant based on specific speed.
State the examples of hydro-electric power plants in India or Maharashtra where following types of hydraulic turbines have been installed : **[7]**
i) Pelton wheel ii) Francis turbine iii) Kaplan turbine

b) Explain the functions of following components in case of reaction turbine installation. **[6]**
i) Scroll casing ii) Guide vanes iii) Draft tube

c) A Pelton wheel is to be designed for the following data : **[12]**
i) Power to be developed = 8 Mw
ii) Net head available = 350 m
iii) Rotational speed = 475 rpm
iv) Minimum value of jet ratio = 10
v) Overall efficiency = 92%
vi) Nozzle co-efficient = 0.98
vii) Speed ratio = 0.46
Determine the runner diameter, number of jets to be provided, the diameter of each jet and the specific speed.

Q6) a) Write a detailed note on objectives of micro-hydel power plants. **[10]**

b) State and explain the design aspects of micro-hydel scheme. **[10]**

c) State the objectives of hydropower policy 1998. **[5]**

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Total No. of Questions : 6]

SEAT No. :

P1446

[Total No. of Pages : 3

[4265] - 459

M.E. (Civil - Structures)

ADVANCED DESIGN OF METAL STRUCTURE

(2008 Course) (Elective - II (a)) (Sem. - I)

Time : 4 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answers any two questions from each section.***
2) ***Answers to the two sections should be written in two separate answer books.***
3) ***Neat, black diagrams should be drawn wherever necessary.***
4) ***Assume suitable data, if required.***
5) ***Use of IS - 800, 875, 1915, 1161 steel section table is allowed.***
6) ***Use of non programmable pocket calculator allowed.***

SECTION - I

Q1) a) Sketch structural configurations of Hoarding structures & state its specific utility & suitability. **[5]**

b) A hoarding of 20 m × 16 m height is to be erected at the height of 16 m from ground level. Limited ground clearance is available to accommodate maximum three vertical pillar structure of not more than 400 × 400 mm size. **[20]**

i) Give the schematic arrangement of hoarding structure. Location of structure Pune city.

ii) Calculate wind load for the structure you have suggested.

iii) Calculate forces for which foundation be designed.

Q2) a) What are assumptions made in calculating stresses in castillated beams. **[6]**

b) Explain with advantages & applications of castillated beam, manufacturing / fabrication of castillated beam. **[6]**

c) Explain calculation of bending stresses & shearing stresses in castillated beams. **[13]**

P.T.O.

Q3) a) Differentiate aluminium structures & steel structures from structural point of view. State advantages & disadvantages of aluminium structures with respect to steel structures. **[8]**

b) Compare the strength of Aluminium and steel I section of depth 200 mm when subjected to flexural loads of uniform intensity. **[10]**

c) Design compression member to carry axial compression of 200 kN over a length of 2.4 m. Use aluminium section. **[7]**

SECTION - II

Q4) a) Explain main difference in the design of microwave towers and transmission line towers. **[3]**

b) State and explain various forces to be considered in the design of transmission line towers. **[6]**

c) Draw the geometry of the tower with reference to the following data. **[16]**

i) Weight span of tower 250 m.

ii) ACSR conductors of 30 mm dia consisting of 50 strands of aluminium and 7 strands of steel wires each of 3 mm in dia.

iii) Unit weight of conductor 17 N/m.

iv) Permissible axial tension 36 kN.

v) Young's modulus of elasticity 9×10^4 N/mm^2.

vi) Coefficient of expansion 0.00002 /^{o}C.

vii) Shape factor for conductor 0.67.

viii) Range of temperature 5^{o}C to 60^{o}C.

ix) Wind intensity 1.5 kN/m^2.

x) Ground wire 10 mm dia gal. steel wire with permissible axial tension of 26 kN.

xi) Vertical height of conductor above ground 7 m.

xii) Vertical spacing between power conductors 4 m.

xiii) Horizontal spacing between power conductors 6.5 m.

Q5) a) Explain the advantages of use of round tubular section over equivalent rolled steel shapes. **[5]**

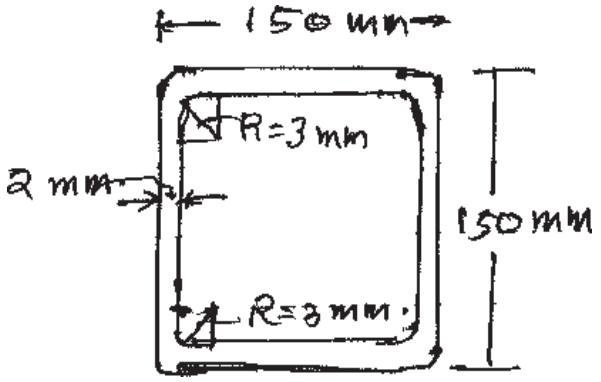
b) A column of 3.5 m effective length is made of heavy gauge tube of 219.1 mm outside diameter. Determine the safe load the column can carry if the column is of IS 1161 grade Yst 210 steel. **[10]**

c) Two members of a tubular truss, consisting of principal rafter and a tension member meets at right angle. Principal rafter carries a load of 180 kN and the tension member carries a force of 60 kN Length of principal rafter is 2.2 m. Design the members. Steel is of IS 1161 grade Yst 240. **[10]**

Q6) a) What is post buckling strength as applied to light gauge sections ? **[4]**

b) Explain effective design width and derive the Von- karman equation.**[7]**

c) Find the allowable load for the column section as shown in the figure below. Effective length of the column is 3 m. Take fy = 235 N/mm^2.**[14]**



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Total No. of Questions : 8]

SEAT No. :

P1452

[Total No. of Pages : 2

[4265] - 484

M.E. (Civil) (Environmental Engineering)

SOLID WASTE AND HAZARDOUS WASTE MANAGEMENT

(2010 Course) (Semester - II)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from Section - I and Section II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Discuss the problems and issues of solid waste and hazardous waste management in India. Also discuss the environmental impact of mismanagement of solid and Hazardous wastes **[18]**

Q2) Describe "Radioactive fallout" and discuss its environmental hazards. Also discuss the control measures for low and high activity liquid radioactive waste. **[16]**

Q3) A risk assessment is to be performed for a proposed hazardous waste incinerator site. Briefly describe the specific factors that should be considered in each of the four steps. **[16]**

Q4) Write a short notes on following (All) : **[16]**

a) Criteria for sitting a hazardous waste incinerator.

b) Radioactive waste management in Nuclear power plant.

c) Hazard identification system.

d) Cradle–to–grave concept for hazardous waste management.

P.T.O.

SECTION - II

Q5) Discuss the site selection criteria for sanitary landfills. Also Discuss the important factors to be considered in the design of landfills. State the advantages and disadvantages of land filling. **[18]**

Q6) What are different types of collection systems of Solid Wastes? Explain any one in detail. **[16]**

Q7) What are Biomedical wastes? Discuss the various methods of its collection and disposal. **[16]**

Q8) Write short notes on :

a) Economic analysis of Solid Waste Management **[6]**

b) Management of Nuclear Waste **[5]**

c) Landfill remediation **[5]**

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Total No. of Questions : 8]

SEAT No. :

P1454

[Total No. of Pages : 3

[4265] - 576

M.E. (Mechanical) (Energy Engineering)

ENERGY CONVERSION SYSTEMS

(2012 Course) (Sem. - I)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each Section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Draw neat diagrams wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of log tables, Mollier charts, electronic pocket calculator and steam tables is permitted.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain Renewable and Non-Renewable Energy Resources. State their Differences. State salient features of Renewable Energy Resources. **[8]**

b) Explain with neat diagram the nuclear power generation by nuclear fission reaction. State main functions of moderator, control rods and coolant in Nuclear power plant. **[8]**

Q2) a) Explain working of Impulse and Reaction steam turbines. **[4]**

b) A gas turbine plant works between the fixed temperature limits of 290 K and 950 K. The pressure limits being 1 bar and 4 bar. The isentropic efficiency of Compressor = 0.85 and the turbine = 0.9. Estimate the actual thermal efficiency of the plant and power available for driving external load if the fuel Consumption is 1.1 kg/s and the calorific value of the fuel = 42000 kJ/kg. **[12]**

Q3) a) Explain the mechanism of fluidized Bed Combustion with neat sketch. State advantages and disadvantages. **[6]**

P.T.O.

b) A vapour compression refrigerator uses R-12 as refrigerant. The temperature in the evaporator is - 15°C. The temperature of the refrigerant leaving the compressor is 15°C where as the vapour is condensed at 10°C. Find the coefficient of performance if **[12]**

i) there is no undercooling

ii) and there is undercooling by 5°C before expansion by throttling.

The properties of refrigerant are as follows :

Temp. in °C	Enthalpy in kJ/kg		Entropy in kJ/ kgK	
	Liquid	Vapour	Liquid	Vapour
-15	22.3	180.88	0.0904	0.7051
10	45.4	191.76	0.1750	0.6921

Cp of super heated vapour is 0.64 kJ/kg K and that of liquid as 0.94 kJ/ kg K.

Q4) Write short notes on :

a) Effect of Regeneration, Reheating and Inter-cooling for net work Done and efficiency improvements in case of Gas turbines. **[6]**

b) Vapour Absorption Refrigerator working with ammonia and water. **[6]**

c) Performance Evaluation of Boilers. **[4]**

SECTION - II

Q5) a) Explain how cogeneration is advantageous over conventional power plant. **[4]**

b) What do you understand by tri generation? **[4]**

c) Explain the operating principles of a waste heat recovery boiler with examples. **[6]**

d) What are the direct and indirect benefits of waste heat recovery? **[4]**

Q6) a) Explain major components of compressed Air system. **[4]**

b) List the factors that affect energy efficiency in air compressors. **[6]**

c) Explain the difference between fans, blowers and compressors. **[2]**

d) Describe a centrifugal fan with the help of neat sketch. **[4]**

Q7) a) Explain static head and friction head in pumps. **[4]**

b) Explain briefly with a sketch the energy loss due to throttling in a centrifugal Pump. **[6]**

c) What are the basic components of cooling tower? Explain in brief. **[6]**

Q8) Write short notes on :

a) The factors affecting waste heat recovery from DG set. **[6]**

b) Function of fill media in a cooling tower. **[4]**

c) Fan total pressure, Fan Air Power, and Fan total efficiency. **[6]**

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Total No. of Questions : 6]

SEAT No. :

P1455

[Total No. of Pages : 2

[4265] - 610

M.E. (Electrical) (Power Systems)

Power Sector Economics Management & Restructuring

(2008 Course) (Semester - I)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any Two questions from each Section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***All questions carry equal marks.***
6) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) A generation company has invested Rs. 2000000 for installing waste heat recovery system to recover waste heat from the flue gas in DG Set. Find out the internal rate of return, if the annual net savings cash flow accrued for 6 years are as given below : The company got a bank loan for the investment at 8% interest rate. Whether the company can recover the investment and repay the bank loan. **[9]**

Year	Annual Net Saving, Rs. lacs
1	6
2	6
3	7
4	7
5	8
6	8

b) Explain institutional structure of Indian Power Sector under going restructuring. **[8]**

c) What are different tariff setting principles followed by regulators? **[8]**

P.T.O.

Q2) a) With reference to regulation explain following terms : **[8]**

i) Regulator asset and liabilities

ii) Equity and cross subsidy

b) Explain tariff determination by price cap and revenue cap regulation. What are the advantages of this regulation over cost plus method? State the limitations of this regulation. **[9]**

c) Explain role of planning commission and central electricity authority in development of power sector in India. **[8]**

Q3) a) What are the conditions that favour deregulation of power sector? Also explain new challenges faced by power engineers in deregulated power industry. **[9]**

b) Explain following tariff strategies : **[8]**

i) Life line tariff ii) Interruptible tariff

iii) Telescopic tariff

c) Discuss the issues of hidden and cost of externalities in regulation. **[8]**

SECTION - II

Q4) a) What are the highlights of deregulated power industry structure in Latin American nations? **[8]**

b) Discuss models on the basis of functionality and role of independent system operator. **[9]**

c) What are transmission rights? What are problems with physical transmission right? Whether it is affecting transmission pricing? **[8]**

Q5) a) Explain Option and contract for differences exercise in power market. **[8]**

b) Define term arbitrage. What is the importance of arbitrage in power system pricing and operation? What are different types explain them with suitable example. **[9]**

c) Explain role of following terms in energy market : **[8]**

i) Opportunity cost ii) Elasticity of demand

iii) Long run and short run costs

Q6) a) What is congestion? Discuss reasons for congestion. Will it affect pricing of power? How? **[8]**

b) Explain open access model and pool model used in power trading. **[8]**

c) Explain following term related to pricing : **[9]**

i) Pricing of reactive power ii) Pricing for renewable energy

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Total No. of Questions : 6]

SEAT No. :

P1456

[Total No. of Pages : 2

[4265] - 612

M.E. (Electrical) (Power System)

DIGITAL SIGNAL PROCESSING AND ITS APPLICATIONS

(2008 Course) (Elective - I (a)) (Semester - I)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any two questions from each Section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) State and prove initial value and final value theorem for Z transform. **[5]**

b) Explain frequency aliasing and sampling theorem. **[6]**

c) Find the response of the following systems to the signal. **[8]**

$$x(n) = \begin{cases} 1 & -2 \le n \le 2 \\ 0 & elsewhere \end{cases}$$

i) $y(n) = \dfrac{x(n) + x(n+1)}{2}$

ii) $y(n) = x(n+1)$

d) Find if the following systems are linear / nonlinear, time variant / time invariant. **[6]**

i) $y(n) = n\,x^2(n)$

ii) $y(n) = x(n) + x(n-1)$

Q2) a) Prove following DFT properties : **[8]**

i) If $x_2(n) = a\,x_1(n) + b\,x_2(n)$
then $X_3(k) = a\,X_1(k) + b\,X_2(k)$

ii) If DFT $[x(n)] = X(k)$ then
DFT $[x((-n))_N]$ = DFT $[x(N-n)]$
$= X((-k))_N = X(N-k)$

P.T.O.

b) Obtain output response $y(n)$ if $h(n) = \{1, 2, 2, 1\}$ and $x(n) = \{1, -1, 1, -1\}$ by using. **[8]**
   i) Linear convolution
   ii) Circular convolution with zero padding for linear convolution

c) Explain radix 2 FFT - dIF algorithm in details. **[9]**

Q3) a) Explain design of causal FIR filter using rectangular window in details. **[10]**

b) Explain direct form and cascade form realization of FIR filters. **[10]**

c) Explain the concept of symmetric and antisymmetric FIR filters in brief. **[5]**

SECTION - II

Q4) a) An analog filter has a transfer function $H(s) = \frac{10}{s^2 + 7s + 10}$ Design a digital filter equivalent to this using impulse invarient method for T = 0.2 sec. **[8]**

b) Explain the steps involved in designing digital low pass IIR filter using Butter worth method. **[10]**

c) Derive the relations for direct form I realization of IIR filters. **[7]**

Q5) Explain following concepts. **[25]**

a) Multiply Accumulate Unit.

b) Harvard Architecture.

c) Desirable features of digital signal processor.

d) Circular addressing.

e) Effect of finite word length.

Q6) a) Explain following concepts for DSP TMS 320C50.
   i) Addressing Modes **[10]**
   ii) Bus structure **[5]**

b) Write a note on DSP based power system harmonic measurement system. **[10]**

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Total No. of Questions : 6]

SEAT No. :

P1459

[Total No. of Pages : 2

[4265] - 617

M.E. (Electrical) (Power System)

POWER SYSTEM PLANNING & RELIABILITY

(2008 Course) (Semester - II)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any two questions from each Section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***All questions carry equal marks.***
6) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain Extrapolation method for load fore casting. **[10]**

b) Explain weather sensitive load forecasting and components associated with it. **[15]**

Q2) a) Explain Recursive method for reliability analysis. **[10]**

b) Explain reactive power planning & its components. **[15]**

Q3) a) Explain objectives and details of long term planning. **[10]**

b) Explain methodology of total fore casting in details for a typical power system. **[15]**

SECTION - II

Q4) a) Explain factors affecting interconnection under emergency condition. **[10]**

b) Explain multilevel energy transmission system. **[15]**

P.T.O.

Q5) a) Explain loss of load expected & loss of energy expected in detail. **[10]**

b) Explain continuous markov process in evaluation of reliability. **[15]**

Q6) a) Explain bus bar failure related to parallel network only. **[10]**

b) Discuss transmission system reliability & describe expressions for LOLP & DNS. **[15]**

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Total No. of Questions : 6]

SEAT No. :

P1501

[Total No. of Pages : 2

[4265] - 38

M.E. (Civil) (Structures)
BRIDGE ENGINEERING
(2002 Course) (Elective - I (a))

Time : 4 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any two questions from each Section.***
2) ***Answers to two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Use of IRC codes, IS 1343, IS 456-2000 & non programmable calculator is allowed.***
5) ***Neat diagrams must be drawn wherever necessary.***
6) ***Assume any other data, if necessary.***

SECTION - I

Q1) a) Write short note on Forces on Abutments. **[8]**

b) Write detail note box girder bridge. **[8]**

c) What are the hydraulic factors affecting the design of bridge. **[9]**

Q2) Design intermediate post tensioned prestressed concrete Tee Beam Bridge girder for the following :

Effective span = 12 m, width of carriageway = 7.5 m, No. of beams 4, equally spaced along the carriageway width, Spacing of cross girders = 3 m c/c, No footpath on either side loading class = IRC class AA, kerb size = 150 X 600 mm, concrete grade M 45 Design should include detail load, bending moment calculation, Check fiber stresses in concrete Draw sketches showing cable profiles. **[25]**

Q3) a) Compare simply supported PSC girder with balanced cantilever PSC girder. **[7]**

b) Design the culvert with the data : **[18]**

Clear span of the culvert = 5 m.
Clear carriage way width = 7.5 m.
Size of kerb = 300 mm × 600 mm.
Average thickness of wearing coat 100 mm.
Use material M 25, Fe 500.
Loading class AA.
Draw the cross section showing details of reinforcement at mid-span and at junction of the slab are kerb.

P.T.O.

SECTION - II

Q4) a) Describe different factor affecting the type of bridge foundations. **[8]**

b) List the different forces to be considered for design of bridge abutment design, explain importance of each. **[8]**

c) Explain with sketches, how tilting of sinking well foundation is corrected. **[9]**

Q5) a) Design wall type RCC pier for the following : **[20]**
Top width of pier = 1.2 m with semicircular ends
Length of pier = 7 m excluding the semicircular part
Height of above footing = 10 m
HFL above the top of footing = 8 m
Total DL Reaction = 2100 kN
Total LL Reaction = 1000 kN
Tractive force = 120 kN
C/C distance of bearing on either side of centre line of pier = 1 m
BM in traffic direction due to unequal DL & LL = 600 kN-m
Material of pier and footing = M 40 & Fe 500
Safe bearing capacity = 200 kN/m^2
Velocity of water current = 4 m/s consider the cross current also
Design the RCC footing and reinforcement in pier, check the stresses at the bottom of pier.

b) List merits and demerits well type over pile foundation used for bridge. **[5]**

Q6) a) Write a short note on metallic bearing, Draw sketches. Explain its merits and demerits. **[5]**

b) Design a reinforced elastomeric bearing at a pinned end of a plate girder of a bridge with following data. **[20]**
Maximum vertical load = 900 kN
Dynamic vertical load = 80 kN
Transverse lateral load = 40 kN
Longitudinal load = 50 kN
Longitudinal total translation 12 mm
Rotation at support = 0.003^0
Shear modulus of elastomeric bearing = 1.2 N/mm^2
Allowable comp. stress for concrete. = 8 N/mm^2
Allowable comp. stress for elastomer = 10 N/mm^2.

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Total No. of Questions : 8]

SEAT No. :

P1503

[Total No. of Pages : 2

[4265] - 51

M.E. (Mechanical) (Heat Power Engineering)

ENERGY CONSERVATION AND MANAGEMENT

(2002 Course)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each Section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of calculator log tables and electronic calculator is allowed.***

SECTION - I

Q1) a) Explain the Objectives of the Energy Management System. **[8]**

b) What is the significance of energy conservation act 2003? What are the various steps in implementation of the energy management in an organization. **[8]**

Q2) a) What is the importance of Analysis and Recommendation for Energy Audit? **[8]**

b) Write short notes on : **[8]**

i) Energy Policy. ii) Energy action planning.

Q3) a) What is Sensitivity Analysis? List different factors considered for sensitivity Analysis. **[8]**

b) Write in short the steps involved in energy audit of Air compressor. **[8]**

Q4) Write a short note on (any three) **[18]**

a) Sources of world Energy.

b) Different Energy Conservation Opportunities in Boiler System.

c) Energy Audit Methodology for Residential Application.

d) Energy Conservation Opportunities in HVAC System.

e) Instruments used in energy audit.

P.T.O.

SECTION - II

Q5) Explain any three of the following : **[18]**

a) Energy efficient lighting.

b) Automatic power factor controller.

c) Importance of performance monitoring.

d) Energy Conservation Opportunities in Compressed Air system.

Q6) a) Write notes on (any two) : **[8]**

i) Lighting levels in various applications.

ii) Efficient options in lighting system.

iii) Energy efficient motors.

b) Find the simple pay-back period required when Rs 10000/- is required to invest for replacing 30 incandescent lamps (40 W) by 9 W CFLs (30 nos.) producing same lumen output. Assume 10 hrs of operations per day and electric charge of RS 4/- per kWh. **[8]**

Q7) a) List the factors affecting on energy efficiency of electric motors. Explain the speed control of an electric motors. **[8]**

b) Explain the Energy Conservation Opportunities in Cooling Tower System. **[8]**

Q8) a) Explain in detail cogeneration systems used in power plants. **[8]**

b) List the advantages and limitations of cogeneration in steam power plant and diesel generating sets. **[8]**

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Total No. of Questions : 8]

SEAT No. :

P1504

[Total No. of Pages : 3

[4265] - 55

M.E. (Mechanical) (Heat Power Engg.)

ADVANCED REFRIGERATION & CRYOGENICS

(2002 Course) (Elective - I (c))

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, non programmable electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary and mention it clearly.***

SECTION - I

Q1) a) With neat schematic explain the cascade refrigeration system. Draw the cycle on T-s and p-h chart. **[7]**

b) Explain in brief, the guidelines for refrigerant piping design. **[4]**

c) Explain the effect of change in condensing and evaporating temperature on refrigeration system performance. **[5]**

Q2) a) What are the various compressors used in refrigeration applications? Compare different compressors stating its advantages and limitations. **[8]**

b) Explain design and selection criteria for refrigerant condensers. **[8]**

Q3) a) Two stage cascade refrigeration system operating between the pressure limits of 10 bar and 1.5 bar. Each stage operates on an ideal vapour compression cycle with refrigerant R 12. Heat rejection from the lower cycle to upper cycle takes place in an adiabatic counter-flow heat exchanger where both streams enters at about 3.8 bar. If the mass flow of refrigerant from the topping cycle is 1 kg/s. Determine **[12]**

i) Mass flow of refrigerant from the bottoming cycle.

ii) Rate of heat removal from the space and compressor power input.

iii) COP of cascade system.

Show the cycle on T-s and p-h diagram.

b) Explain : Vortex tube refrigeration. **[4]**

P.T.O.

Q4) List the various refrigerant controls. Explain in brief the working of any three controls. **[18]**

SECTION - II

Q5) a) Explain the different types of compressors and expanders used in liquefaction system. **[8]**

b) With neat sketch, explain the working of Claude liquefaction system for hydrogen. **[8]**

Q6) a) In vapour absorption refrigeration system, heating, cooling and refrigeration takes place at temperature of 80°C, 30°C, an 0°C. Find the maximum COP of the system. Derive the expression you use. **[6]**

b) With neat schematic explain how the liquid-oxygen is produced? **[7]**

c) What is the effect of low temperature on thermal properties of materials? **[3]**

Q7) a) Discuss the thermodynamics of Joule-Thomson effect. Explain the working of Linde-Hampson cycle with a neat schematic. **[9]**

b) Explain in brief : **[7]**

i) Superconducting bearings.

ii) Controls for absorption systems.

Q8) Write short notes on (any three) : **[18]**

a) Cryogenic insulations.

b) Electrolux refrigerator.

c) Stirling cryocooler.

d) Linde dual pressure cycle.

R-12
PRESSURE (MPa)
ENTHALPY (kJ/kg)
Saturated liquid
Saturated vapor
T = 0°C
T = 100°C
S = 0.9
S = 1.75 kJ/kg-K
S = 2.00
X = 0.5
Density = 10 kg/m³

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Total No. of Questions : 8]

SEAT No. :

P1511

[Total No. of Pages : 2

[4265] - 233

M.E. (Petroleum)

OFFSHORE TECHNOLOGY

(2002 Course)

Time : 3 Hours] *[Max. Marks :100*

Instructions to candidates:

1) ***Q. No. 1 and Q. No. 7 are compulsory. Out of the remaining attempt two questions from Section - I and two questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of Mollier charts, non-programmable electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Discuss in detail well design considerations for offshore deep drilling program. Write the possible difficulties and their solution in brief. **[18]**

Q2) Explain in detail methods to calculate wind, wave and current forces acting on an offshore structure. **[16]**

Q3) Describe in detail conventional station keeping system for floating offshore structure. **[16]**

Q4) a) Write short notes on : **[10]**

i) Remote operating vehicles.

ii) Rate of Penetration in drilling.

b) Explain, typical offshore well completion procedure in brief. **[6]**

P.T.O.

SECTION - II

Q5) a) Draw neat schematic sketch and explain a typical well cementation programme for a deep water offshore well. **[8]**

b) Discuss API grades of casing and tubing pipe used in drilling. **[8]**

Q6) a) What is concrete gravity platform? What is the principal of its operation? Discuss design considerations of it in brief. **[8]**

b) Discuss subsea well control in detail. **[8]**

Q7) Write short notes on : **[18]**

a) Central Tank Farm.

b) Offshore structures.

c) Forces acting on drill ship.

Q8) a) Describe in brief pipe line design considerations for transportation of gas along with analytical equations. **[8]**

b) Discuss offshore processing facility in brief. **[8]**

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Total No. of Questions : 10]

SEAT No. :

P1512

[Total No. of Pages : 2

[4265] - 251

M.E. (Computer Science / I.T.)

SOFTWARE ENGINEERING

(2002 Course)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each Section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is RAD model? Explain the need for it in current industry scenario. What are major issues with this model? **[8]**

b) Describe the spiral model of software development and discuss its strengths and weaknesses. **[8]**

Q2) a) Define TQM. Explain in brief quality planning and quality improvement. **[8]**

b) What is software architecture? Enlist important characteristics of the model of your choice with a suitable diagram. **[8]**

Q3) a) Explain the meaning of reliability or technical metrics and discuss any two metrics in detail that help in the assessment of system performance. **[8]**

b) What do you mean by process maturity? With the help of neat labeled diagram explain Capability Maturity Model. **[8]**

Q4) a) What is PERT / CPM technique? How is this technique useful in software project planning? Explain it with suitable example. **[8]**

b) If you were developing a security-critical system, how would you integrate the security requirements engineering and assurance processes into the model? **[8]**

P.T.O.

Q5) a) State and explain different organizational paradigms for software Engineering teams. **[10]**

b) What is change control? Explain the procedure of change control process? **[8]**

SECTION - II

Q6) a) Briefly explain the purpose of each of the stages in a software project plan. What is the critical distinction between a milestone and a deliverable? **[8]**

b) Suggest why it is important to make a distinction between developing the user requirements and developing system requirements in the requirements engineering process. **[8]**

Q7) a) An analysis rule of thumb is that the model "should focus on requirements that are visible within the problem or business domain". What types of requirements are not visible in these domains? Provide few examples. **[8]**

b) With suitable example, explain fault free analysis in critical system. **[8]**

Q8) a) Explain why an object oriented approach to software development may not be suitable for real time systems. **[8]**

b) Explain how CMM encourages continuous improvement of software process. **[8]**

Q9) a) What are design Patterns? What are different elements of design pattern? **[8]**

b) Explain the following design patterns : **[8]**

i) Observer and ii) Proxy

Q10) Write a short note on : **[18]**

a) Object Oriented Software life cycle model.

b) Software Version and Software Release.

c) Reference Architecture.

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Total No. of Questions : 8]

SEAT No. :

P1513

[Total No. of Pages : 2

[4265] - 294

M.E. (Chemical Engineering)

ADVANCED PROCESS DYNAMICS AND CONTROL

(2002 Course) (Semester - II)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer 3 questions from Section - I and 3 questions from Section - II.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables, slide rules, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain basic principles of empirical modeling of process. **[4]**

b) Explain step response method of process identification. **[7]**

c) Explain frequency response method of process identification. **[7]**

Q2) a) Linearize the Arrhenius equation $K(T) = K_o \exp(-E/RT)$. Also derive the transfer function. **[8]**

b) Linearize the model for liquid level in a tank. $A\frac{dh_1}{dt} = Fi - c\sqrt{n}$. Derive the transfer function. **[8]**

Q3) a) Explain bifurcation behavior of single ODE systems. **[8]**

b) Explain limit cycle behavior of non-linear system. **[8]**

Q4) a) Explain phase plane method of analysis of non-linear systems. **[8]**

b) Explain antireset windup systems. **[8]**

P.T.O.

SECTION - II

Q5) a) Explain dynamic behavior of inverse response systems with suitable physical examples. **[9]**

b) Explain adaptive control systems with suitable example. **[9]**

Q6) a) Explain model - based control systems. **[8]**

b) Explain behavior of open-loop unstable systems with suitable example. **[8]**

Q7) a) Define RGA of a MIMO system. State properties of RGA and explain how it can be used to determine pairing of variables that result in control loops with minimum interaction. **[8]**

b) Explain SVD method of analysis of MIMO systems. **[8]**

Q8) a) With suitable block diagram explain computer - based process control systems. **[8]**

b) Explain use of FOH & ZOH elements used in discrete - time control systems. **[8]**

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Total No. of Questions : 8]

SEAT No. :

P1514

[Total No. of Pages : 2

[4265] - 295

M.E. (Chemical)

NOVEL SEPARATION TECHNIQUES

(2002 Course)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer 3 questions from Section - I and 3 questions from Section - II.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables, slide rule., Mollier charts, electronic pocket calculator and steam tables allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain distinguishing features of novel separation techniques over conventional processes. **[8]**

b) State classification of membranes based on morphology, and materials used. **[8]**

Q2) Explain MF process in detail with reference to : **[16]**

a) Transport mechanism.

b) Membranes used.

c) Industrial applications.

d) Membrane fouling and polarization.

Q3) a) Explain use of membrane reactors for reactive separation processes. **[8]**

b) Explain used of liquid emulsion membranes for separating phenol. **[8]**

Q4) a) Explain applications of PV process. **[9]**

b) Explain different types of membrane modules used in practice. **[9]**

P.T.O.

SECTION - II

Q5) a) Distinguish between physical adsorption and chemisorption methods of separation of gas mixtures. **[8]**

b) Explain thin layer chromatography methods of separation. **[8]**

Q6) a) Explain bioseparation methods used for separation of proteins. **[8]**

b) Explain reactive distillation process with suitable example. **[8]**

Q7) a) Distinguish between TSA & PSA. **[8]**

b) Explain zone melting process. **[8]**

Q8) Write short notes on the following : **[18]**

a) Supercritical fluid extraction.

b) Reverse osmosis.

c) Biodegradation.

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Total No. of Questions : 8]

SEAT No. :

P1532

[Total No. of Pages : 2

[4265] - 506

M.E. (Mechanical) (Heat Power)

ENERGY CONSERVATION AND MANAGEMENT

(2008 Course) (Sem. - I) (Elective - I (c))

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each Section.***
2) ***Answers of two sections should be written in separate answer books.***
3) ***Neat diagram must be drawn whenever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of calculator log tables and electronic calculator is allowed.***

SECTION - I

Q1) a) Explain need of energy management. **[8]**

b) What are the various steps in Implementation of the energy management in an organization. **[8]**

Q2) a) Write short notes on : **[8]**

i) Energy Policy. ii) Energy action planning.

b) What is Sensitivity Analysis? List different factors considered for Sensitivity Analysis. **[8]**

Q3) a) Explain 'Simple Payback Period' method of financial Analysis with its advantages and limitations. **[8]**

b) What is the Energy Audit Methodology for Shopping Moll? **[8]**

Q4) Write a short note on (any three) : **[18]**

a) Energy Conservation Opportunities in Compressed Air system.
b) Energy Conservation Opportunities in Steam System.
c) Energy Audit Methodology for Ice Factory.
d) Energy audit (Types and Methodology).
e) Concept of Time Value of Money.

P.T.O.

SECTION - II

Q5) Explain any three of the following : **[18]**

a) Key features of Electricity Act 2003.

b) Energy Efficient Lamps.

c) System distribution losses.

d) Cost benefits of PF improvement.

e) Power factor improvement.

Q6) a) Write notes on (any two) : **[8]**

i) Lighting levels in various applications.

ii) Efficient options in lighting system.

iii) Energy efficient windows.

b) A cogeneration system installation is expected to reduce an annual company's bill by Rs. 20 Lacks. If the capital cost of the new cogeneration installation is Rs. 60 Lacks. & Rs. 5 Lacks per year on an average required maintaining & operating plant. Calculate simple payback period & % return on Investment (%ROI) What is the future value of Rs. 1000/- after 3 years if the interest rate is 10%? **[8]**

Q7) a) List the factors affecting on energy efficiency of electric motors. Explain the speed control of an electric motors. **[8]**

b) What are different Energy Conservation Opportunities in HVAC System? **[8]**

Q8) a) Short note : **[8]**

i) CDM projects.

ii) Carbon credit calculation.

b) Explain concept of cogeneration with sketch. List the advantages and limitations of cogeneration in steam power plant. **[8]**

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Total No. of Questions : 8]

SEAT No. :

P1533

[Total No. of Pages : 2

[4265] - 508

M.E. (Mechanical-Heat Power)

INTERNAL COMBUSTION ENGINES

(2008 Course) (Elective - II (a)) (Sem. - I)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic calculator and steam table is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) From the data given below, calculate indicated power, brake power and draw a heat balance sheet for a two-stroke diesel engine fun for 20 minutes at full load: rpm = 350, m.e.p. = 3.1 bar, net brake load = 640 N, Fuel consumption = 1.52 kg, Cooling water 162 kg, Water inlet temperature = 30°C, Water outlet temperature = 55°C, Air used/kg of fuel = 32 kg, Room temperature 25°C, Exhaust temperature = 305°C, Cylinder bore = 200 mm, Cylinder stroke = 280 mm, Brake diameter 1 meter, Calorific value of fuel 43900 kJ/kg, Steam formed per kg of fuel in the exhaust 1.4 kg, specific heat of steam in exhaust = 2.09 kJ/kg K, specific heat of dry exhaust gases = 2.09 kJ/kg K. **[12]**

b) Explain factors responsible for good design of DI combustion chamber? **[4]**

Q2) a) Explain Electronic Injection System for petrol engine. **[6]**

b) A six cylinder, 4 - stroke SI engine having a piston displacement of 700cm^3 per cylinder developed 78 kW at 3200 rpm and consumed 27 kg of petrol per hour.
The calorific value of petrol is 44 MJ/kg. Estimate : **[10]**

i) The volumetric efficiency of the engine if the air-fuel ratio is 12 and intake air is at 0.9 bar, 32°C.
ii) Brake thermal efficiency.
iii) The brake torque.

P.T.O.

Q3) a) Enlist the materials used for the following components with their properties : **[12]**

i) Piston rings.

ii) Crank shaft.

iii) Cylinder block.

b) What is the general material selection criteria for I. C. Engines. **[4]**

Q4) Write short notes on (any three) : **[18]**

a) Operating difficulties for a carburetor.

b) Different types of Combustion Chambers in CI engines.

c) Performance maps.

d) Preliminary analysis for engine design.

SECTION - II

Q5) a) Explain four basic types of emissions produced by vehicles. **[8]**

b) Explain effect of pollutions on human and plant life. **[8]**

Q6) a) Explain in detail working of electronic control unit. **[8]**

b) Discuss various sensors used in Electronic Fuel Injection Systems. **[8]**

Q7) a) Explain working and functions of components of Electronic Fuel Injection Systems. **[8]**

b) Explain in detail emission control methods. **[8]**

Q8) Write short notes on (any three) : **[18]**

a) Engine selection parameters.

b) Application of simulation technique for engine tuning.

c) Pollution Norms in India.

d) Exhaust gas recirculation.

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Total No. of Questions : 10]

SEAT No. :

P1535

[Total No. of Pages : 4

[4265] - 528

M.E. (Mechanical) (Design Engg.)

PROCESS EQUIPMENT DESIGN

(2008 Course) (Elective - II (b)) (Theory) (Sem. - I)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answer will be valued as a whole.***
6) ***Use of logarithmic tables, slide rules, Mollier chart, electronic pocket calculator and steam table is allowed.***
7) ***Assume suitable data, if necessary giving reasons.***

SECTION - I

Q1) a) State the general Design procedure of a process equipment Design. **[4]**

b) Give the classification of a process equipment design. **[4]**

c) Give in brief the basic considerations in P.E.D. **[4]**

d) Explain in brief the power for Rotational motion and Drives used for process equipment Design. **[4]**

Q2) a) Explain the significance of the following preliminaries in process equipment Design. **[8]**

i) Mechanical properties,

ii) Factor of safety,

iii) Corrosion allowance,

iv) Corrosion prevention.

b) Explain brief the Design considerations in a process Equipment Design. **[8]**

P.T.O.

Q3) a) Explain in details the Design of a shell and its components of a pressure vessels. **[8]**

b) Refere the following data and Design a pressure vessel you may refer to Plate I. **[8]**

i) Shell :- O.D. = 1200 mm; material of construction = SSG 304, (MOC).
Allowance stress at 150°C, F = 130 N/ mm^2,
Internal pressure, P = 0.3 N/ mm^2,
Joint efficiency = 0.85,
Corrosion allowance, C = Nil.

ii) Head - flanged and shallow dished end : -
External diameter = 1200 mm; crown radius = 1200 mm;
knuckle radius = 72 mm; M.O.C. = SS (304).

Q4) a) Classify the High pressure vessels with constructional features, and give in brief the Design procedure for it. **[8]**

b) Refere the following data for a high pressure vessels and Design it. [High pressure vessel shell Data] **[10]**

Internal diameter of the shell; = 300 mm,

Internal design pressure (Pi) = 150 N/mm^2

External pressure (Po) = 0.1 N/mm^2

Material of Construction (MOC) = H. T. S. (Cr, Mo, V)

Permissible internal stress (Basedon UTS) = 500 N/mm^2,

Permissible stress (basedon YS), f = 700 N/mm^2

Modulus of elasticity = 2×10^5 N/mm^2.

Q5) a) Explain in brief the Design procedure for storage vessels. **[8]**

b) Write short notes on the following : **[8]**

i) Reinforcement of Nozzles.

ii) Design of saddle support.

iii) Inspection and Testing of pressure vessels.

iv) Linings for chemical plants and equipment.

SECTION - II

Q6) a) What are the types of baffles used in heat exchanger? And explain in brief the design considerations in any type of heat exchangers. **[8]**

b) Detailed mechanical design of a fixed conical Roof cylindrical tank with the help of the following data Design the storage vessels. **[8]**

Tanks diameters (Inside) = 20 m;

Tank height = 12 m;

Density of liquid = 1000 kg/m^3

Super imposed load = 1250 N/m^2

Material of construction (MOC) = carbon steel (structural) IS 2062.

Permissible stress, f = 165 N/mm^2.

Conical roof slope = 1 in 5.

Density of the MOC = 7850 kg/m^3.

Modulus of elasticity = 2×10^5 N/mm^2.

Corrosion allowance = 1.5 mm.

Q7) a) Classify the agitators with applications. **[4]**

b) Refer the following data for Reaction vessels and Design it. **[14]**

Vessel shell internal diameter = 2130 mm;

Jacket internal diameter = 2260 mm;

Jacket length = 2500 mm;

Diameter of half coil of width of channel jacket = 100 mm;

Flanged dished head :- Internal diameter = 2130 mm;

Crown radius = 2130 mm; knuckle radius = 128 mm;

Straight flange length = 60 mm;

Internal pressure (Shell) = 0.55 N/mm^2;

Internal pressure (jacket) = 0.35 N/mm^2;

Temperature = 150°C;

Material :- Allowance stress = 96 N/mm^2; modulus of elasticity = 190×10^3 N/mm^2; Poisson's ratio = 0.3.

Q8) a) Classify the filters and state their Advantages & Disadvantages. **[3]**

b) How Evaporators and Crystallisers are classified. **[3]**

c) Considering the following data for a U-tube, 2 pass shell and tube heat exchanger. The Design pressure considered is more than the normal 10 % in excess of the operating pressure. Design shell side only. **[10]**

Shell side:- Material of construction : carbon steel (corrosion allowance - 3 mm);

Number of shells = 1; Number of passes = 1; Fluid = liquid;

Working pressure = 0.33 N/mm^2; Design pressure = 0.50 N/mm^2;

Temperature inlet = 30°C, Temperature outlet = 50°C;

Segmental baffles (25% cut) with tie rods and spacers.

Head :- Crown radius = 400 mm; knuckle radius = 40 mm;

Shell flange = female facing; Bolts = steel;

Gasket = flat metal - jacketed asbestos filled;

Nozzles :- Inlet and outlet = 75 mm; vent = 25 mm;

Drain = 25 mm; opening for relief valve = 50 mm;

Permissible stress for carbon steel = 95 N/mm^2;

permissible stress for bolt material = 140.6 N/mm^2.

Q9) a) What are centrifuges? Give Classification, Applications, Advantages and disadvantages of various centrifuges. **[4]**

b) Give important features of packed or plate columns. **[4]**

c) Explain in brief the process hazards and safety measures in process Equipment Design. **[8]**

Q10) Write short on the following (Any four) : **[16]**

a) CAD and CAM systems used in P. E. D.

b) Process flow and process block diagrams in P. E. D.

c) Optimization techniques used in P. E. D.

d) Supports for vessels.

e) Auxiliary process vessels.

f) Design of machine Elements used in P. E. D.

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Total No. of Questions : 10]

SEAT No. :

P1542

[Total No. of Pages : 2

[4265] - 552

M.E. (Mechanical Mechatronics)

AUTOMOTIVE ELECTRONICS

(2008 Course) (Part - II) (Elective - III (c)) (Semester - II)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Solve any three questions from Section - I and any three questions from section - II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the ritht indicate full marks.***
4) ***Assume suitable data wherever necessary but mention it clearly.***
5) ***Use of scientific calculator is allowed.***

SECTION - I

Q1) Write short notes on any two : **[18]**

a) Modern trends in Spark lgnition Systems.

b) Antilock Breaking System.

c) Automotive air Conditioning.

Q2) a) Explain the role of exhaust gas sensor in Engine Control Unit. **[8]**

b) Explain recent trends in sealed beams in modern automobiles. **[8]**

Q3) a) Explain in brief distributor less ignition system. **[8]**

b) Discuss Modern Wiper System over conventional one speed wiper system. **[8]**

Q4) a) Explain significance of wheel alignments. Explain in brief the sensors used in the process with their significance. **[8]**

b) Discuss in brief Anti fog provisions in Modern automobiles. **[8]**

Q5) a) Explain Roll over protection systems. **[8]**

b) Explain the sensors used in Exhaust system. **[8]**

P.T.O.

SECTION - II

Q6) a) Explain Head light dazzling preventive methods in modern cars. **[8]**

b) Compare 8 bit microprocessors and 16 bit microprocessors in Luxury Cars. **[8]**

Q7) a) Compare Microprocessor assisted Engine Cooling System with fan driven by crank shaft. **[8]**

b) Explain in brief integrated engine control system. **[8]**

Q8) a) Explain On Board Diagnostics in Modern Cars. **[8]**

b) Advantages of microprocessors used in Automobiles. **[8]**

Q9) a) Describe Automobile Battery with respect to types, recent trends, Protections. **[8]**

b) Describe Electronic Injection Advance in Compression Ignition Engines. **[8]**

Q10) a) Explain wiper systems in luxury cars with two significant features. **[9]**

b) Discuss the Battery tests. **[9]**

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Total No. of Questions : 6]

SEAT No. :

P1558

[Total No. of Pages : 1

[4265]-633

M.E. (Electrical) (Power Electronics and Drives)

POWER ELECTRONIC APPLICATIONS

(2008 Course) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer 2 questions from Section I and 2 questions from Section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) With the help of neat diagram explain the Hybrid Electrical Vehicle system. **[15]**

b) How power electronics is used in battery charging. **[10]**

Q2) a) Discuss the different areas of applications of power electronics in Electrical Engineering. **[15]**

b) Explain the operation of 3 phase full bridge converter along with its waveform. Also discuss the different applications of the converter. **[10]**

Q3) a) What are the recent trends in electric traction system? Explain how power electronics is applicable in electrical traction? **[15]**

b) How power electronics is useful in Air Conditioning System? **[10]**

SECTION - II

Q4) a) What is the function of UPS? Draw the block diagram of it. Also discuss the use of power electronics devices in it. **[15]**

b) What is SMPS? What are different controlling strategies in it. **[10]**

Q5) a) Discuss the role of power electronics in electrical power system. **[15]**

b) With the help of neat diagram explain the use of inverter in Wind Power Plant. **[10]**

Q6) a) Explain different industrial applications of Power Electronics? **[13]**

b) What is ZVS? Explain the operation of resonant DC link inverter with ZVS **[12]**

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Total No. of Questions : 8]

SEAT No. :

P1574

[Total No. of Pages : 3

[4265]-678
M.E. (E&TC) (Signal Processing)
SIGNAL PROCESSING TECHNIQUES
(2008 Course) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Question Nos 1 and 5 are compulsory. Out of the remaining attempt 2 questions from Section - I and 2 questions from Section - II.***
2) ***Answer to the two sections should be written in separate books.***
3) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) Consider the system $H(z) = \dfrac{1 - 2z^{-1} + 2z^{-2} - z^{-3}}{(1 - z^{-1})(1 - 0.5z^{-1})(1 - 0.2z^{-1})}$

with ROC : $0.5 < |z| < 1$. **[8]**

i) Sketch the pole - zero pattern. Is the system stable?

ii) Determine impulse response of the system.

b) When input to the causal LTI system is

$x(n) = -\dfrac{1}{3}\left(\dfrac{1}{2}\right)^n u(n) - \dfrac{4}{3}2^n u(-n-1)$ and Z - Transform of output is

$$Y(Z) = \frac{1 + z^{-1}}{(1 - z^{-1})\left(1 + \dfrac{1}{2}z^{-2}\right)(1 - 2z^{-1})}$$

i) Find Z - Transform of x(n)

ii) What is ROC of Y(z)

iii) Find impulse response of the system

iv) Is the system stable? **[10]**

Q2) a) Determine the Z - Transforms of the following signal and sketch the corresponding pole - zero patterns. **[8]**

i) $x(n) = \dfrac{1}{2}(n^2 + n)\left(\dfrac{1}{3}\right)^n u(n-1)$

ii) $x(n) = (1 + n)u(n)$

P.T.O.

b) For a given sequence $x_1(n) = \{1,1,2,2\}$ and $x_2(n) = \{1,2,3,4\}$ **[8]**
   i) Compute circular periodic convolution.
   ii) Also find circular convolution using DFT and IDFT.

Q3) a) Given $x(n) = n + 1$ and N = 8. Find DFT using Radix 2 DIF - FFT algorithm. **[8]**

b) Compute convolution $x(n)$ of the signals $x_1(n) = \{1,2,-1\}$ and

$$x_2(n) = \begin{Bmatrix} 1 & 0 \le n \le 5 \\ 0 & elsewhere \end{Bmatrix}$$ **[4]**

c) Compare DFT with DTFT. **[4]**

Q4) a) Obtain the coefficients of an FIR low pass filter to meet specifications given below : **[8]**
Use window technique.
Pass Band edge frequency = 1.5 kHz
Transition width = 0.5 kHz
Stop band attenuation $\geq$ 50dB.
Sampling frequency = 8 kHz.

b) Write the mathematical equation of frequency response of ideal frequency response characteristics used in approximation with respect to basic digital filter design. Also specify the basic specifications required in the design of any filter. **[4]**

c) Explain the advantages of FIR filter over IIR filter. **[4]**

SECTION - II

Q5) a) What are the limitations of impulse invariant method of IIR filter design? How are these limitations overcome by bilinear transformation? What is the relationship between analog and digital frequencies in this transformation? **[6]**

b) What is the need for employing window technique for FIR filter design. **[6]**

c) Find the pole locations of 6th order Butterworth filter with $\Omega c = 1$ rad/sec. **[6]**

Q6) a) Design a Butterworth low pass filter with T = 1 sec using Bilinear Transform method for the following specification. **[8]**

$$0.707 \le |H(e^{j\omega})| \le 1 \qquad 0 \le \omega \le \frac{\pi}{2}$$

$$|H(e^{j\omega})| \le 0.2 \qquad \frac{3\pi}{4} \le \omega \le \pi$$

b) Determine the coefficients of a low pass FIR filter of length M = 15 has a symmetric unit sample response and a frequency response that satisfies the conditions. **[8]**

$$H\left(\frac{2\pi k}{15}\right)=\begin{matrix}1 & k=0,1,2,3\\ 0 & k=4,5,6,7\end{matrix}.$$

Q7) a) Explain the Fourier Series method of designing an FIR filter. **[6]**

b) Obtain direct form II, cascade and parallel structures for the following system having output

$$y(n)=-0.1y(n-1)-0.72y(n-2)+0.7x(n)-0.25x(n-2)$$ **[10]**

Q8) a) Design an ideal high pass filter with a frequency response. **[8]**

$$H_d(e^{j\omega})=\begin{matrix}1 & for\ \frac{\pi}{4}\le|\omega|\le\pi\\ 0 & |\omega|\le\frac{\pi}{4}\end{matrix}$$

Find the values of $h(n)$ for N = 11 using hamming window. Also find $H(e^{j\omega})$.

b) Obtain FIR filter cascade realization and realization with minimum number of multipliers and of system transfer function. **[8]**

$$H(z)=\left(1+\frac{1}{2}z^{-1}+z^{-2}\right)\left(1+\frac{1}{4}z^{-1}+z^{-2}\right)$$

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Total No. of Questions : 8]

SEAT No. :

P1581

[Total No. of Pages : 2

[4265] - 698

M.E. (Electronics) (Digital Systems)

WIRELESS AND MOBILE TECHNOLOGIES

(2008 Course) (Elective - I (C)) (Semester - I)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each Section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Use of Scientific calculator is allowed.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, wherever required.***

SECTION - I

Q1) a) Explain what is multipath propagation? Explain any multipath fading model. **[8]**

b) Explain what is Doppler effect? How is it related to frequency selective fading? **[8]**

Q2) a) What are Rayleigh fading channels? Explain the term hand off. **[9]**

b) Explain the term diversity. What is time diversity, frequency diversity and space diversity? **[9]**

Q3) a) Explain Direct sequence spread spectrum technique. What is a cellular system? Explain the term frequency reuse. **[8]**

b) Explain carrier sense multiple access control. What is packet reservation multiple access? **[8]**

Q4) a) Draw functional architecture of GSM system. Explain function of each block. **[10]**

b) Explain the operation of mobile originated call. **[6]**

P.T.O.

SECTION - II

Q5) a) Explain IEEE 802.11 protocol architecture. Explain the physical layer frame format using frequency hopping spread spectrum. **[8]**

b) Explain CSMACA scheme with RTS-CTS extension. **[8]**

Q6) a) Explain basic HIPERLAN layers. **[8]**

b) Explain how a packet is sent to a mobile node using tunneling? **[8]**

Q7) a) Explain registration of a mobile node via a foreign agent. What is encapsulation? **[10]**

b) Explain generic routing encapsulation. **[8]**

Q8) a) Explain dynamic sequence distance vector routing. **[8]**

b) Explain indirect TCP. What are its advantages? **[8]**

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Total No. of Questions : 8]

SEAT No. :

P1582

[Total No. of Pages : 2

[4265] - 699

M.E. (Electronics) (Digital Systems)

MACHINE INTELLIGENCE

(2008 Course) (Elective - II (a)) (Semester - I)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each Section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of logarithmic tables slide rules, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain soft computing. Discuss the different characteristics of soft computing. **[8]**

b) Discuss various membership functions with their mathematical equations. **[8]**

Q2) Explain - **[16]**

a) Mamdani type fuzzy inference system.

b) Tsukamoto fuzzy models.

Q3) a) What are different gradient optimization techniques? Explain any one technique in detail. **[8]**

b) What are different defuzzification schemes used for obtaining a crisp output? **[8]**

Q4) Write notes (Any 3) : **[18]**

a) Set theoretic operations.

b) System Identification process.

c) Least squares estimator.

d) Max-min composition & max product composition.

e) Neuro Fuzzy control.

P.T.O.

SECTION - II

Q5) a) Show 3 iterations of the perceptron algorithm for the given data. **[9]**

$$P_1 = \begin{bmatrix} 1 \\ -2 \\ 0 \\ -1 \end{bmatrix} \quad P_2 = \begin{bmatrix} 0 \\ 1.5 \\ -0.5 \\ -1 \end{bmatrix} \quad P_3 = \begin{bmatrix} -1 \\ 1 \\ 0.5 \\ -1 \end{bmatrix}$$

$t_1 = -1, t_2 = -1, t_3 = 1$ with initial weight vector $W = \begin{bmatrix} 1 \\ -1 \\ 0 \\ 0.5 \end{bmatrix}$ learning rate

$\eta = 0.1$. P_1, P_2, P_3 are input to network & t_1, t_2 & t_3 are respecture targets for them.

b) The data given in Q 5 @ is feeded to a Adaline networks. Assuming the same targets and learning rate compute the MSE after 3 iterations. **[9]**

Q6) a) Explain the need for multilayer networks. Explain Back propagation algorithm in detail. **[8]**

b) Explain Principal component networks and the algorithm /method used to find the principal components. **[8]**

Q7) a) Explain competitive learning method. **[8]**

b) Give the steps used in training a SOM network. **[8]**

Q8) a) What are different data Clustering algorithms. Discuss in detail K-means clustering algorithm. **[8]**

b) Draw and explain the architecture of Adaptive Nevro Fuzzy Inference System. (ANFIS) **[8]**

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Total No. of Questions : 8]

SEAT No. :

P1585

[Total No. of Pages : 2

[4265] - 704

M.E. (Electronics) (Digital System)

IMAGE PROCESSING AND PATTERN RECOGNITION

(2008 Course) (Semester - II)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each Section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain Laplacian and sharpening operators. **[8]**

b) What is the process of histogram equalization. Explain algorithm for contrast enhancement using histogram equalization. **[8]**

Q2) a) Discuss in detail the grey level scaling transformations. **[10]**

b) Grey level in the image range from 10 to 50. Using linear transformation display the image that has a grey level range of 0 to 255. **[6]**

Q3) a) How pattern recognition is related with Image processing. Explain in detail with example. **[8]**

b) Discuss the applications of pattern recognition. **[8]**

Q4) Write short notes on : (Any three) **[18]**

a) Statistical significance of Image features.

b) Edge delection operators.

c) Geometric Image scaling & interpolation.

d) Line detection & template matching.

e) FFT transform.

P.T.O.

SECTION - II

Q5) a) Explain the random variables in detail. **[10]**

b) Consider an electrical circuit in which the voltage is normally distributed with mean 120 & Standard deviation 3. What is the probability that the next reading will be between 119 and 121 volts? **[6]**

Q6) a) Explain in detail Bayes's theorem. **[8]**

b) Discuss the nearest neighbor classification technique. Explain K-nearest neighbor technique. **[8]**

Q7) a) Describe hierarchical clustering using ward's method. **[6]**

b) What is an artificial neural network? Construct an ANN to produce logical AND operation. **[10]**

Q8) Write short notes on : (Any three) **[18]**

a) Estimation of parameters from samples.

b) Leaving one - out technique.

c) Adaptive decesion boundary algorithm.

d) Principle component analysis.

e) Partitional clustering.

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Total No. of Questions : 8]

SEAT No. :

P1586

[Total No. of Pages : 2

[4265] - 706

M.E. (Electronics) (Digital Systems)

BIO-MEDICAL SIGNALS & SYSTEMS

(2008 Course) (Elective - III (b)) (Semester - II)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each Section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rules, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is Bio-medical signal? What are the objects of the Bio-medical signal analysis? Explain diff^{n} Bio-medical signal in short. **[12]**

b) Give two reason to justify the use of electronic instrument and computer in medicine. **[6]**

Q2) a) Explain with diagram how E.C.G. and carotid pulse signals may be used to break a PCG signal into systolic & diastolic part. **[8]**

b) List four sources of instrumentation and physiological artifacts in recording the E.C.G. Signal. Described method to remove each artifact. **[8]**

Q3) a) Explain in details Adaptive noise filter for removal of interference and give its uses. **[8]**

b) A Bio-medical signal sampled at 1000 Hz. Found to have significant amount of interference 60 Hz. **[8]**

i) Design notuch filter with two zero to remove the interference.

ii) What is effect of filter if signal sampled at 500 Hz.

P.T.O.

Q4) a) What do you mean by event detection? Develop signal processing techniques to facilitates of the QRS complex. Explain it detail. **[8]**

b) What are fourier domain equivalent of autocorrelation function & cross-correlation function. Describe there common features and differences. **[8]**

SECTION - II

Q5) a) Discuss the similarities and differences between the problem of : **[6]**

i) Detection of spike transient in E.E.G signal.

ii) Detection of QRS complex in ECG signal.

b) List the different steps for ECG wave form analysis & what are the sources of artifact that one has to be consider in recording PCG signal? Recommend and explain the technique to remove artifact. **[12]**

Q6) a) Consider continious time signal of frequency 10 Hz. **[8]**

i) Derive an analytical expression for ACF of signal.

ii) Derived analytical expression for the PSD of signal.

b) A Bio-medical signal is sampled at 500 Hz. & subjected to Autoregressive modeling. The pole of model are $0.4 \pm j0.5$ & $-0.7 \pm j0.6$ **[8]**

i) Derive transfer function of mode.

ii) What are resonant frequency of the system that producing signal.

Q7) a) Discuss the feature of EEG that make signal non stationary. Propose the signal processing strategy to detect each type of non stationarity. **[8]**

b) Define the following term related to measure of diagnostic Accuracy and cost : **[8]**

i) TPF (True positive fraction)

ii) TNF (True Negative fraction)

iii) FPF (False +ve fraction)

iv) FNF

Q8) a) Explain logistic regrestion analysis & gives training & test step. **[8]**

b) Write short note on sources of variability in bio-medical signal. **[8]**

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Total No. of Questions : 8]

SEAT No. :

P1587

[Total No. of Pages : 2

[4265] - 708

M.E. (Electronics) (Digital System)

RECONFIGURABLE COMPUTING

(2008 Course) (Elective - IV (a)) (Semester - II)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of logarithmic tables, slide rule Mollier charts, electronic pocket calculator and steam tables allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is functional density? Explain with example. **[8]**

b) What are the limitations of conventional FPGA that are responsible for not to perform an application at its peak? **[8]**

Q2) Draw and explain the architecture of DPGA. Explain each block in detail. What are its limitations? **[16]**

Q3) a) Compare the architectures of ASIC, PDSP, GPP, FPGA, VLIW. **[10]**

b) Compare various computing architectures w. r. t. multiplier operation. How will you locate reconfigurable device? Where? **[6]**

Q4) Write short notes on any three : **[18]**

a) Memories.

b) MATRIX.

c) Multicontext FPGA.

d) Crossbars.

P.T.O.

SECTION - II

Q5) How is task switching innovative in TSFPGA? Explain the architectural blocks of TSFPGA in detail. What are its limitations? **[16]**

Q6) a) What are the issues in reconfigurable network design? **[8]**

b) Explain the Rent's rule based hierarchical interconnect model. **[8]**

Q7) a) What are the most common techniques generally employed to reduce instruction size and bandwidth. **[8]**

b) How to calculate instruction bandwidth of LUT based structure? How does this bandwidth make a decision of off/on chip memory? **[8]**

Q8) Write short notes on any three : **[18]**

a) Circuit Switching.

b) Bus-based Communication.

c) Communication over Third Party.

d) Granularity.

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Total No. of Questions : 8]

SEAT No. :

P1590

[Total No. of Pages : 2

[4265] - 723

M.E. (E & TC) (Communication Network)

MOBILE COMPUTING

(2010 Pattern) (Elective - III (b)) (Semester - II)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each Section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Discuss the evolution of 1G to 4G Mobile Technologies. **[8]**

b) Explain with schematic, the GPRS architecture. **[8]**

Q2) a) Discuss, how security is addressed in GSM? **[8]**

b) Explain IEEE 802.11 architecture for Wireless LAN. **[8]**

Q3) a) Explain the fundamentals of wireless markup language and WML script applications. **[8]**

b) Discuss the features and value added services in 3G Mobile Technology. **[8]**

Q4) Write notes on : **[18]**

a) Wi-Max b) CDMA 2000

SECTION - II

Q5) a) Draw 4G LTE network architecture and discuss different entities used. **[8]**

b) Discuss Bluetooth technology with different types of networks, Technical Parameters and applications. **[8]**

P.T.O.

Q6) a) Explain basic location tracking and call set up mechanism in GSM system. **[8]**

b) Discuss, typical case studies for secure mobile application development. **[8]**

Q7) a) What is mobile computing environment? Explain three tier architecture for the same. **[8]**

b) Discuss MIMO systems and concept of Spatial Multiplexing. **[8]**

Q8) Write notes on : **[18]**

a) VOIP b) Wi-Fi

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Total No. of Questions : 6]

SEAT No. :

P1594

[Total No. of Pages : 2

[4265] - 743

M.E. (Production) (Manufacturing Engineering and Automation)

PRODUCT LIFE CYCLE MANAGEMENT

(2008 Course) (Elective - III (b)) (Semester - II)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) *All questions are compulsory.*
2) *Draw figures wherever required.*
3) *Assume suitable data wherever necessary and state them clearly.*

SECTION - I

Q1) Define PLM? Explain PLM entities like Item Management, Product Structure Management and Maintenance, User Privilege Management. How entities will define System Architecture of PLM. Explain with suitable example. **[16]**

OR

Explain following with suitable block diagrams : (Any Two) **[16]**

a) Different Views of PLM.
b) Feasibility of PLM.
c) Product Information Model for PLM.

Q2) With suitable example explain how PLM strategies and PLM Phases helps in PRODUCT CANNIBALISM. **[16]**

OR

Explain following for PLM Strategies : **[16]**

a) Strategy elements. b) Strategy Implementation.

Q3) What is Product Data Management? Explain following Typical information managed in the PDM module : Part number, Part description, Supplier/vendor, Vendor part number and description, Unit of measure, Cost/price, Schematic or CAD drawing, Material data sheets. **[18]**

OR

With Suitable example explain following advantages of PLM in detail : Track and manage all changes to product related data, Accelerate return on investment with easy setup, Spend less time organizing and tracking design data, Improve productivity through reuse of product design data, Enhance collaboration. **[18]**

P.T.O.

SECTION - II

Q4) Explain following for Product Design : **[16]**

a) Design of X. b) Optimization and Decomposition.

OR

Explain how Modeling and simulation in product design enables PLM. **[16]**

Q5) Explain various types of building decision support systems used in PLM. **[16]**

OR

For new product development in PLM. Explain Market Entry decision and redesign of Product. **[16]**

Q6) In the view of 2G, 3G features in Mobile Handset, model, Technology forecasting of PLM in respect to Handset Manufacturing and Service Providers Utility Set. Your Answer should also contain suitable PLM Architecture proposed for the system. **[18]**

OR

For Technology Forecasting explain following for PLM (Any Two) : **[18]**

a) Morphological methods and mission flow diagram.

b) Uses in manufacture alternative.

c) Relevance trees.

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Total No. of Questions : 10]

SEAT No. :

P1596

[Total No. of Pages : 3

[4265] - 747

M.E. (Production Engineering)

RESEARCH METHODOLOGIES

(2008 Coures) (Elective - IV (b)) (Semester - II)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each Section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of non-programmable electronic calculators is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are the steps involved in research process? How are they applied to answering research question? **[8]**

b) Compare the historical, descriptive and experimental methods of research. **[8]**

Q2) a) How does single factor and multi factor experimental design differ? Explain with suitable example. **[6]**

b) What is random sampling? How does it relate to generality of your research? **[5]**

c) What are the factors that cause the systematic bias in sampling procedure? **[5]**

Q3) a) A random sample of 200 measurements from an infinite population gave mean value of 50 and standard deviation of 9. Determine the 95 percent confidence interval for the mean value of population. **[6]**

b) What is meta-analysis? What are the steps involved in it? **[5]**

c) What are the different ways of administering a questionnaire? What are the advantages and disadvantages of each? **[5]**

P.T.O.

Q4) a) Explain the term data. What precautions one has to take while collecting data? **[6]**

b) How do parametric and non-parametric statistics differ? **[5]**

c) How are variance and standard deviation related? Why is standard deviation preferred? **[5]**

Q5) Write short notes on **any three** of the following : **[18]**

a) Sources of research ideas.

b) Cumulative scales.

c) Data display techniques.

d) Characteristics of a Hypothesis.

e) Time series analysis.

SECTION - II

Q6) a) How are multiple R, R^2 and adjusted R^2 used to interpret results from a multiple regression analysis? **[6]**

b) State the basic assumptions in analysis of variance. **[5]**

c) Describe the conditions for the application of Chi-Square test. **[5]**

Q7) a) A company appoints four salesmen A, B, C and D and observes their sales in three seasons : Summer, Winter and Monsoon. The figures (in lakh rupees) are given below : **[8]**

	A	B	C	D
Summer	45	40	38	37
Winter	43	41	45	38
Monsoon	39	39	41	41

Carry out the analysis of variances. At 5% level, for D.F. (6, 2), Table value of F is 19.3 and at 5% level, for D.F (6, 3), the table value is 9.94.

b) State the advantages and limitations of Genetic Algorithm and Simulated Annealing methods. **[8]**

Q8) a) Describe the features of different training algorithms used for training of Neural Networks. **[6]**

b) Explain the use of TOPSIS method for research problem with a suitable example. **[5]**

c) Describe the steps in using Data Envelop Analysis (DEA) method. **[5]**

Q9) a) What are the precautions one has to take while writing the research report? **[8]**

b) "It is only through interpretation the researcher can explore the relations and processes that underlie his findings". Explain giving examples. **[8]**

Q10) Write short notes on **any three** of the following : **[18]**

a) Computers and researchers.

b) Bibliography and its importance in context of research report.

c) Discriminant analysis.

d) Statistical estimation.

e) Layout of research report.

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Total No. of Questions : 10]

SEAT No. :

P1613

[Total No. of Pages : 3

[4265]-800
M.E. (Computer Engineering)
DATA WAREHOUSING AND DATA MINING
(2008 Course) (Elective - IV(c)) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***

2) ***Neat diagrams must be drawn wherever necessary.***

3) ***Assume suitable data, if necessary.***

4) ***Section I : Q 1 is compulsory. Solve any two questions out of Q2, Q3, Q4, Q5.***

5) ***Section II : Q 6 is compulsory. Solve any two questions out of Q7, Q8, Q9, Q10.***

SECTION - I

Q1) a) Describe guidelines for Multidimensional Data Modeling. **[8]**

b) How to handle slowly changing dimensions in ETL system? Explain with the help of suitable example. **[8]**

Q2) a) Explain various design techniques for R-OLAP. **[9]**

b) Explain guidelines for designing summary table and fact table in data warehouse. **[8]**

Q3) a) What are the things necessary to implement data warehouse? Explain in short. **[9]**

b) Describe different methods to measure quality of rules in Association Rule Mining. **[8]**

Q4) a) Write a short note on : **[12]**

i) PCA.

ii) Warehouse Manager.

b) Explain Entropy based discretization method for numeric data. **[5]**

P.T.O.

Q5) a) Describes A priori algorithm. Illustrate the working of the algorithm with the help of following data set. Assume $\sigma = 20\%$. T contains 15 records. 1 represents item present in T and 0 represents absent in T. Ai is Item set. **[12]**

A1	A2	A3	A4	A5	A6	A7	A8	A9
1	0	0	1	1	1	0	0	1
0	1	0	1	0	0	0	1	0
0	0	0	0	1	0	0	1	1
0	1	1	1	0	1	1	1	0
0	0	0	0	0	1	0	0	1
0	1	1	1	0	0	1	1	0
1	1	0	0	0	1	1	0	0
0	0	0	1	1	0	1	1	0
0	0	0	0	1	1	0	0	0
0	0	1	0	1	0	0	0	1
0	0	1	0	0	1	1	0	1
0	1	0	1	1	1	1	0	0
1	0	0	0	0	1	0	0	0
0	1	1	0	0	0	0	1	0
1	0	0	0	0	1	1	0	0

b) Explain various techniques for Data Transformation in Data Warehouse. **[5]**

SECTION - II

Q6) a) Consider training data set (Height, Class) [(1.6,0) (1.9,1) (1.88,1) (1.7,0) (1.85,1) (1.6,0) (1.7,0) (1.8,1) (1.95,1) (1.9,1) (1.8,1) (1.75,1)]. Since Regression assumes numeric data, assume that the value for short class is 0 and the value for medium class is 1. Plot the regression line that predicts the class value. **[8]**

b) Explain PageRank technique for web structure mining with suitable example. **[8]**

Q7) a) Describe bagging and Boosting with suitable example. **[9]**

b) Explain Indiscernibility and set approximation in rough set with suitable example. **[8]**

Q8) a) Consider following data set. **[9]**

Object	Attribute 1	Attribute 2	Attribute 3
A	1	1	2
B	3	2	4
C	3	4	6
D	4	6	3
E	2	4	5

Write K - means clustering algorithm. Find the cluster for the objects in data set with K = 2.

b) Write a short Note on : **[8]**

i) Bayesian Classifier.

ii) k-D Tree.

Q9) a) Consider following training set. **[12]**

Outlook	Temperature	Humidity	Wind	Class Attribute
Sunny	Hot	High	False	N
Sunny	Hot	High	True	N
Overcast	Hot	High	False	P
Rain	Mild	High	False	P
Rain	Cool	Normal	False	P
Rain	Cool	Normal	True	N
Overcast	Cool	Normal	Ture	P
Sunny	Mild	High	False	N
Sunny	Cool	Normal	False	P
Rain	Mild	Normal	False	P
Sunny	Mild	Normal	True	P
Overcast	Mild	High	True	P
Overcast	Hot	Normal	False	P
Rain	Mild	High	True	N

Write ID3 Classification algorithmic steps. Construct a decision tree based on above training set using ID3.

b) Describe Deviation based Outlier detection approach in data clustering. **[5]**

Q10) a) Explain Agglomerative clustering techniques (any two) with suitable example. **[12]**

b) Explain different features of Unstructured Text. **[5]**

♦♦♦♦

Total No. of Questions : 6]

SEAT No. :

P1623

[Total No. of Pages : 4

[4265] - 853

M.E. (Petroleum)

PETROLEUM BUSINESS STRATEGIES AND RISK ANALYSIS

(2008 Course) (Eelctive - I(d)) (Sem. - I)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Solve any two questions from Section - I and Section - II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Use graph paper and semi log graph paper wherever necessary.***
4) ***Assume additional data, if required.***

SECTION - I

Q1) a) Following is the production history of a field, which is under consideration for redevelopment. The initial recovery of 20% is expected to increase up to 30% after redevelopment. Draw the production profile and by using same decline, calculate the time taken to reach desired recovery rate. What may be the break-even price if an amount of 125 million dollars is used for redevelopment? How much is the OOIP?**[10]**

Year	Oil Production / year MMbbl	CAPEX $ MM	OPEX $ MM
1		140	
2		140	
3	2.44		9.73
4	1.74		6.99
5	1.45		5.75
6	1.34		5.28
7	1.12		4.75
8	1.15		4.69
9	0.98		3.94
10	0.92		3.64
11	0.83		3.27
12	0.74		2.96

Table 1: for Q. 1. and also for Q. 6.

P.T.O.

b) Write notes on **any two** of the following : **[15]**

i) Decline curves in the calculation of reserves of hydrocarbons,

ii) Errors in calculation of reserves,

iii) Hubert curve.

Q2) a) Prepare a forecast of future oil prices using following equation for the next eight years with the first year price determined on the basis of the market price of designated marker crude and escalated at the rate of 3% per year. **[5]**

Oil Price = (marker crude oil price @ 0° API) + 0.19(°API) -0.77(%sulfur)

Given,

i) Current Market Price of Marker Crude (40° API) = $ 65.00

ii) Current Market Price of Marker Crude (0° API) = $ 51.00.

iii) Quality of oil to be produced :

Gravity = 36°

Sulfur = 1.0%

b) Write notes on **any two** of the following : **[20]**

i) Oil Price Differential,

ii) Crude oil pricing mechanism and factors controlling oil price,

iii) Reserves auditing,

iv) Gas Economy.

Q3) a) An investment of $ 45,000 for a new sucker rod string is estimated to generate a cash flow of $ 18,000, $ 15,000, $ 12,000, $ 10,000, $ 8,000, $ 7,000 and $ 5,000 over the tenure of the project. What is the DCFROR for the cash flow generated? **[10]**

b) Three alternatives are available for consideration where the factors of risk and uncertainty are same for all proposals. Details of investments are given below : **[15]**

Details	X	Y	Z
Initial Investment	$ 5,00,000	$ 8,00,000	$ 9,00,000
Annual Expenses	$ 15,000	$ 22,000	$ 25,000
Annual Revenue	$ 75,000	$ 1,00,000	$ 1,40,000
Tenure (Years)	20	20	20
Salvage Value	$ 50,000	$ 60,000	$ 70,000

If company's cost of capital is 12% which alternative should be selected? The company has enough funds to invest in all alternatives.

Give your decision on Net Present Value (NPV) and incremental, investment analysis. Also find out preferred investment ranking using above methods.

SECTION - II

Q4) a) A wildcat well is being considered in a relatively unknown but highly promising area. Available data indicates that three separate horizons independent from one another would most possibly be producing.

Create a decision tree for the success and failure for the horizons (X, Y and Z) to illustrate the probability of occurrence of these events with possible outcome of events. **[15]**

b) Write a detailed account on Petroleum Accounting system. **[10]**

Q5) a) A piece of equipment having a negligible salvage is estimated to have a service life of 10 years. The original cost of equipment is $ 1,00,000.

Determine the following : **[10]**

i) Depreciation charge for the fifth year, if Double Declining Balance (DDB) and Sum of Years Digit Depreciation (SYD) are used.

ii) Percent of the original investment paid off in the first half of the service life using DDB and SYD method.

b) Construct a critical path to develop a medium size field for which details are given below : **[15]**

i) Twenty four development wells ($ 1.5 mm each) - One third will be injectors.

ii) Three platforms - two for wells, the other for production / injection.

iii) Equipment and pipeline terminus. ($ 200 MM each).
Wells take about one month to drill. Up to two rigs / platform.

iv) Platforms manufactured in one and a half years - tow out time one month during weather window in Summer. (Tow out costs $10 MM) Setup time is three months for drilling / well platform, five months for production platform.

v) Pipeline lay time is about 14 months. (Cost $ 150 MM)

vi) Production "commissioning" and final permit take two months. ($ 5 MM)

vii) Overhead and other ongoing costs = $ 1 MM / month.

The main idea of this exercise is to optimize time, labour and material.

Do the following :

i) Draw a critical path diagram for this project. Assume a starting date of Jan, 1, 2012.

ii) Determine the time length of the critical path. Identify this path on the diagram.

iii) Determine slack times for each activity.

vi) Plot cumulative costs as a function of time.

Q6) Use production data given in Table 1 for this calculation. Following are the assumptions for the analysis : **[25]**

a) Oil price is $ 70 and is constant.

b) Royalty is 10% on annual production, which is to be deducted from gross revenue.

c) Rate of return is 8%.

d) Cost recovery is 75% and is allowed to deduce with the commencement of commercial production. The unrecovered cost is allowed to carry forward to next year.

e) Profit petroleum is shared between government and contractor @ 60% and 40% respectively.

f) Contractor is entitled to pay 25% income tax on profit.

g) Calculate NPV @ 8%.

Prepare a tabular form giving details of cumulative production, gross cash flow, royalty, net cash flow, cost recovery, recovered cost, profit petroleum, government share and contractor share, NPV for contractor BFIT and AFIT. How is one barrel distributed?

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Total No. of Questions : 8]

SEAT No. :

P1631

[Total No. of Pages : 2

[4265] - 876

M.E. (Comp. Science & Engg.) (IT)

GEOGRAPHICAL INFORMATION SYSTEMS

(2008 Course) (Elective - II (c)) (Semester - I)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer 3 questions from Section - I and 3 questions from Section - II.***
2) ***Question Nos. 4 and 8 are compulsory. Out of the remaining attempt 2 questions from Section - I and 2 questions from Section - II.***
3) ***Answers to the two sections should be written in separate books.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Explain with suitable diagram different types of maps. What is meant by typography? **[8]**

b) Explain GIS architecture with suitable diagram. What are the essential elements for effective GIS operations? Identify the fundamental GIS operations. **[8]**

Q2) a) Compare raster and vector data models. Comment on raster and vector data structures. **[8]**

b) What are the data quality components in GIS? Explain the different types of accuracy applicable to GIS data. **[8]**

Q3) a) How will you interpret SAR images? Explain the geometrical characteristics that affect the microwave remote sensing data. **[8]**

b) What are sensor parameters? Explain the three types of resolutions. **[8]**

Q4) Write short notes on the following :

a) Radar Principle. **[4]**

b) UTM Grid. **[4]**

c) Four M'S. **[4]**

d) Buffering. **[4]**

e) Speckle noise. **[2]**

P.T.O.

SECTION - II

Q5) a) Explain in details the process of image interpretation. **[8]**

b) Explain the image enhancement techniques and their significance in image processing of GIS images. **[5]**

c) Detail out the correction methods in preprocessing. **[3]**

Q6) a) Discuss about digital elevation models, their representations and their uses. **[6]**

b) What is geocoding? Explain the geocoding process with example. **[6]**

c) Write in details about different forms of kriging. **[4]**

Q7) a) Write a note on land cover classification system. **[6]**

b) Explain various land use patterns. **[6]**

c) How will you apply photo interpretation in forestry. **[4]**

Q8) Write short notes on the following :

a) Components of a GIS. **[4]**

b) CARTOSAT and latest trends in Remote sensing platforms and sensors. **[4]**

c) Common errors in GIS database. **[3]**

d) Object oriented GIS. **[3]**

e) Image registration. **[2]**

f) Drainage texture. **[2]**

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Total No. of Questions : 6]

SEAT No. :

P1651

[Total No. of Pages : 2

[4265]-31
M.E. (Civil) (Structures)
NUMERICAL METHODS & FEM ANALYSIS
(2002 Course)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any two questions form each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***All questions carry equal marks.***
6) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Solve the following differential equation $\frac{dy}{dx} = x + y,\ y(0) = 1,\ x \in [01]$ by classical fourth order Runge - Kutta Method upto $y(1)$ with step size as 0.1. **[10]**

b) Find the largest eigen value and corresponding eigen vector correct upto '3' decimal places using power method for the given matrix

$$\begin{bmatrix} 1 & 3 & -1 \\ 3 & 2 & 4 \\ -1 & 4 & 10 \end{bmatrix}$$ **[15]**

Q2) a) Solve $\frac{\partial u}{\partial t} = 2\frac{\partial^2 u}{\partial x^2},\ 0 < t < 1,\ 0 < x < 4$ subject to the boundary conditions $u(x,0) = 50(4 - x), u(0,t) = u(4,t) = 0,\ 0 < t < 1$ using Crank - Nicholson method. **[13]**

b) Solve $U_{xx} + U_{yy} = -10(x^2 + y^2 + 10)$ over the square mesh with sides $x = 0$, $y = 0$, $x = 4$, $y = 4$ with $u = 0$, on the boundary mesh of length '2' units using finite difference method. **[12]**

P.T.O.

Q3) Solve the boundary value problem $\frac{d^2y}{dt^2} + \frac{dy}{dt} + t = 0,\ 0 < t < 1, y(0) = y(1) = 0$ using **[25]**

a) Galerkin method

b) Rayleigh - Ritz method

SECTION - II

Q4) a) State & explain approximate methods of structural analysis **[8]**

b) Explain Rayleigh Ritz method. **[9]**

c) Describe stages involved in FEM analysis. **[8]**

Q5) a) Derive element strain displacement relation for 2 - D problem. **[6]**

b) State and explain convergence of polynomial function. **[6]**

c) Determine shape function for four noded rectangular element using natural co - ord. **[6]**

d) Explain CST, LST, QST. **[7]**

Q6) a) A stepped bimetallic bar of Aluminium (E = 70 GPa, L = 200 mm ϕ = 20 mm) and steel (E = 200 GPa , L = 200 mm, ϕ = 10 mm) are loaded with axial tension of 10 kN. Find the nodal displacements, stresses in each bar and total displacement for each bar. **[9]**

b) Explain isoparametric, sub & super parametric elements. **[8]**

c) State and explain with suitable example plain stress, plain strain & axesymmetermic problem(20). **[8]**

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Total No. of Questions : 6]

SEAT No. :

P1653

[Total No. of Pages : 2

[4265] - 34

M.E. (Civil) (Structures)

PLATES AND SHELLS

(2002 Course)

Time : 4 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Attempt any two questions from each Section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of non programmable electronic calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) For a thin plate subjected to bending, derive the governing differential equation. Find expressions for moments, shears using various boundary conditions. **[13]**

b) Obtain the expression for strain energy stored in the small element of a thin plate subjected to bending and twisting moments. What is the Raleigh-Ritz approach to obtain the deflected surface of the plate under a given loading? **[12]**

Q2) a) A window of a high rise building is approximated by a rectangular plate simply supported over its edges. The plate is subjected to uniform wind load intensity of P_o. Apply Levy's method to obtain the maximum deflection. **[19]**

b) State the advantages of Levy's method over Navier's method. **[6]**

Q3) A circular plate of radius 'a' is having fixed edges. Find the maximum values of radial and tangential moments when the plate is subjected to central circular patch load over a area of radius a/4 with intensity p_o per unit area. **[25]**

P.T.O.

SECTION - II

Q4) a) Derive the expressions for displacement in symmetrically loaded shell having the form of a surface of revolution. **[14]**

b) State the advantages and disadvantages of shell structures compared to plates. **[5]**

c) With neat sketches classify shell surfaces based on Gaussian curvature. **[6]**

Q5) a) A horizontal cylindrical shell closed at both ends if filled with water and is simply supported at ends. Derive the stress resultants along any meridian in the shell. **[20]**

b) Differentiate between membrane theory and bending theory for analysis of shells. **[5]**

Q6) a) Describe the principles of Lundgren's beam theory for thin cylindrical shell along with the advantages and limitations of the theory. **[5]**

b) Derive the equilibrium equation and hence the equation for deflection using general cylindrical shell theory (considering the bending action) for axisymmetric case. **[20]**

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Total No. of Questions : 8]

SEAT No. :

P1655

[Total No. of Pages : 3

[4265]-46

M.E. (Mech.) (Design & Heat Power)

NUMERICAL METHODS AND COMPUTATIONAL TECHNIQUES

(2002 Course)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer three questions from Section I and three questions from Section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Solve using Newton - Raphson method the equation $\sin(x) - x\cos(x) = 0$.

Assume initial guess value for $x = \frac{3\pi}{2}$, accuracy of function should be within 0.00001. **[10]**

b) With reference to solution of linear simultaneous equations explain **[6]**

i) Partial Pivoting.

ii) Ill conditioned system of equations.

Q2) Using Gauss Seidal method, solve the following set of simultaneous equations up to 3 decimal places accuracy. **[16]**

$x + 20y + 9z = -23$

$2x - 7y - 20z = -57$

$20x + 2y + 6z = 28$

Q3) a) A weighing machine manufacturing company developed a new type of weighing machine prototype and they are testing its performance. While testing the performance following observations are recorded.

Load lifted N	750	1000	1250	1500	1750	2000
Effort Required N	82.5	105	130	142.5	162.5	178.5

Find the effort required to lift a load of 1300 N using central difference interpolation formula. **[8]**

P.T.O.

b) Derive Gauss two point formula and use the formula to evaluate

$$I = \int_0^5 e^{-x^2} dx$$ **[10]**

Q4) a) For the following matrix A, determine the maximum eigen value using the power method. Also find corresponding eigen vector.

$$A = \begin{bmatrix} 2 & 1 & -1 \\ 2 & 4 & 1 \\ 1 & 2 & 3 \end{bmatrix}$$

How will you determine minimum eigen values using power method? **[10]**

b) Write a short note on Gauss quadrature for double integration. **[6]**

SECTION - II

Q5) a) Derive the (first order accuracy) forward and (second order accuracy) central difference approximations to the first derivatives, along with the leading error term. **[7]**

b) Derive the approximation for the second derivative along with the leading error term. **[4]**

c) Consider $f(x) = \sin(x)$. Taking δx = 0.05, determine the (first order) forward and (second order) central difference approximations to the derivative at x = 1 radian. Compare against the exact solution. **[5]**

Q6) a) A cylinder of surface area, A = 0.2 m^2 is initially at 0°C dipped in a hot fluid which is initially at temperature, T_f = 100°C; Compute temperature of a cylinder after 10 seconds using Euler's Method. Take $\Delta t = 2$ seconds. Take mass of cylinder, m = 2 kg, C_p = 450 J/kgK. The governing equation is,

$$\frac{dT}{dt} = \frac{hA(T - T_f)}{-mC_p}$$

Tabulate the result. Take h = 1200 W/m^2k. **[10]**

b) Evaluate the integral $\int_0^1 \frac{x^2}{1+x^3} dx$ using, **[8]**

i) Trapezoidal Rule with 6 strips.

ii) Simpson's $\frac{1}{3}$ rd Rule with 6 strips (or three areas)

Q7) Consider the equation $\frac{d^2x}{dt^2} + 4x\frac{dx}{dt} + (x+6)\sin\omega t = 0$ with initial condition

$\frac{dx}{dt} = 4$ and $x = 6$ at $t = 0$ and $\omega = 180$

a) Decompose the equation into 2 first order equations. **[2]**

b) Integrate using Forward Euler with step size $dt = 0.2$ for t = 0 till t = 1 **[14]**

Q8) Find solution of boundary value problem by suitable method. **[16]**

$$\frac{\partial^2 u}{\partial t^2} = \frac{\partial^2 u}{\partial x^2},\ 0 \le x \le 1$$

Subject to $u(x,0) = \sin(\pi x),\ 0 \le x \le 1$

$$\frac{\partial u}{\partial t}(x,0) = 0,\quad 0 \le x \le 1$$

$$u(0,t) = 0,\ u(1,t) = 0,\ t > 0$$

Take $\Delta h = \frac{1}{5}$ and $\Delta t = \frac{3}{4}$. Estimate u value at $t = 1.5$

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Total No. of Questions : 8]

SEAT No. :

P1659

[Total No. of Pages : 2

[4265] - 144

M.E. (Electronics) (Digital Systems)

MULTIMEDIA TECHNIQUES

(2002 Course)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each Section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) State the objectives of multimedia techniques. Explain the hardware & software requirements of multimedia system. **[10]**

b) Discuss different types of MIDI messages. **[8]**

Q2) a) What are the main features of MPEG - 4. Draw a neat block diagram of MPEG - 4 encoder / decoder & explain function of each block. **[8]**

b) Explain the various file formats for storing audio. **[8]**

Q3) a) Draw a neat block diagram of PAL decoder & explain function of each block. **[8]**

b) Enlist the main features of multimedia PC level 3 (MPC 3). **[8]**

Q4) a) Explain the different types of coding techniques used in HDTV. **[8]**

b) Write short notes on - (Any Two) : **[8]**

i) Multimedia authoring tools.

ii) MP3

iii) MIDI devices.

P.T.O.

SECTION - II

Q5) a) Discuss the different issues in compression. Also highlight the different compression techniques. **[8]**

b) Explain the various modes of JPEG standard. **[8]**

Q6) a) Explain the different techniques of motion estimation. Indicate the features of each technique. **[10]**

b) What are the main specifications of CCIR-B standard? **[6]**

Q7) a) Discuss in detail the file formats used for storing image & graphics. **[8]**

b) Draw a neat block diagram of digital video camera & explain function of each block. **[8]**

Q8) Write detailed notes on - **[18]**

a) Hypertext, Hypermedia & Multimedia.

b) HTML.

c) MM devices.

d) Web page design.

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Total No. of Questions : 8]

SEAT No. :

P1663

[Total No. of Pages : 7

[4265]-401
M.E. (Civil) (Const & Mgmt)
MATHEMATICS - PROBABILISTIC METHODS & SIMULATION APP. IN CONST
(2008 Course) (Semester - I)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Attempt any three questions from section - I and three questions from section - II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, wherever necessary.***

SECTION - I

Q1) A contractor has kept a record of the penalties which he had to pay due to project delays on 10 of his previously executed construction projects. The data is as follows :-

Project	Penalty in (Rs.)	Project Delay in (months)
1	7,00,000	12
2	20,00,000	29
3	1,50,000	7
4	29,000	4
5	24,00,000	31
6	6,50,000	13
7	18,000	2
8	15,00,000	17
9	9,00,000	13
10	28,00,000	33

Using Monte Carlo Simulation, simulate the mean delay and the mean penalty which the contractor should consider for his future 10 works. **[18]**

P.T.O.

Q2) a) In an item including dewatering at the contractor's cost, for a particular strata and for a particular quantity of work, following costs have ocurred on 12 previous projects.

Sr No.	Cost in Rs.
1	2,400
2	3,100
3	7,200
4	14,800
5	7,300
6	5,100
7	2,600
8	9,200
9	3,400
10	12,500
11	4,100
12	4,700

i) Find mean and standard deviation **[1 + 3]**

ii) Find Range and Coefficient of variance **[1 + 1]**

iii) Find cost based on 3 point estimate **[2]**

iv) Determine probability of ocurrence of the cost determined in (iii) **[2]**

v) If tendered cost is Rs. 3600, forecast whether above activity will be in profit or loss and estimate the same. **[2]**

b) Without drawing a graph, is it possible to determine whether a given set of observations fits into a normal distribution. If yes, how? **[4]**

Q3) a) Two materials suppliers have been evaluated for delivering materials on time. Following values are obtained.

Supplier P $\rightarrow$ $p = 0.65$, $q = 0.35$

Supplier Q $\rightarrow$ $p = 0.55$ $q = 0.45$

Determine probability of both the suppliers to deliver 7 deliveries on time out of 20 deliveries. Which supplier is better and why? **[8 + 2]**

b) Explain FCP concept and its utility in determining $EFCS_{(m9)}$ based on alternate management decisions, with an example. **[6]**

Q4) a) A tenderer is bidding for construction works averagely 10 numbers in a year, since the last 5 years. Determine probability that the tenderer **[10]**

i) gets 9 works.

ii) does not get any work

iii) gets not more than 3 works

iv) gets at least 7 works

v) gets 5 works

b) Discuss any 3 mathematical tools with examples, useful for forecasting construction project risks. **[6]**

SECTION - II

Q5) The duration of an activity depends upon the funds allocated to it and the professional project management. The degree of effective project management is rated on a 10 point scale, with 10 points awarded for excellent project management. Track record for one particular construction activity on 10 different sites is as follows :-

Activity duration (y) days	Funds allocated $(R_s) \rightarrow (x_1)$	Project Management score obtained (x_2)
30	30,000	2
15	60,000	7
45	18,000	6
17	55,000	4
20	50,000	1
32	29,000	2
43	19,000	5
50	15,000	3
23	35,000	8
37	22,000	7

Determine

a) Individual co - relation coefficients between y and x_1 as well as y and x_2. **[10]**

b) Partial co - relation coefficients between y and x_1 and y with x_2. **[3]**

c) Total co - relation coefficient linking y, x_1, x_2 **[2]**

d) Comment on the nature and values of the co-efficients obtained. **[3]**

Q6) For the data sets given in question 5,

a) Determine

i) linear regression equation between y and x_1 **[4]**

ii) linear regression equation between y and x_2 **[4]**

iii) Explain utility of the above equations to the project manager. **[2]**

b) Explain queuing theory applications for optimising the use of machinery in an earthwork operation, with a proper example. **[6]**

Q7) a) In any construction project the quality of concrete delivered to site depends upon many variables. Enlist these variables in terms of mathematical representation. Explain how multiple linear regression analysis with more than 3 variables is needed to solve this problem. Form the multiple linear regression equations involving all these variables in order to forecast the quality of concrete delivered at site. Explain how you would arrive at the co- efficients. **[12]**

b) Explain with examples **[4]**

i) AMI costs

ii) SLI costs

Q8) Perform sensitivity analysis for the

a) EOQ model, based on the following data :-

S = 2,00,000 bags

C_o = Rs. 5,000

C_u = Rs. 365

i = 25%

During execution, it was observed the C_u reduced to Rs. 350, 'S' increased by 5%, 'i' reduced by 4%, whereas 'C_o' remained same.

i) Determine whether the cost of execution increased or decreased and also find out its extent. **[6]**

ii) If in the data given for the 4 variables, all the parameters are underestimated by 15% what is the effect on cost? **[1]**

iii) Determine change in the cost for $\alpha = 0.3$, β, γ, $\delta = 1$ **[1]**

b) Explain following mathematical models and their utility in equipment management.

i) Cox model **[2]**

ii) Nunally model **[2]**

iii) Vorster - Garza model **[4]**

APPENDIX 'C'

TABLE OF RANDOM NUMBERS

39 65 78 45 45	19 90 69 64 61	20 26 36 31 62	58 24 97 14 97	95 06 70 99 00
73 71 23 70 90	65 97 60 12 11	31 56 34 19 19	47 83 75 51 53	30 62 38 20 44
72 20 47 33 84	61 67 47 97 19	98 40 07 17 66	23 05 09 51 80	59 78 11 52 69
75 17 28 69 17	17 95 21 78 48	24 33 45 77 48	69 81 84 09 29	93 22 70 45 80
37 48 79 88 74	63 52 06 34 30	01 31 60 10 27	35 07 79 71 53	28 99 52 01 41
02 89 08 16 94	85 53 83 29 95	56 27 09 24 43	21 78 55 09 82	72 61 88 73 61
87 18 15 70 07	37 40 79 12 38	48 13 93 15 96	41 92 45 71 51	09 18 25 58 94
98 83 71 70 15	89 09 39 59 24	00 06 41 41 20	14 36 59 25 47	54 45 17 24 89
10 08 58 07 04	76 62 60 48 68	58 76 17 14 86	59 53 11 52 21	66 04 18 72 87
17 90 56 37 31	71 82 13 50 41	27 55 10 24 92	28 04 67 53 44	95 23 00 84 47
93 05 31 03 07	34 18 04 52 35	74 13 39 55 22	68 95 23 92 35	36 63 70 35 31
21 80 11 47 99	11 20 99 45 18	76 51 94 84 86	13 79 93 37 55	98 16 04 41 67
95 18 94 36 97	23 37 83 28 71	79 57 95 13 91	09 61 87 25 21	56 20 11 32 44
97 08 31 55 73	10 65 81 92 59	77 31 61 95 46	20 44 90 32 64	23 99 76 75 63
69 26 88 86 13	59 71 74 17 32	48 38 75 93 29	73 37 32 04 05	60 82 29 20 25
41 27 10 25 03	87 63 93 95 17	81 83 83 04 49	77 45 85 50 51	79 88 01 97 30
91 94 50 63 62	08 61 74 51 68	92 79 43 89 79	29 18 94 51 23	14 85 11 47 23
80 06 54 18 07	08 52 85 08 40	48 40 35 94 22	72 65 71 08 86	50 03 42 99 36
76 72 77 63 99	89 85 84 46 06	64 71 06 21 66	89 37 20 70 01	61 65 70 22 12
59 40 24 13 75	42 29 02 23 19	07 94 76 10 08	81 30 15 89 14	81 83 17 16 33
63 02 06 34 41	79 53 36 02 95	94 61 09 43 62	20 21 74 68 86	84 95 48 46 45
78 47 23 53 90	79 93 96 38 63	34 85 52 05 09	85 43 01 72 73	14 93 87 81 40
87 68 62 15 43	97 48 72 66 48	53 16 71 13 81	59 97 50 99 92	24 62 20 42 30
47 60 92 10 77	26 97 05 73 51	88 46 38 00 58	72 63 49 29 31	75 70 16 08 24
56 88 87 59 41	06 87 37 78 48	65 88 69 58 39	88 02 84 27 82	85 81 50 39 38
22 17 68 65 84	86 02 22 57 51	68 69 80 95 44	11 29 01 95 80	49 34 35 86 47
19 36 27 59 46	39 77 32 77 09	79 57 92 36 59	89 74 39 82 15	05 50 94 34 74
16 77 23 02 77	28 06 24 25 93	22 45 44 84 11	87 80 61 65 81	09 71 91 74 25
78 43 66 07 61	97 66 63 99 61	80 45 67 93 82	59 73 19 85 23	53 33 65 97 21
03 28 28 26 08	69 30 16 09 05	53 58 47 70 93	66 56 45 65 79	45 56 20 19 47
04 31 17 21 56	33 63 99 19 87	26 72 39 27 67	53 77 57 68 93	60 61 97 22 61
61 06 98 03 91	87 14 77 43 96	43 00 65 98 50	45 60 33 07 07	98 90 46 50 47
23 58 35 26 00	99 53 93 61 28	52 70 05 48 34	56 65 05 61 86	90 92 10 79 80
15 39 25 70 99	93 86 52 77 65	15 35 59 05 28	22 87 26 07 47	86 96 98 29 06
58 71 96 30 24	18 46 23 34 27	85 13 99 24 44	49 18 09 79 49	74 16 32 23 02
93 22 53 64 39	07 10 63 76 35	37 03 04 79 88	08 33 33 85 51	55 34 57 72 69
78 76 58 54 74	92 38 70 96 92	52 06 79 79 45	82 63 18 27 44	69 66 92 19 09
61 81 31 96 82	00 57 25 60 59	46 72 60 18 77	55 66 12 62 11	09 99 55 64 57
42 88 07 10 05	24 98 65 08 27	47 21 61 88 32	27 80 30 21 60	10 92 35 36 12
77 94 30 05 39	28 10 99 00 27	12 73 73 99 12	39 99 57 94 82	96 88 87 17 91

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Total No. of Questions : 8]

SEAT No. :

P1665

[Total No. of Pages : 3

[4265] - 413

M.E. (Civil) (Const. & Mgmt.)

PROJECT ECONOMICS AND FINANCIAL MANAGEMENT

(2002 and 2008 Course) (Semester - II)

Time : 4 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) *Attempt any three questions from Section - I and three questions from Section - II.*
2) *Answers to the two sections should be written in separate answer books.*
3) *Neat diagrams must be drawn wherever necessary.*
4) *Figures to the right indicate full marks.*
5) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
6) *Assume suitable data, wherever necessary.*

SECTION - I

Q1) Evaluate the following options using any 3 investment evaluation criteria. **[18]**

Year	Option I		Option II	
	Cash Inflow (Rs.) Lakhs	Cash Outflow (Rs.) Lakhs	Cash Inflow (Rs.) Lakhs	Cash Outflow (Rs.) Lakhs
1	40	30	-	60
2	30	20	-	40
3	20	10	-	30
4	10	5	-	20
5	5	3	80	-
6	3	2	60	-
7	2	1	40	-
8	1	-	30	-
9	0.5	-	10	-

Consider cost of capital at 10%. Explain which investment option you would prefer and why?

Q2) a) Explain procedure of capital budgeting under following conditions : **[8]**

i) Inflation ii) Market uncertainty

b) Explain how the working capital requirements are determined by a contractors organisation executing construction works for a client. **[8]**

P.T.O.

Q3) Differentiate between :

a) Ordinary shares and preference shares. **[4]**

b) Mutual funds and debentures. **[4]**

c) Debt financing and equity financing. **[4]**

d) Cash credit and discounted bills. **[4]**

Q4) a) What is balance sheet? How is it prepared? What is its use? **[6]**

b) Prepare balance sheet for the construction organisation based on the following data : **[10]**

i)	Current Assets	-	Rs 20,00,000 /-
ii)	Current Liabilities	-	Rs 15,00,000 /-
iii)	Reserves & Surplus	-	Rs 1,25,00,000 /-
iv)	Fixed Assets	-	Rs 40,00,000 /-
v)	Loans & Advances	-	Rs 20,00,000 /-
vi)	Investments	-	Rs 60,00,000 /-
vii)	Inventories	-	Rs 30,00,000 /-
viii)	Taxes to be paid	-	Rs 25,00,000 /-
ix)	Interests on Capital	-	Rs 5,00,000 /-

SECTION - II

Q5) Your company is considering an investment of Rs. 10 lakhs capital outlay over a period of 5 years. The annual income before depreciation, but after considering all other charges is as follows : **[18]**

Year	Income (Rs.)
1	5,00,000
2	6,00,000
3	4,00,000
4	3,00,000
5	2,00,000

Scrap value expected is 5%. Consider depriciation based on sinking fund method with an annual interest of 4.5% on the sinking fund. Consider cost of capital at 14%.

Determine :

i) Payback period.

ii) Modified payback period.

iii) ARR on average investment.

iv) IRR

v) NPV at 12%.

Q6) a) Explain with examples from construction organisations : **[8]**

i) Consortium ii) Acquisition

iii) Merger iv) JV

b) Define any 8 financial ratios correctly. **[8]**

Q7) a) Explain various objectives of financial management and explain how the finance manager has a herculean task in order to achieve these objectives. What qualities he should possess and what role he should play? Discuss **[8]**

b) Explain the "cash flow cycle" with a flow diagram. **[4]**

c) Enlist and explain any 4 basic accounting principles. **[4]**

Q8) Explain the following : **[16]**

a) Micro finance and its relevance in social equity.

b) Role of Lender's engineer on construction projects.

c) Tender conditions and financial performance.

d) Risk and Return characteristics of portfolios.

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Total No. of Questions : 8]

SEAT No. :

P1667

[Total No. of Pages : 3

[4265]-452
M.E. (Civil) (Structures)
STRUCTURAL MATHEMATICS
(2008 Course) (Sem. - I)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer three questions from section - I and three questions from section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of non programmable electronic calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Discuss the concept of banded matrix. Explain the band width and half band width of stiffness matrix with a suitable example. **[4]**

b) Using Flexibility method, analyze the two span continuous beam each loaded centrally as shown.
Comment on changes that will have to be incorporated in the analysis procedure if support B sinks by amount 'd'. **[13]**

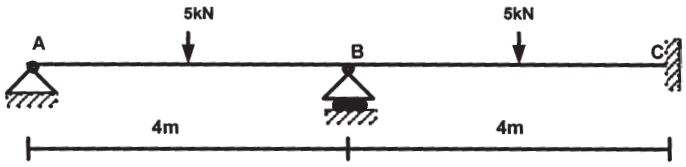

Fig. 1.b

Q2) a) Analyze the truss shown in the Fig. 2.b. Find the joint displacements, support reactions, bar forces and bar elongations. Use either flexibility or stiffness method. Take AE = 6000 kN for all the bars. **[12]**

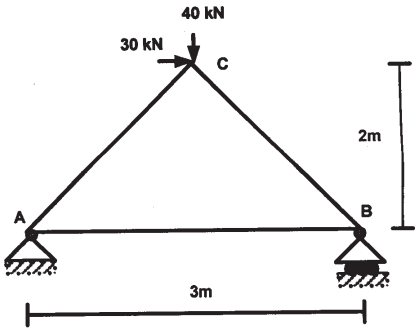

Fig. 2.b

b) Compare the Taylor's series and Euler's method of solving an ordinary differential equation. **[5]**

P.T.O.

Q3) a) In what way is the space frame different from plane frame, grid system and space truss. Show how the plane frame element, the grid element and space truss element are special cases of space frame element considering the conventional stiffness formulation. **[8]**

b) The derivative of y with respect to x is given by $dy/dx = x - y$. At $x = 0$, $y = 1$. Calculate the value of y at $x = 0.1$ and 0.2 using an interval of 0.1. Use Runga kutta method. **[8]**

Q4) a) Find the eigen values and eigen vectors of the following matrix

$$\begin{vmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{vmatrix}$$ **[6]**

b) Derive the stiffness matrix of a typical space truss element. **[7]**

c) Write a note on Inverse of matrix by partitioning. **[3]**

SECTION - II

Q5) a) For the continuous beam shown in Fig. 5.a. apply central difference formula dividing the beam in four equal parts and find the deflection at nodal points, rotation at the simply supported end and moment at fixed end. **[8]**

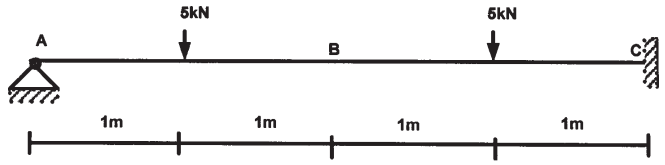

Fig. 5.a

b) A simply supported uniform square plate is subjected to a uniformly distributed load of intensity 'q'. Divide the plate into 4×4 meshes and find the deflection at the interior nodal points using finite difference method. Comment in the changes to be employed if the plate is subjected to concentrated central point load instead of udl. **[8]**

Q6) a) Estimate the lowest buckling load of a uniform pin ended column of length L and flexural rigidity EI using three intervals. **[8]**

b) Find the cubic splines for the following table of values and evaluate y at $x = 10$ **[9]**

x	4	9	16
y = f(x)	2	3	4

Q7) a) Discuss the conceptual difference between interpolating technique and regression technique for a set of data. **[4]**

b) For the data given in table, fit a second order polynomial **[10]**

x :	1	2	3	4
y :	6	11	18	27

c) State Lagrange's interpolation formula. Give its advantages. **[3]**

Q8) a) Explain the advantage of Gauss Quadrature over trapezoidal and simpson's rule in evaluating the area under curve. **[6]**

b) Obtain Fourier series expansion for f(x) defined as follows. **[10]**

$f(x) = x + (\pi/2) \quad -\pi < x < 0$

$f(x) = (\pi/2) - x \quad 0 < x < \pi$

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Total No. of Questions : 6]

SEAT No. :

P1669

[Total No. of Pages : 2

[4265] - 462

M.E. (Civil - Structures)

DESIGN OF INDUSTRIAL STEEL STRUCTURES

(2008 Course) (Elective - II (d)) (Sem. - I)

Time : 4 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Attempt any two questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***
6) ***Use of cell phone is prohibited in the examination hall.***
7) ***Use of electronic pocket calculator, latest IS codes and steel table is allowed.***

SECTION - I

Q1) The span of knee braced roof trusses over an industrial building 28 m long is 18 m. The spacing of roof trusses is 4 m. The pitch of roof is 1 in 4. The galvanized corrugated iron sheet is used for roof covering. The basic wind pressure is 1.5 kN/m^2 and there is no snow fall. The height of eaves above ground level is 8.0 m. Propose a suitable type of roof truss. Determine the load at the various panel points due to dead load, live load and wind load. Also determine the reactions. **[25]**

Q2) Design the columns supporting the roof trusses for the industrial building as in Q. 1. **[25]**

Q3) Taking data of Q. 1, design gable rafter, side rails, gable column and gable wind girder for the industrial building. The gable end of the industrial building is divided into four parts of 4.5 m each by providing three gable columns as shown in **Fig. 3.** The gable rafter is supported over column. The purlins are supported by the gable rafter. **[25]**

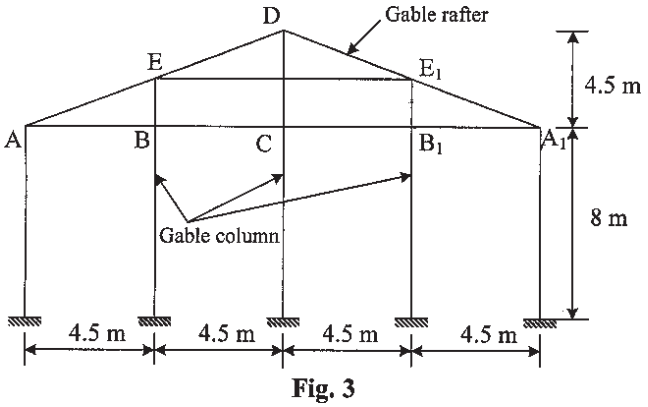

Fig. 3

P.T.O.

SECTION - II

Q4) Design vertical side bracing and rafter bracing for the industrial building as per data given in Q. 1 and 2. The horizontal force along the rail over the gantry girder due to electrically operated overhead crane is 23.40 kN. The height of rails is 5 m above the base. Take maximum compressive force in one rafter of the roof truss as 86.00 kN. **[25]**

Q5) Design a trussed purlin to carry a uniformly distributed load of 32 kN/m over a simply supported span of 8.0 m. Use double angles for chord and single angles for web members. Select suitable geometry for truss purlin and draw its cross section. **[25]**

Q6) Design an open web (castellated beam) for a span of 12 m. The dead load coming on roofing is 1.2 kN/m^2 and live load on the roof is 1.8 kN/m^2. Calculate the spacing of the beam and check for shear and deflection. Adopt suitable pattern of castellation and adjust the section such that overall depth of section should not exceed 900 mm. Assume f_y = 250 Mpa. **[25]**

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Total No. of Questions : 6]

SEAT No. :

P1670

[Total No. of Pages : 2

[4265] - 466

M.E. (Civil) (Structure)

EARTHQUAKE RESISTANT DESIGN OF STRUCTURES

(2008 Course) (Elective - III (a)) (Semester - II)

Time : 4 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any two questions from each Section.***
2) ***Answers to the two sections must be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***
7) ***Use of IS 1893-2002 (Part-I) is permitted.***

SECTION - I

Q1) a) Write notes on : **[8]**

i) Plate techtonic theory.

ii) Soil structure interaction.

b) Describe two approaches in detail for the assessment of severity of an earthquake. **[9]**

c) Describe in detail code based methods of seismic design. **[8]**

Q2) a) "The seismic performance of a structure mainly depends on it's foundation design". Justify the statement with reference to earthquake resistant design. **[8]**

b) What is ductility? Explain philosophy behind earthquake design. **[9]**

c) Explain with sketches the vertical plane irregularities in building. How the building should be planned to have substantial torsional rigidity. **[8]**

P.T.O.

Q3) a) A five storey building has plan dimensions as shown in figure 3.1. The axial load on each shear wall is 6500 kN due to D.L. and L.L. both and length 6 m. The floor height is 3 m. The D.L. per unit area of floor consisting of weight of slab, finishes etc is 4 kN/m^2 and weight of partition wall on floor is 2 kN/m^2. The live load on each floor is 3 kN/m^2 and 1.5 kN/m^2 on roof floor. The soil below foundation is hard and building located in Pune. **[15]**

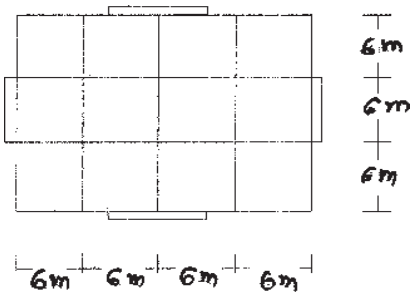

Fig. 3.1

b) Describe various type of the plane frame mathematical models of multistory RC building. **[10]**

SECTION - II

Q4) a) Write notes on : **[9]**
- i) Restoration of masonry walls.
- ii) Ductility & factors affecting ductility of a structure.
- iii) Response spectrum method of dynamic analysis.

b) What are different types of steel frames used in buildings in earthquake prone areas? Explain with neat sketches the types & behavior of braced frames. **[8]**

c) Describe with neat sketches various earthquake protective systems. **[8]**

Q5) a) Explain in detail the non-conventional techniques for retrofitting for RC building. **[9]**

b) Describe the concept of base isolation. What are the different techniques of base isolation? **[9]**

c) Write notes on : **[7]**
- i) Seismic design of RC elevated water tank.
- ii) Infill brick walls & their structural behavior.

Q6) a) Write notes on : **[10]**
i) Behavior of shear wall. ii) Strengthening of steel buildings.

b) Design a RC rectangular beam of span 6 m supported on RCC column to carry a point load of 100 kN in addition to it's self-weight & a live load of 3 kN/m. The moment due to seismic load is 5.01 kN-m & shear force is 32 kN. Use M 20 Grade concrete & FE - 415. **[15]**

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Total No. of Questions : 8]

SEAT No. :

P1675

[Total No. of Pages : 3

[4265]-501
M.E. (Mech.) (Heat Power)
NUMERICAL METHODS IN THERMAL & FLUID ENGG.
(2008 Course) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer three questions from Section I and three questions from Section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Using 'LU Decomposition method' solve the following set of Simultaneous equations.

$2x + 3y + z = 9$

$x + 2y + 3z = 6$

$3x + y + 2z = 8$ **[12]**

b) What is pivoting? Distinguish between partial pivoting and complete pivoting. **[6]**

Q2) a) The Redlich - Kwong equation of state is given by

$$P = \frac{RT}{v-b} - \frac{a}{v(v+b)\sqrt{T}}$$

Where R = the universal gas constant [= 0.518 kJ/kg K], T = absolute temperature, k, P = absolute pressure, kPa, and v = the volume of a kg of gas, m^3/kg. The parameters a and b are calculated by,

$$a = 0.427\frac{R^2 T_c^{2.5}}{P_c}, \quad b = 0.0866R\frac{T_c}{P_c}$$

Where, P_c = 4600 kPa and T_c = 191 K

Determine the amount of methane fuel that can be held in a $3m^3$ tank at a temperature of –40°C with a pressure of 65000 kPa. Use a root locating method of your choice to calculate *v* and then determine the mass of methane contained in the tank. **[12]**

P.T.O.

b) Explain convergence criteria of successive iteration method (Gauss - Seidel Method) **[4]**

Q3) Use Gauss - Newton method to fit the function $f(x; a_0, a_1) = a_0(1 - e^{-a_1 x})$ to the data;

x	0.25	0.75	1.25	1.75	2.25
y	0.28	0.57	0.68	0.74	0.79

Use initial guess of $a_0 = 1$ and $a_1 = 1$ for the parameters. Note that for these guesses, the initial sum of the squares of the residuals is 0.0248. Do only one iteration and find values of a_0 & a_1. **[16]**

Q4) a) Show that, using the data given below, Richard son's extrapolation technique can provide better estimate for first derivative than second order central difference approximation (3 point formula). Compare both results with exact solution.

x	–0.5	–0.25	0	0.25	0.5	0.75	1	1.25	1.5
$f(x) = e^x$	0.6065	0.7788	1	1.284	1.6487	2.117	2.7183	3.4903	4.4817

Estimate $f'(x)$ at $x = 0.5$ and assume h = 0.5 and r = 0.5. **[8]**

b) Find the value of $f(5)$ from following data, by using Lagrane'gs formula. **[8]**

x	3	7	9	12
$y = f(x)$	1.4313	5.9156	8.5881	12.9501

SECTION - II

Q5) a) Use order of h^6 Romberg integration to evaluate - **[8]**

$$\int_0^1 \frac{dx}{1+x^2}$$

b) Evaluate $\int_1^{2.6}\int_2^{3.2} \frac{1}{x+y}\,dx\,dy$, using Gauss - Quadrature two point formula. **[8]**

Q6) a) Reduce the matrix 'A' to the tridiagonal form using House holder's method. **[10]**

$$A = \begin{bmatrix} 1 & 3 & 4 \\ 3 & 2 & -1 \\ 4 & -1 & 1 \end{bmatrix}$$

b) Consider $f(x) = \sin(x)$. Taking $\delta x = 0.05$, determine the (first order) forward and (second order) central difference approximations to the derivative at $x = 1$ radian. Compare against the exact solution. **[8]**

Q7) a) Solve the equation $2\frac{d^2y}{dx^2} = 3x\frac{dy}{dx} - 9y + 9$, subject to the condition $y(0) = 1$, $y'(0) = -2$ using Euler's method and compute y for $x = 0.1$ (0.1) 0.3. **[8]**

b) For the case of water draining out from the bottom of a tank, the water level in the tank can be given as,

$$\frac{dy}{dt} = -k\sqrt{y}$$

Where K = 0.2 $m^{1/2}$/min.

The initial condition is $y = 2.5$ m at t = 0. Integrate this from t = 0 to t = 2 min using Heun's method. with $\delta t = 0.5$ min. **[8]**

Q8) Consider steady state conduction given by the Laplace equation in a square of 1 m length. The boundary conditions are as follows :

- T = 125 for $y = 0, 0 \le x \le 1$
- T = 90 for $y = 1, 0 \le x \le 1$
- T = 170 for $x = 0, 0 \le y \le 1$
- T = 240 for $x = 1, 0 \le y \le 1$

With $\delta x = \delta y = \frac{1}{3}$

a) Form the equations at the interior nodes. **[8]**

b) Carry out two cycles of iterations. **[8]**

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Total No. of Questions : 8]

SEAT No. :

P1676

[Total No. of Pages : 2

[4265] - 513

M.E. (Mechanical) (Heat Power Engineering)

MEASUREMENT TECHNIQUES & DATA ANALYSIS

(2008 Course) (Semester - II)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each Section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the various stages of measurement system. **[8]**

b) Explain uncertainty principle. **[8]**

Q2) a) Explain various static characteristics of an instrument. **[8]**

b) Determine Spearman's co-efficient of correlation between marks assigned to 10 students by two judges. **[10]**

	1	2	3	4	5	6	7	8	9	10
Marks by Judge X	52	53	42	60	45	41	37	38	25	27
Marks by Judge Y	65	68	43	38	77	48	35	30	25	50

Q3) a) Explain uses of regression analysis. **[8]**

b) Calculate Karl pearson's co-efficient of correlation from following data, using 20 as mean for price and 70 as mean for demand. **[8]**

Price	14	16	17	18	19	20	21	22	23
Demand	84	78	70	75	66	67	62	58	60

P.T.O.

Q4) a) Explain Electromagnetic flow meter with a neat sketch. What are its merits, applications? **[8]**

b) Explain the working of vibration measuring device. **[8]**

SECTION - II

Q5) a) Compare electronic controller with other types of controller. **[8]**

b) Given the figure 1. plot graph of proportional + Integral controller output as function of time, $K_p = 5$, $K_I = 1.05^{-1}$ and $p_1(0) = 20\%$. **[8]**

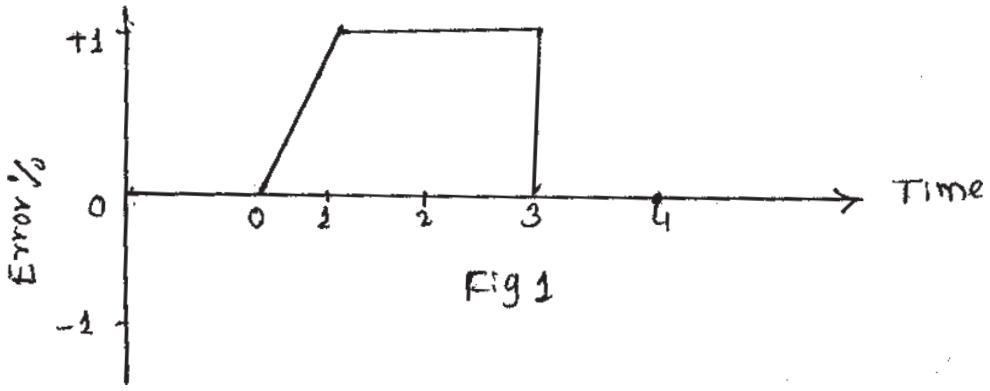

Fig 1

Q6) a) Explain how do you measure velocity of hot gases. What are advantages limitations & applications of the device? **[10]**

b) Explain the characteristics of thermistors. **[8]**

Q7) a) Explain the U-V spectro photometer & applications. **[8]**

b) What are applications of chromatography? **[8]**

Q8) a) Explain thermal conductivity gauge & Ionisation gauge. **[8]**

b) Explain construction, working of a noise meter. **[8]**

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Total No. of Questions : 8]

SEAT No. :

P1680

[Total No. of Pages : 3

[4265]-574

M.E. (Mechanical) (Energy Engg.)

ADVANCED ENGINEERING MATHEMATICS

(Semester - I) (2012 Course)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer three questions from section - I and three questions from section - II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Find power series solution of the initial value problem **[9]**

$$(x^2-1)\frac{d^2y}{dx^2}+3x\frac{dy}{dx}+xy=0,\ y(0)=4,\ y'(0)=6$$

b) Use the method of Frobenius to find solutions of the differential equation

$2x^2\frac{d^2y}{dx^2}+x\frac{dy}{dx}+(x^3-3)y=0$ in some interval $0 < x <$ R. **[9]**

Q2) a) With usual notations prove following recurence relations for Bessel' polynomials : **[8]**

i) $xJ'_n = nJ_n - xJ_{n+1}$

ii) $2J'_n = J_{n-1} - J_{n+1}$

b) Prove Rodrigue's formula :

$$Pn(x)=\frac{1}{2^n n!}\frac{d^n}{dx^n}(x^2-1)^n$$ **[8]**

Q3) a) Prove following recurence formulaes for Legendre's polynomials : **[8]**

i) $nP_n = (2n-1)xP_{n-1} - (n-1)P_{n-2}$

ii) $xP'_n - P'_{n-1} = nP_n$

b) An infinitely long uniform metal plate is enclosed between lines $y = 0$ and $y = l$ for $x > 0$. The temperature is zero along edges $y = 0$ and $y = l$ and at infinity. If the edge $x = 0$ is kept at constant temperature u_0, find the temperature distribution u(x, y) by solving Laplace equation. **[8]**

P.T.O.

Q4) a) Find the characteristic values and characteristic functions of strum - Liouville problem.

$$\frac{d}{dx}\left[x\frac{dy}{dx}\right]+\frac{\lambda}{x}y=0,\ y'(1)=0, y'(e^{2\pi})=0$$ **[8]**

b) Explain D'Alembert's method for finding solution of wave equation

$\frac{\partial^2 u}{\partial t^2}=c^2\frac{\partial^2 u}{\partial x^2}$, given that **[8]**

i) $u(x,0)=f(x)$

ii) $u_t(x,0)=g(x)$

SECTION - II

Q5) a) Define Fourier transform of a function and find the Fourier cosine integral representation of $f(x)=e^{-2x}+4e^{-3x}$ **[9]**

b) A bar of length L laterally insulated has its ends A and B kept at 0°C and $u°_0$ respectively until steady state conditions prevail. If the temperature at B is then suddenly reduced to 0°C and kept so while that of A. maintained at 0°C, find the temperature in the bar at any subsequent time. **[9]**

Q6) a) Define **[8]**

i) Linear transformation and

ii) Regular transformation.

If $T:R^3\to R^2$ is defined by $T(x,y,z)=(x+y+z,\ 2x-3y+4z)$, then show that T is a linear transformation.

b) Define co - ordinate transformation, explain it with **[8]**

i) Cylinderical Co - ordinate system and

ii) Spherical Co - ordinate system.

Q7) a) Explain **[8]**

i) Contravariant Tensor

ii) Covariant Tensor

iii) Mined Tensor

b) Define **[8]**

i) Rank of a tensor

ii) First order tensor

iii) Second order tensor

With suitable examples.

Q8) a) Define Fourier series of a function and hence find Fourier series for $f(x) = x^3$, for $-\pi < x < \pi$, given that $f(x + 2\pi) = f(x)$ **[8]**

b) Solve following wave equation using Fourier series method : **[8]**

$$\frac{\partial^2 y}{\partial t^2} = c^2 \frac{\partial^2 y}{\partial x^2}$$ subject to

i) $y(0,t) = 0$

ii) $y(l,t) = 0$

iii) $\left(\frac{\partial y}{\partial t}\right)_{t=0} = 0$

iv) $y(x,0) = y_0 \sin^3\left(\frac{\pi x}{l}\right)$

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Total No. of Questions : 10]

SEAT No. :

P1681

[Total No. of Pages : 3

[4265]-581
M.E. (Mech.) (CADME)
ADVANCED MACHINE DESIGN
(2012 Course) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answers three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Derive the compatibility equation in cartesian co - ordinate system. **[8]**

b) Investigate what problem of plane stress is represented by the function

$$\phi = \frac{3F}{4h}\left(xy - \frac{2Ry^3}{3h^2} \right) + \frac{P}{2} y^2$$

Where 'h' is half depth of the beam, and 'F' as the concentrated load.**[8]**

Q2) The Airy's stress function for the stress distribution variation at the cross - section of the machine element is represented by $\phi = f(r)\cos 2\theta$, where $f(r)$ is the function of 'r' only. In specific case of large flate plate subjected to uniform tension having a circular hole at the centre, show that stress function is

$$\phi = \left[C_1 r^4 + C_2 r^2 + C_3 + \frac{C^4}{r^2} \right] \cos 2\theta$$

represents stress distribution around the hole. **[16]**

Q3) Prove that according to the distortion energy theory. The yield strength in shear is 0.577 times the yield strength in tension. **[16]**

Q4) State and explain the theorem of virtual work and theorem at least work. Apply these theorems to find out the deflections at the free end at a cantilever beam of length 'L' subject to vertical load 'p' at the free end. **[16]**

P.T.O.

Q5) Write short note on the following. **[18]**

a) Rayleigh Ritz method.

b) Castigliano's theorem.

c) Airy's stress function and its significance in stress analysis.

SECTION - II

Q6) a) The work cycle of a mechanical component subjected to completely reversed bending stresses consists of the following three elements.

i) $\pm$ 350 N/mm^2 for 85% of time.

ii) $\pm$ 400 N/mm^2 for 12% of time.

iii) $\pm$ 500 N/mm^2 for 3% of time.

The material for component is $50C_4$ (σ_{ut} = 660 N/mm^2) and the corrected endurance limit of the component is 280 N/mm^2. Determine the life of the component. **[10]**

b) What is 'profile modification in gears'? **[6]**

Q7) a) What is true stress and true strain? Assuming exponential relation for true stress and true strain, derive the expression to estimate time of ruptur. **[8]**

b) Following creep data at a certain temperature is known

S_1 = 10.5 MPa $\quad \dot{\varepsilon}_1 = 0.012$ % per 1000 hrs

S_2 = 14 MPa $\quad \dot{\varepsilon}_2 = 0.025$ % per 1000 hrs

Determine the constants of the hyperbolic sine law and calculate the creep rates for stresses 20 MPa and 28 MPa. **[8]**

Q8) Two 20° full depth gear of 20 and 30 teeth are to be designed on the extended centre distance system using the recommened values for clearance $f = (0.25 / p_d)$. Make the calculations for p_d = 1. Find the following. **[16]**

a) Values of q_1 and q_2.

b) The actual angle ϕ.

c) The radius of actual pitch circle and centre distance.

d) The tooth thickness on actual pitch circle.

Q9) a) Explain the use of composite materials in mechanical engineering with two examples, state reasons for preference in favour of such materials. **[6]**

b) A unidirectionally reinforced composite of 'Toray' Filament and 'Nameo' resin has the following moduli and Poisson's ratio.

E_{xx} = 181 GPa E_{yy} = 10.3 GPa, v_{xy} = 0.0159

G_{xy} = 7.17 GPa $(1 - \gamma_{xy} \cdot \gamma_{yx})^{-1}$ = 1.045

Estimate the components of moduli for an off - axis orientation of **[10]**

i) $\theta = +30°$ and

ii) $\theta = +45°$

Q10) Write short note on the following : **[18]**

a) Modes of fractures.

b) S & S_o spur gears.

c) Classical limitation theory of composite material.

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Total No. of Questions : 8]

SEAT No. :

P1684

[Total No. of Pages : 2

[4265] - 675

M.E. (E & TC) (VLSI and Embedded Systems)

SOFTWARE DEFINED RADIO

(2008 Course) (Elective - IV (c)) (Semester - II)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each Section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is the need of Software defined radio? Discuss in brief. **[8]**

b) Discuss the benefits of software radio over other radios. **[8]**

Q2) a) Give the Ideal Software radio architecture. **[8]**

b) Discuss the Worldwide frequency band plans. **[8]**

Q3) a) Give the requirements of SCA. **[8]**

b) Explain how smart selection of ADC/DAC enables better design of Software defined radio. **[9]**

Q4) a) Discuss the following : **[8]**

i) Joint Tactical Radio System (JTRS),

ii) COBRA in relation to SDR/JTRS.

b) Enlist the various factors to be considered While designing the dynamic range of SDR receiver? **[9]**

P.T.O.

SECTION - II

Q5) a) What is RTOS? Explain in brief. **[8]**

b) Explain the baseband signal processing. **[8]**

Q6) a) What are the factors to be considered while selecting the antenna for SDR? **[8]**

b) Discuss in brief about Adaptive techniques in antennas. **[8]**

Q7) a) Write a note on Future of Software Radio. **[8]**

b) Explain the parameters to be considered for selecting a processor for SDR application. **[9]**

Q8) What do u mean by Smart antennas? Give Smart antenna architectures. Discuss in brief about phased array antennas. **[17]**

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Total No. of Questions : 8]

SEAT No. :

P1693

[Total No. of Pages : 2

[4265] - 765

M.E. (Production) (CAD/CAM)

ADVANCED MATERIALS AND PROCESSING

(2010 Course) (Elective - III (b)) (Semester - II)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each Section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is high strength low alloy steel (HSLA)? And how it is designated? **[8]**

b) Explain in short : **[8]**

i) Dual phase steel. ii) TRIP steel.

Q2) a) What are metallic glasses? Why is the word 'glass' used for these materials. Explain how it is produced with its properties and application. **[10]**

b) What are the smart materials? Explain. **[6]**

Q3) a) Explain different types of ceramics with their application and characteristics. **[10]**

b) Explain method of processing with properties and application of following material (any two) : **[8]**

i) WC ii) Al_2O_3 iii) Industrial Diamond

Q4) a) What are the different techniques for production of fibers and foam? **[8]**

b) List the name of few of the magnetic and photo electric material And How are they produced? **[8]**

P.T.O.

SECTION - II

Q5) a) State the properties and application of following materials. **[8]**

i) MMC

ii) SMC

iii) BMC

iv) Composit materials.

b) Explain chemical and physical vapour deposiation of matrix on fiber. **[8]**

Q6) Explain principle of LBM with process parameter, advantages, limitation and application. **[16]**

Q7) a) What is mean by thermal metal spraying? Explain its industrial application. **[8]**

b) With neat diagram explain the principle of wire cut EDM also explain the process parameters. **[8]**

Q8) Write short note on any three : **[18]**

a) EDM

b) USM

c) Bag moulding for polymer matrix.

d) Filament winding.

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Total No. of Questions : 8]

SEAT No. :

P1695

[Total No. of Pages : 2

[4265]-772

M.E. (Computer) (Computer Network)

APPLIED ALGORITHMS

(2008 Course) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Prove by mathematical induction **[10]**

i) $C(n,0) + C(n,1) + C(n,2) + \ldots\ldots + C(n,n) = 2^n$

ii) $C(n,0) - C(n,1) + \ldots\ldots + (-1)^i C(n,i) + \ldots\ldots (-1)^n C(n,n) = 0$

b) Consider the sample space S corresponding to rolling three dice : that is $S = \{r_1 r_2 r_3 / r_1, r_2, r_3 \in [1....6]$ calculate the expectation E[X] to each of the following random variable X : **[8]**

i) $X = r_1 + r_2 + r_3$

ii) $X = r_1 + r_2$

iii) $X = \max \{r_1, r_2, r_3\}$

Q2) a) With respect to algorithmic complexity explain the following with example **[12]**

i) Asymptotic order of growth

ii) O, Ω, Θ notations

iii) Asymptotic upper bound

iv) Asymptotic lower bound

v) Asymptotic tight bound

b) Derive and solve a recurrence relation for the best case complexity B(n) for merge sort. **[4]**

Q3) a) What is worst case, average case and best case time complexity of an algorithm? Write a the Insertion sort and selection sort algorithm and Analyze the same to find out its worst case, average case and best case complexity. **[8]**

b) By considering the complete graph with n vertices, show that the number of spanning trees in an n vertex graph can be greater than $2^{n-1} - 2$. **[8]**

P.T.O.

Q4) a) Take following list of functions and arrange them in ascending order of growth rate. That is. If function g(n) immediately follows function f(n) in your list, then it should be the case that f(n) is O(g(n)) **[8]**

$f1(n) = 10^n$

$f\,2(n) = n^{1/3}$

$f\,3\,(n) = n^n$

$f4(n) = \log_2 n$

$f5(n) = n^{\log 2n}$

b) Write an algorithm for Depth First Search algorithm in Graph using suitable data structure. What is the complexity of the algorithm? If we have not use this data structure can still we implement the same algorithm, if yes what is its complexity? **[10]**

SECTION - II

Q5) a) How do we can use the approximation algorithms for solving NP - Hard problems? Explain with absolute approximation and $\in$ – approximation. **[8]**

b) Show that the job sequencing with deadlines problem is NP - Hard. **[8]**

Q6) a) Consider the following instance of Knap sack problem : n= 6, (p1, p2,p3,p4,p5,p6) = (w1,w2,w3,w4,w5,w6) = (100,50,20,10,7,3) and M = 165 Solve the problem using Dynamic programming approach. **[12]**

b) What is principle of optimality? Which algorithmic strategy uses this principle? Explain with suitable example. **[6]**

Q7) a) Write the CRCW and EREW Algorithms for parallel computers. **[10]**

b) What are the advantages of Greedy algorithmic strategy? Analyze an single source shortest path algorithm with time and space complexity using greedy approach. **[6]**

Q8) a) Write a short note on "pointer doubling". **[6]**

b) Explain the following **[10]**

i) Computational complexity.

ii) Decision problem

iii) Deterministic and Non deterministic algorithm

iv) Complexity classes

v) Intractability

♦♦♦♦

Total No. of Questions : 8]

SEAT No. :

P1698

[Total No. of Pages : 3

[4265] - 812

M.E. (Chemical)

INDUSTRIAL POLLUTION CONTROL

(2008 Course) (Semester - I) (Elective - II (a))

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each Section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) The traffic density along a busy highway is 1600 vehicles / hour. and the average vehicle speed is 70 km/hour. The average carbon monoxide emission per vehicle is 50 g/s. Estimate the carbon monoxide concentration at 100 m, 500 m and 1000 m downwind distances of the highway if the wind speed normal to highway is 2.5 m/s. Assume neutral conditions for neutral conditions σ_2 values are 4.7 m, 18 m and 32 m for x = 100, 500 and 1000 m respectively. **[9]**

b) Explain lapse rate and stability. **[7]**

Q2) a) For a cyclone separator derive an equation for finding radial velocity of the gas at radius r. **[8]**

b) Compute efficiency - diameter relation for an electrostatic precipitator which has (A/Q) ratio of 0.060 s/m. For 1 μm diameter particle the drift velocity is 0.033 m/s. The different particle sizes are 0.1, 0.5, 1, 3 & 5 μ m. The drift velocity of the particles is proportional to the particle diameter to the first power. **[8]**

Q3) a) Give a detailed design procedure for designing a gravity settling chamber with all the equations involved. **[8]**

b) Explain Gaussian plume model and its limitations. **[8]**

P.T.O.

Q4) a) What are the different control methods used for control of air pollution in fertilizer industry. **[6]**

b) Discuss different biological treatments used in pulp and paper industry with characteristics of the effluent. **[12]**

SECTION - II

Q5) a) Discuss the points which must be considered while designing activated sludge process. What are the main points for activated sludge process control. **[8]**

b) A settling test was conducted in a settling cylinder 0.5 m high. The following data was obtained for an initial solids concentration of 3200 mg/l. **[10]**

Interface height, mm	500	300	185	125	100	85
Time, min	0	10	20	30	40	50

Determine the area to yield a thickned sludge concentration of 20000 mg/l. With an inflow of 350 m^3/d. Also determine the solids loading.

Q6) a) Design a continuous flow type oxidation ditch to treat a domestic sewage flow of 25 mld. **[10]**

Given the following data :

i) Influent soluble BOD_5, So = 100 mg/L

ii) Effluent soluble BOD_5, S = 11.5 mg/L

iii) MLVSS, x = 2760 mg/L.

iv) Growth yield coefficient = 0.55

v) Micro - organism decay coefficient = 0.03

vi) Mean Cell residence time = 16 days.

Determine :

1) Volume of reactor.

2) Microbial mass in excess sludge

3) Rate of wasting of excess sludge

b) With neat sketch explain different phases of bacterial growth. **[6]**

Q7) a) Write a note on deep well injection method. **[6]**

b) Calculate the effluent BOD_5 of a two stage trickling filter with following given flow rates, BOD and dimensions using NRC formula. **[10]**

Volumetric flow rate = 5000 m^3/day,

BOD_5 = 280 mg/l.

Volume of Primary filter = 1000 m^3

Volume of Secondary filter = 800 m^3

Filter depth = 2 m.

Recirculation ratio for Primary filter = 1.5

Recirculation ratio for Secondary filter = 1.25

Q8) a) What is the concept of osmosis and reverse osmosis? Explain in detail the construction and working of reverse osmosis plant. **[8]**

b) Discuss different technologies available for municipal solid waste management. **[8]**

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Total No. of Questions : 8]

SEAT No. :

P1700

[Total No. of Pages : 4

[4265] - 863

M.E. (Petroleum Engineering)

PIPING DESIGN AND ENGINEERING

(2008 Course) (Elective - III (c)) (Semester - II)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any two questions from each Section.***
2) ***Answer to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) A 150 NB schedule 40 pipe (OD = 168.28 mm) is employed to gaseous products at 40 bar pressure. Material of construction is carbon steel with safe stress value of 850 kg/cm^2 at the operating temperature. Joint efficiency factor = 85% and corrosion allowance = Nil **[20]**

Other data supplied :

i) Moment of Inertia for 150 NB schedule 40 pipe (I) = 1170 cm^4.
ii) Section Modulus (z) = 140 cm^3.
iii) Weight of empty pipe = 30 kg per meter.
iv) Weight of pipe, full of water = 48 kg per meter.
v) Take E = 2.1 × 10^6 kg/cm^2.

Calculate the following :

A) Longitudinal tensile stress due to internal pressure.
B) Safe support span (weight of gaseous products being small can be ignored).
C) Safe span if same pipe is employed for water service at the same temperature.
D) Above pipe, as employed for water service is to be provided a slope (gradient) to prevent water pockets in pipe. What should be gradient, if the actual span provided is 12 m.
E) What are pressure - temperature ratings for pipe flanges? Explain its use by typical example.

b) Write a brief note on : Pipeline construction for cross country and offshore systems. **[5]**

P.T.O.

Q2) a) Discuss in detail leak detection and emergency planning consideration for piping system. **[15]**

b) Discuss different types of Piping elements and give its classification based on material of construction. **[10]**

Q3) a) Discuss the flow regimes and patterns for horizontal and vertical flow for multiphase mixtures. **[10]**

b) Sand with a mean particle diameter of 0.25 mm is to be conveyed in water flowing at 0.5 kg/s in a 25 mm internal diameter horizontal pipe 100 m long. Assuming fully suspended flow, estimate the maximum amount of sand which may be transported in this way if the head developed by the pump is limited to 310 kN/m^2?

The terminal falling velocity of the sand particles in water may be taken as 0.024 m/s. **[15]**

Q4) a) Write short notes on : **[15]**

i) Pipeline systems for heat exchangers.

ii) Piping networks.

iii) Costing for piping system.

b) Discuss in brief statutory regulations and safety for Piping Engineering and design. **[10]**

SECTION - II

Q5) A process sketch of a fractionating tower is given in **Figure 1.** The vessel has the following specifications shell thickness is to be determined. As a thumb rule, it is to be noted that for each 5-6 m height, shell thickness can be increased by 1-2 mm. This is required to determine the number of shell courses. **[25]**

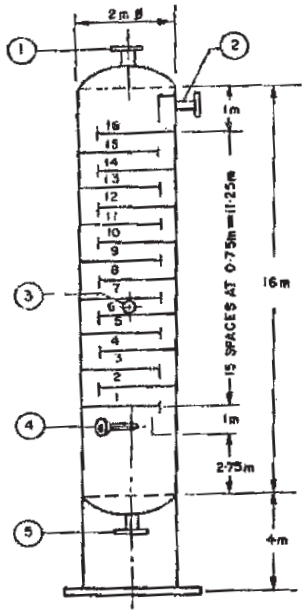

Figure 1 for Q.5

Max. Wind. Velocity expected (for height up to 20m)	= 150 km/hr
Shell OD	= 2.0 m
Shell length tangent to tangent	= 16.0 m
Skirt height	= 4.0 m
Operating Temperature	= 577 K
Operating Pressure	= 0.75 MN/m^2
Design Temperature	= 597 K
Design Pressure	= 0.85 MN/m^2
Shell Material: Shell, double welded butt joints, no Stress relieving or radiographing	= IS: 2002-1962 Grade 2B
Corrosion Allowance	= 3 mm
Tray Spacing	= 0.75 m
Top disengaging space	= 1.0 m
Bottom Separator space	= 2.75 m
Weir height	= 75 mm for all trays
Downcomer clearance	= 25 mm for all trays
Weight of each head	= 8.5 kN
Tray loading excluding liquid (alloy steel trays)	= 1.0 kN/m^2 of tray area
Tray Support rings	= 60 mm × 60 mm × 10 mm angles
Insulation	= 75 mm asbestos
Accessories	= One caged ladder

Manways, gauge glass and level control connections are provided.

Design in accordance with IS : UPV code for class 2 vessels neglecting seismic forces. Nozzle specifications are given below

No.	Size (m)	Service
1	0.400	Overhead Vapor
2	0.075	Reflux
3	0.300	Feed inlet, internal distributor designed to provide even distribution across length of tray.
4	0.400	Reboiler, made tangential
5	0.200	Bottoms

Q6) a) Discuss in brief design considerations for pipeline systems for petroleum products. **[10]**

b) Write a brief note on : Pipe stress analysis and pipe supports. **[10]**

c) Explain different codes and standards available for design of piping systems. **[5]**

Q7) Write short notes on : **[25]**

a) Yard Piping

b) HAZOP and HAZAN

c) Thermal insulation for pipeline systems.

Q8) a) Discuss various factors to be considered for piping design for flow through perforated pipes and porous media. **[15]**

b) Discuss various steps to be considered while developing plot plan. Also give considerations for layout of gas storage, explosive tank farm. **[10]**

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Total No. of Questions : 8]

SEAT No. :

P1708

[Total No. of Pages : 2

[4265]-641
M.E. (E & TC) (Microwave)
ELECTROMAGNETICS AND ANTENNA THEORY
(2008 Course) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answers will be valued as a whole.***
6) ***Use of Logarithmic tables slide rule, Mollier charts electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Consider a thin conducting wire held at constant potential as shown in the following Fig. Q1. Illustrate how do you solve integral equation for determining the charge density along the wire using the moment method in detail. Evaluate the diagonal elements also. **[16]**

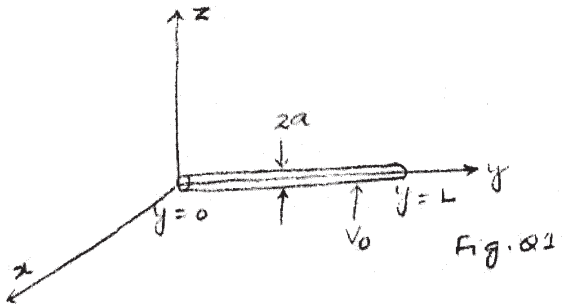


Fig. Q1

Q2) Use Finite difference method to calculate the potentials at nodes 1, 2, 3, 4 and 5 in potential system shown in Fig. Q2. **[18]**

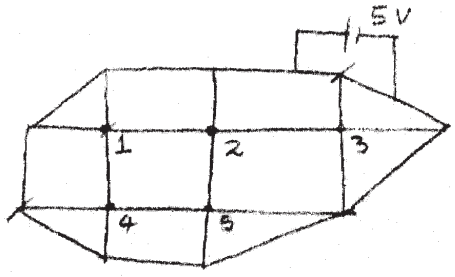


Fig. Q2

P.T.O.

Q3) For each of the triangular elements of Fig. Q3 **[16]**

a) Calculate the shape functions.

b) Determine the co - efficient matrix.

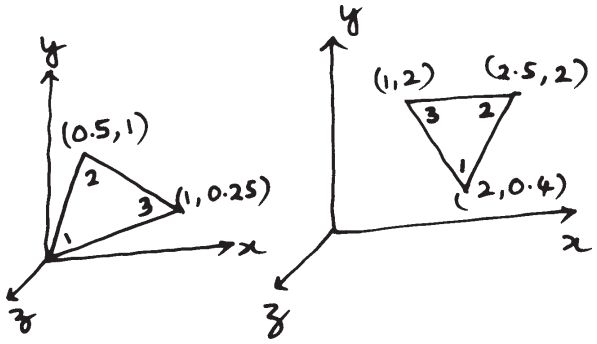


Fig. Q3

Q4) a) List the various Numerical electromagnetic methods and explain their applications, advantages, limitations. **[8]**

b) Explain the significance and formulation of Green's function with the help of suitable example. **[8]**

SECTION - II

Q5) How do you solve for electric field and magnetic fields at for field for a wire antenna? Apply vector potential and solve electromagnetic fields for finite length of dipole. Also determine power radiated, radiation resistance and directivity for Half Wave Dipole. **[18]**

Q6) Derive the expression for array factor of a Linear array of N elements with inter element distance d and phase shift α between elements. Consider uniform amplitude excitation. Draw the radiation pattern of the same given $\alpha = 45°$, $N = 8$, $d = \lambda/2$ by finding direction of side lobes and Nulls elearly. Consider the first element as reference. **[16]**

Q7) Derive the expression for array factor of N - element linear array with Non - uniform distribution considering centre elements as reference. Design a broad side Dolph - Tschebhy Sceff's array of 8 elements with spacing d between elements with major lobe to minor lobe ratio to be 40dB. **[16]**

Q8) a) Explain various modes of helical antenna with the help of illustrative diagrams and mathematical expressions. **[8]**

b) What are the various feeding techniques of micro strip antenna and compare them with illustrative diagrams. **[8]**

♦♦♦♦

Total No. of Questions : 8]

SEAT No. :

P1715

[Total No. of Pages : 4

[4265] - 518

M.E. (Mechanical) (Heat Power Engineering)

HEAT EXCHANGER SYSTEM DESIGN AND PERFORMANCE

(2008 Course) (Elective - IV (a)) (Semester - II)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each Section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary and mention it clearly.***
6) ***Use of logarithmic tables and non programmable electronic pocket calculator is allowed.***

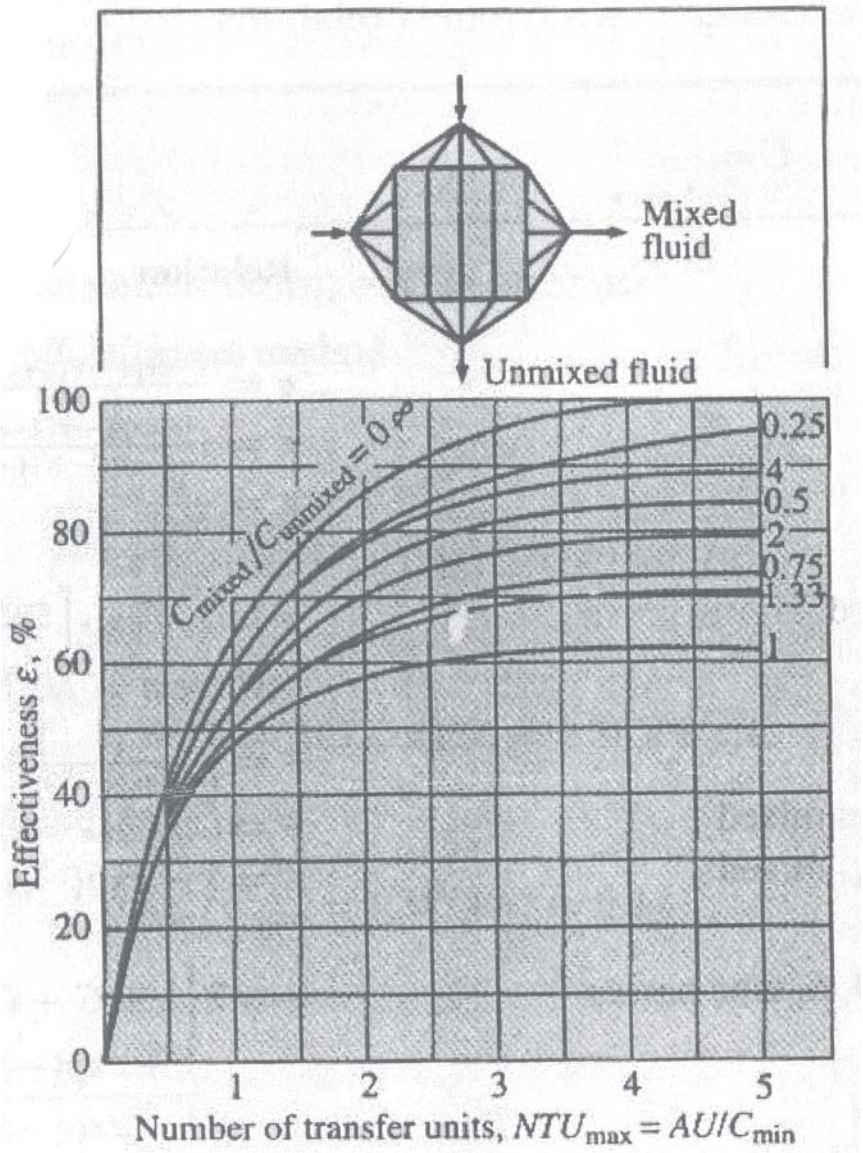
SECTION - I

Q1) a) Show that for counter flow heat exchanger when, $\frac{C_{min}}{C_{max}} = 1$, effectiveness is given by $\varepsilon = \frac{NTU}{1+NTU}$ with standard notation. **[8]**

b) What are the different leakage streams in shell and tube heat exchanger, as identified by Tinker? Discuss how you will reduce them. **[8]**

Q2) a) At 80 km/h, inlet temperature of the air to an automobile radiator is 37.8°C. Water enters at 98.9°C with a flow rate of 1.89 kg/s and leaves with a temperature of 93.3°C. UA for this radiator is 960.6 W/K. Determine the air flow rate and air outlet temperature for this radiator using both LMTD and ε-NTU methods. Assume C_p for air and water as 1.01 kJ/kgK and 4.19 kJ/kgK respectively. The radiator is unmixed on air side and mixed on water side. Assume suitable data if required. **[10]**

P.T.O.



Effectiveness for cross-flow exchanger with one fluid mixed.

b) Explain the causes and effects of fouling in a heat exchanger. **[6]**

Q3) The hot water with a flow rate of 50 kg/s enters a baffled shell-and-tube heat exchanger at 35°C and leaves at 27°C. Heat via be transferred to 120 kg/s of raw water coming from supply at 24°C. Design and estimate constructional parameters of heat exchanger. A single shell and single pass is preferable. The tube diameter is 19 mm OD and 16 mm ID and tubes are laid out on 25.4 mm sq. pitch. The maximum length of heat exchanger required is of 6 m because of space limitation. Estimate shell side heat transfer coefficient by Kern method; assuming constant properties. **[16]**

The properties of the fluid at average temperature are :

Properties	Tube side fluid	Shell side fluid
Specific heat, C_p (J/kg.K)	4182	4179
Dynamic viscosity, μ (Pa.s)	10.02×10^{-4}	8.15×10^{-4}
Thermal conductivity, k (W/m.K)	0.598	0.612
Density, ρ (kg/m^3)	998.2	996
Prandtl number, Pr	7.01	5.75

Q4) Write short notes on : **[18]**

a) P-NTU method.

b) Flow induced vibrations.

c) Rod baffles in heat exchanger.

SECTION - II

Q5) a) Explain plate heat exchanger with respect to its : **[10]**

i) Construction

ii) Materials

iii) Operating limits

iv) Principal applications

b) What are the various correction (j) factors considered for shell side heat transfer coefficient in Bell Delaware method? **[8]**

Q6) a) Explain the heat exchanger design methodology with the help of flowchart. **[8]**

b) Write short and precise answer : **[8]**

i) Why counter flow arrangement generally not preferred in plate fin exchanger?

ii) List down the salient features of heat pipe heat exchangers.

Q7) a) A vapour stream of pure acetone at 120°C and 1 bar is fed to the condenser The acetone exits the condenser as sub cooled liquid at 30°C. A single pass, countercurrent, indirect contact type condenser is used. The cooling water enters at a temperature of 20°C and exit at 40°C. The acetone feed rate is 10 kg/min. Calculate the required cooling water flow rate. The following data of acetone and water are available. **[10]**

Acetone :

Condensation temperature at 1 bar = 56°C

Heat capacity of liquid, C_{pl} = 2.237 kJ/kgK

Heat capacity of vapour, C_{pv} = 1.445 kJ/kgK

Heat of condensation = 432 kJ/kgK

Water :

Heat capacity of liquid, C_{pl} = 4.19 kJ/kgK

Heat transfer coefficients :

Cooling superheated acetone vapours = 816 W/m^2

Condensing acetone = 2040 W/m^2

Subcooling acetone = 1020 W/m^2

Calculate heat transfer area for desuperheater, condensation, subcooler and total area.

b) Explain the working of rotary storage type and matrix storage type regenerator. Discuss the working of Ljung type air preheater. **[6]**

Q8) Name the specific heat exchanger and explain their construction for the following applications : **[16]**

a) Cryogenics

b) Heat recovery in cogeneration

c) Compressor coolers

d) Solvent Recovery

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Total No. of Questions : 10]

SEAT No. :

P1717

[Total No. of Pages : 2

[4265]-525

M.E. (Mechanical Engineering) (Design Engineering)

ADVANCE MATERIAL SCIENCE

(Elective - I (b)) (2008 Course) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables, slide rule and non - programmable electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Draw the planes and directions of FCC structures (321), (102), (201) and (111). **[16]**

OR

Q2) Find the density and atomic diameter of Aluminium if atomic weight of aluminium is 26.98 and lattice parameter is 4.048Å **[16]**

Q3) Explain the following. **[18]**

a) The critical cooling rate (CCR) is approximately 700°C s^{-1} for a fine - grained 0.6% carbon steel, but is only around 30°C s^{-1} for a coarse - grained 0.6% carbon steel.

b) A stainless steel containing 18% Cr has a bcc structure at room temperature, whereas a stainless steel containing 18% Cr plus 8% Ni has fcc structure at room temperature.

c) High - speed steel cutting tools retain their hardness to well above the temperature at which the initial martensitic structure has become over - tempered.

OR

Q4) Explain **[18]**

a) Solid solution hardening

b) Age (precipitation) hardening and

c) Work hardening process used for non - ferrous metals with suitable example.

P.T.O.

Q5) Write short notes on **[16]**

a) Creep resisting alloys.

b) Equilibrium diagram for Fe - C systems.

SECTION - II

Q6) a) Explain desirable material properties for biomedical applications. **[8]**

b) Explain the behavior of a superconductor in a magnetic field. What is Meissner effect? How the critical magnetic field does vary with temperature. **[8]**

OR

Q7) A tensile load of 200 N is applied to a composite material of 1 sq.mm cross - sectional area. The volume of parallel fibre is 40%. Determine the stress in fibres, if axis of load is **[16]**

a) parallel to the fibres, and

b) perpendicular to the fibres. Given that the ratio of Young's moduli of fibre material and matrix material is 7.

Q8) A unidirectional fibre composite consists of 60% by volume of continuous type - I carbon fibres in a matrix of epoxy with fracture strength 2200 MPa. Find the maximum tensile strength of the composite. You may assume that the matrix yields in tension at a stress of 40 MPa. **[16]**

OR

Q9) a) Discuss advantages and limitations of shape memory alloy. **[8]**

b) Discuss tribological aspects of surface coatings. **[8]**

Q10) Write short notes; **[18]**

a) Type - I and Type - II superconducting materials.

b) Thermodynamics of a superconductor.

c) Composite failure criteria.

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Total No. of Questions : 6]

SEAT No. :

P1724

[Total No. of Pages : 2

[4265]-596

M.E. (Electrical) (Control System)

MODELING OF DYNAMIC SYSTEM

(Semester - I) (2008 Course) (Elective - I (b))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections must be written on separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Derive the distributed parameter model in case of heat translation by conduction in an insulated bar. **[8]**

b) Discuss in detail the Lumped parameter approximations for vibration of a rod. **[8]**

c) Explain with neat diagram the magnetic Leviation system for an experimental rail vehicle considering it as distributed parameter model. **[9]**

Q2) a) Discuss the following generalised modeling methods : **[8]**

i) Random Signal testing method.

ii) Parameter tracking method.

b) State and explain Least square methods for modeling. **[8]**

c) Explain with suitable example the method of subsystem coupling for modeling. **[9]**

Q3) a) Enumerate the various digital simulation techniques. Explain briefly any one specific digital simulation technique for finding generalised response. **[15]**

b) Define convolution integral. Explain the procedure for obtaining response to arbitrary inputs with known impulse response. **[10]**

P.T.O.

SECTION - II

Q4) a) Explain with suitable example the analogy between the mechanical system and corresponding analogous electrical system. **[7]**

b) State the D' Alembert's principle and explain its application in system modeling and analysis. **[8]**

c) Consider the electrical system shown in Fig. 1. Obtain the mathematical model (differential equation form) relating $V_1(t)$ to input V(t). Assume $R_1 = R_2 = 2M\Omega$ and $C_1 = C_2 = 2\ \mu f$. **[10]**

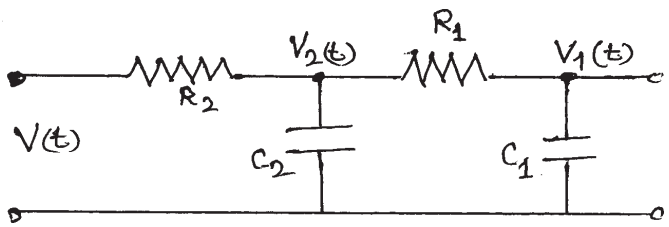

Fig. 1

Q5) a) Give the classification of models of dynamic systems. What are the techniques used for system modelling? **[8]**

b) What is dynamic system? Explain with suitable example any dynamic system and define the terms associated with dynamic system. **[9]**

c) State the various inputs used for system analysis . Outline the procedure for the system simulation. **[8]**

Q6) a) Explain in detail any one static thermal system. How to carry out the circuit analysis of such a system? **[9]**

b) Explain clearly the following concepts : **[8]**

i) Thermal Resistance

ii) Thermal Capacitance

c) Discuss the effect of following properties of fluids on the dynamics of the fluid systems : **[8]**

i) Viscosity

ii) Density

iii) Propagation of speed, and

iv) Temperature (thermal properties).

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Total No. of Questions : 8]

SEAT No. :

P1727

[Total No. of Pages : 2

[4265] - 672

M.E. (E & TC) (VLSI & Embedded System Design)

ADVANCED DIGITAL SYSTEM DESIGN

(2008 Course) (Elective - III (c)) (Semester - II)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each Section.***
2) ***Answer to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Describe the issues in design of data path and control unit of a processor. Justify the design process of data path and control path cannot be independent. **[8]**

b) What are the major steps to design ATM packet generator? Explain in details. **[8]**

Q2) a) Design a sequential circuit that computes the product of two four bit numbers. **[10]**

b) What are different types of Hazards? Explain in details with its significance. **[6]**

Q3) a) Design a hazard free minimum cost implementation of the function. $f(x_1, x_2, x_3, x_4) = \Sigma\, m\,(0, 4, 11, 13, 15) + d\,(2, 3, 5, 8)$. **[8]**

b) Design a sequence detector in which output is '1' only if input sequence of 1001 occurs at consecutive clock pulses. **[8]**

P.T.O.

Q4) Write short notes on (any three) : **[18]**

a) Fault tree analysis

b) Switch bouncing

c) System Integrity

d) Clock distribution network

SECTION - II

Q5) a) What is PRBS generator? Draw and explain a scheme to generate PRBS. **[8]**

b) Explain the BIST scheme with the help of block schematic. **[8]**

Q6) a) Why compressor circuit is needed? Draw SIC and MIC circuit. **[8]**

b) What do you mean by cross talk? Discuss the methods to eliminate it. **[8]**

Q7) a) Explain the following terms : **[6]**

i) Reflection and termination

ii) Failure rate

iii) MTBF

b) With neat flow chart, explain steps in floating point multiplication. **[10]**

Q8) Write short notes on (any three) : **[18]**

a) Network design

b) IEEE 486 bus

c) SRAM cell

d) Scan path technique

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Total No. of Questions : 8]

SEAT No. :

P1728

[Total No. of Pages : 2

[4265]-697

M.E. (Electronics) (Digital Systems)

ADVANCED DIGITAL SYSTEM DESIGN

(Elective - I (b)) (2008 Course) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Discuss the design aspects of RISC and CISC CPU architecture. **[6]**

b) Explain any one method of control unit implementation with block diagram, specifications and code. **[10]**

Q2) a) Design a sequence detector in which output is '1' only if input sequence of 11001 occurs at consecutive clock pulses. **[10]**

b) What is clock skew? What are its fallouts? Discuss the remedy. **[6]**

Q3) a) Design a hazard free minimum cost implementation of the function. **[8]**

$$f(x_1, x_2, x_3, x_4) = \sum m(0,4,11,13,15) + d(2,3,5,10)$$

b) How to design a circuit to eliminate the de-bouncing of a switch. **[8]**

Q4) Write short notes on (any three): **[18]**

a) Fault tree analysis.

b) Signature analysis

c) System Integrity

d) ATM packet generator

P.T.O.

SECTION - II

Q5) a) Design 2*2 array of SRAM cell and explain its operation. **[8]**

b) With example, explain the steps required to carry out floating point addition. **[8]**

Q6) a) What will happen for a finite transmission line, if it is not terminated in Z_0? **[8]**

b) What do you mean by cross talk? Discuss the methods to eliminate it. **[8]**

Q7) a) What is system reliability? How will you define reliability in a system with 'n' components having different failure rate? **[8]**

b) What is the need of network design tool? Explain its structure. **[8]**

Q8) Write short notes on (any three): **[18]**

a) IEEE 486 bus

b) Asynchronous serial data transfer

c) BIST

d) PRBSG

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Total No. of Questions : 10]

SEAT No. :

P1729

[Total No. of Pages : 3

[4265]-713

M.E. (E & TC) (Communication Networks)

MICROWAVE & ANTENNA THEORY

(2008 Course) (Elective - I (a)) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the principle of operation of the magnetron. **[8]**

b) Discuss the different applications of PIN diode. **[8]**

Q2) a) Write notes on : **[12]**

i) Microwave circulator.

ii) Traveling Wave Tube

b) What are the typical applications of Microwaves? **[4]**

Q3) a) Digital microwave link is used for data transmission has following parameters **[12]**

i) Frequency : 6 GHz.

ii) Distance : 20 km.

iii) Receiver sensitivity : – 80.00 dBm

iv) Connector / cable loss : 5 dB(total)

v) Atmospheric loss : 0.05 dB/km

vi) Gain of Transmitting Antenna : 20 dB

vii) Gain of Receiving Antenna : 3 dB

Calculate :

i) Path loss

ii) Transmitted power in watts & dBm.

iii) EIRP

iv) Power flux density

v) Magnitude of received E field.

P.T.O.

b) State the difficulties faced by using BJT, FET, & diodes at microwave frequencies. **[4]**

Q4) a) The Radiated Emission measured on Spectrum Analyser from a wireless communication system using magnetic EMI probe was found to be – 55.1 g dBm.

Frequency of operation : 947 MHz.

Antenna Factor for probe : $27\text{dB}\left(\frac{\mu\text{A/m}}{\mu\text{V}}\right)$

Calculate :

i) Voltage VSA in dB μV

ii) E field strength

iii) H field strength

iv) Power density

Give comment about the radiation level from human safety point of view. **[10]**

b) Discuss CISPR/FCC & MIL standards for radiated emission limits. **[8]**

Q5) a) Explain four port directional coupler & it's applications. **[8]**

b) With the help of applegate diagram, explain the working of two cavity Klystron Amplifier. **[8]**

SECTION - II

Q6) a) Explain the following antenna parameters with necessary mathematical equations. **[10]**

i) Directivity

ii) Beam width

iii) Input Impedance

iv) Polarization

v) Antenna Radiation Efficiency

b) A parabolic reflector has a diameter of 3 meters. Find gain & half power beamwidth at 4 GHz. Assume spillover efficiency (η) as 85% **[6]**

Q7) Discuss the constructional details of following microwave devices. **[16]**

a) Metal Semiconductor Field Effect Transistors.

b) Heterojunction Bipolar Transistors.

Q8) a) Design the rectangular microstrip antenna using substrate with dielectric constant of 2.2, h = 0.1558 cm. Frequency of operation is 10 GHz. Discuss the design procedure. **[10]**

b) State the concept of phased array antennas. **[6]**

Q9) a) Discuss the MMIC used at microwaves. **[8]**

b) Explain the constructional details of Lens Antenna. **[8]**

Q10) Write notes on : **[18]**

a) Dish Antenna

b) Horn Antenna

c) Microstrip Patch Antenna

♦♦♦♦

Total No. of Questions : 8]

SEAT No. :

P1735

[Total No. of Pages : 2

[4265]-877
M.E. CSE (Information Technology)
NET CENTRIC COMPUTING
(2008 Course) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Attempt any three questions from section - I and three questions from Section - II.***
2) ***Answers to the both sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of non - programmable calculator is allowed.***

SECTION - I

Q1) a) State any six functions supported by Data Link Layer of OSI model. **[10]**

b) A network on the Internet has a subnet mask of 255.255.240.0. What is the maximum number of host it can handle? Give the range of IP addresses in decimal dotted form. **[6]**

Q2) a) How TCP/IP is the better choice for the Internet over other network protocol stack? **[10]**

b) Give the mathematical equations for average message length using geometric distribution and exponential distribution. What is the basic difference between these two distributions? **[6]**

Q3) a) In order to improve the performance of computer network, an administrator decided to create the separate collision domains by using manageable layer - III IP switch and subnetting. Campus LAN has assigned a single class C fixed IP address 192.1.1.0. Create the 8 subnets and give the subnet mask and starting and ending address of each subnet. **[10]**

b) How traffic requirements are calculated in order to design the new computer network? **[6]**

Q4) Write short notes on (Any Three) **[18]**

a) Formal optimization techniques for network design.

b) Heuristic approach of network design.

c) CSMA/CD

d) Net BIOS

P.T.O.

SECTION - II

Q5) a) Consider the fully connected 7 node mesh network where all link has the same weight say 1. Will Constrained Minimum Spanning Tree (CMST) algorithm suitable for obtaining multipoint line layout? Justify your answer. **[8]**

b) How tradeoff value becomes zero for the nearest link in the Esau - Williams algorithm? **[8]**

Q6) a) Justify or nullify the following statement.

"Frame Relay Switching is Designed to Minimize Cost". **[8]**

b) Is it true short cell length limits latency at each switch? Justify your answer. **[8]**

Q7) a) How 1.544 - Mbps data rate can be obtained using various channel of ISDN? **[8]**

b) What type of compression algorithm is used in MPEG video? **[8]**

Q8) Write short notes on (Any Three) **[18]**

a) Greedy CMST Algorithm

b) Security in OSI Architecture

c) PSTN Gateways

d) Backup and Mirroring

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Total No. of Questions : 8]

SEAT No. :

P1738

[Total No. of Pages : 4

[4265]-512
M.E. (Mech. - Heat Power)
ADVANCED HEAT TRANSFER
(2008 Course) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

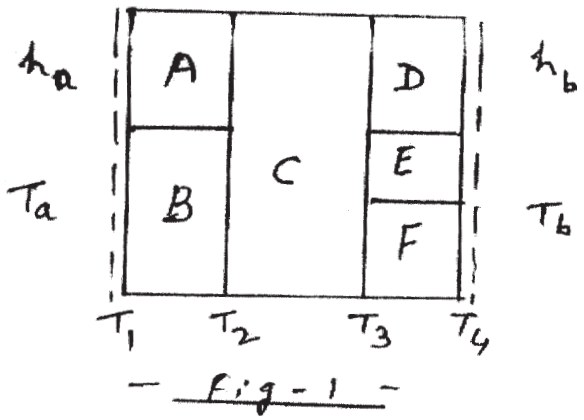
1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Calculate the heat loss per sq. metre surface area of a 40 cm thick furnace wall having surface temperature of 300°C & 50°C, if thermal conductivity of the wall material is given by, $K = 0.005\ T - 5 \times 10^{-6}\ T^2$

Where T = temperature in °C **[6]**

b) Draw a thermal network for the following composite slab with a brief explanation. Here [A, B, C, D, E, F] are the materials and h & T represent heat transfer coefficient & temp. respectively. **[6]**



— Fig - 1 —

c) Write the general differential equation of heat conduction in Cartesian & spherical coordinates. Also draw the schematic of control volume for the two cases. **[6]**

P.T.O.

Q2) a) Explain : **[6]**

i) Fin - efficiency and fin - effectiveness.

ii) Thermal contact resistance.

b) The internal heat generation in a cylindrical fuel rod of a nuclear reactor is given by the relation,

$q_g = q_o\left[1-\left(\frac{r}{R}\right)^2\right]$, where q_g and q_o are the heat generated the heat generation rates at any radius r and at the centre respectively. Also R is the outer radius of the fuel element. Show that the temperature drop from the centre line ($t = t_{max}$) to the outer surface ($t = t_w$) is given by ,

$(t_{max} - t_w) = \frac{3\,q_0 R^2}{16K}$; where K is the thermal conductivity of fuel rod. Consider the boundary conditions as, $\frac{dt}{dr} = 0$ at $r = \infty$ and $t = t_{max}$ at $r = 0$. **[10]**

Q3) a) Three rods, one made of silver (K = 420 W/mK), second made of aluminium (K = 210 W/mK) and the third made of wrought iron (K = 70 W/mK) are coated with a uniform layer of wax all around. The rods are placed vertically in a boiling water both with 250 mm length of each rod projecting out side. If all rods are 15 mm diameter, 300 mm length and have identical surface coefficient of 12.5 W/m^2K; Calculate the ratio of lengths upto which wax will melt on each rod.
Rods may be treated as infinitely long fins **[10]**

b) An electrical conductor of 10 mm diameter and having 2 mm thick insulation is located in air at 25°C having heat transfer coefficient of 8 W/m^2K. The base conductor has resistivity of 72 μΩ-cm and its surface temperature is 80°C. Thermal conductivity of base conductor and insulation is 360 W/mK and 0.18 W/mK respectively. Find the max. current capacity of the conductor. **[6]**

Q4) Write notes on :- **[16]**

a) Biot number and Fourier number.

b) Navier stokes equations.

c) Heisler charts.

d) Time constant of a thermocouple.

SECTION - II

Q5) a) Investigate the effect of the following conditions on the average value of heat transfer coefficient for flow through a tube :

i) Two - fold increase in flow velocity by varying mass flow rate.

ii) Two - fold increase in the diameter of the tube and the flow velocity is maintained constt.

It may be presumed that there is no change in the temperature of the liquid and the tube wall and that the flow through the tube is turbulent in character. **[10]**

b) Air at 20°C flows over a flat plate maintained at 75°C. Measurements show that the temperature at a distance of 0.5 mm from the surface of the plate is 50°C. Presuming thermal conductivity of air as 0.026 W/mK estimate the local value of heat transfer coefficient. **[6]**

Q6) a) A surface at 200°C loses heat both by convection and radiation to the surroundings at 50°C. The convection coefficient is 75 W/m^2-K and the radiation factor due to geometric losses is 0.95. If the heat is conducted to the surface through a solid material of thermal conductivity 10 W/mK determine the temperature gradient at the surface of the solid. **[8]**

b) Write notes on :- **[8]**

i) Mixed convection.

ii) Heat transfer enhancement techniques.

Q7) a) A small sphere with a surface temperature of 550 K is located at the geometric centre of a large sphere with an inner surface temperature of 7°C. The O.D of the small sphere is 5 cm and the I.D. of the large sphere is 25 cm. Assuming that both sides approach black body behaviour, determine howmuch of the emission (in percentage) from the inner surface of the larger sphere is incident upon the outer surface of the smaller sphere. Also find the net exchange of energy between the two spheres. **[8]**

b) A 3.5 kW plate heater of 15 cm × 30 cm size is held vertically with larger side vertical in a water both at 40°C. Calculate the steady state temperature attained by the heater if heat transfer is only due to convection. Use the following correlation.

$Nu = 0.13(Gr.\ Pr)^{0.33}$. Take the following properties of water :-

$\rho = 978\ kg/m^3$, $C_p = 4.18\ kJ/kg\ K$

$\nu = 0.415 \times 10^{-6}\ m^2/S$, $k = 0.66\ W/mK$

$\beta = 4.15 \times 10^{-4}\ K^{-1}$ **[10]**

Q8) Write notes on (Any Four) **[16]**

a) Electronic cooling

b) Critical heat flux

c) Nusselt theory of film condensation.

d) Free – convection boiling

e) Filmwise and dropwise condensation.

♦♦♦♦

Total No. of Questions : 8]

SEAT No. :

P1743

[Total No. of Pages : 2

[4265] - 58

M.E. (Mechanical) (Heat Power Engineering)

NON - CONVENTIONAL ENERGY SOURCES

(2002 Course) (Elective - II(b))

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each Section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary and mention it clearly.***
6) ***Use of logarithmic tables slide rule, Mollier charts, non programmable electronic pocket calculator is allowed.***

SECTION - I

Q1) a) Explain the potential available of renewable energy sources in India. **[8]**

b) Discuss the availability of energy and consumption pattern for India. **[8]**

Q2) a) Explain the following terms : **[8]**

i) solar irradiance ii) solar constant

iii) extra terrestrial iv) terrestrial radiation

b) Explain the design of solar photovoltaic system with its economics. **[8]**

Q3) a) What are the various methods to generate electrical power using Solar energy? Explain in brief. **[8]**

b) Explain the term tilt factor. Why it is different for beam and global radiation? **[8]**

Q4) a) What are the various types of solar collectors? Compare stating advantages and disadvantages. **[6]**

b) What is the significance of collector heat removal factor? Derive the expression for collector heat removal factor. **[12]**

P.T.O.

SECTION - II

Q5) a) Explain the components of wind machine with neat sketch. **[8]**

b) Explain the mechanism of photo conduction in PV cells. **[8]**

Q6) a) Derive the expression for energy available in wind. **[6]**

b) Explain : Energy wheeling and banking. **[6]**

c) Explain the factors affecting the wind energy efficiency. **[4]**

Q7) a) What is the current status of Geothermal energy in India? Discuss the environmental impact of Geothermal energy. **[8]**

b) Explain the working of OTEC plants with its advantages and disadvantages. **[8]**

Q8) Write short note on : **[18]**

a) Clean development mechanism (CDM).

b) Wave energy machines.

c) Fuel cell.

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Total No. of Questions : 8]

SEAT No. :

P1744

[Total No. of Pages : 2

[4265] - 60

M.E. (Mechanical) (Heat Power Engineering)

GAS TURBINES

(2002 Course) (Elective - II (d))

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each Section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain in detail basic requirements of a working medium for gas turbine. **[8]**

b) List in brief advantages and disadvantages of closed cycle gas turbine over open cycle gas turbine. **[8]**

Q2) a) A gas turbine plant works between the fixed temperature limits of 350 K and 1000 K. The pressure limits being 1 bar and 4 bar. The isentropic efficiency of compressor = 0.8 and the turbine = 0.85. Estimate the actual thermal efficiency of the plant and power available for driving external load if the fuel consumption is 1.1 kg/s and the calorific value of the fuel = 42000 kJ/kg. **[12]**

b) Losses in axial compressor stage. **[6]**

Q3) For compressible flows :

a) Derive an expression for To/T and Po/P, where To and Po are the stagnation temperature and pressure respectively. **[8]**

b) What is the behavior of T, To, P, Po, M across a shock. **[8]**

P.T.O.

Q4) Write short notes on (any two) **[16]**

a) Characteristics of Axial flow compressors.

b) Chocking and stalling phenomenon.

c) Dimensionless parameters of centrifugal compressor.

SECTION - II

Q5) Write notes on (any two) : **[16]**

a) Gas turbine emissions.

b) Fuels for gas turbine.

c) Flame tube cooling.

Q6) In a turbojet, the exit velocity relative to the nozzle is twice the flight velocity. Determine the rate of fuel consumption when developing a thrust of 25000 N under the following conditions : **[16]**

Ambient pressure = 1 bar

Ambient temperature = 300 K

Flight speed = 900 kmph

CV of fuel = 42 MJ/kg

Isentropic efficiency of compressor = 0.8

Isentropic efficiency of turbine = 0.9

Turbine pressure ratio = 2.1

Neglect property variation and assume that the mass flow rate is constant.

Q7) Explain in context gas turbines (any two) : **[16]**

a) Matching of components.

b) Applications.

c) Factors influencing selection of materials.

Q8) Write short note on (any three) : **[18]**

a) Turbo fan engine.

b) Fuels for gas turbine.

c) Flame blade cooling.

d) Characteristics of good combustion chamber design.

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Total No. of Questions : 10]

P1746

SEAT No. :

[Total No. of Pages : 2

[4265] - 71

M.E. (Mechanical) (Design Engineering)

RELIABILITY ENGINEERING

(2002 Course) (Elective - II (a))

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each Section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Define reliability. Explain briefly the reasons for unreliability of Engineering system. **[8]**

b) A test was conducted for survival of 200 cardboard boxes for their strength under impact loading. The following results were recorded. **[8]**

No. of impacts	30	42	48	46	50	66	70	75	80
No. of boxes failed	9	20	22	28	30	21	30	15	25

Calculate failure density, hazard rate and reliability.

Q2) a) Why reliability analysis is critical while designing modern systems and devices? **[8]**

b) Explain the following : **[8]**

i) Safety and reliability. ii) Reliability measures.

Q3) a) Explain Baye's theorem with practical engineering applications. **[8]**

b) Discuss bath tub curve with reference to failure modes. **[8]**

Q4) a) Explain reliability of series system with practical example. **[8]**

b) Explain conditional probability analysis. **[8]**

P.T.O.

Q5) Write the short note of the following (any two) : **[18]**

a) Weibull distribution

b) MTTF & MTBF

c) System Redundancy

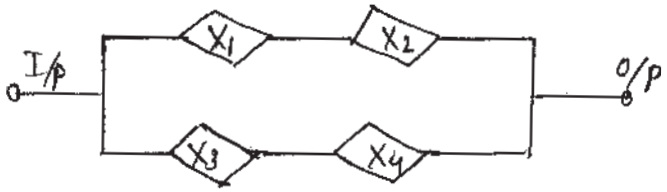
SECTION - II

Q6) a) Explain availability with the help of some practical examples. **[8]**

b) Discuss Total Quality Management. **[8]**

Q7) a) Explain fault tree analysis. **[8]**

b) For the logic diagram shown, construct fault tree. **[8]**



Q8) a) Explain strength based reliability with mechanical component system. **[8]**

b) Discuss minimal cut set method. **[8]**

Q9) a) Describe reliability testing with example. **[8]**

b) Explain AGREE method for reliability allocation. **[8]**

Q10) Write the short note of the following (Any two) : **[18]**

a) Risk Priority Number (RPN).

b) HALT & HASS

c) FMECA

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Total No. of Questions : 6]

SEAT No. :

P1758

[Total No. of Pages : 2

[4265]-465
M.E. (Civil - Structures)
MANAGEMENT IN STRUCTURAL ENGINEERING
(2008 Course) (Semester - II)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answer to the two sections should be written in separate sheets.***
3) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Differentiate time study and motion study on the basis of concept and application. **[8]**

b) Explain the concept of interpersonal behavior. **[5]**

c) What are the functions of finance management. Also explain the key activities of finance manager. **[8]**

d) Define the following terms. **[4]**

i) liability
ii) Accounting
iii) Capital
iv) profit

Q2) a) What are the principles advocated by ISO for maintaining the quality. **[8]**

b) Explain, in detail, the working of fire extinguisher. **[7]**

c) Write short note on : **[10]**

i) corrosion in steel
ii) parameters of quality control in construction.

Q3) a) Explain the working principle of : **[15]**

i) Hammer test
ii) Ultrasonic pulse velocity method
iii) Half cell electric potential test

b) Enlist the parameters to be included in structural audit report. **[5]**

c) Discuss the applications of structural audit report. **[5]**

P.T.O.

SECTION - II

Q4) a) Write short note on need of retrofitting. **[5]**

b) Explain the different chemical based methods used for restoration. **[10]**

c) Write specifications for : **[10]**

i) RCC jacketing

ii) sealing of honeycombed areas with cement mortar

iii) shear wall

Q5) a) Differentiate between jump form and slip form. **[8]**

b) Explain the different methods adopted for construction safety. **[6]**

c) Explain the different methods of material handling. **[6]**

d) Write short note on existing methods of formwork. **[5]**

Q6) a) Explain the different safety measures to be adopted during demolition. **[7]**

b) Explain the step by step procedure of demolition by explosives. **[8]**

c) Write short note on : **[10]**

i) recycling of demolition waste.

ii) role of structural drawing in demolition.

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Total No. of Questions : 8]

SEAT No. :

P1773

[Total No. of Pages : 2

[4265]-721
M.E. (E & TC) (Communication Network)
WIRELESS SYSTEM DESIGN
(2008 Course) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is role of S - parameters in high frequency design? Define S - parameters for two port network. **[9]**

b) Calculate VSWR, reflection coefficient, of a transmission line, whose characteristic impedance is 50 Ω and terminated into load impedance of 40 Ω. Also write relation between phase velocity and wavelength. **[9]**

Q2) a) Draw and explain generic RF amplifier system block diagram. **[8]**

b) In RF amplifier, describe relation between actual input power and incident power, with input reflection coefficient. Also write expression of available power, under maximum power transfer condition. **[8]**

Q3) a) What do you mean by available power (P_A) of RF amplifier? Derive its expression. **[8]**

b) What is stability of RF amplifier? Write expressions for condition of stability. **[8]**

Q4) a) Draw and explain block diagram of basic oscillator configuration, write expression of closed loop transfer function. **[8]**

b) What is operating principle of quartz crystal? Draw and explain its RLC equivalent model. **[8]**

P.T.O.

SECTION - II

Q5) a) Draw and explain YIG tuned oscillator. **[8]**

b) Draw and explain Colpitt oscillator with its describing function model. Write expression of oscillation frequency. **[8]**

Q6) a) What do you mean by conversion gain of mixer? Derive its expression. **[8]**

b) What is single sideband noise figure (SSBNF) and double sideband noise figure (DSBNF) in mixer? Why SSBNF is normally higher than DSBNF? **[8]**

Q7) a) What is SPURS in mixer? Calculate SPUR frequency for second order harmonics of RF = 900 MHz, LO = 1 GHz. **[8]**

b) Draw and explain single balanced mixer. What are its disadvantages? **[8]**

Q8) Write short note on, **[18]**

a) Propagation loss

b) Gunn element oscillator

c) Source degeneration in Mixer

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Total No. of Questions : 8]

SEAT No. :

P1774

[Total No. of Pages : 2

[4265] - 726

M.E. (E & TC) (Communication Networks)

NEURAL NETWORKS IN COMMUNICATION

(2008 Course) (Elective - IV (b)) (Semester - II)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each Section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Draw and explain the McCulloch-Pitts neuron architecture. Generate the output of Exclusive-OR logic function using McCulloch-Pitts neuron. **[10]**

b) Derive the Hebbian and the perceptron learning rule. **[8]**

Q2) a) Explain architecture, algorithm and the application procedure of the perceptron net. **[8]**

b) Develop a perceptron for the AND function with bipolar inputs and targets. **[8]**

Q3) a) Draw the architecture of a BAM network and discuss in detail the training algorithm. **[8]**

b) Explain the discrete Hopfield net with its architecture. **[8]**

Q4) a) With architecture describe the training procedure adopted for neocognitron net. **[8]**

b) Explain in detail how the static and dynamic channel assignment can be done using simulated annealing. **[8]**

P.T.O.

SECTION - II

Q5) a) Describe in detail the architecture and training algorithm used in the back propagation network. **[8]**

b) Discuss the basic architecture and operation of adaptive Resonance Theory (ART) network. **[8]**

Q6) a) Explain the algorithm of the probabilistic neural net with architecture. **[8]**

b) Describe in detail the applications of neural network in Telecommunications. **[8]**

Q7) a) Why self organizing neural net is called the topology preserving maps? With architecture, explain the training algorithm used in Kohonen self organizing feature map. **[8]**

b) Explain traffic density determination using self organizing feature map. **[8]**

Q8) Write short notes on (any three) : **[18]**

a) Support Vector machine.

b) Neural Network channel equalization.

c) Automatic language identification.

d) Neural network for switching.

e) Optical neural network

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Total No. of Questions : 8]

SEAT No. :

P1775

[Total No. of Pages : 3

[4265] - 737

M.E. (Production) (Manufacturing and automation)

TOOL AND DIE DESIGN

(2008 Course) (Elective - II (c)) (Sem. - I)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each Section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) During an orthogonal machining of C - 40 steel, the chip thickness is 0.5 mm, width of cut = 2.75 mm, feed = 0.3 mm/rev, tangential cutting force = 1150 N, feed thrust force = 300 N, cutting speed = 3 m/s, and rake angle = 8°. Calculate (i) Force of shear at shear plane (ii) Kinetic coefficient of friction at tool-chip interface. **[8]**

b) In ORS, inclination angle = 0°, orthogonal rake angle = 10°, principal cutting edge angle = 75°. Calculate (i) Back rake angle (ii) Side rake angle. **[8]**

Q2) a) A cylindrical workpiece ϕ 50f6 is located on V-block with 600 included angle. Calculate the locating error on the top surface and bottom surface of the workpiece. **[4]**

b) Design suitable jig to drill and ream all holes shown in Fig. 1. **[12]**

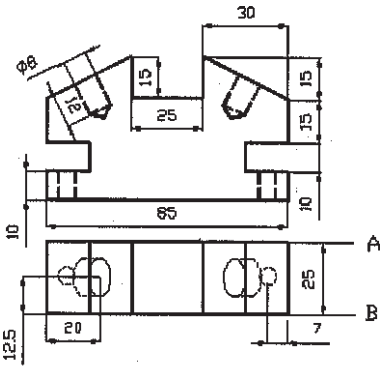

Fig. 1

P.T.O.

Q3) a) In a steel plate of 3 mm thickness, a 50 mm diameter hole is be punched. The ultimate shear strength of the plate material is 575 MPa. If the punching force is to be reduced to 60% of the force using a punch without shear, determine the amount of shear required on the punch. Assume percent penetration as 45%. **[8]**

b) Calculate the bending force for a 45° bend in a aluminum blank. Given that, blank thickness = 1.6 mm, bend length = 1200 mm, die opening = 8 times metal thickness, and ultimate tensile strength = 455 MPa. **[8]**

Q4) Write short notes on any three : **[18]**

a) Determination of optimum clearance in press tool operation.

b) Quick acting clamps.

c) Setting for grinding of drills.

d) Computer applications in fixture design and analysis.

SECTION - II

Q5) a) Explain the factors affecting the selection of parting line in case of drop forging dies. **[8]**

b) Explain with neat sketch the design rules for upset forging dies. **[8]**

Q6) For the component shown in Fig. 2 an injection mold is to be designed,

a) Design the cavity plate and core plate. **[4]**

b) Calculate the mold opening force. **[4]**

c) Calculate the dimensions of the gate and runner. **[4]**

d) Sketch the complete assembly in operation. **[4]**

Given that : Shrinkage = 0.96%, Coefficient of friction = 0.1, Material constant for PVC = 0.9, Poisson ratio and Modulus of elasticity for mold material are 3.33 and 2×10^5 respectively, Injection pressure 50 MPa.

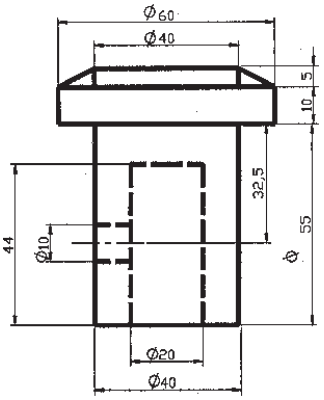

Fig. 2

Q7) a) Derive an expression for estimating the filling time and solidification time in die casting process. **[8]**

b) Explain the aspects of runner design in die casting. **[8]**

Q8) Write short notes on : **[18]**

a) Cooling system design in injection molding.

b) Effect of melt temperature, die temperature, and injection pressure on density of die cast component.

c) Design of edging impression in drop forging.

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Total No. of Questions : 12]

SEAT No. :

P1786

[Total No. of Pages : 4

[4265]-601

M.E. (Electrical) (Control Systems)

SYSTEM IDENTIFICATION & ADAPTIVE CONTROL

(2008 Course) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of unprogrammable electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Define "system identification". Draw a neat flow - chart for system identification and explain each step in details. **[6]**

b) The loss function is given by $V(\theta) = \frac{1}{2} e^T e$ where, $e(t) = y(t) - \phi^T(t)\theta$ with usual notations. If matrix $(\phi^T\phi)$ is positive definite then prove that **[10]**

i) $V(\theta)$ has a unique minimum point given by $\hat{\theta} = (\phi^T\phi)^{-1}\phi^T y$ and the corresponding minimal value of $V(\theta)$ is given by

ii) $V(\hat{\theta})_{minimum} = \frac{1}{2} y^T \left[I - \phi(\phi^T\phi)^{-1}\phi^T \right] y$

OR

Q2) Consider the FIR model $y(t) = b_0 u(t) + b_1 u(t-1) + e(t); t = 1,2.....N$ where $e(t)$ is a sequence of independent normal random variables with zero mean and standard deviation λ.

a) Determine the regressor vector & parameter vector of the linear regression model. **[6]**

b) Data collected from the above FIR model is given below :

t	1	2	3
$u(t)$	1000	1001	1000
$y(t)$	0	2001	2001

Estimate the parameter vector $\hat{\theta}$ from the available data using least square estimation method. **[10]**

P.T.O.

Q3) a) Explain how an appropriate model structure is chosen for estimation of parameter. **[8]**

b) Consider the estimate, with usual notations, **[8]**

$$\hat{\theta} = (\phi^T \phi)^{-1} \phi^T y$$

Assume that the data satisfy $y(t) = \phi^T(t)\theta_0 + e(t)$

Where $e(t)$ is the stochastic variable with zero mean and variance λ^2.

Prove that the covariance matrix of $\hat{\theta}$ is given by

$$\text{Cov}(\hat{\theta}) = \lambda^2 (\phi^T \phi)^{-1}$$

OR

Q4) a) What conditions must be imposed on the input signal for uniqueness of least square estimate? **[6]**

b) An ARX model is given by, with usual notations :

$$y(t) + ay(t-1) = bu(t-1) + e(t)$$

Data collected from this ARX model is as given below :

Sample : t	1	2	3	4	5
Input : $u(t)$	1	0	1	1	0
Output : $y(t)$	0	1	– 0.5	1.25	0.375

Estimate the parameter vector $\hat{\theta}$ from the available data using least square estimation method. **[10]**

Q5) Write detailed notes on any two of the followings :

a) Parametric and Nonparametric training methods. **[9]**

b) Recursive estimation method. **[9]**

c) Self Tuning Regulator. **[9]**

OR

Q6) Write detailed notes on any two of the followings :

a) Learning systems with and without supervision. **[9]**

b) Persistent excitation. **[9]**

c) Ship steering dynamics. **[9]**

SECTION - II

Q7) a) Explain what do you mean by adaptive control :
Write in details the application of adaptive control. **[8]**

b) Explain the term "Gain Scheduling". Explain the working principle of Gain scheduling adaptive control scheme with neat diagrams. State the advantages and drawbacks. **[8]**

OR

Q8) a) Explain precisely the term "Adaptive controller". Draw a block diagram of an adaptive system and explain the working of each block. **[8]**

b) Explain in details all the methods of adaptive schemes. **[8]**

Q9) a) Explain the PID controller and discuss the closed loop method of tuning of PID controller. **[6]**

b) An ideal relay with a saturation level of ± 1 unit, is connected in cascade with a linear transfer function $G(s) = \frac{1}{(s+1)(s+2)(s+3)}$, in a unity feedback control system. Calculate the ultimate gain K_u and ultimate period T_u, using the method of describing function. **[10]**

OR

Q10) a) Explain the pole placement design and derive the Diophantine equation. **[8]**

b) Further show that the pole placement can be interpreted as model following design. **[8]**

Q11) a) State and explain MIT rule. Explain, with neat diagrams, model reference adaptive scheme (MRAS). **[8]**

b) Consider the process $G(s) = \frac{1}{s(s+a)}$, where a is an unknown parameter.

Determine a controller that can give the closed loop system

$$G_m(s) = \frac{w^2}{s^2 + 2\xi w s + w^2}$$

Determine a model reference adaptive controller based on the gradient theory. **[10]**

OR

Q12) Consider a system described by the model **[18]**

$$\frac{dy}{dt} = -ay + bu$$

where u is the control variable and y is the measured output. Assume that it is desired to obtain a closed loop system described by

$$\frac{dy_m}{dt} = -a_m y_m + b_m u_c$$

Where u_c is the controlled input

The controller is given by $u(t) = \theta_1 u_c(t) - \theta_2 y(t)$

Design a MRAS based on the MIT rule.

Explain any approximations made and comment on any

Prior knowledge about the plant that may be required.

♦♦♦♦

Total No. of Questions : 6]

P1787

SEAT No. :

[Total No. of Pages : 2

[4265] - 616

M.E. (Electrical) (Power Systems)

POWER SYSTEM DYNAMICS

(2008 Course) (Semester - II)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any two questions from each Section.***
2) ***Answers to the two sections should be written on separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary and state clearly the same.***

SECTION - I

Q1) a) A generator represented as a voltage source 1.0 p.u $\angle\delta°$ has a reactance j 0.3 pu. It is connected through an external impedance of Z_e = (0.1 + j0.2) p.u to an infinite bus of voltage 1.0 p.u $\angle 0°$. If the power received at the infinite bus is 1p.u. Find the equilibrium values of δ in the range $[-\pi, \pi]$. Test their stability (values of δ) at the infinite bus. **[12]**

b) Derive an expression for the equal area criterion for stability. State clearly all the assumptions made in the derivation. **[13]**

Q2) a) Explain the underlying principle behind park's transformation. Starting from the equations in phase variables, obtain the equations for stator voltages of an alternator in dqO variables. **[20]**

b) What are the advantages of p.u. systems? Explain the choice for stator base quantities for an alternator. **[5]**

Q3) a) A salient pole alternator is operating at rated speed and on no-load. The open circuit voltage is 1 p.u. There is a sudden 3-phase short-circuit at the alternator's terminals at $t = 0$. Obtain the expressions for i_d, i_q, i_f and T_e as a function of time. Neglect armature resistance and transients in the armature. **[15]**

P.T.O.

b) An alternator has the following data : **[10]**

x_d = 1.6 p.u; x_q = 1.55 p.u; x'_d = 0.32 p.u;
T'_{do} = 6 sec; x'_q = 0.32 p.u; T'_{qo} = 0.8 sec;
H = 5; D = 0 ; R_a = 0 p.u ; f_B =60 Hz
The alternator is connected to an infinite bus through an external impedance of j0.4 p.u The generator is operating initially with P_g = 1.0 p.u ; V_t = 1 p.u and E_b = 1 p.u Compute initial conditions.

SECTION - II

Q4) a) Draw a block schematic diagram of a power system stabiliser and explain the functions of each block. State the guide lines for the selection of parameters of the individual blocks. **[15]**

b) The AVR system of an alternator has the following data : **[10]**

	Gain	Time constant
Amplifier	K_A	0.1 sec
Exciter	1.0	0.45 sec
Generator	1.0	1.0 sec
Sensor	1.0	0.06 sec

Determine the range of K_A for control system stability. Use Routh - Hurwitz criterion.

Q5) a) What are SVC (static var compensators)? What are they used for? What are the different types of SVC? Explain the working and characteristic of any one of the SVCs. **[12]**

b) Explain what is meant by voltage stability. Discuss the factors affecting voltage instability and collapse. **[13]**

Q6) Write short notes on the following :

a) Simplified model for multimachine system; **[9]**

b) Swing equation and inertia constants; **[8]**

c) States of operation and power system security. **[8]**

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Total No. of Questions : 8]

P1841

SEAT No. :

[Total No. of Pages : 4

[4265] - 409

M.E. (Civil) (Const. & Mgmt.)

TQM IN CONSTRUCTION

(2008 Course) (Elective - II (b)) (Semester - I)

Time : 4 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Attempt three questions from section - I and three questions from section - II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) "Provide quality or perish" - Justify the above statement in the context of the construction sector business in India, considering the global challenges and the entry of multinational companies operating in India. **[6]**

b) Explain the various barriers in implementing TQM programs in the construction sector in India and suggest corrective measures to encounter them. **[6]**

c) Explain any 3, ISO 9001 : 2000 principles, and their application in a government organisation responsible for executing construction projects. **[6]**

Q2) a) Explain contributions from Deming, Juran and Crossby in the domain of quality with appropriate examples. **[6]**

b) Discuss the 5 domains in which the PRRT software is detailed. Explain how the above software is interacted with by the user. What are advantages of this software in TQM? Explain. **[7½ + 1 + 1½]**

P.T.O.

Q3) a) Explain following construction defects with examples : **[6]**

i) Rework ii) Scrap iii) Backlogs

b) Explain Fishbone diagram and its utility in TQM with an example. **[6]**

c) Explain any 4 long term objectives of TQM. **[4]**

Q4) a) With any case study, explain the process of costing of poor quality in construction of a concrete pavement, for any 3 types of construction defects. Make suitable assumptions. **[9]**

b) Define the various sigma levels. Work out the sigma level for measuring dimensional accuracy of a beam of length 3.0 m and cross-section (250 mm × 400 mm) if actual dimensions of 10 beams are as follows : **[2+5]**

Beam No	L (m)	b (mm)	D mm
1	3.1	248	403
2	2.95	254	400
3	3.05	250	401
4	3.15	251	402
5	2.90	253	405
6	2.85	249	398
7	2.98	255	399
8	3.06	247	402
9	3.03	246	397
10	3.0	250	396

SECTION - II

Q5) Explain 4 levels of quality benchmarked by IRC in their SP-57, associated with various types of highway construction. Which are the major heads under which the differentiation is made? Explain various expectations under different parameter differentiating Q 2 level with Q 4 level. On which type of roads Q 2 is applicable? What type of data is necessary so that the quality manager can determine whether the bench-marked requirements at Q 2 level is achieved or not? Explain. **[18]**

Q6) a) Explain utility of quality control charts for measuring quality of concrete achieved, with the benchmarked parameters,with an example (Graphical representation is expected). **[6]**

b) Identify any 6 reasons for poor quality of plastering item and suggest remedial measures to overcome these defects. **[6]**

c) Draft a checklist to achieve good quality of formwork erected for slab concreting. **[4]**

Q7) a) In a diaphragm wall construction, the cube test results were as follows : **[12]**

Cube No	Compressive strength at 28 days in Mpa for m 30 grade
1	24
2	22
3	27
4	29
5	28
6	31
7	32
8	23
9	26
10	34
11	25.5
12	24.5
13	32.5
14	26.5
15	29.5
16	31.5
17	30
18	28
19	26
20	25.5

The quality control policy of the organisation prescribes that for accepting the work as of required quality, 2 conditions must be simultaneously met with.

i) Standard deviation should be within 4% of the mix grade strength.

ii) Coefficient of variance should be within 6%. If above conditions are not fulfilled then the concrete work is to be rejected.

Suggest whether the diaphragm wall concreting is as per quality requirements. In case of rejection of work, what could be remedial measures, without breaking the diaphragm wall? Suggest.

b) Differentiate between TQC and TQM with appropriate examples. Which is better? Why? **[4]**

Q8) Explain the following : **[16]**

a) Documentation associated with ISO 9001 : 2000.

b) TQM beliefs.

c) ERP utility in TQM.

d) NCR's and how to improve/ minimize them.

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Total No. of Questions : 10]

SEAT No. :

P1846

[Total No. of Pages : 2

[4265]-478

M.E. (Civil) (Environmental Engg.)

ENVIRONMENTAL IMPACT ASSESSMENT & MANAGEMENT

(2008 Course) (Elective - I(c)) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Your answers will be valued as a whole.***
5) ***Use of Logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Explain in brief about the methodologies of evaluation of EI A? **[16]**

Q2) Briefly discuss about Environmental indices & indicators for describing affected environment? **[16]**

Q3) Write in details about existing noise levels & standards & also about assessment of noise impact & mitigation? **[16]**

Q4) Briefly explain the following : **[18]**

a) Life cycle assessment.

b) Screening methodologies.

c) Check list for evolution of EI A.

Q5) State the air quality standards & discuss about impact & assessment of polluted air? **[16]**

SECTION - II

Q6) Explain in brief about the soil standards & the assessment of pollution impact on soil? **[16]**

Q7) Briefly discuss about socio economic environment with prediction & assessment of impact? **[16]**

P.T.O.

Q8) Discuss in detail about any one case study related to Environmental impact assessment? **[16]**

Q9) a) State the procedure for environmental clearance for industries? **[7]**

b) State the water quality standards for Surface & ground water? **[9]**

Q10) Briefly explain the following. **[18]**

a) Rapid & Comprehensive EI A.

b) Post Environmental Monitoring.

c) Resettlement & Rehabilitation of Socioeconomic Environment.

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Total No. of Questions : 8]

SEAT No. :

P1848

[Total No. of Pages : 4

[4265] - 509

M.E. (Mechanical) (Heat Power Engg.)

ADVANCED AIR CONDITIONING & HEATING & VENTILATION

(2008 Course) (Elective - II (b)) (Semester - I)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each Section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of Mollier charts, psychometric chart and electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

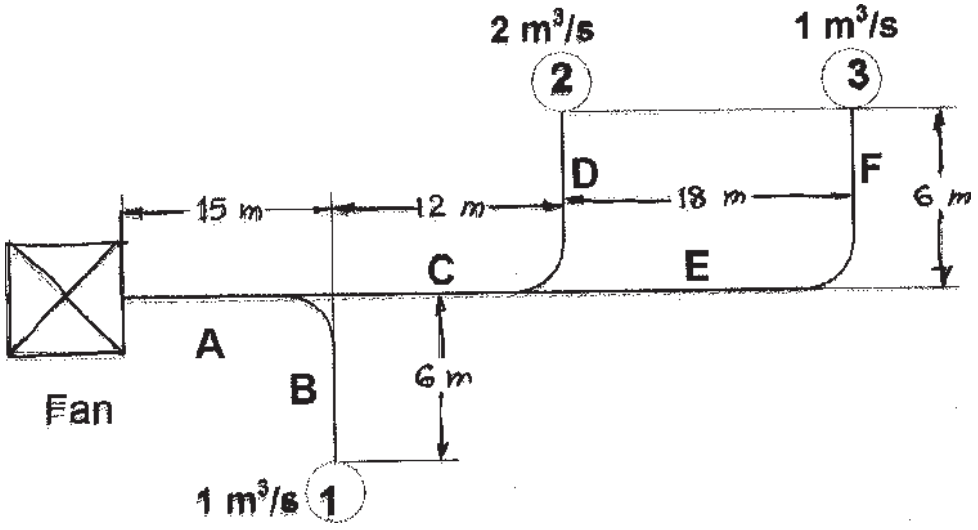
Q1) a) Enumerate all the conditions and factors governing the choice of inside design conditions. **[4]**

b) Discuss the various types of fans and their operating characteristics used in Air Conditioning. **[6]**

c) A fan is designed to operate at a rotative speed of 20 rps. At the design conditions the airflow rate is 20 m^3/s, the static pressure rise is 30 Pa and the air temperature is 20°C. At these conditions the fan requires a power input of 1.5 kW. Keeping the speed constant at 20 rps, if the air temperature changes to 10°C, what will be the airflow rate, static pressure and power input? **[6]**

P.T.O.

Q2) The following figure shows a typical duct layout. Design the duct system using a) Velocity method, and b) Equal friction method. Take the velocity of air in the main duct (A) as 8 m/s for both the methods. Assume a dynamic loss coefficient of 0.3 for upstream to downstream and 0.8 for upstream to branch and for the elbow. The dynamic loss coefficients for the outlets may be taken as 1.0. Find the FTP required for each case and the amount of dampering required. **[16]**



Q3) a) Explain the VAV system concept. List the special characteristics of VAV systems. Discuss the different applications VAV systems. **[10]**

b) Explain general rules of duct design and classify duct systems. **[6]**

Q4) Write short notes on (any three) **[18]**

a) Air locks, Air curtains and Air Showers.

b) Laminar flow clean rooms.

c) Outdoor air control in all air systems.

d) All water system.

SECTION - II

Q5) a) Differentiate clearly between direct and indirect evaporative cooling systems. Show the processes on chart. Explain the working of a two stage evaporative cooling system using cooling tower. **[10]**

b) A 4 m × 5 m wall consists of 3 glass windows of 1.5 m × 1 m dimensions. The wall has thickness of 0.125 m and a thermal conductivity of 0.5 W/m.K, while the glass windows are 6 mm thick with a thermal conductivity of 1.24 W/m.K. The values of internal and external surface conductance for the wall (including glass) are 8.3 $W/m^2.K$ and 34.4 $W/m^2.K$, respectively. The internal and external temperatures are 21°C and –30°C, respectively. Calculate the total heat transfer rate through the wall. What percentage of this heat transfer is through the windows? **[6]**

Q6) a) Explain Simple system with 100% re-circulated air conditioning system and discuss various factors involved with the help of schematic and Psychometric chart. **[6]**

b) A 100% outdoor summer air conditioning system has a room sensible heat load of 400 kW and a room latent heat load of 100 kW. The required inside conditions are 24°C and 50% RH, and the outdoor design conditions are 34°C and 40% RH. The air is supplied to the room at a dry bulb temperature of 14°C. **[10]**

Find

i) The required mass flow rate of air.

ii) Moisture content of supply air,

iii) Sensible, latent heat loads on the coil, and

iv) The required cooling capacity of the coil, Coil sensible Heat Factor and coil ADP if the by-pass factor of the coil is 0.2. Barometric pressure = 1 atm. Comment on the results.

Q7) An air conditioned room that stands on a well ventilated basement measures 3 m wide, 3 m high and 6 m deep. One of the two 3 m walls faces west and contains a double glazed glass window of size 1.5 m by 1.5 m, mounted flush with the wall with no external shading. There are no heat gains through the walls other than the one facing west. Calculate the sensible, latent and total heat gains on the room, room sensible heat factor from the following information. What is the required cooling capacity? **[16]**

Use the following data :

Inside conditions : 25°C dry bulb, 50% RH

Outside conditions : 43°C dry bulb, 24°C wet bulb

U-value for wall : 1.78 $W/m^2.K$

U-value for roof : 1.316 $W/m^2.K$

U-value for floor : 1.2 $W/m^2.K$

Effective Temp. Difference (ETD) for wall : 25°C

Effective Temp. Difference (ETD) for roof : 30°C

U-value for glass : 3.12 $W/m^2.K$

Solar Heat Gain (SHG) of glass : 300 W/m^2

Internal shading Coefficient (SC) of glass : 0.86

Occupancy : 4(90 W sensible heat/person) (40 W latent heat/person)

Lighting load : 33W/m^2 of floor area

Appliance load : 600 W (Sensible) + 300 W (latent)

Infiltration : 0.5 Air Changes per Hour

Barometric pressure : 101 kPa

Q8) Write Short notes on (any three) : **[18]**

a) Principle of velocity method.

b) Infiltration load.

c) Ventilation and Indoor Air Quality.

d) Comfort chart.

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Total No. of Questions : 10]

SEAT No. :

P1852

[Total No. of Pages : 3

[4265]-591

M.E. (Mech.) (CAD Manufacturing and Engineering)

ROBOTICS

(2012 Course) (Elective - II(d)) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of non programmable calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the terms Precision, Resolution and Accuracy related to robotics. **[6]**

b) Compare the five basic robot configurations according to work envelop, Typical application and power source. **[12]**

Q2) a) The one degree of freedom robot has a sliding joint with a full range of 1.5 m. The robot control memory has a 12 bit storage capacity. Determine control resolution. **[6]**

b) Enlist and explain briefly industrial applications of the robot. **[10]**

Q3) a) A camera locates an object by

$$\text{Camera}T_{\text{object}} = \begin{vmatrix} 0 & 1 & 0 & 15 \\ 0 & 0 & -1 & 20 \\ -1 & 0 & 0 & 10 \\ 0 & 0 & 0 & 1 \end{vmatrix}$$

The camera is then translated by 30 units along Z - axis of the object, then rotated about its own X - axis by –60°. Determine the new relation between camera and object. **[10]**

b) Write Euler's angle representation for the RPY system and derive the rotation matrix. **[6]**

P.T.O.

Q4) a) Explain the following terms related to trajectory planning. **[10]**

i) Path verses trajectory.

ii) Joint space verses Cartesian space descriptions.

b) A joint in PTP robot rotates from an initial angle 30° to the final angle of 75° in 5 seconds with a constant maximum velocity of 10°/sec. Determine position of the joint at 1, 2 and 3 seconds and plot the results. **[6]**

Q5) a) Determine the singularities of the RPY wrist by the link joint parameter shown in the table. **[8]**

Link i	a_i	α_i	d_i	θ_i
1	0	90°	0	θ_i
2	0	90°	0	$\theta_i + 90°$
3	0	0°	0	θ_i

b) Discuss the limitations and remedies of Denvit Hertenberg parameters. **[8]**

SECTION - II

Q6) a) Using Lagrange Euler formulations determine the equation of motion for the RP manipulator. **[10]**

b) Explain briefly PID controller with the help of block diagram. **[8]**

Q7) a) Explain the different components of machine vision system with help of block diagram. **[8]**

b) Explain different factors to be considered while selecting the sensors for robot applications. **[8]**

Q8) a) Write a program for palletizing operation the pallet has 3 rows that are 30 mm apart and 4 columns 40 mm apart the robot must pick the parts from incoming chute and deposit them on to a pallet are 30 mm tall. Use appropriate terminology for defining variable and location constants. **[8]**

b) Explain the following DELAY, SPEED, WAIT and SIGNAL commands used in robot programming. **[8]**

Q9) a) Differentiate between lead through and teach pendent programming methods. **[8]**

b) Explain industrial applications of vision controlled robotic systems. **[8]**

Q10) a) Consider a schematic image as shown in Fig. 1 Determine the area, minimum aspect ratio, the diameter, the centric, and the thinness measures of the image. **[8]**

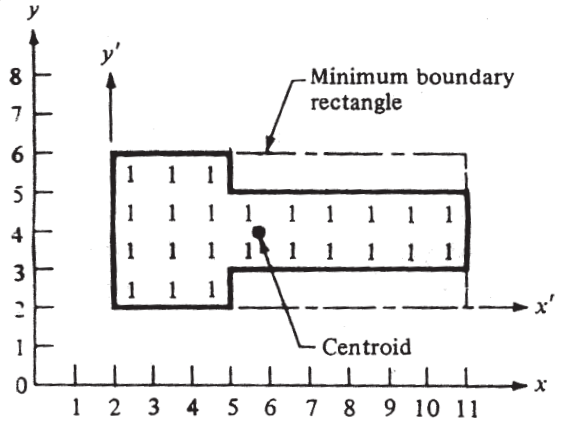

Figure 1 Q10 (a)

b) Differentiate between proximity sensors and Laser range finders. **[8]**

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Total No. of Questions : 6]

SEAT No. :

P1854

[Total No. of Pages : 3

[4265]-627

M.E. (Electrical) (Power Electronics & Drives)
DSP AND ITS APPLICATIONS IN ELECTRICAL DRIVES
(Semester - I) (Elective - I(a)) (2008 Course)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Determine if the systems described by the followed input - output equations are linear or non - linear **[9]**

i) $y(n) = nx(n)$

ii) $y(n) = x^2(n)$

iii) $y(n) = x(n) - x(n-1)$

b) Give the detail classification of discrete time system. **[8]**

c) Determine the inverse z - transform of the following X(z) by partial fraction expansion method if ROC are **[8]**

i) $|z| > 3$

ii) $|z| < \frac{1}{2}$

iii) $\frac{1}{2} < |z| < 3$

$$X(z) = \frac{z+2}{2z^2 - 7z + 2}$$

Q2) a) State and prove following properties of z - transform **[8]**

i) Linearity

ii) Time reversal

iii) Time shifting

iv) Differentiation

P.T.O.

b) Find transfer function and impulse response of discrete time LTI system described by linear constant coefficient difference equation given as

$$y(n) = \frac{1}{2} y(n-1) + x(n) + \frac{1}{3} x(n-1)$$ **[9]**

c) Compute circular convolution of following sequence using matrix approch **[8]**

i) $x(n) = \{1,3,5,3\} \quad h(n) = \{2,3,1,1\}$

ii) $x(n) = \frac{1}{2}$ for $0 \le n \le 3$

$= 0$ otherwise

$h(n) = 2$ for $0 \le n \le 3$

$= 0$ otherwise

Q3) a) State and prove following properties of DFT. **[9]**

i) Periodicity

ii) Linearity

iii) Shifting

b) Explain Radix - 2 DITFFT algorithm. **[8]**

c) Find linear convolution of following sequence using tabular method. **[8]**

i) x(n) = {1, 3, 5, 3} h(n) = {2, 3, 1, 1}

ii) $x(n) = \frac{1}{2}$ for $0 \le n \le 3$

$= 0$ otherwise

$h(n) = 2$ for $0 \le n \le 3$

$= 0$ otherwise

SECTION - II

Q4) a) Compare **[8]**

i) Analog filters Vs. Digital filters.

ii) FIR filters Vs. IIR filters.

b) Design the symmetric FIR low - pass filter whose desired frequency response is given as

$$H_d(w) = e^{-jw\left(\frac{M-1}{2}\right)} \quad \text{for } |w| < 1 \text{ rad/sec}$$
$$= 0 \qquad \text{otherwise}$$

length of filter M = 11. Use rectangular window. **[10]**

c) Explain sample rate conversion by integer and non - integer factor. **[7]**

Q5) a) State and explain what is decimation by factor D and interpolation by Factor I. **[14]**

b) Explain digital relay using DSP for transmission line protection. **[11]**

Q6) a) Explain design of IIR filter using bilinear transformation. **[9]**

b) Write short note on (any two) **[16]**

i) Transformer protection using DSP

ii) Harmonic analysis using DSP

iii) Architecture of TMS 320 CS XXX.

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Total No. of Questions : 8]

P1855

SEAT No. :

[Total No. of Pages : 2

[4265] - 692

M.E. (E & TC) (Signal Processing)

OPERATING SYSTEMS AND OPEN SOURCE SYSTEMS

(2008 Course) (Elective - IV (b)) (Semester - II)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each Section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***
5) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Describe any four types of file organization. **[9]**

b) Enlist various methods of scheduling. Explain the Round Robin method with suitable example. **[9]**

Q2) a) Compare the following page replacement policies on the basis of overhead. **[8]**

i) FIFO ii) LRU

b) Define deadlocks. Describe how deadlocks are detected and resolved in operating system. **[8]**

Q3) a) Describe paging technique. Explain the steps of fault finding in virtual memory system. **[8]**

b) What is device driver? Explain the device drivers for Universal Serial Bus? **[8]**

Q4) a) Explain the shortest seek first (SSF) disk arm scheduling algorithm. **[8]**

b) Define distributed operating system? What is the need of distributed system? **[8]**

P.T.O.

SECTION - II

Q5) a) What do you mean by open source based operating system. Explain the Linux operating system with its architecture. **[9]**

b) Explain the physical memory management in Linux operating system. **[9]**

Q6) a) Explain the file systems in Linux. **[8]**

b) Explain the implementation of networking in the Linux kernel. **[8]**

Q7) a) Explain the input output system in Linux. **[8]**

b) Explain the process management in Linux. **[8]**

Q8) a) Explain the interprocess communication in Linux. **[8]**

b) Enlist the various techniques of virtualization and compare them. **[8]**

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Total No. of Questions : 8]

SEAT No. :

P1857

[Total No. of Pages : 2

[4265]-715

M.E. (E & TC) (Communication Network)

AD HOC NETWORKS

(2008 Course) (Elective - I(c)) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data if necessary.***
5) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) What are design issues of MAC protocol for adhoc wireless networks? **[9]**

b) Enlist various applications of Ad hoc wireless networks and explain it's suitability for military application and wireless mesh network in brief. **[9]**

Q2) a) Is table driven routing protocol suitable for high mobility environment? Compare table driven routing protocol and on - demand routing protocol. **[8]**

b) What are the advantages of hierarchical topology based protocol over protocol that use flat topology? **[8]**

Q3) a) Explain following mesh based multicast routing protocol. **[8]**
On demand multicast routing protocol.

b) Explain following tree based multicast routing protocol. **[8]**
multicast routing protocol based on zone routing

Q4) Explain the following Routing Protocols. **[16]**

a) Core extraction distributed adhoc routing protocol.

b) Zone based hierarchical Link State Routing Protocol.

SECTION - II

Q5) a) What are the design issues of transport layer protocol for adhoc wireless networks? Give classification of transport layer solutions. **[9]**

b) Explain the application controlled transport protocol (ACTP). **[9]**

P.T.O.

Q6) a) What are the battery scheduling techniques? Explain Random technique **[8]**

b) What are the different energy conservation techniques? Explain the device dependent battery management schemes? **[8]**

Q7) a) Explain how security provisioning in ad hoc wireless network differs from that in infrastructure based network. **[8]**

b) Enlist various security attacks in Ad hoc wireless Network? Explain application layer attacks and network layer attacks? **[8]**

Q8) a) What are the issues and challenges for QoS support in ad hoc wireless networks. **[8]**

b) Explain QoS framework which supports adaptive applications in ad hoc wireless networks. **[8]**

♦♦♦♦

Total No. of Questions : 10]

SEAT No. :

P1859

[Total No. of Pages : 2

[4265]-753

M.E. (Production Engineering) (CAD/ CAM)

ADVANCED STRESS ANALYSIS

(Elective - I(a)) (2008 Course) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of Logarithmic tables, slide rule, and non - programmable electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Derive the equations of stresses under plane stress and plain strain conditions. **[16]**

OR

Q2) Explain experimental stress analysis using strain gauges and X - ray diffraction. **[16]**

Q3) Describe complex formulation of the plane elasticity problem. **[16]**

OR

Q4) a) Given the stress components

$\sigma_x = 350$ N/m^2 $\quad \tau_{xy} = -1400$ N/m^2

$\sigma_y = 550$ N/m^2 $\quad \tau_{xz} = 450\sqrt{2}$ N/m^2

$\sigma_z = 1900$ N/m^2 $\quad \tau_{yz} = -450\sqrt{2}$ N/m^2

Find the principal stresses and principal axes. **[8]**

b) Derive the expression for Octahedral shear stress. **[8]**

Q5) Write short notes on **[18]**

a) Maximum and Minimum Shear Stress Values.

b) Mohr's Circles for Stress

c) Principal Stresses and Stress Invariants

P.T.O.

SECTION - II

Q6) A bar of steel has the minimum properties, S_e = 235 MPa, S_y = 385 MPa, and S_{ut} = 515 MPa. The bar is subjected to a steady torsional stress of 108 MPa and an alternating bending stress of 182 MPa. Find the factor of safety guarding against static failure and either the factor of safety guarding against a fatigue failure or the expected life of the part. For the fatigue analysis use : **[16]**

a) Modified Goodman criterion.

b) ASME - elliptic criterion.

OR

Q7) A steel bar undergoes cyclic loading such that σ_{max} = 384 MPa and σ_{min} = – 153 MPa. For the material, S_{ut} = 632 MPa, S_y = 565 MPa, a fully corrected endurance limit of Se = 315 MPa, and f = 0.9. Estimate the number of cycles to a fatigue failure using : **[16]**

a) Modified Goodman criterion.

b) Gerber criterion.

Q8) A material exhibits the following crack growth resistance behavior R = 6.85 $(a - a_0)^{0.45}$, where a_0 is the initial crack size. R has units of kJ/m^2 and crack size is in mm. The elastic modulus of this material is 210 GPa. Consider a wide plate with through crack (a <<W) that is made from this material. If this plate fractures at 148 MPa, compute **[16]**

a) half crack size at failure.

b) amount of stable crack growth that precedes failure.

OR

Q9) If plate described in question 8 has initial crack length ($2a_0$) of 48 mm and the plate is loaded to failure, compute **[16]**

a) stress at failure

b) half crack size at failure.

Q10) Write short note on methods and formulas to estimate fatigue life. **[18]**

♦♦♦♦

Total No. of Questions : 8]

SEAT No. :

P1862

[Total No. of Pages : 2

[4265]-809
M.E. (Chemical)
PROCESS DESIGN & SYNTHESIS
(Elective - I(b)) (2008 Course) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Discuss the hierarchy to chemical process design. **[8]**

b) Discuss the Product design and developments. **[10]**

Q2) a) Discuss the Life Cycle Assessments of process. **[8]**

b) Explain the use of flow sheet simulators to assist in process design. **[8]**

Q3) a) What are the important parameters in choice of reactor? **[8]**

b) Discuss Reactive Residue Curve Maps. **[8]**

Q4) a) Explain Heat & power integration. **[8]**

b) Discuss the pinch point approach. **[8]**

SECTION - II

Q5) a) Discuss column sequence fundamentals. **[6]**

b) Discuss with example the separation of liquid - liquid mixture. **[10]**

Q6) Write short note on **[16]**

a) pressure - swing separation

b) Solid – liquid Separation methods

P.T.O.

Q7) a) Discuss the construction of problem table algorithm. **[10]**

b) Explain Thermal coupling of distillation columns. **[8]**

Q8) a) Explain Composite curves and their use for cascade diagram. **[8]**

b) Describe procedure for construction of Attainable Region (AR). **[8]**

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Total No. of Questions : 10]

SEAT No. :

P1865

[Total No. of Pages : 2

[4265]-872
M.E. (IT)
REAL - TIME AND EMBEDDED SYSTEMS
(2008 Course) (Elective - I(b)) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) Discuss the main features, compare structural description, and behavioral description for formalization of embedded system design with suitable example wherever necessary. **[8]**

b) What are challenges in embedded system design discuss with suitable examples in brief ? **[8]**

Q2) a) Explain briefly following terms with example for each **[8]**

i) Von Neumann architecture
ii) Harvard architecture
iii) RISC Machines
iv) CISC Machines

b) Draw general architectural block diagram of ARM processor. List main features of ARM processor. **[8]**

Q3) a) Explain following with respect to ARM processor. **[8]**

i) AHB, VPB and Local bus
ii) TDMI Engine in ARMTDMI processor.

b) DMA structure in SHARC processor and possible data operations in SHARC processor. **[8]**

Q4) a) Draw core processor architecture of the SHARC processor. Explain following **[8]**

i) DAG registers.
ii) PE, PEX and PEY

P.T.O.

b) How instruction pipeline is implemented in SHARC processor? What is the effect of instruction pipeline in executing branch instructions? **[8]**

Q5) Write short note on Any three

a) Hard and soft real time systems. **[18]**

b) Concurrent engineering.

c) Register structure of ARM processor

d) SHARC link ports

SECTION - II

Q6) a) Explain the following in brief **[8]**

i) Lateness

ii) Feasible schedule

iii) Tardiness

iv) Optimal scheduling

b) Discuss the structure of a cyclic scheduler. **[8]**

Q7) a) Explain any one priority - scheduling algorithm with application. **[8]**

b) Discuss the distributed embedded architecture with suitable diagram. What are advantages and disadvantages of distributed systems? **[8]**

Q8) a) What does CRC stands for? Explain front and back layout of CRC card with suitable example. **[8]**

b) Discuss quality assurance techniques applied for embedded system quality assurance. **[8]**

Q9) a) Draw SDL language symbols. Explain and draw state transition diagram for ATM machine using SDL symbols. **[8]**

b) Explain working of I2C bus with electrical interface diagram. **[8]**

Q10) Write short notes on any three **[18]**

a) CAN data frame format

b) Myrinet

c) Internet enabled systems

d) Schedulable set of jobs and optimal scheduling

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Total No. of Questions : 8]

SEAT No. :

P1871

[Total No. of Pages : 2

[4265]-662
M.E. (E &TC) (VLSI Embedded System)
NANOTECHNOLOGY
(Semester - I) (2008 Course) (Elective - I(b))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Answer any three questions from each section.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What do you mean by smart materials? Explain working of sensor designed using such materials. **[8]**

b) Define carbon nanotube? What are the types of carbon nanotubes. State the proprieties of carbon nanotubes. **[8]**

Q2) a) Explain different methods for producting carbon nano particles? Which is method is widely used? **[8]**

b) What are the energies of first and second energy levels in 100 A GaAs quantum well? Assume that one can treat the problem by an infinite barrier approximation? Effective mass of an electron in GaAs is $0.067m_0$. **[8]**

Q3) a) Explain why proteins called machines of biology? **[8]**

b) Consider a hard wall model of a cubical metal quantum dot having side length L = 3 nm. What is the energy of transition from the (1, 1, 1) state to the (2, 2, 1) state? **[8]**

Q4) Explain :

a) Dynamic force microscopy **[6]**

b) Self healing structures **[6]**

c) Microfabrication **[6]**

P.T.O.

SECTION - II

Q5) a) Explain photolithography with a neat sketch? **[8]**

b) Calculate the energy level of quantum dot in the form of cube 5 nm on a side. Assume zero potential energy in the dot, and infinite high potential bounding the dot. Assume that $m^* = 0.045\ m_e$ in the dot material? **[8]**

Q6) a) Explain mechanical milling process for synthesis of nano particle. List advantages and disadvantages. **[8]**

b) Explain the working of SPM? What care one need to take to achieve very high resolution using SPM? **[8]**

Q7) a) Explain working of MEMS micro accelerometer with neat sketch. **[8]**

b) What are the advantages of chemical methods over physical methods for the preparation of nano particles? **[8]**

Q8) a) Discuss and compare proximity contact and projection method used to pattern a substrate. **[8]**

b) What is radius of (19, 0) carbon nanotube? Repeat for (10, 10) nanotube. Consider an (n, 0) zigzag carbon nanotube that has radius 0.3523 nm. What is value of index n? **[10]**

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Total No. of Questions : 8]

P1876

SEAT No. :

[Total No. of Pages : 2

[4265] - 754

M.E. (Production) (CAD/CAM)

TRIBOLOGY AND SURFACE ENGINEERING

(2008 Course) (Elective - I (b)) (Semester - I)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Solve any three questions from each Section.***
2) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Explain basic mechanism of friction with suitable sketches. **[8]**

b) Explain the Tabor's theory of simple adhesion also state its limitations. **[8]**

Q2) a) What are the assumptions proposed by Reynolds in theory of hydrodynamic lubrication? **[8]**

b) Explain the mechanism of load support in hydrodynamic lubrication. **[8]**

Q3) a) The following data is given for a short hydrodynamic journal bearing : **[10]**

Radial load	= 1250 N
Journal speed	= 2100 r.p.m.
(l/d) ratio	= 0.52
Eccentricity ratio	= 0.60
Radial clearance	= 0.0021 × journal radius
Flow rate of the lubricant	= 3.5 litre/hr

Calculate :

i) Diameter of the journal.
ii) Radial Clearance
iii) Dimensions of the bearing.
iv) Minimum oil film thickness and
v) Absolute viscosity of lubricant.

b) Explain with neat sketch electron microscope and its working principle. **[6]**

P.T.O.

Q4) Write Short Notes on (Any Three) : **[18]**

a) Steps for prevention of wear in bearings.

b) Design of Air and Gas Bearing.

c) Methods of bearing vibration measurement.

d) Mathematical modeling of surface layer.

SECTION - II

Q5) a) Explain clearly the three dimensional structure of surface and the superficial surface. **[8]**

b) Explain the significance of surface engineering in the service life of the component. **[8]**

Q6) a) What is superficial layer? State the parameters used to define a superficial layer. Explain the significance of superficial layer. **[8]**

b) Explain the selection coatings for wear and corrosion resistance. **[8]**

Q7) a) Explain laser beam hardening along with its principle and its effect in consideration with the surface properties obtained. **[8]**

b) Explain the metallurgical aspects to be considered while application of Ion Implantation technique of surface modification. **[8]**

Q8) Write Short Notes on (Any Three) : **[18]**

a) Diffusion coating.

b) PVD and CVD methods for coatings.

c) Electron Beam hardening - method and its effect of the surface properties obtained.

d) Crystallizing Coatings.

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Total No. of Questions : 8]

P1878

SEAT No. :

[Total No. of Pages : 3

[4265] - 656

M.E. (E & TC) (Microwave)

SOFTWARE PROJECT MANAGEMENT

(2008 Course) (Elective - IV (a)) (Semester - II)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each Section.***
2) ***Answers to the two sections must be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are the various activities involved in project management? What is the role of project manager? **[4]**

b) What is the main output of activity sequencing? Explain any one technique for showing activity sequencing. **[6]**

c) An employee of a training organization has the task of creating case study exercises and solutions for a training course that teaches a new systems analysis and design method. The person's work plan has a three-week task 'learn new method'. A colleague suggests that this is unsatisfactory as a task because there are no concrete deliverables or products from the activity. What can be done about this? **[8]**

P.T.O.

Q2) a) The software project consists of a list of tasks along with their estimated durations which are shown in the estimation table below. The project manager also knows the dependencies among those tasks. Please make a CPM graph and a Gantt chart to show how to organize all the tasks so that the project can be down in the shortest time and answer the following : **[10]**

Tasks	Dependency	Duration
A1		3
A2		4
A3	A1	7
A4	A1	8
A5	A2 and A3	12
A6	A2 and A3	9
A7	A4 and A5	5
A8	A4 and A5	2
A9	A6 and A7	6

i) Draw the dependency graph.
ii) Find the critical path and earliest completion time.
iii) Assign the tasks to Raj and Nudaa, and compute the earliest start time.
iv) Compute the latest possible start time given the earliest completion time, 30.

b) Explain the following engineering methodologies : **[6]**

- Functional decomposition.
- Object Oriented.
- Human usage based.

Q3) a) Why do you think schedule issues often cause the most conflicts on projects? **[6]**

b) Using an example explain integrating schedule and critical path. **[10]**

Q4) a) Suppose that the cases are being matched on the basis of two parameters, the number of inputs to and number of outputs from the system to be built. The new project is known to require 10 inputs and 17 outputs. One of the past cases, project A, has 11 inputs and 19 outputs. Project B has 8 inputs and 12 outputs. What would be the Euclidean distance between the project and the target new project being considered above? Is project B is better analogy with the target than project A? **[8]**

b) What are the problems with over and under estimates? Explain in brief, Software effort estimation techniques? **[8]**

SECTION - II

Q5) a) Explain the categories of data function types. Also explain the rules for identification. **[8]**

b) A software application is to be designed and built to assist in software cost estimation. It responds to certain input parameters and produces initial cost estimates to be used at bidding time. **[8]**

i) It has been suggested that a software prototype would be of value in these circumstances. Explain why this might be.

ii) Explain how such prototyping could be controlled to ensure that it is conducted in an orderly and effective way and within a specified time span.

Q6) a) What is the objective of risk management? Explain the Boehm's risk engineering task breakdown structure. **[8]**

b) A software developer working on a college payroll project has written the first 550 lines of a COBOL program that is estimated to require 1000 lines of code. Explain why it would be unreasonable to assume that the programming task is 55% complete. How might you make a reasonable estimate of how near completion it might be? **[8]**

Q7) a) Can function points be used : **[8]**

- For GUI based systems.
- For client/server systems and
- With object oriented development. Explain.

b) Define the transaction function. Explain the two components of transaction function that decides its complexity. **[8]**

Q8) Explain any **THREE** of the following : **[18]**

a) Feasibility Analysis.

b) Leveling Resource Assignments.

c) Types of contract on the basis of payment to the suppliers.

d) Project Control in Project Management.

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Total No. of Questions : 12]

P1879

SEAT No. :

[Total No. of Pages : 3

[4265] - 621

M.E. (Electrical - Power System)

POWER QUALITY ASSESSMENT AND MITIGATION

(2008 Course) (Elective - IV (a)) (Semester - II)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule., Mollier charts, electronic pocket calculator and steam tables allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain Short duration Voltage Variations. **[8]**

b) State and explain Symptoms of Power Quality. **[8]**

OR

Q2) a) State the purpose of Groundings & explain the problems due to poor Grounding. **[8]**

b) Define the following terms. **[8]**

i) Imbalance ii) Flicker

iii) Transients iv) Power Quality

Q3) a) Explain various devices used for Voltage Regulation and impact of reactive power management. **[8]**

b) Write a short note on effect of surge impedance and line termination. **[8]**

OR

Q4) a) Explain the various causes of Voltage Flicker and their effects. **[8]**

b) Define the following terms. **[8]**

i) RMS Voltage Variations ii) Impulsive Transients

iii) Switching Transients iv) Voltage Flicker

P.T.O.

Q5) a) Write a short note on Voltage Sag Indices. **[9]**

b) Explain major causes and consequences of Voltage Sag. **[9]**

OR

Q6) a) Write a short note on Voltage Sag Assessment. **[9]**

b) Explain the following terms. **[9]**

i) Voltage Sag

ii) Interruptions

iii) Area of Vulnerability

SECTION - II

Q7) a) Explain the causes and effect of harmonics. **[8]**

b) Write a short note on computer tools for harmonics analysis and harmonics study procedure. **[8]**

OR

Q8) a) Write a short note on harmonics Indices. **[8]**

b) Define the following terms. **[8]**

i) Sub-harmonics

ii) Passive Filter

iii) Harmonics Series resonance

iv) Inter-harmonics.

Q9) a) Write a short note on Power Quality Monitoring, objectives & requirement. **[8]**

b) Explain about System Wide & Discrete Power Quality Monitoring. **[8]**

OR

Q10) a) Explain the need of Power Quality Monitoring & Power Quality Instrumentation. **[8]**

b) Explain the following terms. **[8]**

i) Harmonics Monitoring

ii) Transient Monitoring

Q11) a) Write a short note on Power Quality Indices & standards for assessment disturbances. **[9]**

b) Explain State Variable Model. **[9]**

OR

Q12) a) Write a short note on Power Quality State Estimation. **[9]**

b) Explain the following terms. **[9]**

i) Waveform Distortion

ii) Voltage Unbalance

iii) Current Unbalance

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Total No. of Questions : 8]

P1889

SEAT No. :

[Total No. of Pages : 2

[4265] - 411

M.E. (Civil) (Construction & Management)

PROJECT RISK ANALYSIS & MITIGATION TECHNIQUES

(2008 Course) (Elective - II (d)) (Sem. - I)

Time : 4 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) *Answer any three questions from each section.*
2) *Answers to the two sections should be written in separate books.*
3) *Use of calculators is allowed.*
4) *Assume suitable additional data, if required.*

SECTION - I

Q1) Differentiate between risk and uncertainty and classify the various types of risks. Explain each type with examples from the construction sector. **[16]**

Q2) What is risk breakdown structure? How is it linked with the work breakdown structure? Explain in case of a metro project, in detail. **[16]**

Q3) Enlist various types of quantitative models available for risk analysis and estimation and explain any 4 in detail. **[18]**

Q4) Explain in brief the various types of risk instruments developed by CIDC for mitigation of construction risks in India. What are advantages of these instruments? **[16]**

SECTION - II

Q5) What is RAMP handbook? Who has evolved it? Explain with diagrams how the project uncertainties vary with the different phases of a construction project. Explain overall procedure suggested in RAMP. **[18]**

Q6) Explain the 4 types of tables suggested in the RAMP handbook for fast estimation of risks and show its application on a construction project with any example. **[16]**

P.T.O.

Q7) Explain the necessity of implementing the risk analysis and mitigation practice by starting with macro level, then linking it with market level and finally considering the project level . Apply this strategy on a multi storeyed building construction project being executed in a global market. **[16]**

Q8) Explain the following : **[16]**

a) CAR

b) Risk management Softwares.

c) Qualitative models for risk estimation.

d) Limitations of risk mitigation strategies.

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Total No. of Questions : 6]

SEAT No. :

P1445

[Total No. of Pages : 2

[4265] - 458

M.E. (Civil) (Structure)

DESIGN OF FOUNDATION

(2008 Course) (Elective - I(d)) (Semester - I)

Time :4 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Your answers will be valued as a whole.***
5) ***Use of electronic pocket calculator is allowed & IS codes are not allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the following: **[10]**

i) Significant Depth.

ii) Teng's correlations.

iii) A-line chart.

iv) Spring Analogy & Soil Structure Interaction.

b) A column footing with size 2M × 3 M, transmits a pressure increament of 150 kN/m^2, at its base embedded 1.6 m in sand, below G.L.Total depth of sand below G.L. is 3.6 M & below it, 2m deep clay was found. Assuming a pressure distribution of 2V : 1H, determine the consolidation settlement at the middle of clay layer. Consider the pressure variation across the 2m deep clay layer. **[15]**

i) For Sand, γ = 16.5 kN/m^3 & γ_{sat} = 18.5 kN/m^3.

ii) For Clay, γ_{sat} = 16 kN/m^3, e_0 = 0.95, C_c = 0.26.
Assume, GWT, at 2.6 m below G.L.

Q2) a) Explain the design steps, with sample calculations, for. **[16]**

i) 'Flat slab Raft'. ii) 'Beam & raft (slab) foundation'.

b) Discuss the conditions favouring the design of different types of raft foundations. **[9]**

P.T.O.

Q3) a) During a block vibration test, vertical resonance have occurred at a frequency of 28 cycles/Sec for a test block of size 1 m × 1 m × 1 m. Determine Cu if the weight of oscillator is 800 N & the force produced by it after 15 cycles is 1500N. Also calculate the max. Amplitude in the vertical direction at 15 cycles/sec. Assume unit weight of Block is 24 kN/m^3. **[10]**

b) Compare in the light of, IS-2974 (pt-II), 1966. **[15]**

i) Design of foundations for, rotary machines.

ii) Design of foundations for, impact machines.

SECTION - II

Q4) a) Explain the following: **[12]**

i) Feld's Rule.

ii) Design steps for precast & cast-in-situ piles.

iii) Negative skin friction.

b) Compute the settlement of pile group, to carry a load of 3000 kN including the weight of pile cap, for a deep clay 20 m. Width of pile cap is 5 M. Length of pile is 10 m with 0.5 m ϕ. The q_u = 70 kN/m^2, clay is underlain by rock. The load is to be transferred at 2/3 length of the pile. Assume the pressure distribution at 30°. Liquid limit is 60% & FOS against shear is 3. **[13]**

Q5) a) Explain the steps of 'Reese & Matlock' method, for laterally loaded piles, for, **[8]**

i) Computation of max. deflection.

ii) Computation of max. B.M.

b) Design an RCC precast pile to sustain a working load of 800 kN. Length of pile is 10 m with 0.5 m ϕ. The qu = 70 kN/m^2. Design with suitable reinforcement & check for handling stresses. **[17]**

Q6) a) Explain the steps for 'Design of pile cap' with the help of sample calculations. **[9]**

b) Discuss the applicability of different 'shell foundations', in the light of IS code recommendations. **[8]**

c) Compare Hyper & conical RC shell foundations, with & without edge beams. **[8]**

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Total No. of Questions : 6]

SEAT No. :

P1460

[Total No. of Pages : 2

[4265] - 622

M.E. (Electrical) (Power Systems)

PARTIAL DISCHARGES IN ELECTRICAL POWER APPARATUS

(2008 Course) (Sem. - II) (Elective - IV(b))

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain following types of discharges such as internal discharge, surface discharge and external discharges. **[8]**

b) Explain the wave-form and characteristics of an individual PD pulse, train of PD pulses in relation to the temporarily assigned instantaneous value of the high voltage. **[8]**

c) Explain the Partial Discharge measuring equipments. Explain the integration in the frequency domain and the integration in the time domain with very large wide band systems. **[9]**

Q2) a) Explain the calibration of PD measuring setup. **[8]**

b) Explain the calibration pulses and uncertainty of measurements. **[8]**

c) Explain the necessity of screening. Also explain factors to be considered to design of screens. **[9]**

P.T.O.

Q3) Write short note on: **[25]**

a) Completely enclosed screen,

b) Screen interruptions,

c) Effect of corners,

d) Cavity resonance

e) Measurement of screening efficiency

SECTION - II

Q4) a) Explain in detail the effects of partial discharge on gaseous insulating materials. **[8]**

b) Explain in detail the effects of partial discharge on liquid insulating materials. **[8]**

c) Explain in detail the effects of partial discharge on solid insulating materials and mixed dielectrics. **[9]**

Q5) a) Explain the relation between measured and actual charge and relation between the time-dependent occurrence of PD. **[8]**

b) Explain the development of PD measurement technique in cables. **[8]**

c) Explain the reflection, superposition effects and damping. **[9]**

Q6) a) Explain the problems during PD measurements on long cables. **[8]**

b) Give the specifications for test methods and permissible PD magnitudes. **[8]**

c) Explain methods for location of PD and explain PD location according to pulse spacing method. **[9]**

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Total No. of Questions : 6]

SEAT No. :

P1461

[Total No. of Pages : 2

[4265] - 626

M.E. (Electrical) (Power Electronics and Drives)

POWER ELECTRONICS DEVICES AND CIRCUITS

(2008 Course) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Attempt any two questions from Section-I and any two questions from Section-II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Use of electronic calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Compare SCR and GTO related with their applications, gate requirements, during commutation. **[10]**

b) What are different protections required for SCR, GTO, MOSFET, IGBT. **[15]**

Q2) a) What are requirement of gate drive circuit. Explain with circuit diagram gate drive circuit applied to MOSFET and SCR. **[15]**

b) What is need of snubber. Explain working of turn on snubber and turn off snubber. **[10]**

Q3) a) The buckboost converter has an input voltage of 12V and a load resistance of 24 ohm. The switching frequency is 10kHz. The values of the inductor and output capacitor are lmH and 100 microfarad resp. If the output voltage is required to be twice that of the input, determine i) the duty cycle ii) the peak to peak output ripple voltage iii) the magnitude of the average input current iv) the magnitude of the average inductor current and v) the peak inductor current. Draw the waveform for each. **[15]**

b) Explain the operation of type E chopper with output voltage and current waveform. **[10]**

P.T.O.

SECTION - II

Q4) a) Three phase converter supplying balance R load. Draw output voltage, current, Thyristor current, voltage across thyristor, supply current waveforms for firing angle of 30º, also derive voltage equation. **[10]**

b) Explain operation of single phase converter for R and RL load. Derive power factor and THD. Draw waveforms for output voltage, current, voltage across device and pulses. **[15]**

Q5) a) If the phase sequence is required to be RBY explain in detail the necessary changes to be incorporated. Justify that the McMurry inverter can deliver six step output voltage. Is it possible to result PWM output from same inverter. **[15]**

b) Compare operation, performance of six step inverter and PWM inverter. **[10]**

Q6) a) What is cyclo converter. Draw circuit diagram of three phase cycloconverter and explain its working with output waveform. **[15]**

b) What are advantages and disadvantages of bidirectional control. Explain single phase bi directional controller with R load. **[10]**

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Total No. of Questions : 12]

SEAT No. :

P1463

[Total No. of Pages : 3

[4265] - 642

M.E. (E & TC / Electronics/ Digital Systems / VLSI Embedded Systems / Communication Network / Microwave / Signal Processing)

PRINCIPLES AND PRACTICES FOR IT MANAGEMENT

(Semester - I) (2008 Course)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the importance of controlling as a function of process of management. **[8]**

b) Explain the role and importance of business policy. **[8]**

OR

Q2) a) Write a short note on business ethics and social responsibility. **[8]**

b) State different tools and techniques of strategic management. **[8]**

Q3) a) Write a note on role and importance of management. **[8]**

b) Explain conflict process and strategies for resolving conflicts for various types. **[8]**

OR

Q4) a) Explain the process of creating budget in detail. **[8]**

b) Explain the various management skills require for manager. **[8]**

P.T.O.

Q5) Discuss the following functions of management: **[18]**

a) Planning

b) Organizing

c) Staffing

d) Directing

e) Controlling

OR

Q6) Explain the various management skills require for manager. **[18]**

SECTION - II

Q7) a) Explain conflict process & strategies for resolving conflicts for various types. **[8]**

b) Discuss in detail the stress management. **[8]**

OR

Q8) a) Explain organizing a project team and team issues. **[8]**

b) State and explain various project quality standards. **[8]**

Q9) a) Explain the applications of IT in quality control and customer relationship. **[8]**

b) Discuss in detail Intellectual Property Rights (IPR) and Cyber laws. **[8]**

OR

Q10) a) Explain applications of IT in insurance & banking. **[8]**

b) Discuss the concept of Supply Chain Management (SCM) as modern approach to management. **[8]**

Q11) Write short notes on any three: **[18]**

a) Formal and Informal groups.

b) Six Sigma.

c) CMMI.

d) Impact of IT quality management system.

e) Energy management and energy audit.

OR

Q12) Write short notes on any three: **[18]**

a) Stress management.

b) IPR & cyber laws.

c) Employee welfare.

d) Technology management.

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Total No. of Questions : 8]

SEAT No. :

P1464

[Total No. of Pages : 3

[4265] - 650

M.E. (E & TC) (Microwave)

MICROWAVE INTEGRATED CIRCUITS

(2008 Course) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Solve any three questions from each section.***
2) ***Figure to the right indicates full marks.***
3) ***Assume suitable data wherever necessary.***

SECTION - I

Q1) a) Compare hybrid and monolithic microwave integrated circuits. **[8]**

b) What are the technological steps involved in the fabrication of hybrid integrated circuits. **[8]**

Q2) a) Design a microstrip antenna to operate at 1.8 GHz given the substrate used in the design is FR4 PCB material with following parameters, **[10]**

$\varepsilon_r = 4.6$

$\tan_\delta = 0.022$

h = 1.6 mm

copper thickness = 35 μm

b) What are the methods for the synthesis of nonlinear microwave integrated circuits? Explain any one method in detail. **[6]**

P.T.O.

Q3) a) A four port network has the scattering matrix shown below. **[10]**

$$[S] = \begin{bmatrix} 0.1\angle 90^\circ & 0.8\angle -45^\circ & 0.3\angle -45^\circ & 0 \\ 0.8\angle -45^\circ & 0 & 0 & 0.4\angle 45^\circ \\ 0.3\angle -45^\circ & 0 & 0 & 0.6\angle -45^\circ \\ 0 & 0.4\angle 45^\circ & 0.6\angle -45^\circ & 0 \end{bmatrix}$$

i) Is this network lossless

ii) Is this network reciprocal

iii) What is the return loss at port 1 when all other ports are terminated with matched load.

b) What do you mean by uncertainty and confidence in measurement? **[6]**

Q4) Write short notes on: **[18]**

a) Circulators and Isolators.

b) MIC phase shifter.

c) MIC differential phase shifter.

SECTION - II

Q5) Draw the circuit diagram of a Colpitts oscillator using a common emitter BJT and show that the necessary condition for oscillation is $\frac{C_2}{C_1} = \frac{g_m}{G_i}$ and the frequency of oscillation is $\omega_0 = \sqrt{\frac{1}{L_3}\left(\frac{C_1 + C_2}{C_1.C_2}\right)}$. **[16]**

Q6) a) Calculate various parameters for the design of co-planar transmission line at 100 MHz. **[8]**

b) Draw the layout diagram and the equivalent circuits of the following microstrip components, **[8]**

i) An equivalent split Wilkinson power divider.

ii) An unequivalent split Wilkinson power divider.

iii) A quadrature (90°) hybrid branch line coupler.

iv) A hybrid or Rat-race in microstrip form.

Q7) a) Define the terms Power gain (G_0), Available Power gain (G_A) and transducer power gain (G_T) for a two port network. Derive an expression for the power gain in terms of S-parameters of the two port network and the reflection coefficients of the source and the load. **[8]**

b) Design a Chebyshev bandpass filter with following specifications. **[8]**

i) Cut-off frequency = 100 MHz.

ii) Number of order = 3.

iii) Impedance = 50 Ω.

Q8) Write short notes on: **[18]**

a) Application of MICs in satelite communication systems.

b) Future trends in MICs.

c) MIC test systems.

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Total No. of Questions : 10]

SEAT No. :

P1465

[Total No. of Pages : 2

[4265] - 665

M.E. (E & TC/Electronics)-(VLSI and Embedded Systems)

MEMORY TECHNOLOGIES

(2008 Course) (Elective - II(b)) (Semester - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Draw and explain typical SRAM basic organization. **[6]**

b) Draw and explain various SRAM circuit elements. **[6]**

c) Explain SOI Technology. **[6]**

Q2) a) Draw and explain the functional diagram of a typical Dual port RAM? **[8]**

b) Explain trench cell and stacked capacitor cell structure of DRAM. **[8]**

Q3) a) Explain with block diagram Application Specific DRAM. **[8]**

b) Explain with block diagram OTP EPROM. **[8]**

Q4) a) Explain in detail FLOTOX (Floating Gate Tunneling Oxide Technology). **[8]**

b) Explain most commonly used RAM fault models and explain in brief. **[8]**

P.T.O.

Q5) Write short notes on:

a) Significance of testing of semiconductor memory. **[6]**

b) Explain March Test Algorithm. **[6]**

c) Antifuse, explain in brief. **[4]**

SECTION - II

Q6) a) Explain in detail the general design for testability techniques? **[8]**

b) Explain BIST (Built in self Test) and built in self repair architecture? **[8]**

Q7) a) What is FRAM? Explain working principle of same. **[8]**

b) Compare FRAM, SRAM and DRAM. **[8]**

Q8) Write short notes on three: **[18]**

a) 3 D memory stacks

b) Radiation hardening techniques.

c) Analog memory.

d) MRAMs.

e) Reliability issues related to semi conductor memory.

Q9) a) Explain in detail memory failure mechanisms. **[8]**

b) Enlist commonly used packages for SMT. **[8]**
(Surface Mounting technology).

Q10) Write short notes on:

a) Digital Tablet PC. **[6]**

b) LCD. **[6]**

c) Memory cards. **[4]**

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Total No. of Questions : 8]

SEAT No. :

P1466

[Total No. of Pages : 3

[4265] - 694

M.E. (Electronics) (Digital Systems)

MICROELECTRONICS

(Semester - I) (2008 Course)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Solve any three questions from each section.***
2) ***Figures to the right indicate full marks.***
3) ***Assume suitable data, wherever necessary.***

SECTION - I

Q1) a) PMOS is good for passing logic '1' and NMOS is good in passing logic '0'. Is the statement correct? Justify your answer. **[8]**

b) What do you mean by pull up and pull down networks in static CMOS logic. Design static CMOS logic circuit for the following logic function. Clearly show the pull up and pull down networks in the circuit. **[8]**

$$g = \overline{x(y+z)+y}$$

Q2) a) What are the various components of the power dissipation in the CMOS logic circuit? Explain the techniques for reducing the power dissipation in the CMOS IC. **[8]**

b) Explain layout design rules with reference to any process technology used in IC fabrication. Draw the stick diagram for. **[8]**

i) Inverter

ii) Two input NAND gate

P.T.O.

Q3) a) Implement following logic gates using complementary CMOS logic, **[12]**

(1) AND gate (2) NAND gate

(3) OR gate (4) NOR gate

(5) XOR gate (6) XNOR gate

b) What are the various parasitic components in a CMOS circuit? With reference to CMOS inverter circuit explain the term parasitic delay. **[6]**

Q4) a) What do you mean by dynamic CMOS logic? Implement the following. Boolean equation in dynamic CMOS logic and conventional static CMOS logic: $Y = \overline{A(B+C)+DE}$. Compare the two circuits with respect to speed and area. **[8]**

b) Write short notes on: **[8]**

i) Technology Scaling.

ii) Ultrafast VLSI circuits.

SECTION - II

Q5) a) What is the necessity of MOS diode/active resistor? Draw the MOS diode/active resistor circuits for NMOS and PMOS transistors. Is there any difference in gain of the following amplifier circuits, **[10]**

i) common source amplifier with NMOS diode connected load

ii) common source amplifier with PMOS diode connected load

Justify your answer with the suitable circuit diagrams.

b) What is Domino logic? Explain the differences between the Domino logic and NORA logic. **[6]**

Q6) a) What do you mean by transmission gates? Implement the following

Boolean equation using transmission gates and conventional static CMOS logic, $Y = A\overline{B} + \overline{A}B$. Compare the two circuits with respect to speed, area and power. **[8]**

b) With reference to following points differentiate between Moore and Mealy finite state machines. **[8]**

i) State Diagram

ii) Model Block diagram

iii) Functional definition of outputs and Next states

iv) Simple VHDL Code

Q7) a) What are the various modeling methods in VHDL? Implement the Full adder circuit using all the modeling methods. **[8]**

b) Define the following terminologies, **[8]**

i) synthesizable and non-synthesizable statements

ii) data objects and data types

iii) subprograms and packages

iv) configuration and attributes

Q8) Write short notes on (any three): **[18]**

a) Signal Integrity.

b) Clock distribution.

c) Mixed signal design issues.

d) Floor planning methods.

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Total No. of Questions : 8]

SEAT No. :

P1468

[Total No. of Pages : 2

[4265] - 720

M.E. (E & TC) (Communication Networks)

NETWORK TRAFFIC ANALYSIS AND QoS

(2010 Course) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) During 1 hour of busy period 700 calls arrived in an exchange. If average holding time per call is 2 minutes, Estimate Traffic in Erlangs and in CCS units. **[8]**

b) Classify traffic Managements in detail? Also explain benefits of traffic Managements. **[8]**

Q2) Compare all traffic shaping techniques in detail with neat diagram? Also justify which techniques is better? **[16]**

Q3) Define QoS & explain in detail its requirements? What are the different methods for QoS improvement? **[16]**

Q4) Write short notes [any two]: **[18]**

a) LAN traffic management.

b) Differentiated Services (DiffServ).

c) Multi Protocol Labeling Switching (MPLS).

P.T.O.

SECTION - II

Q5) a) 20,000 Subscribers are connected to an exchange. If exchange is designed to achieve a call completion rate of 0.7 when busy hour calling rate is 5.1, what is BHCA that can be supported by exchange? What should be call processing time for this exchange? **[8]**

b) Explain Bandwidth allocation & traffic control for network traffic. **[8]**

Q6) a) Define High speed network & explain traffic management for High speed network. **[8]**

b) During 4 hours busy period 48 calls arrived in exchange. Average holding time per call is 2 minutes. Calculate Traffic load in **[8]**

i) Erlangs ii) CCS

iii) CS iv) CM units

Q7) a) Explain QoS oriented communication architecture & protocols? **[8]**

b) Explain Quality of perception in detail. **[8]**

Q8) Write short notes [any two]: **[18]**

a) Statistical analysis for real time traffic.

b) Traffic measurement tools.

c) Traffic engineering models.

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Total No. of Questions : 8]

SEAT No. :

P1502

[Total No. of Pages : 2

[4265] - 49

M.E. (Mechanical Engg.) (Heat Power)

THERMAL AND MECHANICAL DESIGN OF HEAT EXCHANGERS

(2002 Course)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary and mention it clearly.***
6) ***Use of logarithmic tables, slide rule, Mollier charts, non programmable electronic pocket calculator is allowed.***

SECTION - I

Q1) a) Classify heat exchangers with their applications. **[8]**

b) Show that for counterflow heat exchanger when, **[8]**

$\frac{C_{min}}{C_{max}} = 1,$ effectiveness is given by $\varepsilon = \frac{NTU}{1+NTU}$ with standard notation.

Q2) a) What are the various types of condensers used in refrigeration applications? Explain each in brief. **[10]**

b) Write a short note on: Heat exchanger for Electronic cooling. **[6]**

Q3) a) What are the various correction *(j)* factors considered for shell side heat transfer coefficient in Bell Delaware method? **[8]**

b) What are the various types of fouling? Discuss the Causes and effects of fouling. **[8]**

P.T.O.

Q4) Write short notes on: **[18]**

a) Rod baffles in heat exchanger

b) P-NTU method

c) Flow induced vibrations

SECTION - II

Q5) a) Explain the important aspects of TEMA standards. **[8]**

b) Explain Heat pipe heat exchanger. List its applications. **[8]**

Q6) a) Explain the meaning of the following terms used in mechanical design of heat exchanger. **[8]**

Design temperature, Design pressure, Maximum allowable working pressure, Joint efficiency, and Allowable stress.

b) Explain the design procedure of condenser of split air conditioner. **[8]**

Q7) A double pipe heat exchanger is used to condense steam at a rate of 0.03 kg/s at 50°C. Cooling water enters through the tubes at a rate of 0.9 kg/s at 10ºC. The specific enthalpy of phase change h_{fg} of water is 2382.7 kJ/kg and the specific heat of water is 4.18 kJ/kg K. The tube (M.S. with k = 45W/m K) OD and ID are 25.4 mm and 22.1 mm respectively. The heat transfer coefficient on the steam side is 10000 W/m^2 K and that of on the cooling water side is 8000 W/m^2 K. Inside and outside fouling resistances are 0.176 and 0.088m^2 K/kW, respectively. **[16]**

Determine the outside surface area and length required for the plain tube for clean and fouled heat exchangers.

Q8) a) What are the various components of pressure drop considered while calculating the total shell side pressure drop in Bell Delaware method? **[8]**

b) Explain the heat exchanger design methodology with suitable example. **[10]**

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Total No. of Questions : 6]

SEAT No. :

P1507

[Total No. of Pages : 2

[4265] - 176

M.E. (Electrical) (Power System)

POWER SYSTEM PROTECTION

(2002 Course)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Compare electromagnetic, static and digital relays. State advantages & disadvantages. **[9]**

b) Explain directional over current relay. **[8]**

c) Explain under frequency relay. **[8]**

Q2) a) Explain working of CVT and compare with electromagnetic voltage transformer. **[8]**

b) Explain the following w.r.t. CT. **[9]**

i) Thermal capacity.

ii) Flux swing in the core.

iii) Saturation voltage of secondary winding.

c) Explain ratio and phase angle errors. **[8]**

P.T.O.

Q3) a) Derive from fundamentals the generalised expression for radius of circle & co-ordinates of the centre of a dual input phase comparator. **[10]**

b) What is over reach of relay? Explain its effect. **[5]**

c) Explain duality between amplitude and phase comparator. **[10]**

SECTION - II

Q4) a) With reference to protection schemes using distance relay, explain - **[16]**

i) Limitations of 3 - stepped distance relay.

ii) Synthesis of quadrilateral distance relay.

iii) Effect of arc resistance.

iv) Effect of power swings.

b) Explain digital protection based on fundamental signal. **[9]**

Q5) a) Explain Modern Bus bar protection scheme. **[12]**

b) Explain digital protection of synchronous generator. **[13]**

Q6) a) Explain digital protection of transformer. **[9]**

b) Explain magnetising inrush current and overfluxing protection. **[8]**

c) Explain Buchholz Relay. **[8]**

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Total No. of Questions : 8]

SEAT No. :

P1516

[Total No. of Pages : 2

[4265] - 404

M.E. (Civil) (Construction Management)

NEW CONSTRUCTION MATERIALS

(2008 Course) (Sem. - I) (Elective - I(a))

Time :4 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) With respect to FRP & CMBR, explain the following: **[18]**

a) Material Composition and properties.

b) Manufactures process & storage.

c) Testing & acceptance criteria.

Q2) a) Explain properties of any four construction chemicals. **[8]**

b) Discuss various radiation shield materials & the effect of nuclear radiation. **[8]**

Q3) a) Explain why the use of Glenium concrete based on nanotechnology, give Total Quality Control concept in concrete. **[6]**

b) What do you mean by smart materials? Explain any three smart materials with reference to application and limitations for use in construction. **[10]**

P.T.O.

Q4) Explain Green building? What is energy rating system? Explain new construction materials used in Green Buildings with a case study. Discuss the concept of carbon credit. **[16]**

SECTION - II

Q5) a) What is Silica fume? **[4]**

b) Discuss any four construction applications and advantages of Silica Fume. **[6]**

c) Explain physical properties of Silica fume and what precaution should be taken while using silica fume. **[6]**

Q6) a) Draw a neat labeled sketch showing production process of fly ash. **[6]**

b) Enlist the properties of fly ash which has made it construction material. **[4]**

c) Classify fly ash and compare class "C" and class "F" based on their properties. **[6]**

Q7) a) With neat labeled sketch explain "slump flow test"; "L Box test"; "V funnel test" conducted on SSC. Discuss the purpose and result time of these tests. **[9]**

b) Explain in brief various materials used in SSC. **[4]**

c) Discuss "how SSC is different than conventional with respect to constructability and application?" **[5]**

Q8) Explain details of :- **[16]**

a) FRP application in civil engineering.

b) Construction admixtures.

c) High performance concrete; its use and advantages.

d) Use of steel fibers in concrete and comparison with carbon fiber.

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Total No. of Questions : 8]

SEAT No. :

P1517

[Total No. of Pages : 2

[4265] - 407

M.E. (Civil) (Construction Management)

CONSTRUCTION SAFETY

(2008 Course) (Semester - I) (Elective - I(d))

Time :4 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are the duties and responsibilities of safety officer for fly over bridge construction on heavy traffic road? **[10]**

b) What are minor and major precautions should be taken into account by general employee at organization to achieve safety in construction? **[6]**

Q2) Write note on: **[16]**

a) Safety committee.

b) Personal protective equipment.

c) Safety audit.

d) Display of safety sign and symbol.

Q3) a) Which are physiological and psychological causes of accidents? What are the effects and cost associated with accident? **[8]**

b) Prepare safety checklist for excavation of the foundation and erection of frames and trusses in Industrial building construction. **[8]**

P.T.O.

Q4) With a case study, Explain in detail safety of accident for high rise building at various stages of construction. What safety measures are to be taken into account especially before execution of building? Design the report to be generated and submitted to the top management. **[18]**

SECTION - II

Q5) a) List out any four precautions for each, to be taken while operating with vehicles, hoists, lifts and cranes. **[8]**

b) State the operational and common health hazards while doing operations for tunnel construction. **[8]**

Q6) a) State and explain in brief the various clauses included in labour law. **[7]**

b) Write short notes on: **[9]**

i) Safety of scaffolding.

ii) Cost aspects of accidents on site.

iii) Group insurance policy for labours.

Q7) What are the safety policies, methods, tools and training provided in ISO certified construction company? Explain with suitable example. **[16]**

Q8) a) Give the first aid to be given in case of the following accidents: **[12]**

i) Head hit by hammer.

ii) Shock at Short circuiting.

iii) Skin burnt during welding.

iv) Leg cramp while loading/unloading.

b) Explain various equipments and gear used on site. **[6]**

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Total No. of Questions : 6]

SEAT No. :

P1518

[Total No. of Pages : 3

[4265] - 454

M.E. (Civil) (Structure)

STRUCTURAL DYNAMICS

(2008 Course) (Sem. - I)

Time :4 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Define Vibrations, What are the types of vibrations? **[6]**

b) A vibrating system is defined by the parameters, m = 3000gm, k = 100 N/m, c = 3 N-S/m. Determine **[10]**

i) The damping factor.

ii) The Natural frequency of damped vibration.

iii) Logarithmic decrement.

iv) Ratio of consecutive amplitudes.

v) No. of cycles after which the original amplitude is reduced to 20 percent.

c) Explain coulomb's damping. Prove that for one complete cycle amplitude reduces by 4 x_f. **[9]**

Q2) a) Obtain the equation for natural frequency for damped free vibration SDOF system. Find the natural frequency of the system shown in figure 01. K = 2 x 10^5 N/m, m = 20 kg. **[8]**

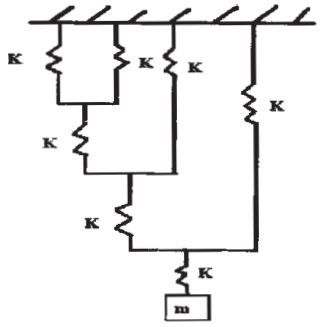


Fig. 01

P.T.O.

b) Explain impulsive loading. Using Duhamel's integral, Determine response of an undamped. **[10]**

i) Free vibration SDOF system.

ii) Forced vibration SDOF system.

c) For the system shown in figure 02. The characteristic of the dashpot is such that when a constant force of 49 N is applied to the piston its velocity is found to be constant at 0.12 m/s. Determine **[7]**

i) the value of C.

ii) the complete system is periodic or non periodic.

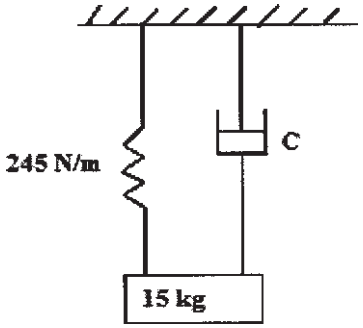


Fig. 02

Q3) a) Define transmissibility. Show that the transmissibility is unity for different damping ratios, at frequency ratio $\sqrt{2}$. **[9]**

b) Explain linear acceleration step by step method. **[6]**

c) A vibratory body of mass 150 kg supported on springs of total stiffness 1050 kN/m. It has a rotating unbalance force of 525 N at a speed of 6000 rpm. If the damping factor is 0.3, determine **[10]**

i) the transmissibility

ii) the actual force transmitted and its phase angle.

iii) the amplitude caused by the unbalance and its phase angle.

SECTION - II

Q4) a) Write short notes : **[8]**

i) Tuned mass Damper.

ii) Power method.

b) Derive mode shapes and frequencies by stodola method. Ref. Fig. 03. **[10]**

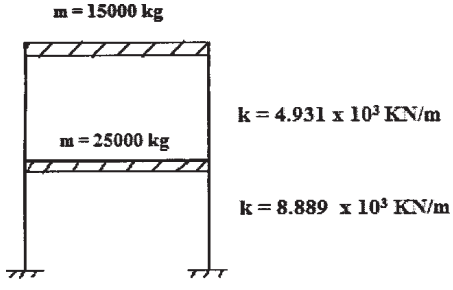


Fig. 03

c) State and prove the orthogonality property of mode shapes. **[7]**

Q5) a) Explain Non- Linear analysis by Wilson Theta method. **[10]**

b) Obtain Equation of motion and find the natural frequencies for a 3 storey shear frame as shown in figure 04 by using Eigen Value- Eigen Vector method. Take column sizes 500 x 400 mm for ground floor and 500 x 200 mm for first and second floor. Neglect Damping. **[15]**

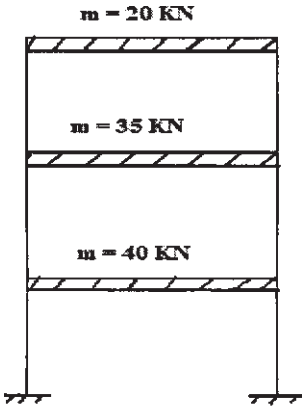


Fig. 04

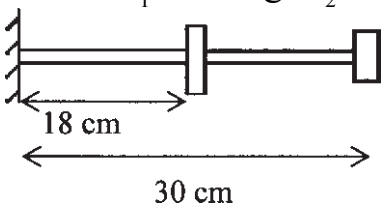
Q6) a) Explain Rayleigh method and its disadvantages. **[6]**

b) Explain Rayleigh Ritz method as applied to simply supported beam. **[9]**

c) Find the lowest natural frequency of vibration for the system shown in Fig.05 by Rayleigh's method. **[10]**

$E = 1.96 \times 10^{11}$ N/m^2, $I = 4 \times 10^{-7}$ m^4

$M_1 = 100$kg $M_2 = 50$ kg



Total No. of Questions : 6]

SEAT No. :

P1519

[Total No. of Pages : 2

[4265] - 455

M.E. (Civil) (Structures)

ADVANCED DESIGN OF CONCRETE STRUCTURES

(2008 Course) (Sem. - I) (Elective - I(a))

Time :4 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Use of IS 456, IS 1343, IS 3370 & non programmable calculator is allowed.***
5) ***Neat diagrams must be drawn wherever necessary.***
6) ***Assume any other data, if necessary.***

SECTION - I

Q1) a) Differentiate between the Yield line theory & Hillerborg's strip method. **[7]**

b) Design a RCC slab for a circular hall of clear diameter 6m using Yield Line Theory. Assume the peripheral support thickness 300mm, the slab is simply supported Use M20 Fe500 take Live load = 4.5 kN/m^2 & floor finish load = 1.5 kN/m^2. Draw details of reinforcement. **[10]**

c) Draw yield lines for the following **[8]**

i) Equilateral triangular slab fixed at one of the sides, unsupported at two sides and having a column at the intersection of these two sides.

ii) Rectangular slab with fixed supports on two adjacent sides with remaining sides unsupported and having column at intersection of these shorter unsupported sides.

Q2) a) Design a intermediate panel of flat slab for a hall with column spacing 6m × 6m c/c.the size of the column diameter is 500mm each Use M20 Fe500 take Live load = 5 kN/m^2 & floor finish load =1.5 kN/m^2. Draw reinforcement details. **[10]**

b) Design a grid slab for a floor of hall 15 × 13.5 m c/c having square grid of 1.5m. Use M20 Fe500 take Live load = 4.5kN/m^2 & floor finish load = 1.5 kN/m^2. Apply the required check & draw reinforcement details. **[15]**

P.T.O.

Q3) Design a staging for circular type ESR for 4.5lakh liters with staging height 12m using M25, Fe500 in earthquake zone III. Safe bearing capacity is 180 kN/m^2 Design of container is not required. Assume approx dimension of container, wall, top, bottom slab thickness, beams sizes & number of columns. Design must include Calculations of vertical loads and horizontal force Design the bracings, columns and foundations. Draw the reinforcement details. **[25]**

SECTION - II

Q4) a) Write detailed note on classification Deep beam. **[5]**

b) Design a bell type RCC shear wall for length 4m, thickness 230mm for the following.
Axial forces of 1800kN and 250kN due to dead & live load and due to seismic load respectively. Bending moment of 300 kN-m and 4000 kN-m due to dead & live load and due to seismic load respectively. Use M25 Fe500. Draw reinforcement details. **[20]**

Q5) A two span prestressed concrete continuous beam AB = BC = 16m, having cross section 230 × 750 mm simply supported at A & C and continuous over B. The eccentricities at A & C = 0, at B = 250mm upward and at midspan of AB & BC = 320mm downwards. Material used is M45 and multistrand cables 2 Nos 9T13 (having 7 strands of l00mm^2 with fy =1950 N/mm^2), stressed to 75% of fy, superimposed load on both the spans 12 kN/m, Assume 18% loss of prestress. **[25]**

i) Determine primary, secondary moment at support at prestress and dead load.

ii) Draw the resultant line of thrust at working load.

iii) Calculate shift and stress in extreme fibers at working load.

Q6) Design post tensioned prestressed concrete slab for a floor for the following. Flat interior panel of 7m × 8m, live load on slab 5 kN/m^2, floor water proofing load on slab = 2 kN/m^2,concrete grade M40, Multi-strand cables S3 (having 3 strands of 100mm^2 with fy =1950 N/mm^2) stressed up to 75% of 'fy'. Assume 3 panels in each direction. Width of the beam on periphery of floor 600mm and column size 600mm × 600mm. Design must include check fiber stresses in concrete and deflection. Draw sketches showing cable profiles **[25]**

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Total No. of Questions : 6]

SEAT No. :

P1520

[Total No. of Pages : 3

[4265] - 456

M.E. (Civil) (Structures)

STRUCTURAL DESIGN OF CONCRETE BRIDGES

(2008 Course) (Sem. - I) (Elective - I(b))

Time :4 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Use of IRC - 5,6,18,27,45,78 & 83 codes, IS 1343, IS 456-2000 is allowed.***
5) ***Mere reproduction of theory from IS or IRC codes as answer will not get full credit.***
6) ***Neat diagrams must be drawn wherever necessary.***
7) ***Assume any other data, if necessary.***

SECTION - I

Q1) a) Write short note on planning of bridges. **[8]**

b) Explain IRC standards for live load on road bridges. **[9]**

c) Write detailed note beam and slab deck bridges. **[8]**

Q2) a) Design the culvert with the data. **[18]**

Clear span of the culvert = 5.6 m

Clear carriage way width = 7.5m

Size of kerb = 200mm × 600 mm

Average thickness of wearing coat 100 mm

Use material M25, Fe 500

Loading class AA

P.T.O.

Draw the cross section showing details of reinforcement at mid-span and at junction of the slab are kerb.

b) Write short note economical span of bridge. **[7]**

Q3) Design intermediate post tensioned prestressed concrete Tee Beam Bridge for the following: **[25]**

Effective span = 15m, width of carriageway =7.5m, No. of beams 4, equally spaced along the carriageway width, Spacing of cross girders = 3m c/c, width of footpath on either side of carriageway = 1.2m loading class = IRC class AA., kerb size = 200 × 600mm, concrete grade M45 Design should include detail load, bending moment calculation, Check fiber stresses in concrete Draw sketches showing cable profiles.

SECTION - II

Q4) a) Describe different factor affecting the design of rigid frame bridge. **[8]**

b) Explain with sketches, how rigid frame bridges are different from simply supported bridges. **[9]**

c) Explain with sketches necessity of expansion joint in bridges. **[8]**

Q5) a) Write a short note on Forces acting on abutments. **[7]**

b) Design a reinforced elastomeric bearing at a pinned end of a plate girder of a bridge with following data. **[18]**

Maximum vertical load= 950 kN

Dynamic vertical load = 90 kN

Transverse lateral load = 40 kN

Longitudinal load = 50 kN

Longitudinal total translation 12 mm

Rotation at support 0.003°

Shear modulus of elastomeric bearing = 1.2 N/mm^2

Allowable comp. stress for concrete. = 8 N/mm^2

Allowable comp. stress for elastomer = 10 N/mm^2

Q6) a) Design wall type RCC pier for the following: **[18]**

Top width of pier = 1.2m with semicircular ends

Length of pier = 7m excluding the semicircular part

Height of above footing = 9m

HFL above the top of footing = 7m

Total DL Reaction = 1800kN

Total LL Reaction = 1100kN

Tractive force = 130kN

C/C distance of bearing on either side of centre line of pier = 1 m

BM in traffic direction due to unequal DL &LL = 500 kN-m

Material of pier and footing = M40 & Fe500

Safe bearing capacity = 200 kN/m^2

Velocity of water current = 3m/s consider the cross current also

Design the RCC footing and reinforcement in pier, check the stresses at the bottom of the pier.

b) List merits and demerits caisson type foundation used for bridge. **[7]**

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Total No. of Questions : 6]

SEAT No. :

P1521

[Total No. of Pages : 2

[4265] - 457

M.E. (Civil) (Structure)

DESIGN OF COMPOSITE CONSTRUCTION

(2008 Course) (Semester - I) (Elective - I(c))

Time :4 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain composite construction? What are the advantages of composite construction? Explain the IS codal provisions for the same? **[10]**

b) Explain the behavior of composite beam? **[5]**

c) Show that for no interaction case, at x = 0, slip strain is maximum and slip is zero. Also draw typical deflection, slip strain and slip for above condition. **[10]**

Q2) a) Compare the stress block parameters for concrete strength as per IS 456-2000 and Eurocode using figures and equations? **[15]**

b) Explain the three structural elements of composite floors. State and explain the terms of the equation for neutral axis above sheeting? **[10]**

P.T.O.

Q3) A composite column of 400mm × 400mm × 3500mm is cast with M25 concrete grade and ISHB 300 steel section. It consists of 4 bars of 16mm diameter of FE 500. If the design axial load is 1600kN and design moment about xx axis is 200kN-m. Check the adequacy of concrete encased composite section for uniaxial bending. For steel section fy = 250MPa and modulus of elasticity for steel is 200GPa and for concrete 28500. **[25]**

SECTION - II

Q4) A composite truss has the data as given below: **[25]**

a) span of truss = 12m

b) spacing of truss = 5m

c) slab thickness = 120mm

d) profile depth = 70mm

e) self weight of deck slab = 2.8kN/m^2

f) maximum laterally unrestrained length in top chord = 1.5m

g) concrete grade = M30

Design

i) Top chord member

ii) Bottom chord member

iii) Design the capacity of composite section in compression.

Q5) Explain design steps of multistoried residential composite building for following components - **[25]**

a) Slabs with profile decks

b) Vertical cross bracings

c) Foundation.

Q6) State IRC specifications and code of practice for loads and composite constructions in bridges. Enlist detailed steps in composite deck slab design. **[25]**

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Total No. of Questions : 6]

SEAT No. :

P1522

[Total No. of Pages : 2

[4265] - 461

M.E. (Civil) (Structures)

PLASTIC ANALYSIS AND DESIGN OF STEEL STRUCTURES

(2008 Course) (Semester - I) (Elective - II(c))

Time :4 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat sketches must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of non-programmable calculator, IS:800 - 2007 and steel table is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain complete, over complete and partial plastic collapse of structure. **[5]**

b) A simply supported beam of T section is subjected to sagging bending moment. Find the shape factor if permissible yield stress in compression and tension is 250 MPa and 300 MPa respectively. The section has following dimensions: **[15]**

Top flange = 150 mm x 15 mm

Web = 15 mm x 175 mm (excluding top flange)

c) Explain various factors considered to arrive for partial safety factor for material. State IS: 800 - 2007 values for this factor. **[5]**

Q2) a) A continuous beam ABCD is simply supported at A, B, C & D. Spans AB = 5m, BC = 6m and CD = 5m. Mp is uniform. It is subjected to factored load as under: **[12]**

i) Total udl value on AB and CD = 2W

ii) Concentrated load W at center of BC

Find collapse load W and statically admissible bending moment diagram. What is the type of collapse?

P.T.O.

b) A rectangular portal frame ABCD has fixed base A & D, 5 m apart. Height of column AB and CD is 6 m. A vertical downward load 2W is acting at the center BC and horizontal point load W is acting at B in the direction of BC. Plastic moment of resistance for beam is 2 times that of column. Determine collapse load. **[13]**

Q3) A symmetrical gable portal frame ABCDE has bases A & E fixed 14 m apart. Vertical column AB & ED each equal to 8 m and apex C is 10m above the base. It is subjected to horizontal load 45 kN at B and a concentrated load 90 kN each at center of each gable beam. Mp is uniform. **[25]**

a) Draw all basic mechanism and obtain Mp in each case.

b) Draw (Sway + Gable) mechanism and obtain Mp

SECTION - II

Q4) a) Classify symmetrical 'I' section having width of flange 350 mm and overall depth 480 mm. The thickness of section is 12 mm uniform. F_y = 260 Mpa. If this section is used as a beam, find moment of resistance as per IS: 800 - 2007 codal provisions. **[10]**

b) Using data in Q No.2 (a) for W = 120 kN and fy = 250 Mpa design rolled steel section for Mp. Check the section for combined action of moment and shear. Use IS: 800-2007 specifications. **[15]**

Q5) A column in a building is subjected to factored axial compressive load of 300 kN & factored bending moments of 60 kNm & 30 kNm at its top hinged end & bottom fixed end respectively. Both bending moments produce identical curvature about zz axis. Height of column is 5m & it is braced at its mid-height to provide local lateral restraint for buckling about yy axis. The column belongs to nonsway frame. Design the section & use specifications for interaction between moment & axial compression as per IS : 800 - 2007. **[25]**

Q6) Design symmetrical gable portal frame for workshop shed of span 26m. Height of both columns is 10m and apex is at 13m from base. Column bases are fixed. AC sheet is used over purlins. Using (DL + LL) combination, design uniform section for bending as per IS : 800 - 2007. **[25]**

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Total No. of Questions : 6]

SEAT No. :

P1524

[Total No. of Pages : 2

[4265] - 469

M.E. (Civil) (Structures)

NON-LINEAR ANALYSIS OF STRUCTURES

(2008 Course) (Elective - III (d)) (Semester - II)

Time :4 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of non-programmable calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Derive load deflection equation for a beam with hinged ends. Use shape function $w(x) = \Sigma A_m \sin \pi x/a$. **[10]**

b) Derive the governing nonlinear equation for a moderately thick beam due to stretching. **[15]**

Q2) a) Derive the simplified nonlinear governing equation using Berger approximation for plates with immovable boundaries. **[8]**

b) Explain 'Displacement Equations Approach' of nonlinear analysis of plates. **[10]**

c) Derive Material Nonlinearity of plates using Ramberg-Osgood relation. **[7]**

Q3) a) Find the nonlinear load deflection relationship of rectangular plates. **[17]**

b) State a system of four equations governing the large amplitude flexural vibrations of anisotropic skew plates. **[8]**

P.T.O.

SECTION - II

Q4) a) Obtain the deflection components of cantilever column at post-buckling stage due non linear behaviour. **[17]**

b) Derive nonlinear stiffness matrix for a truss element. **[8]**

Q5) a) Develop stiffness matrix for nonlinear analysis of plane frame as shown in fig . 1. **[15]**

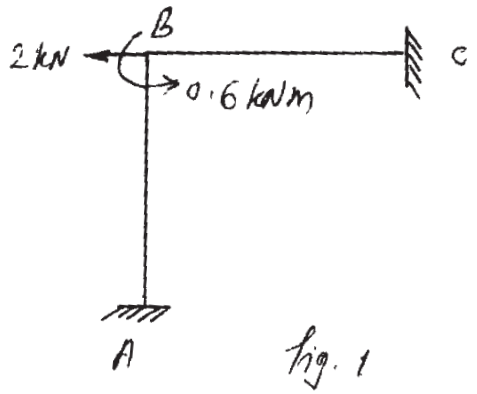

fig. 1

l(AB) = l(BC) = 3m;

Cross sectional area of each element = 0.02 × 0.02m;

E = 200 GPa

b) Explain Incremental procedure of analysis of material nonlinear problems. **[10]**

Q6) a) Perform elastic plastic material analysis of cantilever beam subjected to point load at the free end. **[15]**

b) Explain initial strain method for Elastic-Plastic Behaviour. **[10]**

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Total No. of Questions : 8]

SEAT No. :

P1525

[Total No. of Pages : 3

[4265] - 480

M.E. (Civil) (Environmental Engineering)

PRINCIPLES AND DESIGN OF BIOLOGICAL TREATMENT SYSTEMS

(2010 Course) (Semester - I) (Elective - II (b))

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data wherever necessary.***

SECTION - I

Q1) a) State the objectives of biological treatment. Differentiate between attached and suspended growth process. **[8]**

b) The 5-day BOD of a waste is 280 mg/l. The ultimate BOD is reported as 410 mg/l. At what rate is the waste being oxidized? **[8]**

Q2) a) Define Unit Operation and Unit Process and give three examples of each. State the Primary, Secondary and Tertiary treatments with suitable examples. **[8]**

b) Design an aerated grit chamber for the treatment of municipal wastewater. The average flow rate is 0.5 m^3/s. Take peak factor as 2.75. **[8]**

P.T.O.

Q3) a) Design primary sedimentation tank to treat domestic wastewater flow of a town having 5,00,000 population. Use following data: **[8]**

i) Average rate of water consumption = 230 lpcd.

ii) Waste generation rate = 90% of the water supplied.

iii) Suspended solids in wastewater =245 mg/l.

iv) BOD_5 AT 20ºC = 210 mg/l.

v) SLR at daily average flow = 40 m^3/m^2-d. SLR at peak flow = 100 m^3/m^2-d.

vi) Detention time = 2.0 Hrs.

b) Discuss sampling of wastewater in detail explaining grab and composite samples. **[8]**

Q4) Write short notes on: **[18]**

a) Flow equalization.

b) Symbiotic relationship between bacteria and algae.

c) Disinfection with chlorine compounds.

d) Techniques for control of odour and volatile organic compounds.

SECTION - II

Q5) a) Design an activated sludge process for municipal wastewater flow rate of 8000m^3/day, BOD of settled effluent = 180 mg/l, expected BOD of treated effluent = 10 mg/l, yield coefficient = 0.5 kg/kg, k_d = 0.05/day, MLSS = 3000 mg/l, return sludge solids concentration = 10,000 mg/l, and mean cell residence time is 10 days. **[12]**

Determine

i) Volume of reactor,

ii) F/M ratio,

iii) VLR,

vi) Oxygen requirement,

v) Recycle ratio &

iv) BOD removal efficiency.

b) Discuss sludge volume index & sludge bulking. **[4]**

Q6) a) Design a high rate trickling filter using NRC equations for : **[8]**

i) sewage flow = 5MLD,

ii) recirculation ratio = 1.5,

iii) BOD of raw sewage = 300 mg/l,

iv) BOB removal in PST = 35%,

v) final effluent BOD desired = 30 MG/L.

b) Discuss ventilation and recirculation in trickling filters. **[8]**

Q7) a) Design a secondary sedimentation tank to treat effluent from Activated Sludge Plant with average wastewater flow = 50 MLD, MLSS concentration in effluent = 3000 mg/l & peak flow factor = 2.25. **[8]**

b) With the help of a flow chart explain various processes involved in the treatment and disposal of sludge. **[8]**

Q8) a) Design a staged RBC for BOD removal using following data: **[10]**

Parameter	Unit	Primary effluent	Target effluent
Flowrate	M^3/d	4000	
BOD	mg/l	140	10
sBOD	mg/l	90	10
TSS	mg/l	70	20

b) Explain the working principle of UASB process with reactor cross section. Draw a flow chart to treat municipal wastewater with UASB Reactor. **[8]**

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Total No. of Questions : 8]

SEAT No. :

P1528

[Total No. of Pages : 2

[4265]-492
M.E. (Civil - WREE)
ADVANCED FLUID MECHANICS
(2012 Course) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, and non - programmable electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Derive three - dimensional form of equation of continuity in cylindrical co - ordinate system. **[8]**

b) Define two dimensional source, sink and doublet. Obtain the expressions for velocity potential function and stream function for these cases in Cartesian and polar co - ordinates. Sketch the patterns of equipotential lines and streamlines in these cases. **[9]**

Q2) a) In what respects are Navier - Stokes' equations different from Euler's equations of motion both for three - dimensional flow in cartesian co - ordinate system? Starting from Euler's equations of motion, obtain the derivation of Navier - Stokes' equations. **[9]**

b) Using Navier - Stokes' equations or otherwise, derive the general equation for velocity distribution for steady incompressible laminar flow between parallel surfaces. **[8]**

Q3) a) Derive Karman's Momentum Integral equation for boundary layer flow under the condition of zero pressure gradient. **[8]**

b) State the general form of velocity distribution equation as suggested by Karman and Pohlhausen for laminar boundary layer. Also explain the essential and desirable boundary conditions which must be satisfied by any assumed velocity distribution equation. Check the validity of the velocity distribution equation $\frac{u}{U} = 2\frac{y}{\delta} - 2\frac{y^3}{\delta^3} + \frac{y^4}{\delta^4}$ in the light of these boundary conditions. **[8]**

P.T.O.

Q4) Write short notes on ANY FOUR of the following : **[16]**

a) Solution of Laplace equation by Relaxation Method;

b) Causes of boundary layer separation and its control;

c) Conformal mapping;

d) Karman - Pohlhausen's solution for boundary layer;

e) Cauchy - Riemann equations.

SECTION - II

Q5) a) Explain the statistical theory of turbulence. **[6]**

b) Differentiate between isotropic and homogeneous turbulence. **[4]**

c) Write down Reynolds' equations of motion. Explain the significance of each term in the equation. **[6]**

Q6) a) Explain the following : **[8]**

i) Probability density function.

ii) Prandtl's mixing length hypothesis.

b) For turbulent flow through a circular pipe of diameter 300 m, the centreline velocity is 1.65 m/s and the local velocity at a radial distance of 75 mm is 1.5 m/s. Calculate the discharge flowing through the pipe. Also obtain the friction factor and the average height of roughness protrusions for the pipe. **[8]**

Q7) a) Derive the fundamental equation for velocity of propagation of compression pressure wave in an elastic medium. Modify this equation for isothermal and frictionless adiabatic flow. **[9]**

b) Air flows through a duct of variable cross - sectional area. At a particular cross - section, the velocity is 360 m/sec, pressure 85 kN/m^2 (abs) and temperature 38°C. Assuming frictionless adiabatic condition, calculate the velocity at a section where the pressure is 138 kN/m^2 (abs). Take R = 0.297 kJ/kgK and K = 1.4. Also calculate the temperature and Mach number at the section. **[9]**

Q8) Explain the following : **[16]**

a) Mechanism of turbulence;

b) Moody's diagram;

c) Energy equation in compressible flow;

d) Mach angle and Mach cone.

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Total No. of Questions : 8]

SEAT No. :

P1529

[Total No. of Pages : 2

[4265]-494
M.E. (Civil) (WREE)
HYDROLOGY AND GROUND WATER
(2012 Course) (Elective - I(b)) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, non programmable electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the procedure of Depth - Area - Duration analysis. Discuss in brief the practical uses of these curves. **[8]**

b) Following are the ordinates of 4 - hr unit Hydrograph. Derive the ordinates of 12 - hr unit Hydrograph for the same catchment using S - Curve method. **[8]**

Time (hr)	0	4	8	12	16	20	24	28	32	36	40	44
Ordinates of 4 hr. UH m^3/sec.	0	18	75	130	155	130	85	60	30	15	5	0

Q2) a) Define time series. Discuss the components of time series and give example of each. **[8]**

b) Discuss the Thomas and Fiering method for generating monthly flows. **[8]**

Q3) a) Explain Gumbel's method of estimation of peak floods. **[8]**

b) Explain the following terms. **[8]**

i) Standard project flood.
ii) Probable maximum flood
iii) Design flood.
iv) Design storm.

P.T.O.

Q4) Writes short notes on. **[18]**

a) Infiltration indices.

b) Various - statistical distributions.

c) Rational method of peak flood estimation.

SECTION - II

Q5) a) Derive the basic differential equation of unsteady ground water flow in a confined aquifer. State the assumptions involved. **[8]**

b) A tube well of 30 cm diameter penetrates fully a confined aquifer. The length of the strainer is 25 m. Calculate the yield from the well under a drawdown of 3 m. The coefficient of permeability of aquifer is 48 m/day. Assume radius of circle of influence equal to 200 m. **[8]**

Q6) a) Discuss any two methods for ground water exploration. **[8]**

b) Write a note on quality of ground water and ground water pollution. **[8]**

Q7) a) Discuss various parameters of ground water budget. **[8]**

b) What is artificial recharge of ground water? Explain any two methods. **[8]**

Q8) Write notes on : **[18]**

a) Interference of wells.

b) Pumping machinery for tube wells.

c) Method of images.

♦♦♦♦

Total No. of Questions : 10]

SEAT No. :

P1541

[Total No. of Pages : 2

[4265]-548
M.E. (Mechanical) (Mechatronics)
INDUSTRIAL AUTOMATION
(2008 Course) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Solve any three questions from Section I and any three questions from Section II.***
2) ***Answers to each section should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data wherever necessary but mention it clearly.***
5) ***Use of scientific calculator is allowed.***

SECTION - I

Q1) a) Explain START and STOP button ladder programs used in PLC programming with usual notations. **[8]**

b) Explain the concept of sourcing and sinking terminals of PLC. **[8]**

Q2) a) Explain Count Up Timer Instruction w.r.t, conveyor with all status bits. **[8]**

b) Explain with a schematic diagram basic electromechanical relay with all its terminals. **[8]**

Q3) a) Explain Examine ON and Examine OFF Conditions with two suitable examples of each in the form of ladder diagrams. **[8]**

b) Compare delay on and delay off timers with suitable industrial application. **[8]**

Q4) a) Given four push buttons (S1, and S2) of Normally Open (NO) type, two lamps namely RED(L1) and GREEN(L2). Write the PLC ladder diagram for following objectives.

i) When S1 is pushed and S2 is not pushed RED lamp is On

ii) When S1 is not pushed and S2 is pushed GREEN lamp is On

iii) When both the buttons are pushed or not pushed, both the lamps are Off

Write the names of input terminals to which switches are connected as well as output terminal names to which lamps are connected

Write the Boolean (Digital) equations with truth table of each rung you draw

Draw the ladder diagram using only Examine ON, Examine OFF and output coil symbols. **[12]**

P.T.O.

b) List three important specifications of PLC. **[6]**

Q5) a) Significance of Boolean algebra in constructing ladder program. Explain with suitable example. **[8]**

b) Explain in brief the concept and applications of SCADA. **[8]**

SECTION - II

Q6) a) Explain the full form of G codes for linear interpolation and circular interpolation. **[8]**

b) Explain Modal and Non Modal commands in NC part program with two examples each. **[8]**

Q7) a) Figure Q7(a) shows a profile for turning job. Prepare a NC part program, mention all the assumptions including raw material dimensions. Write the program in TAB sequential format. Do not use special canned cycles. **[12]**

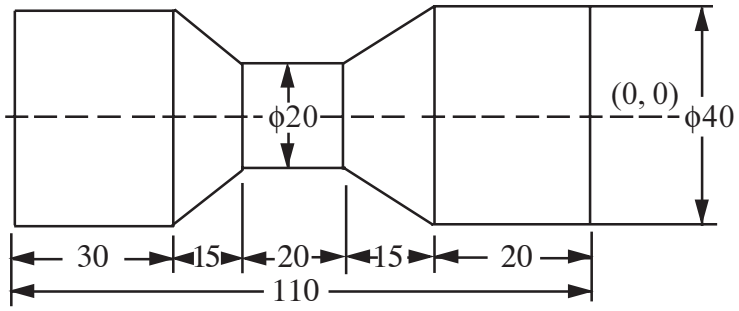

Figure Q7(a)

b) Explain three advantages of subprograms in APT programming. **[6]**

Q8) a) Explain the significance of absolute coordinates and incremental co - ordinates with suitable example. **[8]**

b) Discuss in brief the flexible manufacturing systems. **[8]**

Q9) a) Discuss in brief tool offset and wear offset in CNC programming. **[8]**

b) Principle of working and types of position sensors used in CNC machines. **[8]**

Q10) a) Discuss in brief tool offset and wear offset in CNC programming. **[8]**

b) Explain significance G94, G95, G98 and G99 with suitable example. **[8]**

♦♦♦♦

Total No. of Questions : 10]

SEAT No. :

P1545

[Total No. of Pages : 2

[4265]-566
M.E. (Mechanical) (Automotive Engg.)
AUTOTRONICS
(2008 Course) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Solve any three questions from Section I and any three questions from Section II.***
2) ***Answers to each section should be written in separate answer book.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data wherever necessary but mention it clearly.***
5) ***Use of scientific calculator is allowed.***

SECTION - I

Q1) a) Explain in brief Crank angle position sensors w.r.t. need, significance applications in recent automobiles. **[8]**

b) Explain in brief electronic spark timing. **[8]**

Q2) a) Write a short note on injection system controls. **[8]**

b) Explain with a neat block diagram Multi Point Fuel Injection System. **[8]**

Q3) a) Discuss in brief vehicle speed sensors. **[9]**

b) Explain significance of oxygen sensors in exhaust emission control engineering. **[9]**

Q4) a) Explain advantages of electronic ignition systems. **[8]**

b) Discuss in brief integrated engine control system. **[8]**

Q5) a) Describe detonation sensors w.r.t. significance, input and output. Explain the use of its signal to Engine Control Unit (ECU). **[8]**

b) Describe in brief basic sensor arrangement in Engine Management System. **[8]**

P.T.O.

SECTION - II

Q6) a) Discuss the comfort aspects of Seats in luxury cars. **[8]**

b) Explain Microprocessor and microcomputer applications in automobiles. **[8]**

Q7) a) Write a short note on electronic governors. **[8]**

b) Explain starter motor & drive mechanism in Luxury cars. **[8]**

Q8) a) Explain in brief cruise control in modern cars. **[8]**

b) Explain with neat block diagram the Common Rail Diesel injection system. **[8]**

Q9) a) Explain alternator regulation for charging. **[8]**

b) Explain the recent trends electronic power windows. **[8]**

Q10) a) Discuss in brief dashboard instruments with respect to warning system and safety devices. **[9]**

b) Describe in brief basic sensor arrangement in Engine Management System. **[9]**

♦♦♦♦

Total No. of Questions : 6]

SEAT No. :

P1555

[Total No. of Pages : 2

[4265] - 625

M.E. (Electrical) (Power Electronics and Drives)

ENERGY MANAGEMENT AND POWER QUALITY IN ELECTRICAL DRIVES

(2008 Course) (Semester - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer two questions from section I and two questions from section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Explain High Efficient Motors. Justify its advantages with the help of a case study. **[15]**

b) Explain with example of a case study the optimal selection & sizing of Variable speed drives. **[10]**

Q2) a) Explain energy Conservation measures in Lighting Schemes. **[10]**

b) Explain Transformer loading & efficiency analysis. **[15]**

Q3) a) Explain Optimal operation of Cogeneration plants with the help of a case study. **[15]**

b) Explain Energy conservation measures in Solar Water Heaters & Electrolytic Processes. **[10]**

P.T.O.

SECTION - II

Q4) a) Explain power quality disturbances and its causes. **[15]**

b) What are power quality indices? Explain different types. **[10]**

Q5) a) Explain effect of power quality problems in equipments and methods for its correction. **[10]**

b) What are power system harmonics? Explain its causes, effects and corrective measures. **[15]**

Q6) a) Explain how transformer connection have great influence on power quality. **[15]**

b) Explain shunt type active power filter and its control scheme. **[10]**

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Total No. of Questions : 6]

SEAT No. :

P1556

[Total No. of Pages : 2

[4265] - 630

M.E. (Electrical) (Power Electronics & Drives)

FACTS & HVDC

(2008 Course) (Elective - II(a)) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer two questions from Section-I and two questions from Section-II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) What are different sources of reactive power in power system? Why reactive power compensation is required? **[15]**

b) Explain with the help of neat diagram functioning of TCSC. **[10]**

Q2) a) Explain in brief different compensating techniques used in power systems. **[15]**

b) Give comparison between series and shunt compensation. **[10]**

Q3) a) With the help of block diagram explain the working of different FACTS controllers. **[12]**

b) What is UPFC? How it can be used for power flow control? **[13]**

P.T.O.

SECTION - II

Q4) a) Discuss the role of HVDC in modern power system. **[12]**

b) Draw a schematic diagram of a typical HVDC converter station and explain the working of each part of it in detail. **[13]**

Q5) a) With the help of neat diagram and necessary waveforms explain the working of 6 pulse bridge converter. **[15]**

b) What are the different faults occurred in converter circuit? Discuss the protection provided against it. **[10]**

Q6) a) From fundamentals explain basic principle of DC link control? Draw and explain basic converter control characteristics. **[15]**

b) Explain the different types of filters used in HVDC substation. **[10]**

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SECTION - I

Q1) a) What are different sources of reactive power in power system? Why reactive power compensation is required? **[15]**

b) Explain with the help of neat diagram functioning of TCSC **[10]**

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SECTION - II

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Q6) a) From fundamentals explain basic principle of DC link control? Draw and explain basic converter control characteristics. **[15]**

b) Explain the different types of filters used in HVDC substation. **[10]**

Total No. of Questions : 6]

SEAT No. :

P1560

[Total No. of Pages : 2

[4265] - 637

M.E. (Electrical) (Power Electronics and Drives)

MICRO-CONTROLLER APPLICATIONS

(2008 Course) (Elective - III(C)) (Semester - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer two questions from section I and two questions from section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Draw and explain architecture of micro-controller 8051 also explain its parallel ports **[15]**

b) Explain RESET circuitry and POWER DOWN mode of 8051. **[10]**

Q2) a) Explain different addressing modes of 8051 with examples & develop a program to interchange the content of 30H-39H and C000H-C009H. **[10]**

b) Explain microcontroller based auto synchronizing unit. **[15]**

Q3) a) Explain queues and macros. **[15]**

b) Explain cross assembler directives. **[10]**

P.T.O.

SECTION - II

Q4) a) Explain interrupt structure in 8051 and different modes. **[15]**

b) Explain TCON and TMOD timers with respect to 8051. **[10]**

Q5) a) How 8051 based 3 phase SPWM control scheme is developed. **[10]**

b) Explain different sensors/Transducers interface scheme with 8051. **[15]**

Q6) a) Explain microcontroller based PMBLDC motor control scheme. **[15]**

b) Explain VSI based induction motor control scheme. **[10]**

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Total No. of Questions : 6]

SEAT No. :

P1561

[Total No. of Pages : 3

[4265]-643

M.E. (E &TC) (Microwave)

RF WAVE AND MICROWAVE CIRCUIT DESIGN

(2008 Course) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Solve any TWO questions from each section.***
2) ***Figure to right indicates full marks.***
3) ***Assume suitable data whenever necessary.***

SECTION - I

Q1) a) Describe RF system along with design consideration or bottleneck along with Example. **[10]**

b) Explain in details the design consideration related to amplifier design? **[10]**

c) Discuss the term gain compression in RF system design. **[5]**

Q2) a) Explain in detail P - MOS (Depletion type) device with its fabrication structure and input, output waveforms. **[10]**

b) The n- type three phase surface channel CCD has the following specification. **[15]**

i) Electron density $N_{max} = 2 \times 10^{12}$ cm^{-3}

ii) Insulator relative dielectric constant $\epsilon r = 3.9$

iii) Insulator thickness d = 0.15 μm.

iv) Insulator cross section $A = 0.5 \times 10^{-4}$ cm^2

v) Power dissipation allowable per bit P = 0.67 mW

vi) Clock frequency = 10 MHz.

Compute

1) The insulator capacitance per square centimeter.

2) Determine the maximum stored charges per well in coulombs.

3) Find out required gate voltage.

P.T.O.

Q3) a) A typical n - channel GaAs MESFET has the following parameters. **[18]**

i) Electron concentration $N_d = 8 \times 10^{17}$ cm^{-3}

ii) Channel width a = 0.1 μm

iii) Dielectric constant Єr = 13.1

iv) Channel length L = 14 μm

v) Channel width Z = 36 μm

vi) Electron mobility μ = 800 cm 2/V-s

vii) drain voltage $V_d = 5$ V

viii) Gate voltage $V_g = -2$V

ix) Saturation drift velocity $V_s = 2 \times 10^5$ m/s

Calculate

1) Pinch - off voltage

2) Velocity ratio

3) Saturation current at $V_g = 0$ V

4) Drain current I_d

b) Compare microwave transistor with respect to low frequency transistor on the basis of following points. **[7]**

i) Frequency response

ii) Power handling capacity

iii) Fabrication techniques

iv) Size of transistor

v) Operating voltages required.

Also mention the typical operating range for each parameter.

SECTION - II

Q4) a) What is Gunn effect? How it is used for microwave generation? Discuss Two - valley model theory along with necessary figures, symbol for diode & voltage characteristic graphs. **[15]**

b) A typical GaAs Gunn diode has a following parameters : **[10]**

i) Threshold field Eth = 2800 V/cm

ii) Applied field E = 3200 V/cm

iii) Device length L = 10 μm

iv) Coping concentration $n_0 = 2 \times 10^{14}$ cm^{-3}

v) Operating frequency f = 10GHz

Find

1) Electron drift velocity

2) Current density

3) Estimate negative current mobility.

Q5) a) A BJT is used in common base configuration with biasing condition as V_{ce} = 3V, V_{be} = 0.9V, The S parameters for this condition are $S_{11} = 1.47\angle 125°, S_{12} = 0.327\angle 130°, S_{21} = 2.2\angle -63°$ and $S_{22} = 1.23\angle -45°$. Design a series feedback oscillator at frequency f = 1.5 GHz. **[13]**

b) Explain the criterion for mixer design. **[12]**

Q6) a) Draw generic amplifier system and discuss the concept transducer power gain, available power gain and operating power gain. **[8]**

b) Discuss stabilization method for transistor amplifier design. **[5]**

c) A MESFET operated at 5.7 GHz has the following S parameters. $S11 = 0.5\angle -60°, S12 = 0.02\angle 0°, S21 = 6.5\angle 115°$ and $S22 = 0.6\angle -35°$. Determine

i) Stability of the device.

ii) Find the maximum power gain under optimal choice of the reflection coefficient assuming no unilateral gain.

iii) Adjust the load reflection coefficient such that the desired gain is realized using concept of constant gain circle.

[12]

♦♦♦♦

Total No. of Questions : 8]

SEAT No. :

P1562

[Total No. of Pages : 2

[4265] - 646

M.E. (E & TC) (Microwave)

COMMUNICATION NETWORKS

(Semester - I) (2008 Course) (Elective - I(c))

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any Three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Discuss the network design and network performance issues of communication networks. **[16]**

Q2) a) If 0.2 Erlangs of traffic is offered to a single line and that 50% of the blocked calls retry. What are the probabilities of blocking and loss predicted by the extended Erlang - B Method. **[8]**

b) Explain the M/M/1 Queueing system. **[8]**

Q3) a) Draw and explain the structure of a Network Design Tool. **[8]**

b) Draw and explain the format of a Frame Relay frame. **[8]**

P.T.O.

Q4) Write short notes (any Three): **[18]**

a) Centralised Data Networks.

b) Distributed Data Networks.

c) Static Shortest Path Routing.

d) Erlang B - Function.

SECTION - II

Q5) a) Compare ATM with TCP - IP and point out the main differences. Discuss the pros and cons of both approaches & their influences on mobility & wireless access. **[10]**

b) Differentiate between the IEEE 802.11a and 802.11b WLAN standard. **[6]**

Q6) a) Explain the applications and set-up requirement of protocol analyser. **[8]**

b) Draw and explain the three common firewall configurations. **[8]**

Q7) a) Explain the applications of network monitoring tool and what are insecurities while using the same tool. **[8]**

b) Draw and explain the architecture of a Wi-MAX network. **[8]**

Q8) Write short notes (any three): **[18]**

a) Security on E-mails.

b) Bluetooth Protocol Stack.

c) AES algorithm.

d) Video Streaming.

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Total No. of Questions : 8]

SEAT No. :

P1563

[Total No. of Pages : 2

[4265] - 648

M.E. (E & TC) (Microwave)

SPEECH PROCESSING AND APPLICATION

(2008 Course) (Elective - II(b)) (Semester - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Use of scientific calculator is allowed.***
4) ***Assume suitable data, if necessary.***
5) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Draw LTI model for speech production. Convert the model to LTV model and explain its significance. **[8]**

b) Explain the classification of speech into voiced, unvoiced and silence part. Explain any one method for classification. **[8]**

Q2) a) Explain speech coding using ADPCM. Can you make it predictive? Explain the advantage of coding a difference signal. What is the need for an adaptive coding? **[10]**

b) What is a step size? How will you calculate the quantization noise power given the step size? Explain forward adaptive coding. **[8]**

Q3) a) What is LPC? What is the residual signal? Explain Linear predictive decoder. What is the use of detection a pitch value? **[8]**

b) What is the advantage of sub band coding? Will it increase the bit rate? **[8]**

Q4) a) What is a cepstral domain? Draw a block schematic to find a cepstrum of a speech segment? **[8]**

b) What are formants? Find the relation between the formants and LPC. **[8]**

P.T.O.

SECTION - II

Q5) a) What is MFCC? Explain the significance of a mel scale. Draw a block schematic to find MFCC and explain the function of each block. **[10]**

b) What is the need for time warping in case of template matching? Explain the procedure to find DTW. **[8]**

Q6) a) What is Hidden Markov Modeling? Explain the use of HMM for speech recognition. **[8]**

b) What is discriminant analysis? Explain the use of such analysis for classification purpose. **[8]**

Q7) a) What is speech synthesis? What is the state of art in speech synthesis? Can you add emotion in synthesized speech? **[8]**

b) Explain the problems involved in prosody synthesis. Explain the meaning of intonation. **[8]**

Q8) a) Which parameters of speech are useful for Speaker Verification? How will you train a system for speaker verification? **[8]**

b) What is an echo? How will you detect the echo? Explain any one method for echo cancellation. **[8]**

Total No. of Questions : 8]

SEAT No. :

P1564

[Total No. of Pages : 2

[4265] - 652

M.E. (E & TC) (Microwave)

MOBILE COMMUNICATION GSM & CDMA

(2008 Course) (Semester - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Solve any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the terms: **[8]**

i) Traffic measurement units ii) Grade of service

iii) Blocking probability iv) Traffic usage

b) Discuss CDMA access technique in detail. Mention its advantages and disadvantages. **[10]**

Q2) a) Explain the concept of frequency reuse in cellular communication. What are the advantages of this approach? **[8]**

b) What is handoff ? Explain how Handoff is achieved in Cellular Mobile Communication Systems. **[8]**

Q3) Explain the concepts of : **[16]**

a) Cell sectoring b) Cell splitting

Q4) With the help of a neat block diagram, explain the architecture of GSM. Write the functions of each block. **[16]**

P.T.O.

SECTION - II

Q5) Explain IS 95 CDMS standard. Explain its features, physical and logical channels. **[18]**

Q6) Write is spread spectrum? Explain the types of spread spectrum. State its advantages. **[16]**

Q7) a) What is fading? Explain with its types. **[10]**

b) Explain GMSK modulation technique. **[6]**

Q8) Write a note on: **[16]**

a) Rake receiver

b) OFDM

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Total No. of Questions : 8]

SEAT No. :

P1565

[Total No. of Pages : 2

[4265] - 653

M.E. (E & TC) (Microwave)

FIBER OPTIC COMMUNICATION

(Semester - II) (2008 Course) (Elective - III(a))

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Solve any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain fiber optic communication with the help of a neat block diagram. Also compare it with other communication techniques stating its advantages and disadvantages. **[10]**

b) A graded index fiber has the characteristics of N1 = 1.487 and $\Delta = 1.71\%$. For a link of 5km in length, compute pulse spreading due to modal dispersion and determine maximum bit rate. **[8]**

Q2) a) Explain fabrication techniques of optical fiber. **[10]**

b) A glass clad fiber is made with core glass of refractive index 1.5 and cladding is doped to give a fractional index difference of 0.0005. Find cladding index, critical internal reflection angle, the external critical acceptance angle, NA. **[6]**

Q3) a) Explain the working principle of an electro-optics switch with the help of an example. **[8]**

b) Draw and explain the schematic of an optical receiver. **[8]**

P.T.O.

Q4) What is attenuation? Explain the cause of attenuation in the case of optical fibers. Write a note on the degradation of the signal due to dispersion. **[16]**

SECTION - II

Q5) a) Explain OTDR. How to locate fault in fiber using OTDR? **[10]**

b) Explain the working principle of any one optical source. **[8]**

Q6) a) Explain in detail the concept of WDM. **[8]**

b) Discuss the different power penalties in the optical link. **[8]**

Q7) a) Explain the terms **[8]**

i) BER

ii) Quantum Limit

b) What is mean by link power budget? How to calculate the required length of fiber if rest parameters are given? **[8]**

Q8) Explain in detail Raman Amplifier. **[16]**

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Total No. of Questions : 8]

SEAT No. :

P1567

[Total No. of Pages : 2

[4265] - 661

M.E. (E & TC) (VLSI & Embedded System)

ASIC DESIGN & MODELLING

(2008 Course) (Elective - I(a)) (Semester - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION – I

Q1) a) Explain the different type of modelling used in VHDL with respect to different constraints. **[6]**

b) Write a VHDL code for four bit Universal shift register. **[12]**

Q2) a) Draw and explain the ASIC design flow. **[8]**

b) Explain the block diagram of synthesis in detail and explain the technology library used in synthesis. **[8]**

Q3) a) Find the minimal test set for the circuit shown in fig. a. to show the coverage of various stuck at 1 for all possible tests. **[8]**

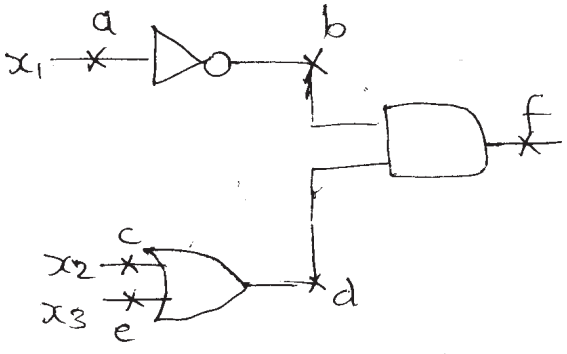

fig a

P.T.O.

b) Explain w.r.t floorplanning **[8]**

i) Goals and objectives

ii) Measurement of delay

iii) Floorplanning tools

iv) Channel capacity

Q4) Write short note on

a) Power grid analysis. **[6]**

b) Static timing analysis. **[6]**

c) EDA tool. **[4]**

SECTION - II

Q5) a) Explain placement using simulated annealing algorithm. **[8]**

b) Explain the method of partitioning a network and its graph theory. **[8]**

Q6) a) Explain the scan path technique for testable sequential circuit design. **[8]**

b) Explain the following terms. **[8]**

i) Signature analysis

ii) Fault grading

iii) Hazards

Q7) a) Explain with blocks the process involved in physical design. **[8]**

b) Draw and Explain the extraction flow in ASIC. **[8]**

Q8) Write short note on:

a) Kenighan-Lin algorithm. **[6]**

b) IC verification. **[6]**

c) Fault simulation. **[6]**

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Total No. of Questions : 8]

SEAT No. :

P1568

[Total No. of Pages : 3

[4265] - 663

M.E. (E & TC)(VLSI & Embedded System)

MACHINE INTELLIGENCE

(2008 Course) (Elective - I (c)) (Semester - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is an adaptive network? Describe in detail a multilayer perceptron and back propagation learning. **[8]**

b) What is meant by gradient decent methods? Describe the Method of Steepest descent and Newtons method and clearly explain the difference between the two. **[8]**

Q2) a) Explain: **[8]**

i) Eigenvalues

ii) Eigenvectors

iii) Principal Components

b) What is Hebbian learning? Explain how a hebbian-type learning rule can be used with a simple neural network to perform principal component analysis. **[10]**

P.T.O.

Q3) a) What is Data Clustering? Explain the K-means clustering, Fuzzy C-means clustering, Mountain clustering and Subtractive clustering. **[8]**

b) Describe in detail Radial Basis Function Networks. **[8]**

Q4) Write short notes on: **[16]**

a) Dynamic Programming.

b) Kohonen Self-Organizing Networks.

c) The Hopfield Network.

d) Learning Vector Quantization.

SECTION - II

Q5) a) Explain the following terms. Use mathematical equations and diagrams wherever necessary. **[8]**

i) Fuzzy set and membership functions.

ii) Universe of discourse.

iii) Strong α-cut (alpha cut).

iv) A convex fuzzy set.

b) Four types of fruits are available in the market; apples, bananas, oranges and grapes. Write the fuzzy set C showing your likeability of the fruit to eat. Draw a diagram illustrating the membership function of this fuzzy set C. What is the difference between fuzzy set theory and probability theory? **[8]**

Q6) a) Explain the following. Use mathematical equations and diagrams wherever necessary. **[10]**

i) Triangular and Gaussian MF.

ii) Cylindrical extension of one dimensional fuzzy set.

iii) Extension principle.

iv) Max-min composition.

b) $X = \{1, 2, 3\}$, $Y = \{\alpha, \beta, \gamma, \delta\}$ and $Z=\{a, b\}$ are fuzzy sets. **[8]**

R_1 = "x is relevant to y"

R_2 = "y is relevant to z"

are two fuzzy relations defined on X × Y and Y × Z respectively, which are expressed as

$$R_1 = \begin{bmatrix} 0.1 & 0.3 & 0.5 & 0.7 \\ 0.4 & 0.2 & 0.8 & 0.9 \\ 0.6 & 0.8 & 0.3 & 0.2 \end{bmatrix} \text{ and } R_2 = \begin{bmatrix} 0.9 & 0.1 \\ 0.2 & 0.3 \\ 0.5 & 0.6 \\ 0.7 & 0.2 \end{bmatrix}$$

Find the degree of relevance between 2 (ϵ X) and a (ϵ Z) using

i) Max-min composition

ii) Max-product composition.

Illustrate the composition of this fuzzy relation with diagram and appropriate possible paths between the elements.

Q7) a) Explain soft computing and artificial intelligence. What is derivative free optimization? **[8]**

b) What are genetic algorithms? Describe major components of genetic algorithms. **[8]**

Q8) Write short notes on: **[16]**

a) Fuzzy if-then rules and fuzzy reasoning.

b) The Mamdani fuzzy inference system.

c) Fuzzy filtered neural network.

d) Simulated Annealing.

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Total No. of Questions : 8]

SEAT No. :

P1569

[Total No. of Pages : 2

[4265] - 664

M.E. (E & TC) (VLSI & Embedded System Design)

RECONFIGURABLE COMPUTING

(2008 Course) (Elective - II (a)) (Semester - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Draw and explain the architecture of DPGA? Explain each block in detail. Highlights on , its limitations. **[16]**

Q2) a) Compare the FPGA, GPP and ASIC w.r.to functional capacity, data density and functional diversity. **[8]**

b) Give the detail mathematical analysis of interconnect growth, what are the various solutions. **[8]**

Q3) a) What is rent rule? How will you apply it in the design of your own RC devices? **[8]**

b) List out the typical characteristics and merits of multicontext FPGA. **[8]**

Q4) Write short notes on: **[18]**

a) Challenges in design of general purpose processor.

b) Network utilization efficiency.

c) Limitations of current FPGA.

P.T.O.

SECTION - II

Q5) a) List the research challenges in the software development for reconfigurable devices. **[8]**

b) Explain the hierarchical interconnect in detail. **[8]**

Q6) Draw and explain the architecture of TSFPGA. What are its merits and limitations? **[16]**

Q7) a) What is meant by data bandwidth? What is its impact in design of new architecture. **[8]**

b) What is peak performance density? Explain it with the help of determining parameters. **[8]**

Q8) Write short notes on: **[18]**

a) RP space area model.

b) Weak Upper bound and interconnects.

c) MATRIX.

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Total No. of Questions : 8]

SEAT No. :

P1570

[Total No. of Pages : 2

[4265]-668

M.E (E & TC) (VLSI & Embedded Systems)

EMBEDDED SIGNAL PROCESSING

(2008 Course) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Explain in place computations & bit reversal in FFT algorithm. Also explain number of computations for 8 point DFT & 8 point FFT. **[8]**

b) Show that multiplication of two DFT's is equal to the circular convolution. **[8]**

c) Draw and explain the 2 Pt- DFT operation called Butterfly? Why is it so called. **[2]**

Q2) a) Give differences between **[8]**

i) FIR & IIR filters

ii) Recursive & Non recursive realization of filter.

b) What are the basic types of elements used for realizing digital filters? Draw & explain different structures used for realizing filters. **[8]**

Q3) a) Determine the 2D, DCT coefficients for the following image. **[8]**

$$\begin{bmatrix} 100 & 50 \\ 100 & -10 \end{bmatrix}$$

b) What is STFT? Explain with example how STFT can be used for time frequency analysis. **[8]**

Q4) a) Design a first order digital low pass filter with a 3 dB cut off frequency at 0.3π by applying a bilinear transformation to a given analog butterworth filter with a transfer function. **[8]**

$$H(s) = \frac{1}{1+s}$$

P.T.O.

b) Write short notes on : **[8]**

i) Convolution & Correlation.

ii) Wavelets & Filter banks

SECTION - II

Q5) a) What is multirate DFGs? Explain process to compute the iteration bound of multirate DFG. **[8]**

b) In the SFG shown in Fig. 1, the computation time for each mode is assumed to be 1 u.t. **[8]**

i) Calculate the critical path computation time.

ii) Obtain an appropriate pipelined circuit with critical path 2 u.t.

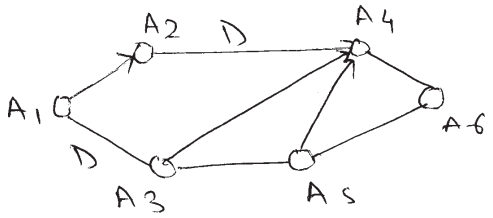

Fig. 1 . SFG

Q6) a) Consider the DFG shown in Fig. 2, where the number at each node denotes its execution time. **[8]**

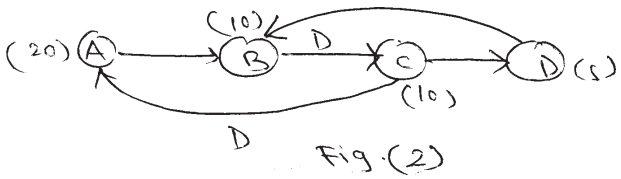

Fig. (2)

i) What is the maximum sample rate of this DFG.

ii) Manually retime this DFG to minimize the clock period.

b) Describe the folding transformation for multirate DSP system? **[8]**

Q7) a) Compare between microprocessor & DSPs? What are the various elements that central processing unit of TMS320C67XX consists of? **[8]**

b) Explain any two applications of DSP systems. **[8]**

Q8) a) Explain fixed point & floating point data format in DSP processor. **[4]**

b) What are the commonly used addressing modes in TMS 320C54XX? Explain. **[8]**

c) With the help of architecture of DSP processor explain **[6]**

i) Barrel Shifter.

ii) Cache memory.

iii) DAG

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Total No. of Questions : 8]

SEAT No. :

P1571

[Total No. of Pages : 2

[4265] - 669

M.E. (E & TC) (VLSI & Embedded System)

RF IC DESIGN

(2008Course) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain effects of Velocity Saturation on transistor Dynamics. **[8]**

b) What is EMC? What are the techniques to achieve EMC for ASIC? **[8]**

Q2) a) Describe Nonquasistatic behavior of MOSFET. **[8]**

b) Figure 1 shows a 75 Ω source resistance loaded with 75 Ω. Determine how much noise voltage per unit bandwidth is present at the output. Then, for any R_L, what is the maximum noise power that this source can deliver to any load? Also find the noise factor, assuming that R_L does not contribute to noise factor, and compare to the case where R_L does contribute to noise factor. (Figure 1). **[10]**

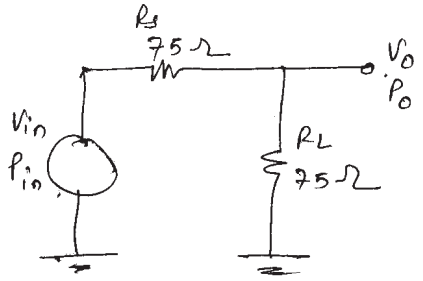

figure 1

P.T.O.

Q3) a) Discuss Cross talk, EMI or RFI mitigation techniques. **[8]**

b) Design Common Source amplifier with single tuned load. Voltage gain: > 50, Total BW (-3dB): > 1 MHz, Centre frequency: 75 MHz, Source resistance: 50 Ω, load: 10 pF purely capacitive. Assume 0.5 μm process technology. **[8]**

Q4) a) What do you mean by neutralization? How we implement it in the amplifier design? **[8]**

b) How AM – PM conversion destroys the Orthogonality ? **[8]**

SECTION - II

Q5) a) Discuss various issues while designing RF integrated Circuit. **[8]**

b) Discuss how open circuit time constant method is valuable tool for designing amplifier. **[8]**

Q6) a) Describe Various Bandwidth Enhancement techniques in amplifier design. **[8]**

b) Explain with necessary expressions various methods to compute bandwidth of HF CMOS amplifier. **[8]**

Q7) a) Compare Single ended LNA and Differential LNA with appropriate diagram and expression. **[8]**

b) Design LNA to operate at 900 MHz Design suitable bias, compute device width, degenerating inductance, noise figure and Lg. Assume suitable data. **[8]**

Q8) Write short notes on (any Three): **[18]**

a) S- parameters for two port network

b) Thermal Noise in MOSFETs.

c) Properties of Cascaded amplifier

d) SPURS

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Total No. of Questions : 8]

SEAT No. :

P1572

[Total No. of Pages : 2

[4265] - 674

M.E. (E & TC) (VLSI & Embedded Systems)

System on Chip (SoC)

(2008 Course) (Semester - II) (Elective - IV (b))

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Compute the zero delay signal probabilities for all signals in these networks assuming the signal probabilities for primary input as shown in Fig 1. **[8]**

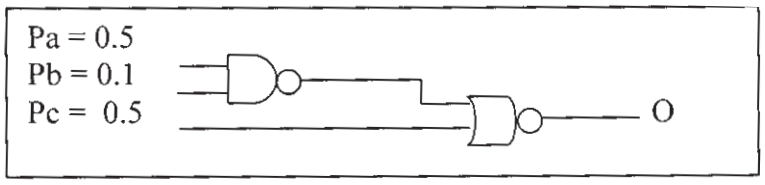

Fig 1

b) Explain rat's nest plot algorithm? What are limitations of this algorithm? **[8]**

Q2) a) What do you mean by design abstraction? Explain it one example? **[8]**

b) How many group node capacitance must be split into properly simulate an SRAM at switch level? **[8]**

Q3) a) Compare and contrast τ & π model. **[8]**

b) Explain Kitchen timer floor plan. Discuss area and speed issue in detail. **[8]**

Q4) List the advantages of all carry adders by comparing the average power consumption carried out by them? Which one is most suitable for low power designs? **[18]**

P.T.O.

SECTION - II

Q5) a) Compute using τ model, high to low transition time and delay (at power supply voltage 3.3 V) of input 2-input , static complementary NOR gate with minimum sized transistor driving these loads : **[8]**

i) An inverter with minimum sized pullup and pulldown .

ii) An inverter whose pullup and pulldown are both of size W = 10 λ, L = 10 λ

iii) A 2000 $\lambda \times 2 \lambda$ poly wire connected to an inverter with minimum sized pullup and pulldown .

Size the transistor in a two input NOR gate such that the gates rise time and fall time are approximately equal.

b) Differentiate: Delay independent Vs Delay dependent. **[8]**

Q6) a) What happens to delay in case of CMOS circuit if load capacitance is increased? **[8]**

b) Explain the different schemes employed for power analysis? **[8]**

Q7) a) Explain in detail : **[2 × 4 = 8]**

i) One row layout.

ii) Intra wiring.

b) Define layout routing? How automatic layout routing is playing important role in CMOS fabrication? **[8]**

Q8) a) Why an output pad does not require electrostatic discharge protection circuitry? **[3]**

b) Design and analyze 8 × 8 Wallance tree multiplier **[15]**

i) Draw the block diagram for an 8-bit carry save adder.

ii) Draw the complete block diagram for the multiplier.

iii) Draw the basic floorplan for multiplier including the partial product generators and Wallance tree.

iv) Identify the critical path through the multiplier.

Total No. of Questions : 8]

SEAT No. :

P1575

[Total No. of Pages : 2

[4265] - 679

M.E. (E & TC) (Signal Processing)

DIGITAL IMAGE PROCESSING

(2008 Course) (Semester - I) (Elective - I(a))

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Compare following image transforms based on energy compaction, computation cost, separability and application. **[9]**

i) K-L transform.

ii) DCT.

iii) Hadamard transform.

b) What is multi resolution analysis (MRA)? How Discrete Wavelet Transform (DWT) is used for MRA. **[9]**

Q2) a) Explain image enhancement using Homomorphic Filter. **[8]**

b) Pixel values of 8 levels 4 × 4 image are given below. Compute cumulative histogram. Give resultant image after Histogram equalization. **[8]**

5	7	7	5
5	0	0	7
7	5	5	0
1	1	1	5

P.T.O.

Q3) a) Explain the concept of spatial frequency. Discuss frequency response curve of human vision system. **[8]**

b) 4×4 gray-scale original image given below passes through box filter and Median filter, Compute filtered image outputs **[8]**

15	27	26	25
28	26	56	26
27	58	28	23
17	21	28	25

Q4) Write short notes on: **[16]**

a) Pseudo-coloring b) Principal Component analysis

SECTION - II

Q5) a) Explain split and merge image segmentation technique. **[8]**

b) Explain edge linking and boundary detection by local processing. **[8]**

Q6) a) With the help of block diagram explain process of lossless predictive encoding and decoding. **[8]**

b) With block diagram explain transform coding. What the advantages are of transform coding over spatial coding. **[8]**

Q7) a) Explain morphological thinning operation. State its application. **[8]**

b) Plot the signature of the following boundary: **[8]**

i) Equilateral triangle ii) Square iii) Circle

Q8) a) Draw and explain model of Image degradation and restoration process. **[9]**

b) What is fractal? Explain encoding process of image compression based on the fractals. **[9]**

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Total No. of Questions : 8]

SEAT No. :

P1576

[Total No. of Pages : 2

[4265] - 682

M.E. (E & TC) (Signal Processing)

BIOMEDICAL SIGNAL PROCESSING

(2008 Course) (Elective - II (a)) (Semester - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables, slide rules, electronic calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Write minimum and maximum values of EEG signal voltages and frequencies. State the different frequency bands and their applications in analysis of EEG signal. **[8]**

b) What is artifact? What are the different types of artifact? How they are minimized. Explain in details? **[8]**

Q2) a) Explain the Heart structure in detail? **[8]**

b) Define Z-transform & explain properties of Z- transform? **[8]**

Q3) a) Explain the mechanism of an electromagnetic blood flow transducer? **[8]**

b) Discuss Sonography technique in detail? **[8]**

Q4) Write a short note on: **[18]**

a) C-T scan

b) ECG technique

P.T.O.

SECTION - II

Q5) a) Define autocorrelation and cross correlation and explain the difference between them? **[8]**

b) Discuss wavelet signal decomposition? **[8]**

Q6) a) Explain characteristics of blood flow in details? **[8]**

b) Explain basic principle of X-ray. **[8]**

Q7) a) Design an active filter to reject a single frequency of 100 Hz. Justify the filter topology used and mention the specification requirements of the components used? **[8]**

b) Explain the cell bio-electric phenomenon in details? **[8]**

Q8) a) Discuss active filters in details? **[9]**

b) How is autocorrelation function helpful in finding periodicity in signals? **[9]**

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Total No. of Questions : 8]

SEAT No. :

P1577

[Total No. of Pages : 3

[4265] - 683

M.E. (E & TC) (Signal Processing)

WIRELESS AND MOBILE COMMUNICATION

(2008 Course) (Elective - II (b)) (Semester - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is the necessity of prioritizing the handoffs? What are the different methods of it? What is the Umbrella Cell approach and cell dragging effect? Why they need to be taken into considerations? Explain with suitable diagram. **[10]**

b) What are the different methods of improving the coverage and capacity in the cellular system? Explain with suitable diagrams. **[8]**

Q2) a) State the Erlang B and C formula used for the telecommunication traffic and explain their significance. **[4]**

b) A certain city has an area of 1300 sq. miles and is covered by a cellular system using a seven cell reuse pattern. Each cell has a radius of four miles and the city is allocated 40 MHz of spectrum with a full duplex bandwidth of 60 kHz. Assume a GOS of 2 % for an Erlang B system. If the offered traffic per user is 0.03 Erlangs, Compute (i) Number of cells in the service area, (ii) the number of channels per cell and (iii) the maximum carried traffic (Given: The traffic intensity per cell for the given system is 84 Erlangs /cell) **[4]**

P.T.O.

c) Explain with suitable diagram the various upgrade paths for the 2G technologies. Also explain the different 3G wireless networks in brief. **[8]**

Q3) a) What are the large scale propagation and small scale fading models? Explain the free space propagation model. **[6]**

b) What are the three basic propagation mechanisms? Explain the concept of the Fresenel zone geometry and give its significance. **[6]**

c) Write a short note on the 'Durkin's Model'. **[4]**

Q4) a) Consider a transmitter which radiates a sinusoidal carrier frequency of 900 MHz. For a vehicle moving 70 mph, compute the received carrier frequency if the vehicle is moving (i) directly towards the transmitter, (ii) directly away from the transmitter, and (iii) in a direction which is perpendicular to the direction of the arrival of the transmitted signal. **[6]**

b) Explain the different types of the small scale fading. **[6]**

c) Explain the following terms in brief: **[4]**

i) rms Delay Spread

ii) Coherence Bandwidth

iii) Doppler Spread

iv) Coherence Time

SECTION - II

Q5) a) What are the different types of the equalization techniques used in the communication receivers? Explain any one in brief **[6]**

b) What is meant by the diversity reception? What are the different types? What are its advantages in the cellular communication? **[6]**

c) What are block codes? Explain in brief the important parameters and the properties of the block codes. **[6]**

Q6) a) State and explain the practical antenna design issues. Write a short note on the smart antennas. **[8]**

b) Explain how the effect of the signal coverage and the interference can be tackled by : **[8]**

i) Decreasing power

ii) Decreasing antenna height

iii) Beam tilting

iv) Proper cell site location

Q7) a) What are the uplink and downlink frequency bands used in GSM 900? What are the logical and physical channels in the GSM system? Explain the different logical channels with the classification. **[8]**

b) What are the different subsystems in the GSM? Explain with the help of the GSM system architecture. **[8]**

Q8) a) Explain with the suitable diagram the forward channel modulation process in the CDMA. What is the role of Walsh code used in it? **[10]**

b) What are the different types of hand off techniques used in the CDMA? Explain with suitable diagram. **[6]**

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Total No. of Questions : 8]

SEAT No. :

P1578

[Total No. of Pages : 2

[4265] - 690

M.E. (E & TC) (Signal Processing)

MULTIMEDIA TECHNIQUES

(Elective - III(c)) (2008 Course) (Semester - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answers will be valued as a whole.***
6) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Compare different standards used by the different countries for colour TV transmission and reception. **[8]**

b) Explain the working of NTSC encoder & decoder with the help of suitable diagrams. **[8]**

Q2) a) Discuss the .wav format & .bmp format for storing Audio & Image in a file, respectively. **[8]**

b) What is aliasing? Explain the methods of minimizing the aliasing. **[8]**

Q3) a) An NTSC encoded video clip has a frame size of 720 × 480 pixels & is digitizing using a bit-depth of 8 bits for each Y, Cb & Cr & a chroma sub-sampling scheme of 4:2:2. Calculate the file size of a 30 sec. video clip & total time taken for it to be transmitted over a 2 Mbps transmission line. **[8]**

b) With the help of suitable block diagram, explain JPEG compression standard for video. **[8]**

P.T.O.

Q4) Write short notes on any three: **[18]**

a) Multimedia applications

b) Compression Techniques

c) MPEG compression

d) Properties of Multimedia presentation

SECTION - II

Q5) a) With the help of suitable block diagram explain the working of digital camera. **[8]**

b) Explain the features of typical scanning software. **[8]**

Q6) a) Explain in detail MIDI messages. **[8]**

b) Explain various types of text that can be incorporated in a multimedia presentation. **[8]**

Q7) a) Explain the steps in creating 3D animation. **[8]**

b) Explain the salient features of a typical audio editing software. **[8]**

Q8) Write short notes on any three: **[18]**

a) Components of a Graphic system

b) Audio file formats

c) Techniques used in animation

d) Text compression methods

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Total No. of Questions : 8]

SEAT No. :

P1579

[Total No. of Pages : 2

[4265] - 693

M.E. (E & TC) (Signal Processing)

COMPUTER VISION

(2008 Course) (Sem. - II) (Elective - IV(c))

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data if required.***

SECTION - I

Q1) a) Explain the terms world coordinates, camera coordinates and image coordinates. Give relation between them. **[8]**

b) Assume that first the camera center is at the origin of the world coordinates. Next the camera is translated by (2,1,1) units in x, y & z direction respectively and then rotated by 45 degrees around x axis in the clockwise directions. Assume that focal length of the camera is 0.030 Find the image coordinates of the point which has world coordinates (1,1,1). **[8]**

Q2) a) Explain image formation in pinhole camera. Whether Image formation will get affected if hole size is increased? **[8]**

b) Explain working principle of Fovean X3 layered sensor? Give its merits and demerits. **[8]**

Q3) a) Explain internal and external camera parameters. **[9]**

b) What is camera calibration? Why it is required? Explain camera calibration procedure. **[9]**

P.T.O.

Q4) Explain the following: **[16]**

a) Foreshortening.

b) Depth of field.

c) Orthographic projection.

d) Image resolution.

SECTION - II

Q5) a) What is feature tracking? How it is done? Give its application. **[8]**

b) Explain optical flow estimation using Image pyramid. **[8]**

Q6) a) What is disparity? How we can find disparity in the images? What information we get from disparity. **[8]**

b) Explain epipolar geometry, epipolar line and epipoles. **[8]**

Q7) a) Explain problem in stereo matching in case of object occlusion. How it can be solved using dynamic programming. **[8]**

b) Explain Fourier slice theorem. **[8]**

Q8) Write short notes. **[18]**

a) Fundamental matrix.

b) Infrared imaging.

❄❄❄

Total No. of Questions : 8]

SEAT No. :

P1584

[Total No. of Pages : 3

[4265] - 703

M.E. (Electronics) (Digital Systems)

COMMUNICATION NETWORK AND SECURITY

(2008 Course) (Semester - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule and electronic calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) List the entities of mobile IP and describe data transfer from a mobile node to a fixed node and vice versa. Why and where is encapsulation needed? **[8]**

b) How is mobility restricted using WLANs? What additional elements are needed for roaming between networks, how and where can WLAN s support roaming? In your answer think of capabilities of layer 2 where WLAN s reside. **[8]**

Q2) a) Classify Routing protocols for Mobile Ad hoc networks (MANETs). Explain DSDV (Destination Sequenced Distance Vector) routing protocol in detail. Why DSDV protocol is not scalable in limited bandwidth, highly dynamic ad hoc networks? **[8]**

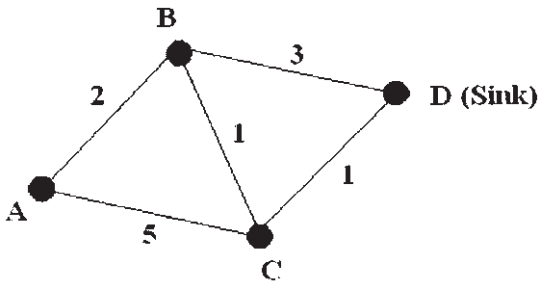
b) Discuss Power-Aware Routing Metrics in relation to Mobile Ad hoc networks. **[8]**

P.T.O.

Q3) a) What are the disadvantages of the binary exponential back-off mechanism used in MACA and how they are overcome in MACAW? Explain with suitable example topology why exposed node should not be allowed to transmit in MACA W. **[8]**

b) Consider the network topology shown in following Figure. The numbers on the edges indicate the cost of the particular hop. Show the step-wise working of the cost-field approach to determine optimal paths, if the sink is D. **[8]**

Assume $\gamma = 10$.



Q4) Write short notes (Any Three): **[18]**

a) IEEE 802.11 Infrastructure networks v/s Ad hoc networks

b) Bluetooth

c) Snooping TCP

d) Issues in Designing a Sensor Network

SECTION - II

Q5) a) Give detailed classification of Security Services, Security Mechanisms and Security Attacks. **[8]**

b) What is the purpose of the S-Boxes in DES? Explain the S-Box design criteria. Explain the strengths of DES in brief. **[8]**

Q6) a) What requirements should a Digital Signature scheme satisfy? What are the properties a digital signature should have? What are some threats associated with a direct digital signature scheme? **[8]**

b) What properties a hash function H must have for message authentication? Explain simple hash function. **[8]**

Q7) a) Explain possible approaches to attacking the RSA algorithm. **[8]**

b) What are three broad categories of applications of Public-Key Cryptosystems? What requirements must a Public-Key Cryptosystem fulfill to be a secure algorithm? **[8]**

Q8) Write short notes (Any Three): **[18]**

a) IDEA Symmetric Key Algorithm.

b) S/MIME.

c) Secure Electronic Transaction (SET).

d) Encapsulating Security Payload (ESP).

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Total No. of Questions : 10]

SEAT No. :

P1592

[Total No. of Pages : 4

[4265] - 729

M.E. (Production Engineering)

CAD - CAM - CIM

(2008 Course) (Semester - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of non-programmable electronic calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) A rectangle A (2, 2), B (2, 10), C (10, 10) and D (10, 2) is to be reflected about a line $7x + 4y = 28$. Determine: **[8]**

i) the concatenated matrix and.

ii) final coordinates of the rectangle.

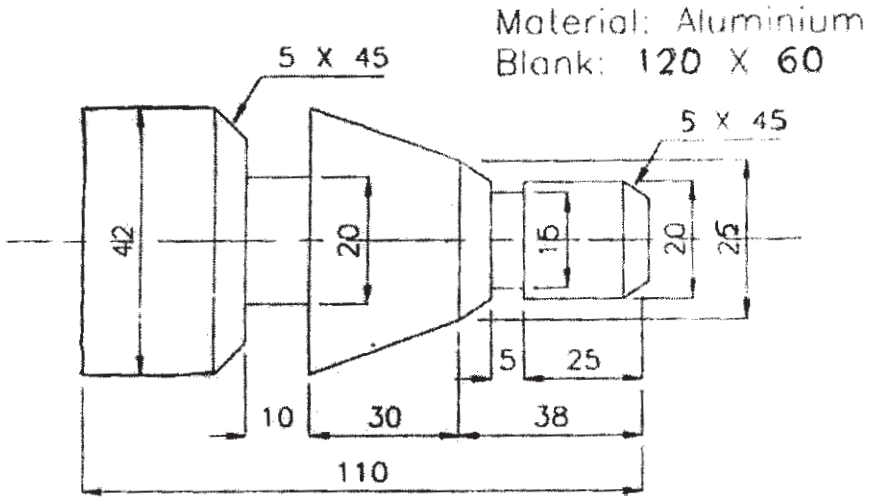
b) What is surface modeling? Describe the commonly used surface entities. What are the modeling methods available for surface design in a surface modeling software? **[8]**

Q2) a) The end points of a curve segment are A (2, 3) and B (4, 6) and the slopes at those two points are 45° and 75° respectively, with magnitude 4. Develop the Hermite curve equation and draw the curve. **[10]**

b) What is rendering? What are different stages of rendering an image? **[6]**

P.T.O.

Q3) a) Write a NC program to machine the work piece as shown in Figure 1. **[10]**



b) Explain how mass property calculations are computed in CAD/CAM environment. **[6]**

Q4) a) Figure 2 shows a cluster of four springs. One end of assembly is fixed and a force of 1000 N is applied at the end. Using finite element method determine: **[10]**

i) Deflection of each spring.

ii) The reaction forces at support.

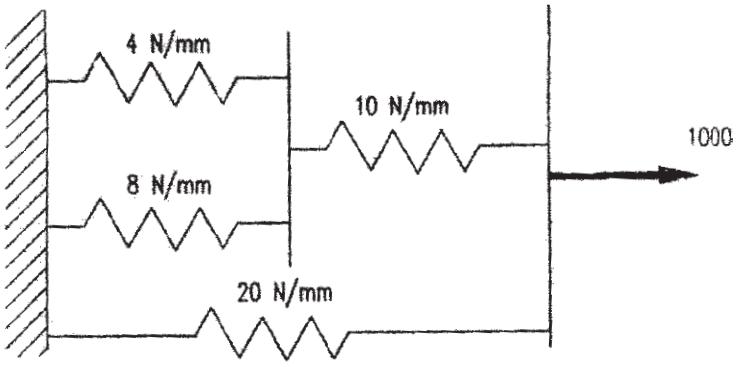


Fig. No. 2

b) How does FEA software help in checking the model? **[6]**

Q5) Write short notes on any three of the following: **[18]**

a) Hidden surface removal techniques.

b) Mechanical assembly.

c) Process and application of computer animation.

d) CNC systems for factory automation.

e) Modified Newton-Raphson method.

SECTION - II

Q6) a) Discuss the Variant Process Planning method with suitable example. **[6]**

b) State various types of information/data to be collected from shop floor and describe any one method of data collection. **[5]**

c) What is Group Technology (GT)? What are the advantages of using GT principles in manufacturing? **[5]**

Q7) a) Is it always justifiable to have complete automated process planning system? Comment. **[6]**

b) Describe with neat diagram computer aided Material Requirement Planning. **[5]**

c) Explain the features of tool management system used in FMS. **[5]**

Q8) a) Consider the following part-machine incidence matrix. Apply the Rank Order Clustering (ROC) algorithm to it and identify the part families and machine groups. **[10]**

	P1	P2	P3	P4	P5	P6	P7
M1		1		1	1	1	
M2	1		1				
M3	1		1			1	1
M4		1		1		1	
M5	1				1		1

b) What are the machine readable media used in shop floor data collection. **[6]**

Q9) a) Describe with a neat sketch the building blocks of FMS. **[6]**

b) What is the principle of Coordinate Measuring Machine? **[5]**

c) What is the difference between hierarchical structure and chain type structure in a classification and coding scheme. **[5]**

Q10) Write short notes on any three of the following: **[18]**

a) Virtual Cell Manufacturing System.

b) Control system for FMS modules.

c) Types of AGVs.

d) Geometric modeling for process planning.

e) Composite part concept in application of GT.

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Total No. of Questions : 8]

SEAT No. :

P1598

[Total No. of Pages : 3

[4265] - 751

M.E. (Production) (CAD/CAM)

COMPUTER AIDED MANUFACTURING

(2010 Course) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of non-programmable electronic calculators is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Draw a flow chart for control architecture showing how all levels can be implemented in distributed computers. **[6]**

b) What are the characteristics of re-circulating ball screw? Explain its advantages as compared to traditional screws. **[5]**

c) Describe the principle of operation of CNC. **[5]**

Q2) a) Write a NC program to drill and bore the work piece as shown in Figure 1. **[10]**

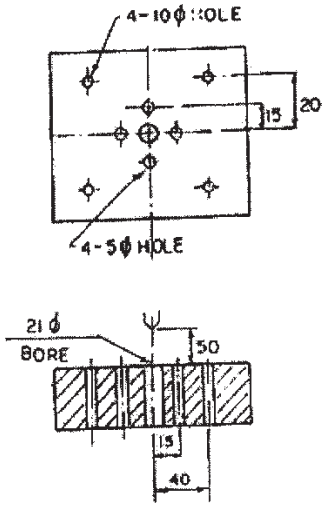

Figure 1

P.T.O.

b) Describe any two standard communication interfaces used in CNC machine tools. **[6]**

Q3) a) Develop an APT program to make the part as shown in Figure 2 below **[10]**

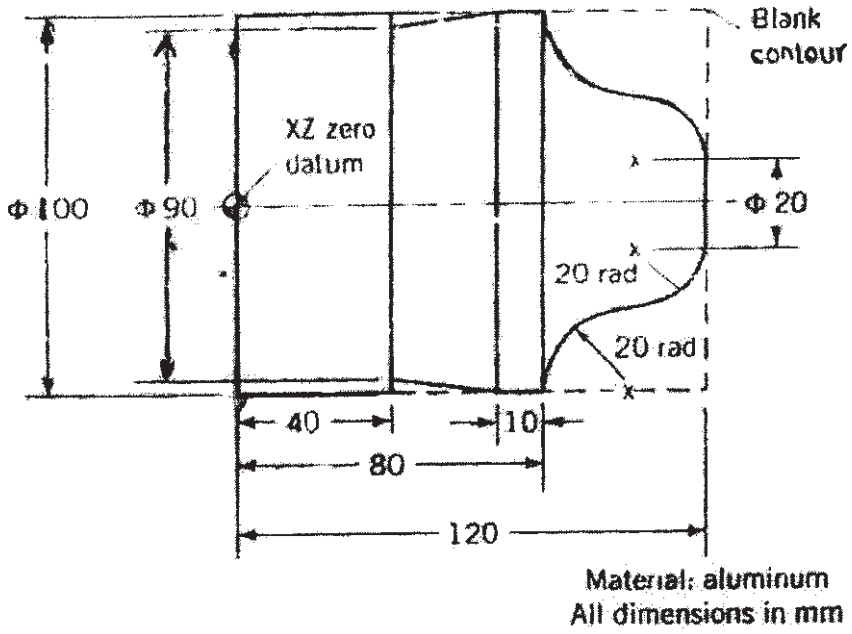

Figure 2

b) What are the types of CNC presses available in India? Describe the advantages and limitations of each. **[6]**

Q4) Write short notes on any three of the following: **[18]**

a) In process gauging in CNC systems

b) Configuration of DNC systems

c) CNC molding machines

d) Virtual machining

e) Automated welding techniques

SECTION - II

Q5) a) Describe the basic functions of a machine vision system. **[6]**

b) What are the automated and semi-automated data collection systems used on shop floor? **[5]**

c) A feeder-selector device at one of the stations of an automated assembly machine has a feed rate of 25 parts per minute and provides a throughput of one part in four. The idle cycle time of the assembly machine is 10 sec. The low level sensor on the feed track is set at 10 parts and the high level is set at 20 parts. i) How long will it take for the supply of parts to be depleted from the high level sensor to the low level sensor once the feeder-selector device is turned off ? ii) How long will it take for the supply of parts to be resupplied from the low level sensor to the high level sensor, on average, after the feeder-selector device is turned on? **[5]**

Q6) a) Describe any four types of automated assembly systems with the help of suitable diagrams. **[8]**

b) Tata Motors has a unit load AS/RS with 10 aisles. Ten S/R machines are used, one for each aisle. The aisle length (rack length) is 300 ft and aisle height is 80 ft. The horizontal and vertical speeds are 350 ft/min and 90 ft/min, respectively. A P/D operation of an S/R machine takes approximately 0.30 min. Determine and the single and dual command cycle times for a unit load AS/RS of Tata Motors. **[8]**

Q7) a) Briefly describe the types of AGVS guidance system **[6]**

b) What are the important issues related the layout and design of AS/RS? **[5]**

c) Describe the principles of automated inspection. **[5]**

Q8) Write short notes on any three of the following: **[18]**

a) Non-contact, non optical inspection methods

b) Shop floor control using barcodes

c) Powered and non-powered conveyors

d) Future automated factory

e) Steps in Systematic Handling Analysis (SHA)

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Total No. of Questions : 8]

SEAT No. :

P1602

[Total No. of Pages : 2

[4265]-775
M.E (Computer)
ADVANCED SOFTWARE ENGINEERING
(2008 Course) (Elective - I(a)) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any Three questions from each Section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain why legacy systems may be critical to the operation of business. **[8]**

b) Describe the spiral model of software development and discuss its strengths and weaknesses. **[8]**

Q2) a) Explain the service - oriented system architecture with conceptual block diagram. **[8]**

b) Explain the UI design process with block diagram. **[8]**

Q3) a) What are the key factors that you should consider when planning software reuse? **[8]**

b) Discuss the problems of developing and maintaining 'nonstop' systems such as telephone exchange software. How might exceptions be used in the development of such systems? **[8]**

Q4) Write short notes on : **[18]**

a) System safety and security.

b) RUP

c) CBSE

SECTION - II

Q5) a) What is meant by software inspection? What are the major advantages of inspection over testing? **[6]**

b) Explain with suitable example partition testing. **[6]**

c) Explain why ensuring system reliability is not a guarantee of system safety. **[4]**

P.T.O.

Q6) a) Explain in detail the Extreme programming practices. **[8]**

b) Explain the strategy and tactics of cleanroom testing. How they are different from conventional testing approaches? **[8]**

Q7) a) What are various categories of software metrics? Discuss with the help of suitable examples. **[8]**

b) What is software maintenance? Describe various categories of maintenance? Which category consumes maximum effort and why? **[8]**

Q8) Write short notes on : **[18]**

a) The RMMM plan.

b) Formal methods.

c) Project duration and staffing.

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Total No. of Questions : 8]

SEAT No. :

P1603

[Total No. of Pages : 2

[4265]-776

M.E. (Computer Engg.)

INTELLIGENT SYSTEMS

(2008 Course) (Elective - I(b)) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer 3 questions from Section - I and 3 questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain a goal - based agent with a neat diagram and example. **[8]**

b) Explain the properties of task environments. List the examples of task environments. **[8]**

Q2) a) What is problem formulation? Explain the different types of problems with suitable examples. **[8]**

b) How search strategies are evaluated? Explain the iterative deepening search algorithm with example. **[8]**

Q3) a) Explain A* search with the suitable example. What is heuristic function? Write heuristic function for 8 - puzzle problem. **[10]**

b) Explain the hill - climbing algorithm with the application. **[8]**

Q4) a) Explain the difference between problem solving and planning. Solve the blocks world problem. **[8]**

b) Describe how states, goals and actions are represented using STRIPS language. **[8]**

SECTION - II

Q5) a) Write and explain a partial - order planning algorithm (POP). **[8]**

b) Explain a partial order plan for solving the shoes and socks problem. **[8]**

Q6) a) Explain hierarchical decomposition with the example. **[8]**

b) Explain resource constraints with example. **[8]**

P.T.O.

Q7) a) Explain execution monitoring and re - planning agents. **[6]**

b) Compare between conditional planning and replanning. **[6]**

c) Explain fully integrated planning and execution. **[6]**

Q8) a) What is the use of Bayesian Network in probabilistic reasoning? Explain a simple Bayesian Network with the example. **[8]**

b) Explain with example, first order logic and associated inferences. **[8]**

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Total No. of Questions : 8]

SEAT No. :

P1604

[Total No. of Pages : 2

[4265]-779

M.E. (Computer Engineering)

INFORMATION AND NETWORK SECURITY

(2008 Course) (Elective - II (a)) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain various X.800 security mechanisms? Give applications in which they can be used to provide security? **[8]**

b) Explain the design parameters for development of a cipher. Give suitable example. **[8]**

Q2) a) What is hash? What are the requirements of a good hash function? Explain various security attacks on hash functions. **[8]**

b) Define digital certificate? Explain steps to create digital certificate? **[8]**

Q3) a) Compare transport layer security with network layer security? Justify which is better, when and why? **[8]**

b) Explain various ways in which secret key can be distributed to a group of 'n' Communicating parties? **[8]**

Q4) Write short notes on any THREE of the followings: **[18]**

a) Information security policy.

b) ARP hazard

c) Security aspects of biometric devices and solutions

d) Secure RSVP.

P.T.O.

SECTION - II

Q5) a) User A and B exchange the key using Diffee Hellman algorithm. Assume a = 5, q = 11, XA = 2, XB = 3, Find YA, YB, K. **[8]**

b) Explain in short - **[8]**

i) DNS poisoning

ii) IP spoofing

iii) One time password

Q6) a) Explain how wireless security is different from wired data security, and how WEP addresses security in wireless LANs? **[8]**

b) Perform encryption and decryption using RSA algorithm for p = 11, q = 13, e = 11 and M = 88 **[8]**

Q7) a) Derive a security protocol which incorporates advantages of both public key and private key cryptography? **[8]**

b) List design goals for a firewall. Also list four techniques used by firewalls to control access and enforce a security policy. **[8]**

Q8) Write short notes on any THREE of the following: **[18]**

a) Email security

b) PKI components

c) Distributed Denial of Service Attack in Wireless Networks

d) Cyber laws

♦♦♦♦

Total No. of Questions : 8]

SEAT No. :

P1605

[Total No. of Pages : 2

[4265]-781
M.E. (Computer)
WEB SERVICES AND SOA
(Theory) (Elective - II (c)) (2008 Course) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are web services? Explain how it differs from distributed computing. **[6]**

b) How SOAP is useful in design phase of SOA? **[4]**

c) What is UDDI? Explain in brief about the UDDI elements. **[6]**

Q2) a) Define SOA and discuss the benefits of using SOA. **[6]**

b) Explain the basic architecture of SOA. **[6]**

c) How services of SOA lead to reusability & reusable enterprise resources? **[4]**

Q3) a) What is ESA and explain ESA in detail? **[8]**

b) Discuss the stages of SOA life cycle with an example of your choice for the following service oriented analysis, service design and mapping to technology like J2EE or .NET. **[8]**

Q4) Write short notes on (Any Three) **[18]**

a) Web service security

b) IT's Role within ESA and benefits of systems created using ESA

c) Services of WSDL

d) Need for Enterprise Service Bus (ESB)

e) Non - functional requirements of SOA

P.T.O.

SECTION - II

Q5) a) What is AJAX and why AJAX is widely used in web applications? **[8]**

b) Explain what happens when a typical AJAX enabled web page is requested by a visitor and give some common scenarios where AJAX can be successfully used? **[8]**

Q6) a) How SOA is better than traditional middleware like CORBA & DCOM? and why SOA is growing in importance? **[6]**

b) Discuss the tools used for design of SOA. **[4]**

c) What is XML and explain how XML is suitable for SOA. **[6]**

Q7) a) What do you understand by service level agreements in managing SOA? **[8]**

b) Explain the operational management challenges for SOA. **[8]**

Q8) Write short notes on (Any Three). **[18]**

a) Challenges of web 2.0 technologies for enterprise.

b) QOS in SOA governance

c) Salient features of SOA

d) Scripting languages

e) Security in SOA

♦♦♦♦

Total No. of Questions : 8]

SEAT No. :

P1606

[Total No. of Pages : 2

[4265]-782
M.E. (Computer Engineering)
EMBEDDED SYSTEM DESIGN
(2008 Course) (Sem. - I) (Elective - II (d))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is the need of data converters in a typical Embedded System? Which are the commonly used data converters? **[10]**

b) Which are the various type of RAM technologies used in ES? Elaborate SDRAM technology with important features. **[8]**

Q2) a) Draw and explain the block diagram of MIPS R5000 processor. **[10]**

b) With the help of neat diagram, describe different components of a typical embedded system. **[6]**

Q3) Design and explain an embedded system for the Cruise Control used in the automobile. **[16]**

Q4) a) What is IEEE 802.11 protocol? Explain the data transfer using this protocol. **[8]**

b) Differentiate PCI and PCI-X standards elaborately. **[8]**

P.T.O.

SECTION - II

Q5) a) Architecture of CPLD is less suitable for large and complex design. Explain why? Describe various features of FPGA. **[10]**

b) Why C & C++ is specially suitable for programming in Embedded systems? **[8]**

Q6) a) Explain top down approach and bottom up approach in the embedded system design process with major levels of abstraction in design process with suitable diagrams wherever necessary. **[10]**

b) Write a note on Cross compiler. **[6]**

Q7) a) Explain the use of semaphore and its related OS functions. **[8]**

b) Explain the memory management functions of RTOS. **[8]**

Q8) a) With suitable example explain Inter Process Communication (IPC). **[8]**

b) Briefly describe the difference between waterfall and spiral development model. Explain the suitability with respect to embedded system. **[8]**

♦♦♦♦

Total No. of Questions : 8]

SEAT No. :

P1608

[Total No. of Pages : 2

[4265]-785

M.E (Computer Engineering)

NETWORK DESIGN, MODELING & ANALYSIS

(2008 Course) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) A system fails when a defect occurs in one of 9 subsystems labeled 1,2,3..., 9 (only one defect occurs at a time). Let pi denote the probability that the defect is in subsystem i. Suppose that each of the subsystems 4,5,6 is twice as likely to contain the defect as any one of the other subsystems. What is the probability of failure of each system? **[4]**

b) Discuss relaxation algorithm in detail with an example. **[8]**

c) Justify - "Poisson random variable may be used to approximate a binomial random variable when n is large and p is small". (where n is number of trials and p is probability of success). **[4]**

Q2) a) Justify - "A single sever infinite buffer case is a good approximation for a single server finite buffer case". **[8]**

b) A facility of m identical machines is sharing a single repairperson. The time to repair a failed machine is exponentially distributed with mean $1/\lambda$. A machine, once operational, fails after a time that is exponentially distributed with mean $1/\mu$. All failure and repair times are independent. **[8]**

i) Represent this system using discrete - time Markov chain.

ii) What is the probability that there is no operational machine?

Q3) a) There are 20 people in office. During course of 8 hours per day the attempt to make 16 calls, which is having average of 3 minutes. There are 3 phone lines in the office. What is the probability of loss? **[8]**

b) What are smallest numbers of lines that can allow an offered load of 0.5 Erlangs to suffer no more than 2%. **[8]**

P.T.O.

Q4) Write short note on ANY THREE **[18]**

a) Reservations and Polling

b) M/G/1 queue

c) Application of Little's Theorem

d) Priority queuing

SECTION - II

Q5) a) Explain terminal assignment problem (give formal problem definition) in centralized networks. Explain greedy algorithm as solution to this problem. **[8]**

b) Analyse M/M/1 queuing system using state transition diagram. **[8]**

Q6) Enlist steps of Esau - William's algorithm (which uses nearest neighbor method) for multipoint line topology problem and Solve the following problem using these steps. **[16]**

Node → ↓	b	c	d	e	f	G
a	8	9	13	15	16	22
b		13	9	9	12	25
c			10	13	12	18
d				15	8	16
e					22	13
f						12

Costs are symmetric. Weight of each node is one except that of node c which has weight two. Weight Constraint on line is three.

Q7) a) Explain Functions and responsibilities of network administrator. **[8]**

b) Explain Queuing Network Model of Nodes in a PSN. **[8]**

Q8) Write Short note on ANY THREE **[18]**

a) Tools for Network administration.

b) Bandwidth management

c) Bin packing

d) Unified algorithm

♦♦♦♦

Total No. of Questions : 8]

SEAT No. :

P1609

[Total No. of Pages : 2

[4265]-787

M.E. (Computer Engg.)

PATTERN RECOGNITION & MACHINE VISION

(2008 Course) (Elective - III(b)) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***
6) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***

SECTION - I

Q1) a) Discuss pattern recognition system and its applications. **[8]**

b) Discuss maximum Likelihood approach used for parameter estimation. **[8]**

Q2) a) Define loss and risk. Discuss baysian classification and its decision rules and also explain bayes minimum error rate classification. **[8]**

b) What is a multi - category pattern classification? Discuss the LMS procedure for multicategory pattern classification. **[8]**

Q3) a) What is mean by shape and land marks? Discuss procrustes shape alignments. **[8]**

b) What is the need of dimension reduction in image formation? Discuss principal component analysis for dimension reduction. **[8]**

Q4) a) Define Parzen probability density estimation. Given a set of five data points x1 = 2, x2 = 2.5, x3 = 3 and x4 = 1and x5 = 6, find parzen probability density function estimates at x = 3, using the guassian function with $\sigma = 1$ as window function. **[8]**

b) Write a short notes on any two **[10]**

i) Estimation theory

ii) Active Shape models

iii) Fisher's discriminant classification.

P.T.O.

SECTION - II

Q5) a) What is Kalman filtering? What are its applications? State & discuss linear 1 - D Kalman filter for motion estimation. **[10]**

b) Discuss the main properties of the essential and fundamental matrices? Discuss eight point algorithm. **[8]**

Q6) a) Discuss the main issues of representing 3 - D objects for model - based recognition. Discuss interpretation tree with example. **[10]**

b) What are the intrinsic and extrinsic parameters of a stereo system. **[6]**

Q7) a) What is mean by invariants? Discuss on Invariant based recognition algorithms. **[8]**

b) What is Appearance based identification. Discuss image comparison with Eigen spaces. **[8]**

Q8) a) What are the main properties of feature - based methods for finding correspondences. **[4]**

b) Write a note on any two **[12]**

i) A simple stereo system.

ii) Motion based segmentation.

iii) Geometric hashing.

♦♦♦♦

Total No. of Questions : 8]

SEAT No. :

P1610

[Total No. of Pages : 2

[4265]-795

M.E. (Computer) (Computer Networking)

ADVANCED SOFTWARE ENGINEERING

(2008 Course) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Giving reasons for your answer, suggest which dependability attributes are likely to be most critical for the following systems. **[9]**

i) An Internet - server provided by an ISP with thousands of customers.

ii) A directional control system used in a Satellite Launch Vehicle.

iii) An Internet - based personal finance management system.

b) Explain the requirement engineering process with suitable case study. **[9]**

Q2) a) What is meant by interface? Explain interface specification with example. **[8]**

b) Discuss the problems of using natural language for defining user and system requirements, and show, using small examples, how structuring natural language into forms can help avoid some of these difficulties. **[8]**

Q3) a) Explain CORBA architecture in detail. **[8]**

b) What are the possible risks that can arise when systems are constructed using COTS, What steps can you take to reduce these risks? **[8]**

Q4) a) What is meant by component - based software engineering? Explain in brief. **[4]**

b) Explain the components of real - time operating system with block diagram. **[6]**

c) Write short note on : The UI design process. **[6]**

P.T.O.

SECTION - II

Q5) a) "Formal specification and proof do not guarantee that the software will be reliable in practical use". Justify the above statement. **[6]**

b) What are the various approaches used for test case design? Explain each of them. **[10]**

Q6) a) How does Cleanroom Software Engineering differs from the conventional and object oriented software engineering methods? **[6]**

b) Explain in detail the Extreme Programming. **[10]**

Q7) a) Define software metrics. Why do we need metrics in software? **[4]**

b) What is maintainability of software? What is its role in software maintenance? **[6]**

c) Describe the difference between risk components and risk drivers. **[6]**

Q8) Write short notes on : **[18]**

a) The people capability Maturity Model.

b) Algorithmic cost modeling.

c) Pair Programming.

♦♦♦♦

Total No. of Questions : 8]

SEAT No. :

P1611

[Total No. of Pages : 2

[4265]-797

M.E. (Computer) (Computer Networking)
NETWORK DESIGN, MODELING AND ANALYSIS
(2008 Course) (Elective - III (b)) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) In a network, there are 10, 15 and 20 messages of types I, II and III, respectively, waiting to be processed on a machine. The machine randomly selects parts one at a time for processing (i.e. each part is equally likely to be selected at any time). What is the probability that the first 4 messages processed are of types, II, II, III, II and in this exact order? **[8]**

b) If the number of accidents on a highway each day is a Poisson random variable with parameter $\lambda = 3$, what is the probability that no accidents occur today? **[4]**

c) A multipoint line serves 200 stations. The probability that a given station has a message is 0.01. What is the probability that no station has a message? **[4]**

Q2) a) Analyze following queuing system in detail.

Customers arrive to a system with m servers in a Poisson process with a rate λ. Their service times are exponentially distributed with mean service time $1/\mu$. The given system has infinite queue size. **[10]**

b) Messages arrive independently to a system at the rate of 5 per minute. Their lengths are exponentially distributed with an average of 4000 characters. They are transmitted over a 9600 bits per second channel. (Each character is 8 bit long) **[6]**

i) What is the probability that there are two messages in the system?

ii) What is the average number of messages in the queue?

iii) What is the average waiting time in queue?

Q3) a) Justify - "In steady state, the M/M/1 system appears statistically identical to an arriving and a departing customer". **[8]**

P.T.O.

b) Suppose a traffic with intensity 2 Erlangs is offered to three lines. What is the probability of loss predicted by Erlang - B and Erlang - C formulas? **[8]**

Q4) Write Short note on ANY THREE: **[18]**

a) Little's Theorem

b) Applications of queuing analysis

c) Memoryless property of exponential random variable

d) Priority queuing

SECTION - II

Q5) a) Explain concentrator location problem (give formal problem definition) in centralized networks. Explain center of mass algorithm as solution to this problem. **[8]**

b) There are eight terminals in a city with traffic 7,2,6,5,2,6,9,3 and a multipoint line is capable of holding 20 units of traffic. Find number of multipoint lines required by using all three variants of bin - packing algorithm. **[8]**

Q6) a) Explain Open, Closed and Semiopen queuing networks with an example. **[6]**

b) Write down the steps of Greedy algorithm for terminal assignment problem and Solve the following problem using these steps. **[10]**

Concentrator

Terminal ↓	G	H	I
a	6	3	8
b	2	9	4
c	3	1	4
d	2	5	9
e	1	6	3
f	2	7	9

Q7) a) Enlist and explain responsibilities of a network administrator. **[8]**

b) What do you mean by sub - netting? Explain advantages of sub - netting. **[8]**

Q8) Write short notes on ANY THREE: **[18]**

a) PSN node

b) Bandwidth management

c) Importance of Network Analysis

d) Sharma's Algorithm.

♦♦♦♦

Total No. of Questions : 8]

SEAT No. :

P1612

[Total No. of Pages : 2

[4265]-798

M.E. (Computer Engineering)

SOFTWARE PROJECT MANAGEMENT

(2008 Course) (Elective - IV(a)) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answers any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the project Lifecycle activities with an example of payroll system. **[6]**

b) Give the techniques of cost benefit analysis. **[6]**

c) How project is viewed as a system? **[4]**

Q2) a) Explain the stages of project management where estimation can be applied and how? **[8]**

b) What is the strategy in selecting prototyping model? Explain. **[8]**

Q3) a) Explain the activity based approach to planning. **[8]**

b) Explain and give the activity network using CPM for library issue system. **[8]**

Q4) Explain the following.

a) Types of contract. **[6]**

b) Sheduling. **[6]**

c) Project Reviews. **[6]**

SECTION - II

Q5) a) What are the different issues with reviews and explain in brief review meetings. **[8]**

b) How function points can be used to count transaction? **[8]**

P.T.O.

Q6) Write short notes on **[18]**

a) Project Risk Management

b) Project controls

c) Function Point Analysis.

Q7) a) How Risk management is applied in complex project? **[8]**

b) State the role of leader in the team, give details of team formation model. **[8]**

Q8) a) Give Qualitative analysis of a complex software project. **[8]**

b) Compare and contrast the LOC and function point metrics. **[8]**

♦♦♦♦

Total No. of Questions : 8]

SEAT No. :

P1628

[Total No. of Pages : 2

[4265]-861
M.E. (Petroleum)
ARTIFICIAL LIFT TECHNIQUES
(2008 Course) (Elective - III(a)) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, Slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Which method or methods of artificial lifting you will propose for the following requirements and why? **[13]**

i) Offshore oil production from deviated, high GOR wells with sand production problems.

ii) Onshore, Deviated, high PI, high production rate wells

iii) Onshore heavy oil production from unconsolidated Formation along with free gas.

iv) Water loaded gas wells.

v) Deviated wells with low dogleg severity to lift around 300 bbls/day from 11,500 ft depth medium viscous oil with very low GOR.

b) Draw the neat schematic sketch and show the unloading operation used in wells with high P.I. and a reasonably high bottom hole pressure relative to well depth. **[5]**

Q2) a) Use the following data and decide depth for point of gas injection. Also prove that, for a continuous flow injection.

P_{wh} + Gfa.L + Gfb(D – L) = Pwf. Data Given :

Depth = 8500 ft. Expected rate = 980 bbls/day. Tubing size = $2\frac{3}{8}$ inch. P_{wh} = 150 psig. SBHP = 2900 psig. P.I. = 2.8, solution GOR = 275, SCF/STB, Sp. Gravity of injection gas = 0.68, S/C available pressure = 980 psig, °API = 40, S/C Temp. = 122 °F B.H. Temp. = 222 °F. 275 psi/1000 ft = flowing gradient of FBHP. 22.5 psi/1000 ft = casing pressure gradient. Substract 100 psi from point of balance. **[10]**

P.T.O.

b) Calculate the total injection gas necessary if, optimum GLR = 600 SCF/STB, Formation GLR = 300 SCF/STB while desired oil production (100% oil) is 1000 bbls/day. **[6]**

Q3) Draw the sketch, relevant graphs and discuss in detail plunger assisted intermittent gas lift system along with advantages and disadvantages. **[16]**

Q4) a) Explain and derive the equation to calculate ideal counterbalance effect required in SRP. **[10]**

b) Draw typical dynagraph curves and indicate various operational problems of SRP system on it. **[6]**

SECTION - II

Q5) a) What is production optimization? Draw graph to demonstrate concept of optimum GLR and explain in brief production optimization using inflow and outflow performance curves for a producing wellbore **[8]**

b) Write the function of ESP components in brief. **[10]**

Q6) Draw the neat schematic sketch of surface and sub-surface set-up of ESP and Calculate total dynamic head, no. of stages required and motor horsepower required for following ESP data.

Data :

Desired rate = 9,100 b/d.

P.I. = 8.2 bbl/day/ft., of drawdown.

Static fluid level 400 ft. from the S/C.

Surface flow line = 2,450 ft. of 4 inch, with elevation rise of 40 ft.

For this friction loss is 41 ft.,/1000 ft.

Perforations = 1850 – 2350 ft.

Wellbore depth = 2350 ft.

Tubing friction loss given = 20 ft., /1000 ft.

From the performance curve, it is recommended to use the pump which gives 65 ft . of head per stage; while horsepower required is 9 hp per stage. **[16]**

Q7) Write any four major workover problems and give the operational solution / steps to solve these problems to improve the production performance, of the wellbore. **[16]**

Q8) a) Explain IPR, skin factor and its relevance for a damaged and improved well. **[6]**

b) Draw and explain a typical surface read - out graph and hydraulic fracturing process. Indicate and explain all the features of it. **[10]**

♦♦♦♦

Total No. of Questions : 8]

SEAT No. :

P1639

[Total No. of Pages : 2

[4265]-928

M.E. (Instrumentation & Control - Process Instru. Biomedical Instru.)
ADVANCED PROCESS INSTRUMENTATION
(2008 Course) (Elective - III(a)) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Solve any THREE questions from each section.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the step analysis method of finding Time constant of the process in detail. **[8]**

b) A system is having two time constants does the step analysis method is suitable for analysis of such process. Explain How? **[8]**

Q2) a) What is duplex controller? Which process needs duplex controller? Explain in detail. **[8]**

b) What is Auto - Selector control? Explain the Auto - Selector controller for specific application. **[8]**

Q3) a) What is interaction? Elaborate its important effects on multivariable system behavior. **[9]**

b) What is the need of Bristol Array Technique? How it is useful in studying interaction in multivariable control system. What are its uses & limitations? **[9]**

Q4) a) With the help of basic assumptions & neat sketch explain Feed forward Controller as applied to Composition control of Distillation Column. **[8]**

b) Explain the effect of additions of feed-forward control to original feedback only system. Also elaborate how it affects the resonant frequency & the amplitude ratio at resonant frequency. **[8]**

P.T.O.

SECTION - II

Q5) a) A self regulating process has equal lag & dead time. With proper justification explain Which controller will be most suitable for this process? **[9]**

b) In a Dead time process PI controller eliminates the offset without much sacrifice in period of oscillation? Justify. **[9]**

Q6) a) Draw & explain the techniques for controlling flow from the gear pump. **[8]**

b) Explain Inferential control of dryer with all assumptions & neat sketch. **[8]**

Q7) Explain why end point detection is important in reactor? Explain in detail batch endpoint control of reactor. **[16]**

Q8) Explain the complete procedure of Design of FLC for process Control. It is generally used for nonlinear process control. Why? Elaborate. **[16]**

♦♦♦♦

Total No. of Questions : 12]

SEAT No. :

P1640

[Total No. of Pages : 2

[4265]-936
M.E. (Polymer)
POLYMER REACTION ENGINEERING
(2008 Course) (Elective - I(a)) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answers to Section - I and Section - II should be written on separate answer book.***
2) ***Solve 3 questions from Section - I and 3 questions from Section - II.***
3) ***Neat diagrams should be drawn whenever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***
6) ***Use of electronic pocket calculator is allowed.***

SECTION - I

Q1) a) Briefly explain the effect of mixing on kinetics of polymerization reaction. **[6]**

b) Compare polymerization by step-growth and chain-growth mechanisms. **[5]**

c) Explain in detail the distinguishing features of polymer manufacturing compared to monomer/chemical manufacturing. **[7]**

OR

Q2) a) Given polymer sample composed of 350 moles of 1000 monomer length and 150 moles of 100 monomer lengths. Calculate the polydispersity index for this polymer sample. **[4]**

b) Comment on the effect of mixing on molecular weight distribution (MWD). **[6]**

c) Explain the following terms and their significances in polymer processing – Number average molecular weight, Weight average molecular weight, Number average degree of polymerization, weight average degree of polymerization. **[8]**

Q3) a) What do you understand by Instantaneous fractional degree of polymerization and Weight degree of polymerization? **[4]**

b) Explain the concept of Tromsdorff effect. **[8]**

c) Briefly explain how MW and MWD affect commercially important properties of polymers. **[4]**

OR

Q4) a) For free radical polymerization reaction derive the expression for Instantaneous fractional degree of polymerization. **[8]**

b) Write a short note on "Auto - acceleration effect" seen in free radical polymerization. **[8]**

P.T.O.

Q5) a) Enlist various models of Tromsdorff effect. Explain any one in detail. **[8]**

b) What do you understand by Diffusion Controlled Polymerization Reaction? Explain with suitable example. **[8]**

OR

Q6) a) Write a short note on Interfacial Polymerization in case of immiscible monomers. **[8]**

b) Explain the concept of Anionic or Cationic Polymerization. **[5]**

c) Briefly explain concept of Rate of Reaction. **[3]**

SECTION - II

Q7) Explain in detail Smith - Ewart model used to understand kinetics of Batch Emulsion Polymerization. **[18]**

OR

Q8) a) Comment on the Performance of Suspension Polymerization based on mathematical model. **[10]**

b) What is RTD? Explain its effect of polymerization reaction. **[8]**

Q9) a) Compare between plug flow and continuous stirred tank type reactors. **[8]**

b) Write a short note on Performance of batch reactor in case of step - growth polymerization. **[8]**

OR

Q10) a) Explain the concept of Macro - and Micro - mixing in polymerization reactors. **[8]**

b) Compare the performance of Homogenous continuously stirred tank and segregated continuously stirred tank types of reactors. **[8]**

Q11) a) Write short note on "Fluidized Bed Reactor used in Co-ordination Polymerization". **[8]**

b) Explain the Polymerization of olefins using Metallocene catalyst. **[8]**

OR

Q12) a) Explain in detail various design considerations used for designing polymerization reactor. **[8]**

b) Write a short note on "Qualitative account of control engineering considerations in operation of batch and continuous polymerization processes". **[8]**

♦♦♦♦

Total No. of Questions : 6]

SEAT No. :

P1646

[Total No. of Pages : 1

[4265]-956
M.E. (Printing Engg.)
DESIGN OF EXPERIMENTS & RESEARCH METHODOLOGY
(2008 Course) (Sem. - I) (Elective - I(c))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answer to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data wherever necessary.***
5) ***Figures to the right indicate marks.***

SECTION - I

Q1) a) Explain different types of Research. **[13]**

b) What is Research Methodology? How it differ from Research Method? **[12]**

Q2) a) What is hypothesis? Explain qualities of good hypothesis. **[13]**

b) What is Literature Review? **[12]**

Q3) a) What is concept of modeling? **[13]**

b) Explain classification of Mathematical Models. **[12]**

SECTION - II

Q4) a) What is Surface Design? **[13]**

b) What is Product Design? **[12]**

Q5) How analysis of Results is carried out? **[25]**

Q6) a) Write note on various types of Research Reports. **[12]**

b) Explain layout of Research Reports. **[13]**

♦♦♦♦

Total No. of Questions : 6]

SEAT No. :

P1647

[Total No. of Pages : 1

[4265]-959
M.E. (Printing)
QUALITY CONTROL SYSTEM AND PRODUCTIVITY
(Elective - II (c)) (2008 Course) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, wherever necessary.***
5) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) What is the role of pre - press in Printing Industry? **[15]**

b) Explain different process variables. **[10]**

Q2) a) Explain the calibration process with reference to press Activity. **[15]**

b) Explain SWOP for web - off set. **[10]**

Q3) a) What is colour Gamutes? Explain with tab values. **[13]**

b) Write notes on **[12]**

i) Contrast
ii) Dot gain,
iii) Trap.

SECTION - II

Q4) a) What is the roll of Quality control department in Printing Industry. **[15]**

b) Which is the most used quality system in Printing Industry? **[10]**

Q5) a) Explain types of control charts used in Printing Industry. **[13]**

b) What is SPC and its implementation in Printing Industry. **[12]**

Q6) Explain in details the process of Analysis in print industry. **[25]**

♦♦♦♦

Total No. of Questions : 6]

SEAT No. :

P1650

[Total No. of Pages : 1

[4265]-965
M.E. (Printing Engg.)
PRESS FINGER PRINTING
(Elective - III (c)) (2008 Course) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answer to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data wherever necessary.***
5) ***Figures to the right indicates full marks.***

SECTION - I

Q1) What is the need of standardization and how it helps for Time, Material, efficiencies and capabilities? **[25]**

Q2) a) What are the press variables? **[10]**

b) Write notes on - **[15]**

i) Constrast,

ii) Hue Error

iii) Gray Balance

Q3) a) What is importance of Registration mark, Tracker line, and step wedge? **[15]**

b) What is ECI 2002 chart? **[10]**

SECTION - II

Q4) Write in details about consistancy maintenance in print industry. **[25]**

Q5) a) Explain Analysis of Results in post finger printing. **[12]**

b) What is bumg curve and their applications? **[13]**

Q6) a) Explain process stability and process capability. **[15]**

b) What is short term and long term variations? **[10]**

♦♦♦♦

Total No. of Questions : 6]

SEAT No. :

P1652

[Total No. of Pages : 2

[4265] - 33

M.E. (Civil) (Structures)

ADVANCED STRUCTURAL MECHANICS

(2002 Course)

Time :4 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections must be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Obtain the differential equation of equilibrium to be satisfied by rectangular stress components acting on element in a stressed body. **[7]**

b) What is compatibility of strains? Obtain strain compatibility equation for 2D problem in elasticity? **[8]**

c) Given the following strain field - **[10]**

$\varepsilon_{xx} = 2x^2 + 3y^2 + z + 1$

$\varepsilon_{yy} = x^2 + 2y^2 + 3z + 2$

$\varepsilon_{zz} = 3x = 2y + z^2 + 1$

$\gamma_{xy} = 10xy$

$\gamma_{yz} = \gamma_{zx} = 0$

i) Check whether this strain field is compatible?

ii) Compute the values of strain variables at the origin for this strain field.

Q2) a) What is Airy's stress function? Show that the Airy's stress function for 2D problem satisfies the bi-harmonic equation? **[10]**

P.T.O.

b) Obtain the expressions for stresses for 4th degree polynomial for 2D elasticity problem. **[15]**

Q3) a) What are different types of Elastic foundations? Give examples. **[5]**

b) Using polar co-ordinates, obtain the solution for stress distribution for radial and transverse stresses in a hollow cylinder subjected to uniform internal pressure 'Pi' **[10]**

c) Find stress and strain components of a cantilever beam loaded with a point load at its free end using Airy's Stress Function? **[10]**

SECTION - II

Q4) a) Explain the methods of combining various mechanisms for plastic collapse of multi- bay, multi-storey rectangular frames? Illustrate each by simple example. **[10]**

b) Based on kinematic concept, determine the collapse load for a portal frame ABCD having fixed base A and D, 4m apart. Height of column AB and CD is 4m. A vertical downward force 'W' acts at center of beam BC and horizontal load W/2 is acting at point B in the direction BC. Assume plastic moment of resistance for beam 1.5 times that of column. **[15]**

Q5) A three span girder is simply supported at the ends. The height of the girder is 4 m and panel width 3 m. The girder is subjected to a point load 600 kN at each interior panel. Construct B.M. and S.F. diagram for this girder. **[25]**

Q6) A simply supported beam ABC of length 'L' m supports a uniformly distributed load 'w' kN/m over left third of span and a point load 'wL' acting downward at point 'C'. Take l(AB) = l(BC) = l(CD) = L/3 m. Assume $2I_{AB} = I_{BC} = I_{CD}$. Estimate the maximum deflection in the beam by Finite Difference Method. **[25]**

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Total No. of Questions : 8]

SEAT No. :

P1657

[Total No. of Pages : 2

[4265] - 48

M.E. (Mechanical) (Design & Heat Power Engg.)

INSTRUMENTATION & AUTOMATIC CONTROL

(2002 Course)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

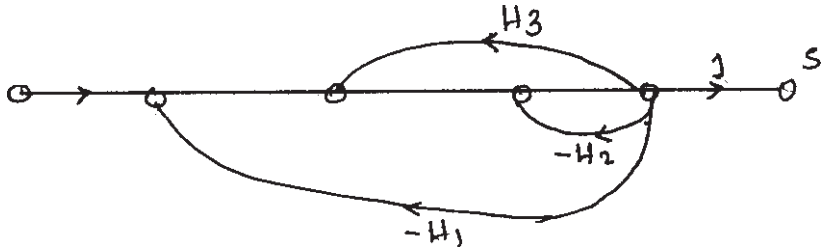
1) ***Answer any three questions from each section.***
2) ***Answer three questions from section I and three questions from section II.***
3) ***Answers to the two sections should be written in separate books.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain properties of Transfer function. **[8]**

b) Distinguish between Analog & Digital Control System. **[8]**

Q2) a) Obtain the overall T.F. of following system shown in fig. 1. **[10]**



b) Explain advantages & limitation of signal flow graph. **[8]**

Q3) a) Explain with block diagram the generalised measurement system. **[8]**

b) Discuss control system for a boiler used in power plant. **[8]**

P.T.O.

Q4) a) Explain the architecture of PLC system. **[8]**

b) Explain the static characteristics of an instrument. **[8]**

SECTION - II

Q5) a) Compare step response of first order & second order instruments. **[8]**

b) Explain the working of very low pressure measuring instrument. **[8]**

Q6) a) Explain how torque can be measured on a rotating shaft. **[8]**

b) Explain the working of a accelerometer. **[8]**

Q7) a) Draw a ladder diagram for control of level of water in a tank . **[8]**

b) Explain P + I + D controller. **[8]**

Q8) Write short notes on any three: **[18]**

a) A/D convertors.

b) Thermal conductivity gauge.

c) Servomotors.

d) Thermistors.

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Total No. of Questions : 8]

SEAT No. :

P1666

[Total No. of Pages : 2

[4265] - 438

M.E. (Civil) (Hydraulics)

WATER RESOURCE PLANNING AND MANAGEMENT

(2008 Course) (Semester - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the term "water resources planning and management" with reference to the following: **[8 + 4 = 12]**

i) Objectives ii) Necessity

b) Explain the term " Economic Aspects" of water resources planning and management. **[6]**

Q2) a) Enlist the various methods of cost benefit studies of single and multipurpose projects. Explain the benefit cost ratio method in detail. **[8]**

b) Describe the "Multi objective planning models" alongwith various parameters involved in it. **[8]**

Q3) a) Explain the term "Irrigation Management Policy". **[8]**

b) Explain the steps involved / procedure for the formation of water users cooperative society. **[8]**

P.T.O.

Q4) a) Two water resource project 'A' and 'B' are planned to be constructed with following parameters. **[8]**

Sr.No	Parameter	Project 'A'	Project 'B'
1	Cost of construction	Rs. 40×10^6	Rs. 80×10^6
2	Annual maintenance and operation cost	Rs. 6 lakh	Rs. 15 lakh
3	Annual Benefits	Rs. 5×10^6	Rs. 10×10^6
4	Useful life of a project	50 years	80 years

Rate of interest = 10%

Which of the above two projects is more economical ?

b) Write short notes on the following: **[8]**

i) Social and Engineering aspect of water resources planning.

ii) Technological options for water resources development.

SECTION - II

Q5) a) Describe "integrated approach in WRE". **[12]**

b) Explain the term "state water disputes" with suitable examples. **[6]**

Q6) a) Explain the role of different bodies in water resources planning. **[8]**

b) What are the various steps to be taken for most of the water resources project with reference to the feasibility of project design. **[8]**

Q7) a) Describe the preparation of feasibility reports with reference to the following: **[12]**

i) Investigations into resources

ii) Site conditions

iii) Legal issues and all other factors bearing upon the design of engineering works.

b) Write short note on "Global water partnership". **[4]**

Q8) a) Explain the term "ICOLD" **[8]**

b) Describe the term "ICID". **[8]**

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Total No. of Questions : 6]

SEAT No. :

P1668

[Total No. of Pages : 2

[4265] - 453

M.E. (Civil) (Structures)

ADVANCED SOLID MECHANICS

(2008 Course) (Sem. - I)

Time :4 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Obtain the differential equation of equilibrium to be satisfied by rectangular stress components acting on element in a stressed body. **[7]**

b) Define strain compatibility. In a general state of stress, assuming the strain displacement relations, obtain the necessary strain compatibility equation. **[8]**

c) A plane passing through point (x, y, z) in a stressed elastic body has its normal 'n' with direction cosines cos(n, x), cos(n, y), cos(n, z). Obtain expressions for the stress resultants (Tn) and its direction in terms of six independent components at that point. **[10]**

Q2) a) What is Airy's stress function? Show that the Airy's stress function for 2D problem satisfies the bihrmonic equation? **[7]**

b) Explain the concept of Stress Invariants? Hence, discuss the state of pure shear and hydrostatic state of stress? **[8]**

c) If $\Phi = a.x^4/12 + b.x^3y/6 + c.x^2.y^2 + d.x.y^3/6 + e.y^4/12$, obtain the stress distribution on the sides of rectangular plate of size L × 2C. Neglect body forces. **[10]**

P.T.O.

Q3) a) Write the basic equations for stress equilibrium, compatibility and stress components in an axi-symmetric problem. **[6]**

b) Obtain the equations of equilibrium in polar co-ordinates for a plane elasticity problem. **[7]**

c) Using Polar Coordinates, show that for an axial symmetric distribution, the stress function $\Phi(r, \theta)$ is of the form

$\Phi = A.\log(r) + B.r^2.\log(r) + C.r^2 + D.$ **[12]**

SECTION - II

Q4) a) A thick walled long cylinder with closed ends has internal and external radii '**a**' and '**b**' respectively. It is subjected to uniform internal and external pressure $\mathbf{P_i}$. Treating this as an axially symmetric plane strain problem, obtain expressions for radial and tangential stresses in the cylinder wall. **[12]**

b) A curved bar with constant narrow c/s and circular axis is bent in the plane of curvature by a moment "M" applied at the ends. Obtain the necessary equation to find stress distribution σ_r and $\sigma\,\theta$. **[13]**

Q5) a) What are different analogous methods used for solving torsion problem? Explain Prandlt's theory for torsion of solid section. **[10]**

b) Derive Poisson's equation for torsion of prismatic bars of non-circular section in terms of stress function Φ using St. Venants Theory. Neglect body forces. **[15]**

Q6) a) What are different types of Elastic foundations? Give examples. **[7]**

b) An infinite elastic beam is subjected to concentrated load 'P'. Obtain and plot the equations for slope, deflection, bending moment and shear force. **[18]**

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Total No. of Questions : 8]

SEAT No. :

P1679

[Total No. of Pages : 2

[4265] - 540

M.E. (Mech.) (Mechatronics)

MECHANICAL & ELECTRONIC MEASUREMENTS

(2008 Course) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answer three questions from Section-I and three questions from Section-II.***
3) ***Answers to the two sections should be written in separate books.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain four important characteristics of an instrument. **[8]**

b) Explain various stages of an instrumentation system. **[8]**

Q2) a) Calculate the correlation co-efficient between the height of father and height of son from the given data **[10]**

Height of father in inches (x)	64	65	66	67	68	69	70
Height of son in inches (y)	66	67	65	68	70	68	72

b) Compare regression and correlation analysis. **[8]**

Q3) a) Explain operational amplifier as differentiator with a neat figure. Discuss one application. **[8]**

b) Discuss Mean, Mode, Deviation, Variance and probability of error. **[8]**

P.T.O.

Q4) a) Explain the terms related to DSO **[8]**

i) Sampling Speed ii) Band width

iii) Depth of Memory iv) Functions of DSO

b) Explain the working of ultrasonic flow meter with a neat sketch. State its applications, merits & demerits. **[8]**

SECTION - II

Q5) a) A pressure sensor that has a output of 25 mv/kPa for pressure variation of 0 to 20 kPa is used as level measurement of liquid with a density of 1300kg/m^3. What output voltage is expected for level variation of 2.0m. **[8]**

b) Explain with a neat sketch the working of thermal conductivity gauge. **[8]**

Q6) a) Explain Hall effect. A hall effect sensor is used to measure a magnetic field of 5000 G. A 2 mm slab of Bismuth is used with 3 A current. $K_H = -1 \times 10^{-8}$ V/A.G. Find the voltage output of the device. **[8]**

b) Explain method of measurement of torque. **[8]**

Q7) a) Explain the construction and working of logic analyzer with a neat block diagram. **[8]**

b) The resistance of a sensor changes from 100Ω to 280Ω as temperature changes from 20ºC to 220ºC. Find the equation relating to temperature & resistance. **[8]**

Q8) Write short notes on any three: **[18]**

a) Techniques of EMI measurement.

b) Process control charts.

c) Surface finish measurement.

d) Volt standard.

e) R-2R DA convertor.

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Total No. of Questions : 6]

SEAT No. :

P1710

[Total No. of Pages : 2

[4265] - 125

M.E. (E & TC) (Microwave)

ANTENNA AND RADIATING SYSTEMS

(2002 Course)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any 2 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Calculate $D(\theta,\phi)$,the directivity for three unidirectional sources with following patterns

i) $\phi = \phi_m \sin\theta \sin^2\theta$

ii) $\phi = \phi_m \sin\theta \sin^3\theta$

iii) $\phi = \phi_m \sin^2\theta \sin^3\theta$ where $0 \le \theta \le \pi$ and $0 \le \phi \le \pi$ **[13]**

b) Explain in detail the strengths and weakness of method of moments and FDTD. **[12]**

Q2) a) Derive expression for radiation field, power density, and radiation resistance for infinitesimal dipole positioned symmetrically at origin of the co-ordinate system and oriented along z-axis. **[13]**

b) Derive the expression for Green's function G corresponding to PDE, for free space. **[12]**

Q3) a) Define following terms related to antenna **[6]**

i) Antenna efficiency

ii) Directivity

b) A parabolic dish provides a gain of 75 db at frequency 20 GHz. Calculate capture area of antenna, its 3dB and null beam width. **[6]**

c) Explain construction and working of Helix antenna. Calculate the directivity in dB of 40 turns helix with $\alpha = 12°$ and circumference equal to one wavelength. **[13]**

P.T.O.

SECTION - II

Q4) a) Write notes on the following : **[15]**

i) Microstrip patch antenna

ii) Lorentz reciprocity theorem

iii) Yagi-Uda antenna

iv) Near field managements

b) Explain the concept of pattern multiplication with suitable example. **[10]**

Q5) a) A rectangular aperture of dimensions 2a along z-axis and 2b along y-axis and is located in Z=0 plane. Assume that the field in the aperture is uniform and is given by

$E_a = E_o\, a_x$ $x \leq a, y \leq b$

= 0 otherwise

Find the radiated electric field and beam width of maximum lobe. **[15]**

b) Determine the length '1' and width 'w' and half angle θ and ϕ of pyramidal E.M horn for which the mouth height is h= 10λ. The horn is fed by rectangular wave guide with TE_{10} mode. **[10]**

Q6) a) Derive expression for radiation resistance and directivity of loop antenna. **[10]**

b) Find the radiation efficiency of a single turn and 4 turn circular loop each of radius $\lambda/10\pi$ and operating at 10 MHz. The radius of wire is $10^{-3}\lambda$ and the turns are spaced $3x10^{-3}\lambda$ apart. Assume the wire is copper with a conductivity of 5.7×10^7 s/m and the antenna is radiating into free space. **[15]**

Total No. of Questions : 8]

SEAT No. :

P1713

[Total No. of Pages : 2

[4265] - 447

M.E. (Civil) (Hydraulics Engineering)

HYDROLOGY

(Semester - II) (2008 Course)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Make suitable assumptions, if necessary.***

SECTION - I

Q1) a) Define Unit Hydrograph. Enlist the uses and Limitations of Unit Hydrograph. **[8]**

b) What are the various methods of determination of infiltration? Describe anyone method. **[8]**

Q2) a) Define Autoregressive Process, Moving Average process and ARIMA. **[6]**

b) What is stochastic process and which are the types of stochastic processes used in Hydrological studies. **[6]**

c) Write a short note on extreme value theory. **[6]**

Q3) a) The analysis of a 30 year flood data at a point on a river yielded $\bar{x} = 1200$ m^3/s and $S_x = 650$ m^3/s. For what discharge would you design the structure at this point to provide 95% assurance that the structure would not fail in the next 50 years? **[8]**

b) Explain the method of design flood estimation using rational method. **[8]**

P.T.O.

Q4) a) A tube well penetrates fully an unconfined aquifer. Calculate the discharge from well lpm. **[6]**

Diameter of well : 30 cm

Drawdown in the well : 3m

Effective length of the strainer under the above drawdown : 10m
Coefficient of permeability : 40m/day

Radius of zero drawdown : 300m

b) Device the well discharge formula for steady flow in an unconfined aquifer using Dupit's theory. Clearly mention the assumptions and draw a neat sketch. **[6]**

c) Write a short note on method of image. **[4]**

SECTION - II

Q5) a) Write a short note on ground water budget. **[4]**

b) define any four of the following: **[8]**

i) cascading water

ii) E log

iii) gravel pack

iv) overall pumping efficiency

v) water well efficiency

vi) water well development

c) Describe with a neat sketch the Hele-shaw model for studying the ground water. State its limitations. **[6]**

Q6) a) State and describe the methods of controlling the sea water intrusion in coastal aquifers. **[8]**

b) When salt water intrusion takes place? How the fresh water and sea water interface is located? **[8]**

Q7) a) What are the steps involved in steepest gradient method. **[8]**

b) What is meant by conformal mapping. State Reimann theorem. **[8]**

Q8) a) What are models? What is use of models? Which are the different types of models to solve ground water flow problems? **[8]**

b) Explain model conceptualization & model calibration process. **[8]**

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Total No. of Questions : 10]

SEAT No. :

P1718

[Total No. of Pages : 4

[4265] - 531

M.E. (Mechanical) (Design Engineering)

ADVANCED MACHINE DESIGN

(2008 Course) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Derive an expression for maximum space efficiency of helical springs. **[6]**

b) A semi-elliptic leaf spring used for automobile suspension consists of three extra full length leaves & 15 graduated length leaves, including the master leaf. The centre-to-centre distance between two eyes of the spring is 1m. The maximum force act on the spring is 75 kN. For each leaf, the ratio of width to thickness is 9 : 1. The material used for leaves have following properties. **[10]**

i) Modulus of Elasticity = 207 000 N/mm^2.

ii) The induced stresses corresponding to maximum force in all leaves are same and equal to 450 N/mm^2. Determine;

- the width & thickness of the leaves;
- the initial nip and
- the initial pre-load required to close the gap C between extra full - length leaves & graduated - length leaves.

P.T.O.

Q2) a) What is difference between design for finite and infinite life probem? **[6]**

b) A cold drawn steel rod of circular cross section is subjected to a variable bending moment which varies from 565 N-m to 1130 N-m, and axial load varies from 4500 N to 13500 N. The maximum bending moment occurs at the same instant that the axial load is minimum. The effect of stress concentration may be neglected. If the factor of safety is '2' determine the diameter of rod, using maximum shear stress theory. Assume following data. **[10]**

Sut = 550 N/mm^2; Syt = 470 N/mm^2

Surface finish factor = 0.82

Size factor = 0.80 ; Reliability factor = 0.897.

Q3) a) Explain the following terms in context with creep. **[8]**

i) Stress relaxation

ii) Creep in Bending.

b) For an alloy steel, the following creep rate is observed at 800ºC. **[8]**

Stress S_1 = 21 MPa; creep rate 0.128% per 1000 Hrs.

S_2 = 28 MPa; creep rate 0.64% per 1000 Hrs.

Determine the constants of the hyperbolic sin law & the creep rate for a stress of 10.5 MPa.

Q4) a) Explain the use and importance of composite materials in mechanical engineering. **[4]**

b) A particular laminate has following elastic constants along the principal axes X - Y. **[12]**

E_{XX} = 200 GPa; E_{YY} = 20 GPa; G_{XY} = 10 GPa; ν_{YX} = 0.25

At a point in the laminate, the following state of stress exists.

$\sigma_{X'X'}$ = 200MPa; $\sigma_{Y'Y'}$ = 20MPa; $\tau_{X'Y'}$ = 20MPa

The x' - axis makes an angle at 30º with the fibre axis, counter - clockwise. Calculate the principal stresses, the principal strains & their orientations.

Q5) Write short note on the following: **[18]**

a) Design for brittle fracture.

b) Vibration and Surging of Helical springs.

c) Hybrid materials & applications.

SECTION - II

Q6) a) Explain the concept of Geometric programming. **[6]**

b) The company manufactures two products P and Q using two limited resources. The maximum amounts of resources 1 and 2 available per day are 1000 and 250 units respectively. The production of 1 unit of product 'P' requires 1 unit of resources 1 and 0.2 unit of resource 2, and the production of 1 unit of product Q requires 0.5 unit of resource 1 and 0.5 unit of resource of 2. The unit costs of resources 1 and 2 are given by the relation $(0.375 - 0.00005\ u_1)$ and $(0.75 - 0.0001\ u_2)$; where u_i denotes the number of units of resource i used (i = 1,2). The selling prices per unit of product P and Q, A_P and A_Q are given by, **[10]**

$A_P = 2.0 - 0.0005\ X_P - 0.00015\ X_Q$

$A_Q = 3.5 - 0.0002\ X_P - 0.0015\ X_Q$

Where, X_P and X_Q indicate respectively, the number of units of product P and Q sold. Estimate the problem of maximizing the profit assuming that the firm sell all the units it manufactures.

Q7) a) What is need of profile corrections of gears? Explain how it is carried out. **[6]**

b) Two 10 teeth gears are to mesh without under cutting. The gears are generated using standard hob with 20° pressure angle. Module is 4 mm. The clearance is 0.2 mm. Using extended centre distance method find out; **[10]**

i) Hob shift

ii) Blank diameter & depth of cutter setting.

iii) Actual pressure angle.

Take usual notations;

$Q = \text{inv}\ \phi$

$$\phi = v - \frac{2}{15} v^3 + \frac{3}{175} v^5$$

where $v = \sqrt[3]{3\theta}$; θ & ϕ are in radians.

Q8) a) Explain fault tree analysis with suitable example. **[6]**

b) A batch of 100 helical compression springs are tested for the deflection under axial load. The results are tabulated as follows. **[10]**

Deflection of springs, mm	No. of springs
26 – 28	2
28 – 30	12
30 – 32	50
32 – 34	32
34 – 36	4

If the permissible deflection for the springs is between 29 mm & 33 mm, determine the % of the springs likely to be rejected. The area below the standard normal distribution curve from zero to 'Z' are as follows:

Z	0.8	0.9	1.0	1.1	1.2	1.3
Area	0.2881	0.3159	0.3413	0.3643	0.3849	0.4032

1.4	1.5	1.6	1.7	1.8
0.4192	0.4332	0.4452	0.4554	0.4641

Q9) a) Discuss the various design considerations for piston. **[4]**

b) The cylinder of a four - stroke diesel engine has following specifications: **[12]**

Brake power = 7.5 kw

Speed = 1400 rpm

Indicated mean effective pressure = 0.35 MPa.

Mechanical efficiency = 80 %.

Maximum gas pressure = 3.5 MPa

The cylinder linear and head are made of gray C.I FG 260 (Sut = 260 N/mm^2 and μ = 0.25).

The studs are made of plain-carbon steel 40C8 (Syt = 380 N/mm^2). The factor of safety for all parts is '6'. Calculate

i) bore & length of the cylinder linear

ii) thickness of the cylinder linear

iii) thickness of the cylinder head

iv) size, number & pitch of stud.

Q10) Write a short note on following: **[18]**

a) Design for assembly.

b) Multivariable search method.

c) S and S_0 spur gears.

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Total No. of Questions : 8]

SEAT No. :

P1732

[Total No. of Pages : 2

[4265] - 943

M.E. (Polymer)

POLYMER STRUCTURE AND PROPERTIES

(2008 Course) (Semester - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answers to Section-I and Section-II should be written on separate answer book.***
2) ***Question 1 from Section-I and Question 5 from Section-II are compulsory.***
3) ***Solve any 2 questions from Section-I and any 2 questions from Section-II from remaining.***
4) ***Neat diagrams should be drawn wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Assume suitable data, if necessary.***
7) ***Use of electronic pocket calculator is allowed.***

SECTION - I

Q1) Answer any 3 : **[18]**

a) Comment on the structural features which resist internal rotation.

b) Write down short note on "Hydrogen" as side groups in different polymers.

c) With suitable examples explain the effect of various types of bonds between Carbon and Oxygen on polymer properties.

d) Explain the concept of Dynamic and Equilibrium flexibility of polymer chains.

e) Enlist various factors causing polydimethylsiloxane (PDMS) to be one of the most flexible polymer known.

Q2) a) With suitable examples explain the concept of Configuration and Conformation. **[6]**

b) What are the various factors those affect kinetic flexibility of chain? Explain any two in detail. **[6]**

c) Although glass transition temperature of PE is less than room temperature why is it not in rubbery state? **[4]**

P.T.O.

Q3) a) What do you understand by Spherulite? Comment on the factors affecting spherulitic growth and thus their effect of properties. **[8]**

b) Write a short note on effect of chemical groups on the adhesion. **[8]**

Q4) a) What is tacticity? Atactic and isotactic PP are crystalline materials. Do agree with the statement. Justify your answer. **[6]**

b) On the basis of chain flexibility explain why rubbers are flexible. **[6]**

c) Enlist factors affecting optical properties of polymers. Discuss anyone in brief. **[4]**

SECTION - II

Q5) Answer any 3 : **[18]**

a) What do you understand by bond polarity? Explain its role in defining electrical properties of polymer

b) Morphology of polymeric product can get affected by conditions. With appropriate justification comment on validity of the statement.

c) With suitable examples comment on moisture absorption phenomenon in Nylons.

d) Write a short note on Fringed micelle model

e) Comment on effect of quenching on crystallization. Also define supercooled state.

Q6) a) Write on structural development during injection moulding process. **[8]**

b) Write a short note on molecular structure requirement for blow moulding and injection moulding operation. **[8]**

Q7) a) What are various transitions observed in polymers? Explain the effect of molecular and sub-molecular factors on the transitions. **[10]**

b) Comment on structural development during rotational moulding operation. **[6]**

Q8) a) Write a note on Effect of Kinetic and Thermodynamic forces on polymer properties. **[8]**

b) Explain the role of molecular weight and molecular weight distribution in defining polymer processing techniques. Give suitable examples. **[8]**

Total No. of Questions : 8]

SEAT No. :

P1733

[Total No. of Pages : 3

[4265] - 777

M.E. (Computer Engineering)

INTERNET ROUTING DESIGN

(Semester - I) (2008 Course) (Elective - I (c))

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Define: Network Algorithmics. Explain various characteristics of Network Algorithmics. **[8]**

b) Describes IP Protocol Stack Architecture with different packet formats. **[8]**

Q2) a) Explain Bellman-Ford Algorithm and the Distance Vector Approach with centralized and distributed view. **[8]**

b) Explain Dijkstra's shortest path first algorithm (distributed approach) with tracking of next loop. **[8]**

Q3) a) What are the main differences between RIPvl and RIPv2? What are the three timers in RIPv1 ? **[8]**

b) Why are different types of LSAs defined in OSPF? Explain any four similarities and differences between IS-IS and OSPF protocol. **[10]**

P.T.O.

Q4) a) Explain aspects of IGRP to compute the composite metric for representing the link cost. **[8]**

b) Identify the functionality in OSPF that allows a static route to be injected into an OSPF domain. **[8]**

SECTION - II

Q5) a) What is the maximum time allowed for a lookup in a router to sustain a data rate of 20 Gbps with an average packet size of 100 bytes? Assume that the router requires 15 ns per packet for other operations in the packet. **[8]**

b) Construct a tree bitmap for the prefixes shown in Table 1. Use a stride of 2 for the first level, a stride of 3 for the second level, and a stride of 2 for the third level. **[8]**

TABLE Prefix table

Prefix Label	Prefix
P_1	0*
P_2	10*
P_3	111*
P_4	10001*
P_5	1*
P_6	1001*
P_7	101000*
P_8	1010000*

TABLE : 1

Q6) a) Define longest prefix matching problem. Explain why longest prefix match is important. What are the primary metrics of performance for evaluating a longest prefix matching algorithm? **[8]**

b) Construct a grid-of-tries using the rules in Table 2. Describe the steps involved in classifying the packet with $F_1 = 0011$ and $F_2 = 0011$? **[8]**

TABLE A two-field classifier

Rule	F_1	F_2
R_1	0*	10*
R_2	0*	01*
R_3	0*	1*
R_4	00*	1*
R_5	00*	11*
R_6	10*	1*
R_7	11*	00*
R_8	*	00*

TABLE : 2

Q7) a) What are different attributes of QoS routing? How QoS routing measures for these factors accumulated along a path in terms of satisfying the guaranteed requirement of an arriving call? **[8]**

b) A General Framework for Source-Based QoS Routing with Path Caching. **[8]**

Q8) Write Short notes on: any three **[18]**

a) QOSPF and PNNI.

b) MPLS and GMPLS.

c) Hierarchical Intelligent Cuttings.

d) Hardware algorithms.

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Total No. of Questions : 8]

SEAT No. :

P1737

[Total No. of Pages : 3

[4265] - 868

M.E. (Information Technology)

APPLIED ALGORITHMS

(2008 Course) (Semester - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Prove by mathematical induction **[10]**

i) $C(n,0)+C(n,1)+C(n,2)+.....+C(n,n) = 2^n$

ii) $C(n,0)-C(n,1)+...+(-1)^iC(n,i)+. ..(-l)^nC(n,n) = 0$

b) Prove by contradiction **[8]**

a) there are infinitely many prime numbers

b) there exist 2 irrational numbers X and Y such that X^Y is rational

Q2) a) With respect to algorithmic complexity explain the following with example. **[12]**

i) asymptotic order of growth

ii) O,Ω, Θ notations

iii) Asymptotic upper bound

iv) Asymptotic lower bound

v) Asymptotic tight bound

b) Derive and solve a recurrence relation for the worst case complexity B(n) for Binary search. **[4]**

P.T.O.

Q3) a) What is time complexity and space complexity of an algorithm? How do we measure these complexities of an algorithms? Discuss the recursive and non - recursive version of finding the maximum value in the array of 10 elements and compare the time space complexity requirement in the same. **[8]**

b) By considering the complete graph, with n vertices, show that the number of spanning trees in an n vertex graph can be greater than 2^{n-1}-2. **[8]**

Q4) a) What is self-adjusting binary search tree? What are the advantages and disadvantages of such binary search trees? Explain the splay tree with suitable example of all possible splaying steps for self-adjustment. **[6]**

b) Write an algorithm for Depth First Search algorithm in Graph using suitable data structure. What is the complexity of the algorithm? If we have not use this data structure can still we implement the same algorithm, if yes what is its complexity? **[10]**

SECTION - II

Q5) a) Design and analyze an algorithm that determines whether a graph is bipartite and identifies the bipartition of the vertices. If it is bipartite for the following implementation of the graph **[10]**

i) An adjacency matrix

ii) Adjacency lists

b) What is an NP-hard and approximation algorithm? What is the relation between these two? Give suitable example. **[6]**

Q6) a) You are given a convex polygon P in the plane whose vertices in the CCW order are p1; p2; : : : ; pn. Preprocess P using O(n) space and O(n log n) time so that the following queries can each be answered in O(log n) time. **[10]**

i) Given a query line L : ax+by = c, decide if L intersects P, and if so, report the edges of P crossed by L.

ii) Given a linear function $f(x; y) = ax + by$, find the vertex of P at which the value of f is maximum.

b) Explain the following with respect to approximation algorithm. **[8]**

i) absolute approximation algorithms

ii) f(n)-approximation algorithms

iii) $\in$ - approximate algorithm

iv) approximate scheme

Q7) a) Write the CRCW and EREW Algorithms for parallel computers. **[10]**

b) Write a short note on "pointer doubling" **[6]**

Q8) a) Explain the following : **[10]**

i) Computational complexity

ii) Decision problem

iii) Deterministic and Non deterministic algorithm

iv) Complexity classes

v) Intractability

b) What is parallel algorithms? How does it different than its counterpart i.e. serial algorithm? Give suitable example. And Discuss various parallel computational model and how do they achieve the parallelism in the algorithmic design. **[6]**

Total No. of Questions : 10]

SEAT No. :

P1745

[Total No. of Pages : 2

[4265] - 70

M.E. (Mechanical) (Design Engineering)

ROBOTICS

(2002 Course) (Elective - I(c))

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of non programmable calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the terms Precision, Resolution and Accuracy related to robotics. **[8]**

b) Classify robots according to robot configuration and explain anyone in detail. **[8]**

Q2) a) An object tracking system identifies a flying object at the position of (700, 600, 1200) in its current coordinate system, which is oriented by 30° about X-axis, then 30º of rotation about the Y-axis and finally it was rotated by –45º about Z-axis of the universal coordinate system. Map the object in Universal coordinate system. **[8]**

b) Discuss the limitations and remedies of Denvit Hertenberg parameters. **[8]**

Q3) a) A camera locates an object by **[10]**

$$ {}^{\text{Camera}}_{\text{Object}}T = \begin{vmatrix} 0 & -1 & 0 & -20 \\ 1 & 0 & 0 & 45 \\ 0 & 0 & 1 & 30 \\ 0 & 0 & 0 & 1 \end{vmatrix} $$

The camera is then translated by 25 units along Z-axis of the object, then rotated about its own X-axis by -90°. Determine the new relation between camera and object.

P.T.O.

b) Explain the procedure used to establish the Jacobean matrix for wrist positioning. **[6]**

Q4) a) Derive an equation to determine the joint torque and the components of forces applied at the wrist or tool for controlling the robot arm. **[10]**

b) A two DOF Planar RR manipulator has L1= 120mm and L2 = 90 mm. Determine joint angle using Geometric approach, so that the free end is located at(100,70). **[6]**

Q5) Short notes on :

a) Steps in trajectory planning **[6]**

b) Need for manipulator control **[6]**

c) D' Alberts equation of motion **[6]**

SECTION - II

Q6) a) Explain Joint space control and operational space control. **[8]**

b) Explain the term adaptive control used in robotics. **[4]**

c) Explain the stiffness control in case of end effectors in robotics. **[4]**

Q7) a) Explain different types of robot teaching system. **[6]**

b) Explain WAIT, DELAY, SIGNAL command with suitable example. **[6]**

c) Explain the importance of Artificial intelligence in robotics. **[4]**

Q8) a) Distinguish between position based control and image based control. **[8]**

b) What is need of actuators in robotics. Explain different types of actuators used in robot. **[8]**

Q9) a) Explain the term Hybrid force/Motion control. **[6]**

b) Explain the significance of the terms mass, stiffness of the spring, coefficient of friction in designing of the robot. **[6]**

c) What are the major differences between open loop and close loop servo system? **[4]**

Q10) Attempt any three : **[18]**

a) Local dexterity for open and close chains.

b) Extractions of visual features.

c) Explain the desired characteristics for the control of the system.

d) Write a short note on path planning for a robot.

Total No. of Questions : 6]

SEAT No. :

P1747

[Total No. of Pages : 3

[4265]-124
M.E. (E & TC) (Microwave)
RF & MICRO WAVE CIRCUIT DESIGN
(2002 Course)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Solve any two questions from each section.***

2) ***Answers to the two sections should be written in separate books.***

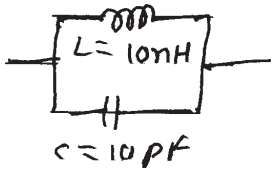
3) ***Neat diagrams must be drawn wherever necessary.***

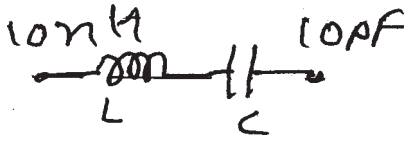
4) ***Figures to the right indicate full marks.***

5) ***Assume suitable data, if necessary.***

SECTION - I

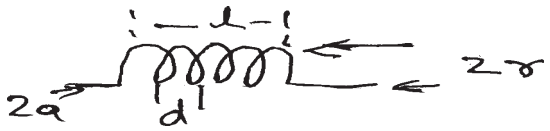
Q1) a) Find the frequency response impedance magnitude of following series and parallel circuits LC circuits.





Compare your result to the situation when can ideal inductance is replaced by the same inductance and an 5 Ω resistance connected in series. Assume circuit operates at VHF/GHF frequency band 3 – 3000 MHz. **[8]**

b) Estimate the frequency response of RFC coil formed by N = 3.5 turns of AWG 36 copper wire on 0.1 inch air core, the length of coil is 0.05 inch, radius of coil core r = 1.27 mm, radius of wire R = 63.5 μm, distance between two adjacent turn is 3.6×10^{-4} meter **[8]**



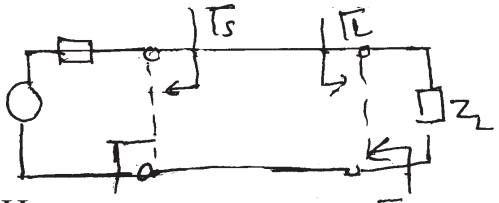
c) Discuss capacitor and inductor behavior at high frequency. **[9]**

P.T.O.

Q2) a) A particular RF circuit requires that a line impedance of 50 Ω is to be maintained. The selected PCB board material is FR-G with $\in_r = 4.6$ and thickness of 40 mil. What is the width of trace, phase velocity and wavelength at 2 GHz. **[10]**

b) Define standing wave ratio with its formula. **[5]**

c) For the shown circuit, assume a lossless line with Z_o = 75Ω, Z_G = 50 Ω,Z_L = 40 Ω. Compute input power and output power delivered to the load. Assume length of line is λ/2 and V_G = 5 V. **[10]**



F = 2 GHz

Q3) a) What is smith chart? Explain different parameters that can be obtained from smith chart. **[8]**

b) Plot the following normalized impedances and admittances in smith chart. **[8]**

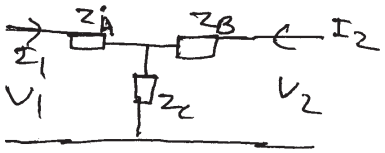
$z = 0.1 + j0.7$

$y = 0.3 + j0.5$

$z = 0.2 + j0.1$

$y = 0.1 + j0.2$

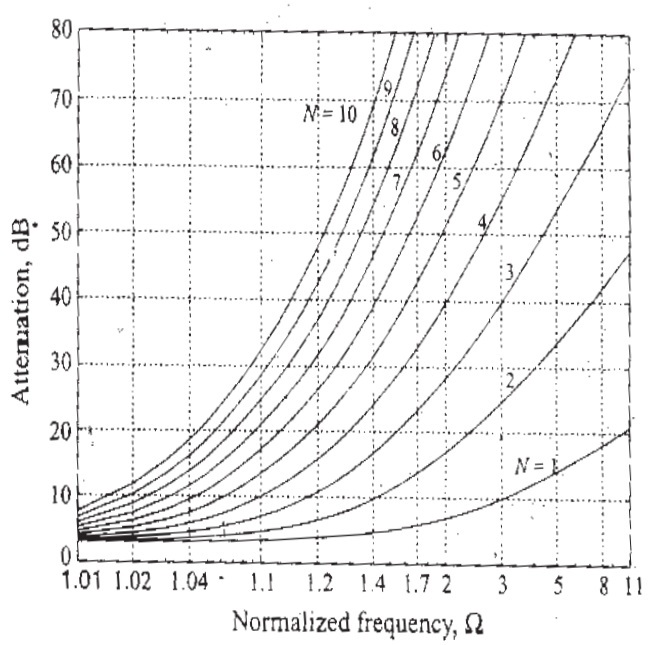
c) For the following generic T network, find the impedance and admittance matrix. **[9]**



SECTION - II

Q4) a) Discuss kuroda's identity and Ruharson's transformation. Design a prototype for low pass butter worth filter that will prove at least 20 dB attenuation at the frequency of $2F_{3dB}$ **[12]**

b) A coupled line band pass filter in the passband to be designed for a center frequency of 5 GHz and lower and upper cut off frequencies of 4.8 & 5.3 GHz. The attenuation should be less than 30 dB at 5.3 GHz. Select the number of elements and find odd and even mode characteristic impedance of transmission line. **[13]**



Q5) a) Explain Schottky diode, fabrication, equivalent circuit in detail. **[15]**

b) An npn transistor is operated under dc bias of $I_C^Q = 6$ mA, $I_B^Q = 40$ μA and an early voltage is recorded to be $V_{AV} = 30$ V, transistor operating frequency is 31 GHz. Find hybrid π parameters, $\beta_0, \gamma_\pi, C_\pi, r_0$ and g_m. **[10]**

Q6) a) Draw generic amplifier system and discuss the concept transducer power gain, available power and operating power gain. **[10]**

b) Write detail notes on microwave oscillator and mixer. **[10]**

c) Check the stability of BJT with following S parameters. **[5]**

$S_{11} = 0.70 \angle -57°$, $S_{12} = 0.04 \angle 47°$, $S_{21} = 10.5 \angle 136°$ $S_{22} = 0.79 \angle -33°$.

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Total No. of Questions : 12]

SEAT No. :

P1755

[Total No. of Pages : 2

[4265]-448
M.E. (Civil) (Hydraulic)
SEDIMENT TRANSPORT AND RIVER MECHANICS
(2008 Course) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer Q 1 or Q 2, Q 3 or Q 4 , Q 5 or Q 6 from Section - I Answer Q 7 or Q 8, Q 9 or Q 10, Q 11 or Q 12 from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Define sediment and write the sources of sediment. Also explain the factors affecting sediment yield. **[8]**

b) What are the different bed forms in alluvial rivers. **[8]**

OR

Q2) a) What are the several aspects of shield diagrams. **[8]**

b) Write short notes on **[8]**

i) Flow regime

ii) Resistance analysis.

Q3) a) Explain the mechanism of sediment transport. **[8]**

b) Define bed load & explain Du Boy's formula and Meyer Peter's formula for determining the bed load in stream flow. **[8]**

OR

Q4) a) Define suspended load and explain the theory of distribution and transportation of suspended sediment in stream flow. **[8]**

b) Explain the use of remote sensing in determining the sediment load. **[8]**

Q5) a) Explain the procedural steps in tractive force approach for design of stable channels. **[8]**

b) Design a channel section using Lacey's theory for discharge = 15 m^3/s, mean diameter of silt particle = 0.33 mm and side slope = ½ : 1 Also find the longitudinal slope. **[10]**

OR

P.T.O.

Q6) a) What is meant by regime? Differentiate between regime in natural rivers and artificial channels. **[8]**

b) A canal has bed width = 6 m, depth = 1.2 m, discharge = 4.60 cumces, slope = 1 in 5000, Manning's N = 0.0225 and critical velocity ratio = 0.95. Check whether the chosen section satisfies Kennedy's theory. **[10]**

SECTION - II

Q7) a) Explain the methods of sediment bed load measurements. **[8]**

b) What do you mean by aggradation? What are the causes of occurrence of aggradation, explain it with suitable examples. **[8]**

OR

Q8) a) What are the various methods for suspended load measurement for sediments. **[8]**

b) What are the different types of degradation? Give the effects of degradation. How will you control degradation? **[8]**

Q9) a) Explain causes of sitting of reservoirs and methods for its control. **[8]**

b) Explain the behaviour of rivers with special reference to straight reaches and bonds. **[8]**

OR

Q10) Write short notes on the following **[16]**

a) bifurcation

b) confluences

c) river gauging

d) sediment deposition in reservoirs and recovery of storage in reservoirs.

Q11) a) Write short notes on

i) planform river bends

ii) channel characteristics **[8]**

b) What do you mean by river training? Describe various types of river training and protection works. **[10]**

OR

Q12) a) Explain the role of cut - offs in the meandering of rivers. **[6]**

b) What is meant by guide banks? What are their functions? **[6]**

c) Distinguish between permeable spurs and impermeable spurs. **[6]**

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Total No. of Questions : 12]

SEAT No. :

P1756

[Total No. of Pages : 3

[4265] - 451

M.E. (Civil) (Hydraulic Engineering)

WATER MANAGEMENT & CONVEYANCE SYSTEM

(2008 Course) (Elective - III (c)) (Semester - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 from Section I, Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12 from Section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is meant by point & non-point source pollution in case of water systems? Differentiate between point & non-point source pollution. Also explain the assessment of point & non-point source pollution. **[9]**

b) Explain the following: **[9]**

i) Application of computer based models for water quality and contaminant transport.

ii) Pollutant transport mechanism and modeling.

OR

Q2) Write short notes on following: **[18]**

a) Mixing in rivers - turbulent diffusion & dispersion.

b) Nature of waste inputs to water system.

c) Lake & estuaries models.

d) Dissolved oxygen models.

P.T.O.

Q3) a) Discuss the water problems from global and national perspective. **[8]**

b) What is the criteria for water tariff setting? Explain the various water tariff structures. **[8]**

OR

Q4) a) Discuss the law and legislations for water problems giving examples. **[8]**

b) Write short notes on : **[8]**

i) Tariff adjustment processes.

ii) Affordability & social protection measures of water charges.

Q5) a) Explain and differentiate water conveyance systems without intermediate storage and with intermediate storage. **[8]**

b) What are the technologies used for water conservation and explain the impact of water conservation system. **[8]**

OR

Q6) Write short notes on: **[16]**

a) Measurement techniques for water distribution.

b) Impact of water conservation practices & policies.

c) Multipurpose reservoirs.

d) Design elements of water distribution system.

SECTION - II

Q7) a) What are the methods of controlling run off from urbanised areas. **[8]**

b) Write short notes on: **[8]**

i) Meteorological data analysis.

ii) Use of deterministic and stochastic modeling.

OR

Q8) a) What is meant by sustainable drainage system? Explain the need and principles of sustainable urban drainage system. **[8]**

b) Write explanatory note on “Run-off control by on site detention”. **[8]**

Q9) a) What are the structural and non-structural alternatives for control? Explain them. **[8]**

b) Write short notes on: **[8]**

i) Dam failure system warning for structural modifications.

ii) Floodways.

OR

Q10) a) Discuss the effects of hydraulic structures on river surface profiles and sediment transport. **[8]**

b) Write short notes on : **[8]**

i) Channel improvement.

ii) Effect of levees on river stages.

Q11) a) How will you make the assessment of water power potential of a hydro-electric power station. **[9]**

b) Write short notes on : **[9]**

i) Flow augmentation.

ii) Relative economics of hydel and thermal power plants.

OR

Q12) a) Explain the various components of hydro power station giving a schematic diagram. **[9]**

b) Write a explanatory note on: **[9]**

"Hydro-electric development and power sector".

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Total No. of Questions : 10]

SEAT No. :

P1763

[Total No. of Pages : 2

[4265] - 535

M.E. (Mechanical) (Design Engineering)

COMPUTER AIDED ENGINEERING

(2008 Course) (Elective - III (c)) (Semester - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Discuss the set of issues that need to be addressed during development of conceptual model for simulation. **[8]**

b) Discuss the requirements of product data exchange between dissimilar CAD / CAM systems. **[8]**

Q2) a) Explain the setup procedure required by the system before constructing the geometric model? Enlist the corresponding command sequence. **[8]**

b) Explain the requirements for the development of successful design project using CAE software. **[8]**

Q3) a) Justify with suitable example which type of geometric modeling technique is preferred for assembly modeling. **[8]**

b) Explain 3D mating relationships used in assembly modeling. **[8]**

Q4) a) Give details of various element shapes employed for modeling of any non-linear mechanical systems. **[8]**

b) Explain stress tensors and their invariant in contest to von-misses stress. **[8]**

Q5) Write short notes on :

a) Techniques for system dynamics. **[6]**

b) Use of FEA software to determine dimensions and materials of the parts. **[6]**

c) Mesh refinement techniques. **[6]**

P.T.O.

SECTION - II

Q6) a) Explain various descretization techniques used in CFD analysis. **[8]**

b) Explain some of the quality checks used for checking 3D mesh. **[8]**

Q7) a) Discuss the region based meshing approach used in FEA. **[8]**

b) Differentiate between the most popular approaches used to derive integral equations in FEM. **[8]**

Q8) a) Explain the general procedure for steady state analysis of any engineering systems with suitable example. **[8]**

b) Explain different levels of approximations used in CFD analysis. **[8]**

Q9) a) Discuss the limitations and advantages of CFD against experimental fluid dynamics. **[8]**

b) Explain different types of grids used in CFD. **[8]**

Q10) Write short notes on :

a) Basic fluid motions in CFD. **[6]**

b) Analysis of coupled thermo mechanical systems. **[6]**

c) Features of CFD Modeling for steady incompressible flow systems. **[6]**

Total No. of Questions : 8]

SEAT No. :

P1768

[Total No. of Pages : 2

[4265]-602

M.E. (Electrical) (Control Systems)

ADVANCED DIGITAL CONTROL TECHNIQUE

(2008 Course) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, Slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Explain following methods of digital programming in detail. **[16]**

a) State variable method.

b) Numerical integration method.

Q2) a) Explain 'warping' and 'pre - warping'. **[8]**

b) Describe in detail, closed form solution of G(T) **[8]**

Q3) a) Draw and explain the basic block diagram of a digital controller and state its physical realizability conditions. **[6]**

b) Explain in detail, following digital programming methods for realization of a digital controller :

i) Direct digital programming. **[6]**

ii) Cascade digital programming. **[6]**

Q4) a) Design a digital PID controller for a controlled process of a system given by,

$$G_p(s) = \frac{5}{s^2 + s + 10}$$

Consider a sampling period of 0.5 sec. The performance criterion is that the Ramp error constant $K_V^* = 10$. **[12]**

b) What is partial matching of states? **[6]**

P.T.O.

SECTION - II

Q5) a) Write a short note on : **[10]**

i) Decimation

ii) Interpolation

b) Explain finite wordlength effect in digital filters. **[6]**

Q6) a) Enlist different criteria for selection of DSP. **[4]**

b) Explain in detail, architecture of TMS 320 C5X DSP. **[12]**

Q7) a) Explain the phenomena of instruction pipelining in C5X DSP. **[8]**

b) Enlist different addressing modes in TMS320C5X DSP 'programming'. Explain 'immediate' addressing mode in detail. **[10]**

Q8) Explain following terms in detail related to TMS320C54X DSP. **[18]**

a) Internal memory organization.

b) Central processing unit.

♦♦♦♦

Total No. of Questions : 8]

SEAT No. :

P1777

[Total No. of Pages : 3

[4265] - 757

M.E. (Production) (CAD/CAM)

MECHATRONICS

(2008 Course) (Elective - II (a)) (Semester - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Draw and explain the functional block diagram of a typical sensor and actuator systems? **[8]**

b) Explain the scope and components of a mechatronic system? **[8]**

Q2) a) Explain in the significant trade-offs between inductive, capacitive and photo-optic sensors. **[8]**

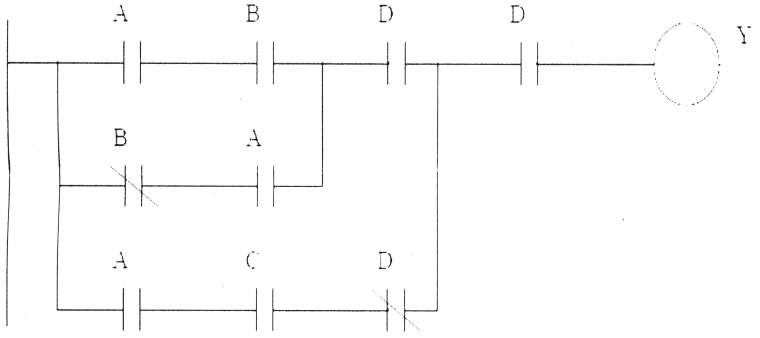
b) Draw a simple hydraulic system that will advance and retract a cylinder using PLC outputs. Sketches should include details from the PLC output card to the hydraulic cylinder. **[8]**

Q3) a) Explain the following with neat diagrams : **[10]**

i) Velocity sensors

ii) Temperature sensors

b) Convert the following ladder logic to a Boolean equation. Then simplify it, and convert it back to simpler ladder logic. **[6]**



P.T.O.

Q4) a) What are the principles of analog and digital signal conditioning. Explain? **[6]**

b) Explain in brief the role of multiplexers in mechatronics applications. **[6]**

c) Use Boolean equations to develop simplified ladder logic for the following truth table where A, B, C and D are inputs, and X and Y are outputs. **[6]**

A	B	C	D	X	Y
0	0	0	0	0	0
0	0	0	1	1	0
0	0	1	0	0	0
0	0	1	1	1	0
0	1	0	0	0	0
0	1	0	1	0	1
0	1	1	0	0	1
0	1	1	1	0	1
1	0	0	0	0	0
1	0	0	1	1	0
1	0	1	0	0	0
1	0	1	1	1	0
1	1	0	0	0	0
1	1	0	1	1	1
1	1	1	0	0	1
1	1	1	1	1	1

SECTION - II

Q5) a) Given the truth table below find the most efficient ladder logic to implement it using karnaugh maps. **[8]**

D	E	F	G	Y
0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	0
0	1	0	1	1
0	1	1	0	0
0	1	1	1	1
1	0	0	0	0
1	0	0	1	1
1	0	1	0	0
1	0	1	1	1
1	1	0	0	0
1	1	0	1	1
1	1	1	0	0
1	1	1	1	1

b) Describe the basic steps of operation for a PLC after it is turned on. Why does removing a battery from some PLCs clear the memory. **[8]**

Q6) a) Write a program that will turn on a flashing light for the first 15 seconds after a PLC is turned on. The light should flash for half a second on and half a second off. **[8]**

b) Distinguish between a microprocessor and a microcontroller. Explain with a neat diagram the organization of a microcontroller system. **[10]**

Q7) a) A wrapping process is to be controlled with a PLC. The general sequence of operations is described below. Develop the ladder logic using process sequence bits. **[12]**

i) The folder is idle until a part arrives.

ii) When a part arrives it triggers the *part* sensor and the part is held in place by actuating the *hold* actuator.

iii) The first wrap is done by turning on output *paper* for 1 second.

iv) The paper is then folded by turning on the *crease* output for 0.5 seconds.

v) An adhesive is applied by turning on output *tape* for 0.75 seconds.

vi) The part is release by turning off output *hold.*

vii) The process pauses until the *part* sensors goes off, and then the machine returns to idle.

b) Explain the applications of microcontrollers in automation and control. **[4]**

Q8) Write a short note on the following : **[16]**

a) Elements of data acquisition and control system

b) Micro sensors

c) PID control

d) Role of artificial intelligence in mechatronics

Total No. of Questions : 8]

SEAT No. :

P1781

[Total No. of Pages : 2

[4265] - 813

M.E. (Chemical)

PROCESS OPTIMIZATION

(2008 Course) (Elective - II (b)) (Semester - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Solve any three questions from each section.***
2) ***Figures to the right indicate full marks.***

SECTION - I

Q1) Minimize $f(x) = x^2 + (3/(1+x))$. Use Newton Raphson Method. Write complete algorithm for this method and demonstrate at least 3 steps towards finding optimized solution for the above function. Do not try to solve it completely. **[17]**

Q2) Minimize $f(x) = 8x^3 - 2x^2 + 5x + 4$. Use Internal halving Method. Write complete algorithm for this method and demonstrate at least 3 steps towards finding optimized solution for the above function. **[17]**

Q3) A typical plate to plate material and energy balances over a plate distillation column is an example of a set of ordinary differential equations. Define typical constraints on such a problem and construct a problem around a plate distillation column and identify the objective function. Also discuss the strategy to get optimized solution out of it. Do not solve it. **[16]**

Q4) Write short notes (Any three) : **[16]**

a) Parametric optimization.

b) Design parameters.

c) Constrained optimization.

d) Linear constraints.

P.T.O.

SECTION - II

Q5) Minimize $f(x) = (x_1 - 2)^2 + x_2^2$ **[17]**

Subject to linear constraints

$x_1 \geq 0$, $x_2 \geq (-10)$, $7 - 2x_1 - x_2 \geq 0$, $24 - 3x_1 - 2x_2 \leq 0$

Q6) State various conditions of definiteness of a function using Hessian matrix Find whether the following function is strictly convex / strictly concave.

$f(x) = 5x_1^2 + 7x_1x_2 + 10x_1 + 5x_2 - 9x_2^2 + 4$ **[17]**

Q7) Explain the Simplex Search Method and demonstrate for minimization of $f(x) = 2x_1^2 + 5x_2^2 + 8$ starting at $(x^0)^T = [3\ 2]$ in the direction $s^0 = [-3\ -2]^T$. Perform 4 steps. **[16]**

Q8) Write short notes (Any three) : **[16]**

a) Linear programming.

b) Objective function.

c) Concavity of a function.

d) Grad Function.

Total No. of Questions : 8]

SEAT No. :

P1791

[Total No. of Pages : 2

[4265] - 127

M.E. (E & TC) (Microwave)

MACHINE VISION AND PATTERN ANALYSIS

(2002 Course) (Elective - I (a))

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Solve any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) Discuss the metric and topological properties of digital image. **[8]**

b) Explain the following hierarchical data structures. **[10]**

i) Pyramids.

ii) Quad tree.

Q2) a) What is an image filtering operation? Explain any one technique to perform high pass filtering operation. What are the effects of such operation on the image? **[8]**

b) What is histogram? Write the applications where histogram of an image is used. Draw the nature of histograms for low contrast, high contrast dark and bright images. **[8]**

Q3) a) What is thresholding? Explain any one technique of determining the threshold. **[8]**

b) What are the different methods of image restoration? Explain inverse filtering. **[8]**

Q4) a) Explain watershed segmentation algorithm. **[8]**

b) What is morphology? Explain image closing operation and its function. **[8]**

P.T.O.

SECTION - II

Q5) a) Explain sobel operator for detecting the edges in an image. State a suitable application where edge detection is necessary. Explain it. **[10]**

b) Explain Hough transform. **[8]**

Q6) a) What is texture? Explain various approaches for texture analysis. **[8]**

b) With the help of a neat block diagram, explain the steps in a pattern recognition system. **[8]**

Q7) a) Define the terms : **[8]**

i) Pattern.

ii) Class.

iii) Features.

iv) Classifiers.

b) What do you mean by boundary descriptors? Explain any one boundary descriptor. **[8]**

Q8) a) State various types of statistical pattern recognition techniques. Explain any one technique in detail. **[8]**

b) Explain the use of fuzzy systems in pattern recognition. **[8]**

Total No. of Questions : 6]

SEAT No. :

P1793

[Total No. of Pages : 2

[4265] - 182

M.E. (Electrical) (Power System)

POWER SYSTEM DYNAMICS

(2002 Course)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written on separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary and state clearly the same.***

SECTION - I

Q1) a) Explain in detail the Clarke's diagram as a tool to determine the steady state power limit of a two machine system with consideration of shunt admittance. **[12]**

b) An alternator is delivering 53% of P_{max} to an infinite bus through a transmission line. A fault occurs on the line such that the new maximum power is 40% of the original value of P_{max}. When the fault is subsequently cleared, the maximum power that can be delivered is 80% of the original vlaue of P_{max}. Determine i) the critical clearing angle; and ii) the maximum value of δ for which the machine swings around its new equilibrium position, if the fault is cleared at $\delta = 74^{o}$. **[13]**

Q2) a) Discuss the effects of saturation and saliency on the steady state stability of a salient pole alternator. **[10]**

b) State and explain the equal area criterion used in power system stability studies. Describe any two applications of this technique. **[15]**

Q3) Write short notes on the following :

a) Voltage instability in power systems; **[8]**

b) Islanding in power systems; and **[8]**

c) Power system stabilisers. **[9]**

P.T.O.

SECTION - II

Q4) a) Explain how the loads are represented in stability studies of a power system. Discuss the effects of loads on steady state stability limit. **[10]**

b) A 50Hz synchronous alternator has $x'd = 0.3$ p.u. and H = 9.8 MJ/MVA. The alternator is connected to an infinite bus through a transformer which has a leakage reactance of 0.2 p.u. and a double circuit transmission line of reactance 0.25 p.u. each. The alternator is delivering 0.7 p.u. of real power at 0.866 p.f. lagging to the infinite bus. The p.u. damping coefficient of the alternator is 0.12. For a small disturbance of 6° in the load angle of the alternator, obtain the equation of motion of rotor angle and generator frequency. **[15]**

Q5) a) Explain Euler's modified method. Using it, solve the differential equation

$$\frac{d\delta}{dt} = 2t^2 - \delta$$

given that $\delta_0 = 1$ radian at t = 0. Determine the value of δ at t = 0.15 sec. Take h = 0.05 sec. **[15]**

b) Describe the classical multimachine model for dynamic studies in power system bringing out the drawbacks in modelling. **[10]**

Q6) Write short notes on the following :

a) Methods of improving power system stability, **[9]**

b) Runge-Kutta method; and **[8]**

c) Pre-calculated swing curves. **[8]**

Total No. of Questions : 11]

SEAT No. :

P1794

[Total No. of Pages : 4

[4265] - 200

M.E. (Production Engineering)

RELIABILITY ENGINEERING

(2002 Course) (Elective - II (c))

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***
6) ***Use of non-programmable electronic calculator is allowed.***

SECTION - I

Q1) a) A series of tests conducted under certain stipulated conditions on 800 electronic components, the total duration of tests is 15 hrs. The number of components that fail during each hourly interval is noted. The results obtained are tabulated as shown in table

Time (t)	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
No. of failures	00	120	85	71	62	53	45	41	37	35	29	50	45	63	35	29

Based on the failure data or survival test results shown in table. Define & Calculate failure density (fd) ; failure rate (Z) and Reliability (R). **[12]**

b) Explain with neat sketch different failure modes of 'Bath tub' curve. **[4]**

OR

Q2) a) In order to test the strength of a new glue, ten similar structures constructed using the glue were subjected to a continuous vibratory load, and the duration of survival of each structure was noted, the values obtained the following **[6]**

Specimen Numbers	01	02	03	04	05	06	07	08	09	10
Hours of Survival	60	62	58	50	61	55	59	62	54	55

Calculate the mean time to failures (MTTF) from this data.

P.T.O.

b) In a test involving continuous satisfactory performance of 110 electronic instruments under excessive vibration conditions, the following failure frequencies were observed, the total test period being 8 hrs.

Time interval	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8
Number of failures	3	16	22	42	11	09	04	03

Calculate the mean time to failures (MTTF) from this data. **[6]**

c) Define reliability & discuss in it details. **[4]**

Q3) a) Explain the concept of "Techno-Physico Constraints" with a conceptual system. **[6]**

b) Construct a fault tree from **Fig.l** such that the top event is a system failure and component failures are basic events. If Pr{A}=Pr{B}=0.9, Pr{C}=Pr{D}=0.8 and Pr{E}=Pr{F}=0.75, compute the probability of the top event. **[10]**

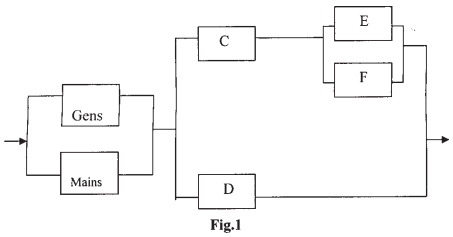


Fig.1

OR

Q4) a) Construct a reliability block diagram for given fault tree. **Fig.2** **[8]**

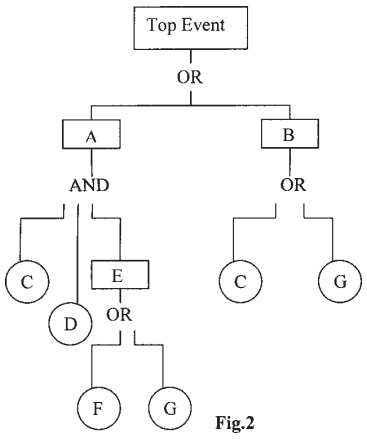


Fig.2

b) Differentiate between :Design FMEA and Process FMEA .Explain methodology of system analysis. **[8]**

Q5) a) Explain with neat sketch 1) Series Configuration 2) General Series- Parallel configuration. **[10]**

b) Find the system reliability of the configuration in **Fig.3** **[8]**

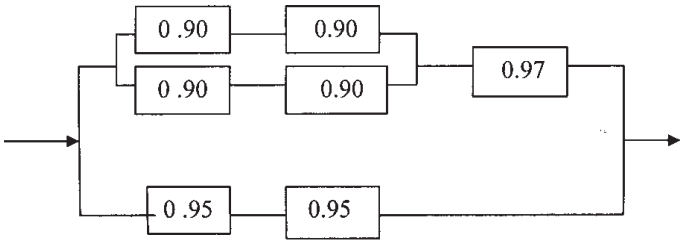


Fig.3

OR

Q6) a) Find the reliability of the configurations shown below in **Fig.4**, **[8]**

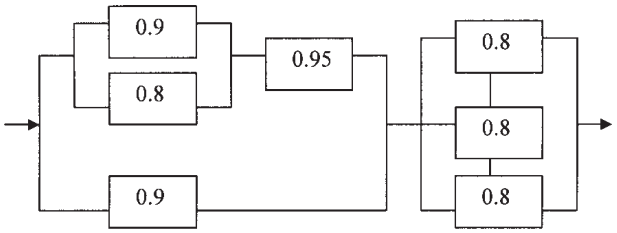


Fig.4

b) Explain with neat sketch 1) Parallel Configuration 2)General Parallel-Series configuration. **[10]**

SECTION - II

Q7) a) Define Tero-technology and state the importance of the same in evolving the "LCC" of an asset. **[8]**

b) A company is planning to acquire a truck. Two makes of trucks are available in the market. The cost of garaging and the driver's wages are same for both. The other data on cost are provided in the table.

Parameters	Truck A	Truck B
Capital cost	Rs. 5 Lakhs	Rs.3 Lakhs
Annual Road Tax & Insurance	Rs. 8,000	Rs. 7,000
Operating Cost a) fuel consumption b) oil consumption c) fuel cost d) oil cost	 20km/Lit. 2 lit/l000 km Rs.3/lit. 25/lit.	. 20km/Lit. 2 lit/l000 km Rs.3/lit. 21/lit.

Maintenance Cost		
a) service interval	Every 7,000 km	Every 4,000 km
b) cost of service	Rs.3,000	Rs.5,000
c) random breakdown	Every30,000 km	Every 10,000 km
d) cost of breakdown	Rs.9,000.	Rs.6,000.
Expected life	10 yrs.	10 yrs.

Calculate annual maintenance cost for a period of 30,000 km & find out which truck is advantageous? **[8]**

OR

Q8) a) Explain mean, median and mode ranking method. **[8]**

b) The following data refer to 'Mean time to failure' of a equipment used in electric power house installation.

No.of failure	1	2	3	4	5	6	7	8	9
MTTF/MTBF (Hrs)	31.3	45.9	78.3	22.1	2.3	4.8	8.1	11.3	17.3

Plot the reliability against time using the method median statistics. How will values changes with mean statistics? **[8]**

Q9) a) Explain i) Inherent availability ii) Achieved availability iii) Operational availability. **[6]**

b) Derive an expression $Rp(t)= e^{-\lambda 1t} + e^{-\lambda 2t} - e^{-(\lambda 1+\lambda 2)t}$. **[10]**

OR

Q10)a) What do you mean by the terms grouped, ungrouped and censored data. **[6]**

b) The following data have been collected at the plant : **[6]**

Mean time before failure=60hrs.

Mean time to repair = 30 hrs.

Administrative logistic time is 30% of Mean Down Time(MDT).

Calculate the operational availability and inherent availability of the plant.

c) Explain the term availability and maintainability of system. **[4]**

Q11)Write short note on (Any 3) : **[18]**

a) Mixed configuration in system reliability.

b) Reliability & Quality

c) k out of m systems.

d) Types of maintenance system

e) Risk priority number in FMEA

f) "Tie-set" & " cut set."

Total No. of Questions : 12]

SEAT No. :

P1801

[Total No. of Pages : 2

[4265] - 599

M.E. (Electrical) (Control Systems)

SCADA SYSTEM & APPLICATIONS

(Semester - I) (2008 Course) (Elective - II (c))

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer three questions from section I and three questions from section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain with example various monitoring & supervisory functions of SCADA system. **[15]**

b) What is the need of Interfacing PLC & SCADA. **[5]**

OR

Q2) a) Draw & explain directional control of motor with start & stop push button feature using ladder diagram programming. **[10]**

b) Draw block diagram of SCADA & explain evolution of SCADA. **[10]**

Q3) State & explain various IED's used in SCADA. **[15]**

OR

Q4) Explain various SCADA Architectures & explain any one in detail. **[15]**

Q5) Explain various SCADA system components in Detail. **[15]**

OR

Q6) Compare SCADA architectures with its important features. **[15]**

P.T.O.

SECTION - II

Q7) Which are the various communication protocols for SCADA? Explain their main features. **[20]**

OR

Q8) Which are the available wired & wireless methods of communication system? Explain. **[20]**

Q9) Draw flowchart to explain energy management system using SCADA. Also draw its block diagram. **[15]**

OR

Q10) Explain substation control using SCADA. Draw its state diagram & block diagram. **[15]**

Q11) How monitoring & analysis of water Industry plant can be done using SCADA? Explain. **[15]**

OR

Q12) Explain any one utility application with its block diagram using SCADA. **[15]**

Total No. of Questions : 11]

SEAT No. :

P1806

[Total No. of Pages : 4

[4265] - 732

M.E. (Production Engineering)

RELIABILITY AND FAILURE ANALYSIS

(2008 Course) (Elective - I (b)) (Semester - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***
6) ***Use of non-programmable electronic calculator is allowed.***

SECTION - I

Q1) a) Explain with neat sketch different type of probability distributions. Discuss how it can be used to determine reliability? **[8]**

b) For the block diagram shown in the **fig. A**, write down the minimal tie-sets and minimal cut-set. Using these, calculate the reliability of the system, assuming the elements to be independent and identical. **[8]**

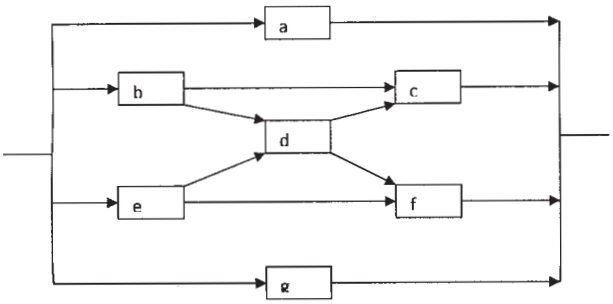


Fig.A

OR

Q2) a) Discuss with neat sketch **[8]**

i) General Series - Parallel configuration.

ii) General Parallel - Series configuration.

b) Find the reliability of the configurations shown below in **Fig.B,** **[8]**

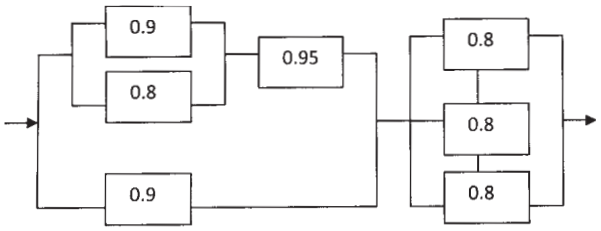


Fig. B

P.T.O.

Q3) a) Explain stages of FMEA and how it can be related with reliability? **[8]**

b) Draw a fault tree for the motor circuit shown in **Fig.C**. The top event for the fault tree is simply failure of the motor to operate. **[8]**

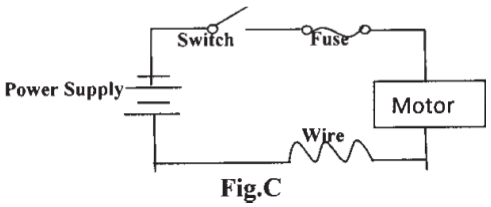


Fig.C

OR

Q4) a) What is fault tree analysis in system reliability? Discuss with neat sketch "Event tree and Fault Tree" analysis. **[8]**

b) Construct a block diagram, perform FMEA on the product given below. Start the Design FMEA process by identifying a common failure mode for the product or a potential failure mode. Then list all categories of design FMEA. **[8]**

i) Computer Mouse.

ii) Home hot water heater.

Q5) a) Explain with neat sketch concept of unit redundancy and standby redundancy in reliability improvement of a system. **[8]**

b) A system consists of 5 sub systems in series. System reliability GOAL 0.990 for 10 hrs.

The data available is as shown in table 1. Compute the reliability Goal for subsystems. **[10]**

Table 1

Sub System Number (i)	Number of Modules (N_i)	Importance Factor (W_i)	Operating Time (t_i)
1	25	1.00	10
2	80	0.97	9
3	45	1.00	10
4	60	0.93	7
5	70	1.00	10

OR

Q6) a) Discuss in detail AGREE and ARNIC method. **[8]**

b) Fig. D shows a typical configuration of a system having components arranged in mixed mode. Find out the overall system reliability using star delta method and compare the results with by solving conditional probability method. **[10]**

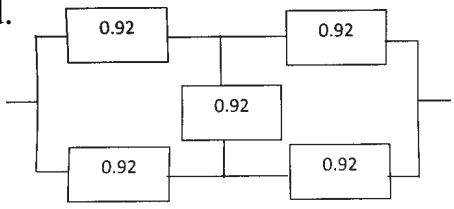


Fig. D

SECTION - II

Q7) In a short sample "accelerated life testing" of a system, based on Weibull distribution the following data is recorded

Failure Nos.	1	2	3	4	5	6	7
MTTF (Hrs.)	28.0	12.0	21.5	26.0	35.0	38.0	30.0

Plot the variation of reliability against time using i) Mean; ii) Median ranking method. **[16]**

OR

Q8) a) Explain mean and median ranking method. **[8]**

b) The following data refer to 'Mean time to failure' of a equipment used in electric power house installation :

No. of failure	1	2	3	4	5	6	7	8	9
MTTF/MTBF (Hrs)	31.3	45.9	78.3	22.1	2.3	4.8	8.1	11.3	17.3

Plot the reliability against time using the method median statistics. How will values changes with mean statistics? **[8]**

Q9) a) Define Terotechnology and explain various elements of LCC. **[8]**

b) A company is planning to acquire a truck. Two makes of trucks are available in the market. The cost of garaging and the driver's wages are same for both. The other data on cost are provided in the table.

Parameters	Truck A	Truck B
Capital cost	Rs. 5 Lakhs	Rs. 3 Lakhs
Annual Road Tax & Insurance	Rs. 8,000	Rs. 7,000
Operating Cost		
a) fuel consumption	20km/lit.	20km/lit.
b) oil consumption	2 lit/1000km	2 lit/1000km
c) fuel cost	Rs.3/lit.	Rs.3/lit.
d) oil cost	25/lit.	21/lit.
Maintenance cost		
a) service interval	Every 7,000 km.	Every 4,000 km.
b) cost of service	Rs.3,000	Rs.5,000
c) random breakdown	Every 30,000 km.	Every 10,000 km.
d) cost of breakdown	Rs.9,000	Rs.6,000
Expected life	10 yrs.	10 yrs.

Calculate annual maintenance cost for a period of 30,000 km & find out which truck is advantageous? **[8]**

OR

Q10) a) Derive and expression for techno-economic life of equipment given maintenance function (at^n), operating cost per year (v) and first cost (C). **[6]**

b) The following data have been collected at the plant : **[6]**

Mean time before failure = 30hrs.

Mean time to repair = 15hrs.

Administrative logistic time is 30% of Mean Down Time (MDT).

Calculate the operational availability and inherent availability of the plant.

c) Explain the term availability and maintainability of system. **[4]**

Q11) Write short note on (Any 3) : **[18]**

a) Graph Theory.

b) Ferrography and SOAP program.

c) Reliability centered maintenance.

d) Parametric and non parametric reliability.

e) Total productive maintenance.

f) Risk priority number in FMEA.

Total No. of Questions : 8]

SEAT No. :

P1810

[Total No. of Pages : 3

[4265] - 670

M.E. (E & TC) (VLSI Embedded System)

FAULT TOLERANT SYSTEM DESIGN

(2008 Course) (Elective - III (a)) (Semester - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain general procedure for detecting static hazards in a combinational circuit and Construct AND gate using 6-valued logic. **[8]**

b) Construct a primitive cube table for the function, $Z = \bar{x}_2 + \bar{x}_1.x_3$ **[8]**

Q2) a) Define wired logic mechanism. Explain in detail with diagram wired AND logic and bidirectionality. **[8]**

b) For the circuit of Figure 1 **[8]**

i) Find the set of all tests that detect the fault c s-a-1.

ii) Find the set of all tests that detect the fault a s-a-0.

iii) Find the set of all tests that detect the multiple faults {c s-a-l, a s-a-0}.

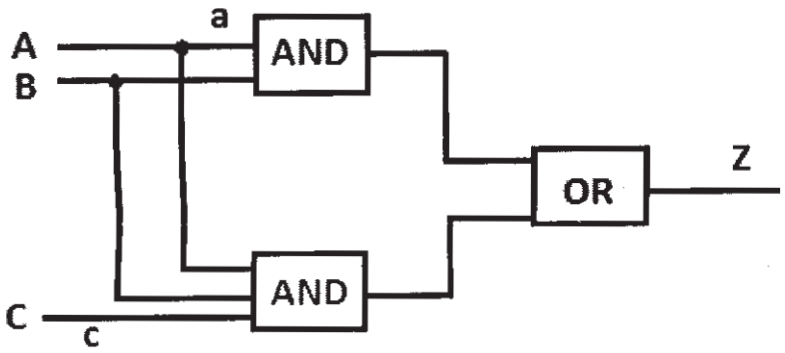


Figure 1

P.T.O.

Q3) a) Explain the working of bridging fault model in detail with its advantages and disadvantages. **[8]**

b) Generate the test sequence for the fault G_1 s-a-1 in irredundant circuit shown in Figure 2. **[8]**

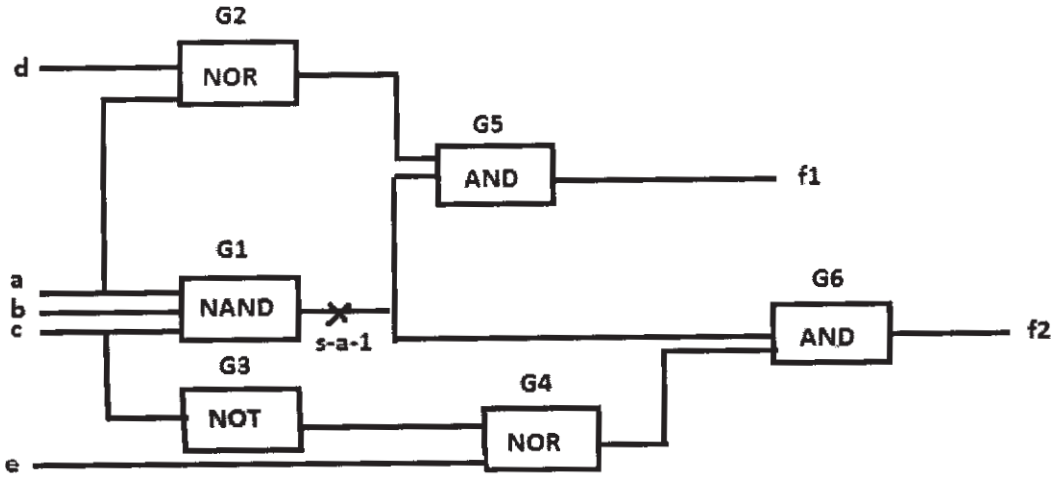


Figure 2

Q4) Write short notes on : **[18]**

a) Binary Decision diagram

b) Delay models

c) Fault sampling

SECTION - II

Q5) a) Explain with step by step process the procedure to test sequential circuit with and without faults. **[8]**

b) Define and explain controllability / observability using scan based DFT technique method. **[8]**

Q6) a) Define the following terms **[8]**

i) Fault location

ii) Fault propogation

iii) Fault Justification

iv) Fault Efficiency

b) Explain the necessity of compression techniques. List out different compression techniques and write the features of each technique. **[8]**

Q7) a) Explain in detail Path Oriented Decision making algorithm. **[8]**

b) Differenciate between On-line and Off-line BIST. Explain in detail the Off-line BIST architecture at the board level. **[8]**

Q8) Write short notes on : **[18]**

a) 9-V algorithm

b) Truth table and primitive cubes

c) Testing of PLAs

Total No. of Questions : 8]

SEAT No. :

P1817

[Total No. of Pages : 2

[4265] - 408

M.E. (Civil Construction and Management)

RESOURCES MANAGEMENT

(2008 Course) (Elective - II (a)) (Semester - I)

Time :4 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Question nos. 1 and 5 are compulsory. Out of the remaining attempt 2 questions from section I and 2 question from section II.***
3) ***Answers to the two sections should be written in separate answer books.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

(Materials Management)

Q1) a) Discuss in details Role of Material Manager taking an example of a Township project. **[8]**

b) What are the objectives of A–B–C analysis. Enlist its advantages and disadvantages. **[10]**

Q2) a) Write a note on vendor Analysis. Explain in brief the process of shortlisting the vendor. **[8]**

b) Derive formula for EOQ. Discuss its advantages and limitations with reference to construction industry. **[8]**

Q3) a) Explain how constraint of time and availability of funds affects scheduling of Men, Materials and equipment for earthern Dam project. **[8]**

b) Explain Stastical Method of Quality control. Discuss different sampling Techniques in quality control. **[8]**

P.T.O.

Q4) Write short notes on (Any four) : **[16]**

a) TQM in construction Industry.
b) J.I.T in construction Sector.
c) M.I.S. in Materials Management.
d) Safety Stock.
e) Value Engineering in construction Industry.

SECTION - II

(Human Resources Management and Equipment Management)

Q5) a) Role of HRD and HRM in construction Industry. Also discuss the HR Development system. **[9]**

b) Explain in brief the factors affecting while selecting different construction equipments. **[9]**

Q6) a) Discuss factors affecting cycle time and output of any construction equipment considering management and job conditions. **[8]**

b) For a dam project 6 scrappers of 200 kW engine capacity and a tractor of 160 kW capacity were assigned. The equipments has worked for 9000 hours and output at present is 190. cu.m/day. Assuming working hours 1500 hours and working days 180, days. The initial cost of scrapper is Rs. 50,00,000/- and of tractor is Rs. 15,00,000/-. Life of scrapper is 12000 hours and tractor is 15000 hours. cost of type of scrapper is Rs. 3,00,000/- and its life is 2700 hours. Estimate the hourly ownership and operating cost of scrapper only. Assume suitable data. Wherever necessary. **[8]**

Q7) a) Explain any 2 methods of working out depreciation of construction equipment. **[8]**

b) Discuss capacity building of resources requirement at different level in construction sector. **[8]**

Q8) Write short notes on any four of following : **[16]**

a) Equipment log book.
b) Check list for sucessful equipment management.
c) Flow diagram of HRD and HRM.
d) Equipment down time.
e) OLDES programma of C.I.D.C.

Total No. of Questions : 8]

SEAT No. :

P1818

[Total No. of Pages : 2

[4265] - 497

M.E. (Civil) (Water Resources & Environmental Engineering)

UNIT OPERATIONS IN ENVIRONMENTAL ENGINEERING

(Semester - I) (2012 Course) (Elective - II (a))

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from Section - I and Section - II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator and steam table is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are pump characteristics? Differentiate between total and operating characteristics. Draw typical operating characteristics for centrifugal pump. **[10]**

b) Explain working of centrifugal pump with a neat labeled sketch, stating functions of various parts. **[8]**

Q2) a) Compare pumps and compressors specifications for any 6 common parameters. Also for differentiate between pumps and compressors clearly. **[8]**

b) With neat sketches draw the development of the thermal boundary layer over a thin, smooth, long flat flate and explain the degree to which convection or conduction dominates during heat transfer, based on the configuration of the boundary layer. Explain impact of the same on working out the heat transfer coefficients. **[8]**

Q3) a) Discuss the different types of actuators used in hydraulic and pneumatic circuits. **[8]**

b) What is plate tectonics? How does it help in understanding distribution of earthquakes and volcanoes? **[8]**

P.T.O.

Q4) a) What is seismic zoning map? How is it useful in Civil Engineering practice? On a seismic zoning map of India, which is the severe zone (highest zone) and comment on the regions covered by the same. **[8]**

b) How is seismogram different from a seismograph? what are strong-motion recorders? Indicate their use in Civil Engineering. **[8]**

SECTION - II

Q5) a) Discuss four important dimensionless numbers in heat transfer along with their significance. **[8]**

b) State the following and explain the terms involved **[8]**

i) Ficks Law.

ii) Henry's Law.

iii) Raoult's Law.

iv) Gibb's Phase Rule.

Q6) a) Draw a neat sketch of continuous fractionation column. Name the parts and discuss in brief their function. **[6]**

b) An aqueous solution exposed to atmosphere contains volatile toxic substance A having vapor pressure of 500 mm Hg at room temperature. Molecular weight of the toxic substance is 50. Composition of liquid solution is given as 20% (Weight %) A. Calculate ppm of A in surrounding air assuming it to be in equilibrium with the liquid solution. **[10]**

Q7) a) Discuss the theory of wet-bulb thermometry. Under what conditions the wet bulb temperature and adiabatic saturation temperature will be identical? **[8]**

b) Discuss the significance and applications of psychometric charts in simultaneous beat/mass transfer operations. **[8]**

Q8) Write notes on any three : **[3 × 6 = 18]**

a) Ways of providing pressure gradient in filtration operation

b) Cross Flow, Deep Bed and Cake Filtration

c) Classification of filtration system

d) Process variables affecting filtration

Total No. of Questions : 10]

SEAT No. :

P1823

[Total No. of Pages : 3

[4265] - 551

M.E. (Mechanical) (Mechatronics)

ROBOTICS

(2008 Course) (Elective - III(b)) (Semester - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any THREE questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***
6) ***Use of pocket non programmable electronic calculator is allowed.***

SECTION - I

Q1) a) Define and explain the meaning of the following terms. **[8]**

i) Repeatability
ii) Resolution
iii) Work volume and
iv) Remote Compliance

b) In one degree of freedom robot, it has one sliding joint with full range of 1 meter. The robots control memory has a 12 bit storage capacity. Determine the control resolution for this axis of motion. **[5]**

c) Explain briefly the classification of robots. **[5]**

Q2) a) Compare different drive systems used in robotics. **[8]**

b) Explain the steps to implement D-H convention for three axis articulated arm robot. **[8]**

Q3) a) Derive the equation to calculate force generated by the end of the arm given the joint torques as shown in figure 2. Tl and T2 are the torques applied at the joints O and A respectively. **[8]**

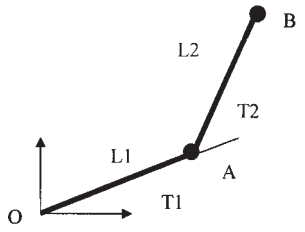


figure 2, Q 8(b)

P.T.O.

b) Explain the different parameters considered during planning of joint interpolated trajectories. **[8]**

Q4) a) Suggest suitable Gripper used to load and unload thin sheets and explain its working with neat sketch. **[4]**

b) Find the resultant rotation matrix for Euler's angle representation in following sequence of rotation. **[12]**

i) Rotation by an angle Φ about OW axis

ii) Rotation by an angle θ about OV axis

iii) Rotation by an angle Ψ about OU axis.

Find the desired position and orientation of the hand of a Cartesian-RPY robot is given next. Find the necessary roll, pitch and yaw angles and displacements.

$$\begin{bmatrix} 0{,}534 & -0.674 & 0.649 & 4.33 \\ 0.505 & 0.722 & 0.475 & 2.50 \\ -0.788 & 0.160 & 0.595 & 8 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

Q5) a) What is the requirement of actuators used in robotics? **[8]**

b) A part weighing 15 kg to be held by a gripper using friction against two opposing fingers. The coefficient of friction between the figures and the part surface is 0.3. Assume appropriate g factor for the gripper. Compute the required gripper force. **[8]**

SECTION - II

Q6) a) Sketch and explain the terms "Path points", "via points" and "pseudo via points" with suitable example. **[8]**

b) Explain feedback sensors used in Robot Joints. **[8]**

Q7) a) Explain lead through Robot Programming. **[8]**

b) It is desired to have the first joint of six axis of robot go from initial angle of 30 degree to the final angle of 75 degree in 5 seconds. Using a third order polynomial. Calculate the joint angle at 1, 2, 3 and 4 seconds. **[8]**

Q8) a) Classify and explain MOVES, DEPART, WAIT, DELAY, SIGNAL, SPEED and CLOSE commands used in Robot Programming. **[10]**

(b) Explain the method of defining position in space of robot arm and wrist during teach mode programming. **[6]**

Q9) a) Explain use of sensors in robotics. **[6]**

b) The A/D converter has an 8 bit capacity. **[10]**

i) A continuous voltage signal is to be converted into a discrete signal. The range of the signal after simplifications 0 to 5V. Determine the no of quantization levels, quantization level spacing. The resolution and the quantization error.

ii) For an image digitized at 128 points per line and 128 lines. Determine total no of bits to represent the gray level values.

Q10) Write short notes on :

a) Robots joint space scheme. **[6]**

b) Robot Applications in Painting. **[6]**

c) Frame buffers and grabbers. **[6]**

Total No. of Questions : 10]

SEAT No. :

P1825

[Total No. of Pages : 3

[4265] - 580

M.E. (Mechanical) (Energy Engg.)

NON CONVENTIONAL ENERGY SOURCES

(2012 Course) (Elective - II (c)) (Semester - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Define following terms with neat sketches. **[10]**

i) Altitude angle ii) Solar azimuth angle

iii) Surface azimuth angle iv) Declination

v) Latitude angle

b) Discuss the various instruments used for measuring solar radiation data. Explain the working of pyranometer. **[8]**

Q2) a) Why orientation is needed in concentrating type collectors? Describe the different methods of sun tracking. **[8]**

b) Data for a flat collector used for heating are given below. **[8]**

Factor	Specification
Location and latitude	Coimbatore 11°00′N
Day and time	March 22, 14.30 - 15-30 (LST)
Average intensity of solar radiation	560 W/m^2
Collector tilt	26°
No. of glass cover	2
Heat removal factor for collector	0.82
Transmittance of glass	0.88
Absorption of the plate	0.93
Top loss coefficient of collector	7.95 w/m^2 °C
Collector Fluid Temperature	75°C
Ambient Temperature	25°C

P.T.O.

Calculate

i) Solar altitude angle

ii) Incident angle

iii) Collector efficiency.

Q3) a) Classify the methods of solar energy storage. Describe the thermal energy storage system. **[8]**

b) What is solar pond? Describe a non-convective solar pond for solar energy collection and storage. **[8]**

Q4) a) What is insolation? Intensity of solar energy received on earth surface is much less than the intensity with which it is beamed from surface of sun. Discuss various factors responsible for the same. **[8]**

b) Explain advantages and limitation of concentrating solar collector over flat plate type collectors. Define aperture, concentration ratio and acceptance angle for concentrating collectors. **[8]**

Q5) Write short notes on any two of the following : **[16]**

a) Liquid collector.

b) Heat extraction method from solar pond.

c) Chemical energy storage method.

SECTION - II

Q6) a) Explain Biomass conversion in details? **[9]**

b) What is community biogas plant? What are the main problems encountered in its operation? **[9]**

Q7) a) Derive the expression for maximum power developed due to wind machine? **[8]**

b) Describe the main considerations in selecting the site for wind generators? **[8]**

Q8) a) What are the major applications of Geothermal energy? **[5]**

b) Explain open cycle Ocean Thermal Energy conversion system (OTEC System)? **[6]**

c) What are the advantages and limitations of wave energy conversion? **[5]**

Q9) a) Explain fixed Bed Gasifier (cross draft type)? **[5]**

b) Explain pumping application of wind energy with neat sketch. **[6]**

c) Comments on scope of Tidal Energy in India? **[5]**

Q10) Write short notes on any two : **[16]**

a) Sources of Biomass

b) Environmental Aspects in Wind Power.

c) Integrated Renewable Energy System.

d) Prospects of Geothermal Energy.

Total No. of Questions : 6]

SEAT No. :

P1826

[Total No. of Pages : 2

[4265] - 644

M.E. (E & TC) (Microwave)

APPLICATIONS OF MICROWAVE TO RADAR AND SATELLITE

(2008 Course) (Semester - I) (Elective - I (a))

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Solve any <u>two</u> questions from <u>each</u> section.***
2) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Explain ambiguity function related to synthetic aperture radar in detail. **[12]**

b) Given that the IF bandwidth for the 252 channel FM/FDM telephony carrier is 7.52 MHz and that the required C/N ratio at the earth station receiver is 13dB. Calculate i) C/T ratio ii) Satellite EIRP required if the total loss amounts to be 200dB and the earth station ratio G/T is 37.5dB. **[13]**

Q2) a) Explain Kepler's law of orbital motion of a body in detail along with related expressions. **[13]**

b) What are the techniques for RCS prediction? Explain one of the technique. A RADAR operating at $\lambda = 0.03$ m has $R_{max} = 50$ km. Its antenna gain is 2000 and transmitted power 250 kW. Minimum detectable signal is 10 Pw. Find RCS of target. **[12]**

Q3) a) Derive RADAR range for R_{max} & R ambiguity. **[15]**

b) Explain FDMA downlink analysis. **[10]**

SECTION - II

Q4) a) A pulse RADAR has peak power $P_t = 5$kW and uses two PRFs given by $PRF_1 = 10$ kHz of PRF_2 as 20 kHz. Find the required i) Duty cycle ii) The peak repetation interval iii) The pulse width for each PRF to make the constant average transmitted power of 1 kW iv) Pulse energy. **[15]**

b) Explain satellite switched TDMA. **[10]**

P.T.O.

Q5) a) A satellite is at a distance of 40000 km from the point on earth's surface radiates a power of low from an antenna with a gain of 17 dB in the direction of observer. Find the flux density at the receiving point and the power received by antenna at this point with effective area of $10m^2$. If above satellite is operating at 11GHz, gain of receiving antenna equals to 52.3 dB, find received power. **[15]**

b) Explain Earth & space segment. **[10]**

Q6) a) Explain in detail the TT & C system in satellite communication. **[15]**

b) What are different satellite access technique? Explain any one. **[10]**

Total No. of Questions : 8]

SEAT No. :

P1829

[Total No. of Pages : 2

[4265] - 655

M.E. (E & TC) (Microwave)

EMI & EMC TECHNIQUES

(2008 Course) (Elective - III(c)) (Sem - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer three questions from section I and three questions from section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answers will be valued as a whole.***
6) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Derive the expression for voltage and current by solving Helmoltz equation for a transmission line. **[10]**

b) Find reflection co-efficient, standing wave ratio and the input impedance for a given $Z_L = 60 + j50$, f = 10MHz, Zo = 100 Ω and length of the transmission line is 30 metres. **[8]**

Q2) a) Explain the terms with relevance to Wave Guides : Lossless wave guides, cut off condition, wave impedance, signal flow graph with mathematical expressions : **[10]**

b) What do you mean by repeatability in measurements. **[6]**

P.T.O.

Q3) a) Derive the expression for noise Figure for two port Network. **[8]**

b) Explain the uncertainty and confidence in measurement. **[8]**

Q4) a) What is the main principle of attenuation measurement? **[6]**

b) What are the important considerations when making attenuation measurements explain. **[10]**

SECTION - II

Q5) What is the principle of RF voltage measurement and explain the fast sampling DMMS and sampling RF voltmeters in detail. **[16]**

Q6) Describe how do you make following measurements with relevant mathematical expressions and block diagrams. **[16]**

a) RF Power measurements.

b) RF Noise measurement.

c) RFlC and MMIC measurements.

Q7) Write detailed note on the following instruments. **[16]**

a) Vector Network Analyzer.

b) Spectrum Analyzer.

Q8) Write short notes on : **[18]**

a) Noise Figure analyzer.

b) Power sensors.

c) Impedance and admittance measurement.

d) Accuracy enhancement.

e) Power coupler and Reflectometer.

f) Optoelectronic sampling.

Total No. of Questions : 8]

SEAT No. :

P1834

[Total No. of Pages : 2

[4265] - 792

M.E. (Computer) (Computer Network)

WIRELESS TECHNOLOGY

(2008 Course) (Elective - II(a)) (Semester - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Question nos. 4 and 5 are compulsory. Out of the remaining attempt 2 questions from section I and 2 questions from section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Why values of frequency reuse factor (N) are 1, 3, 4, 7, 9, 12, 13 16, 19, 21, etc? Explain various approaches used to increase the cell capacity. **[8]**

b) What are the main benefits of spread spectrum system. How can spreading be achieved? How can DSSS systems benefits from multipath propagation? **[8]**

Q2) a) What are the three phases for communication via circuit switching? Define packet switching. List the advantages and disadvantages of packet switching over circuit switching. **[6]**

b) A data message of 10 ms duration having 3200 bits crosses 9 nodes (10 hops) to reach its destination. Find the data rate & total delay for circuit switched connection. (Assume node delays as 1 ms). **[4]**

c) If the message of 10 ms duration is to be sent in a data packet of size 1020 bit having 16 overhead bits in each packet, then estimate end-to-end delay for packet switching connection. **[6]**

Q3) a) Compare different wireless LAN Technologies. **[8]**

b) Explain the operation of a piconet in terms of the states of operation during link establishment & maintenance using bluetooth state transition dig? **[8]**

P.T.O.

Q4) a) Draw the GSM architecture dig and explain each section in brief. State what are the major interfaces & protocols used. **[10]**

b) Write short note on (Any two) : **[8]**

i) Line of sight transmission.

ii) 802.11 frame format.

iii) FTP over bluetooth.

SECTION - II

Q5) a) Explain TDMA with its frame format used in satellite communication. **[8]**

b) Explain how tunneling works in general and especially for Mobile IP using IP-in-IP minimal & generic routing encapsulation respectively. Discuss the advantage & disadvantage of these three methods. **[10]**

Q6) a) Draw a diagram showing WEP operations which handles confidentiality & integrity simultaneously. Explain WEP data transmission. **[8]**

b) Explain CSM A/CA briefly. **[8]**

Q7) a) Explain the IEEE 802.16 Architecture. **[10]**

b) Explain the errors in a wireless network with degrage TCP performance. Briefly explain how TCP snooping can improve the situation. **[6]**

Q8) a) Explain how co-channel interference is reduced by using three and six directional antennas. **[10]**

b) Explain GSM logical channels. **[6]**

Total No. of Questions : 8]

SEAT No. :

P1888

[Total No. of Pages : 3

[4265] - 759

M.E. (Production) (CAD/CAM)

ENERGY MANAGEMENT

(2008 Course) (Elective - II(c)) (Semester - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Use of non-programmable electronic pocket calculator and statistical table are allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the difference between energy conservation and energy efficiency. What are the energy efficiency benefits to Industry and Nation. **[8]**

b) What do you mean by : **[4]**

i) ROI.

ii) Present Value of money.

c) Cost of an heat exchanger is Rs. 1 lakh. Calculate simple pay back period considering annual saving potential of Rs. 60,000/- and annual operating cost of Rs. 15,000/-. **[4]**

Q2) a) List steps involved in 'detailed energy audit'. **[8]**

b) List any one energy audit instrument used for power measurement and one for flue gas measurement along with parameters to be measured?**[4]**

c) A plant is using 4 tonnes / day of coal for its boiler. The calorific value of the coal is 4000 kcal/kg. The cost of coal is Rs. 2,000/tonne. It is interested to use rice husk in the calorific value of rice husk is 3000 kcal/kg. The cost of rice husk is Rs.700/tonne. Find out the annual savings at 300 days of operation and assuming that the boiler efficiency does not change. **[4]**

P.T.O.

Q3) a) Explain at least eight of the energy conservation opportunities available in a boiler system related to combustion, heat transfer, avoidable losses, high auxiliary power consumption, water quality and blowdown. **[8]**

b) Write short notes on : **[6]**

i) Thermodynamic steam traps.

ii) Thermostatic steam traps.

c) Match the following : **[2]**

Insulating material	Suitable temperature
a) Rockwool	i) –178°C to 4°C
b) Fibre glass	ii) –167 °C to 82°C
c) Polystyrene	iii) Up to 820°C
d) Polyurethane	iv) Up to 540°C

Q4) Attempt any three questions : **[18]**

a) What do you mean by "Economic thickness of insulation"? Explain in details.

b) How energy pricing is done in India?

c) Explain the limitations with 'Simple Payback Period' technique with an example.

d) List down at least six energy conservation opportunities available in a steam system?

SECTION - II

Q5) a) During April-2003, the plant has recorded a maximum demand of 600 kVA and average PF is observed to be 0.82 lag, the minimum average PF to be maintained is 0.92 lag as per the independent utility supplier and every one % dip in PF attracts a penalty of Rs. 10,000/in each month. **[4]**

i) Calculate the improvement in PF for May-2003 by installing 100kVAr capacitors.

ii) Calculate penalty to be paid if any during May-2003.

b) Explain in brief two imp factors to be considered while selecting a motor? **[4]**

c) List all the possible energy conservation measures possible in lighting system? **[8]**

Q6) a) In an automobile industry one compressor of rated capacity of 1000 cfm is operated to evaluate leakage quantity in the plant during a holiday when no equipment was using compressed air. FAD test was also carried out before conducting leakage test and found that the compressor is delivering out put of 90% of rated capacity. **[8]**

The observations on leakage test are :

i) Compressor was on load for 08 minutes

ii) Compressor was unloaded for 48 minutes

iii) Compressor was consuming 144 kW

Evaluate

1) Free air delivery
2) Specific power consumption
3) % leakage in compressed air system
4) Leakage quantity
5) Power lost due to leakage

b) List the types of refrigeration compressors used in industries. Select the lowest specific power consumption (kW/TR) refrigeration system for Air-conditioning and compare with other options (w.r.t power consumption) for 350 TR cooling load. **[4]**

c) Name the parameters that a psychometric chart provides for an air conditioning engineer? **[4]**

Q7) a) Draw a centrifugal pump system curve with representation of static and Friction head. **[4]**

b) Highlight the specific differences between fan, blower and air compressors? **[4]**

c) What is co-generation? How do you classify it? Explain with schematic diagram advantages and disadvantages of Back Pressure Steam Turbine Co-generation system? **[8]**

Q8) Write short notes: (Any Three) : **[18]**

a) What are the losses in the 'induction motor' and briefly explain them?

b) Explain the simple steps that can be followed in shop - floor for quantification of compressed air leakages.

c) Compare the efficacy, color rendering index and life of generally used lamps in the industry. Also state the typical applications of the same.

d) Draw schematic diagram and explain any three types of Industrial fans.

Total No. of Questions : 6]

P1424

SEAT No. :

[Total No. of Pages : 3

[4265] - 36

M.E. (Civil) (Structures)

ADVANCED DESIGN OF STEEL STRUCTURES

(2002 Course) (Elective - II)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in two separate answer books.***
3) ***Neat diagrams should be drawn wherever necessary.***
4) ***Assume suitable data, if required.***
5) ***Use of IS 800, 875, 1915, 1161, steel table is allowed.***
6) ***Use of electronic pocket calculator is allowed.***

SECTION - I

Q1) a) Draw schematic arrangement of deck & through type of railway plate girder Indicate various bracing systems. **[7]**

b) Design the flange of plate girder for deck type of plate girder railway bridge. The depth of girder is limited to 1.8m and span is 22m. The track is broad gauge main line. Total live load for bridge BM = 2000 kN, for SF = 2000 kN. Weight of main & guard rails is 0.6 & 0.8 kN/m respectively. Weight of fastenings is 0.2 kN/m. load of concrete sleepers are 19 kN/m^3 spaced as 400 mm c/c. The dimensions of sleeper are standard dimensions. **[18]**

Q2) A deck type 'N' truss bridge is having 8 panels of 5m length each. Depth of truss is 5m. The Dead load & live load on bridge are 20 kN/m and 35 kN/m respectively. Draw influence line diagrams for members meeting at second top panel point from left end of truss. Design bottom chord member. Use impact factor as 0.37. **[25]**

P.T.O.

Q3) a) Write note on behaviour of compression elements of light gauge steel. **[6]**

b) Explain manufacturing of light gauge steel members. **[6]**

c) What are the advantages using light gauge members. **[6]**

d) Illustrate stiffened, unstiffened, multistiffened element of light gauge element. **[7]**

SECTION - II

Q4) Deck slab of thickness 600 mm (concrete) with floor finish thickness 120 mm is supported by steel tubular formwork. The width of slab is 16.5m. Sofit of slab is 12m above the ground level. Calculate load on form work sketch the schematic arrangement of formwork. Design steel tabular sections for form work. Sketch the design details. **[25]**

Q5) a) Sketch various load resisting systems used for multi storied buildings. Explain utility of each system. **[8]**

b) Explain length of plastic hinge with suitable illustration & sketch. **[6]**

c) Draw schematic arrangement of **[11]**

i) beam to beam rigid connection using bolts.

ii) beam to column moment resisting welded connection.

Show atleast two possible arrangements for each connection.

Q6) The three storied three bay rectangular portal frame is as shown in figure. 6. Analyse the middle portion 'JKFG' of frame and design column JF using I section & flange plates if required. **[25]**

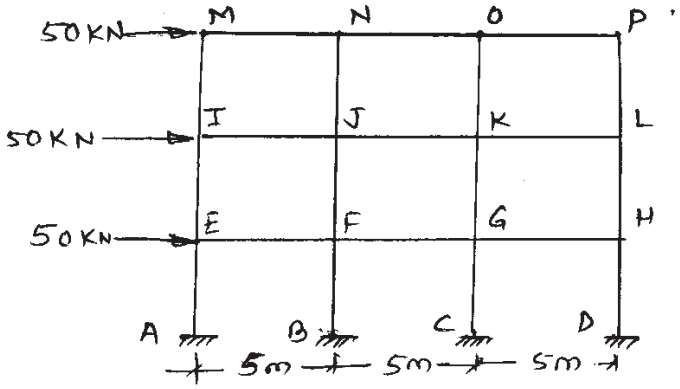


Fig. 6.

GRADEWISE PERMISSIBLE STRESSES (IN N/mm²)IN TUBE SECTIONS

SLENDERNESS RATIO λ	GRADE Yst 22	GRADE Yst 25	GRADE Yst 32
	IN COMPRESSION (AXIAL)		
0	125	150	190
10	122	145	182
20	118	140	175
30	113	135	168
40	109	130	161
50	105	126	154
60	100	121	147
70	97	116	138
80	93	109	126
90	88	100	113
100	81	91	99
110	75	81	87
120	67	72	76
130	60	64	67
140	54	57	58
150	49	50	52
160	43	44	45
170	38	40	40
180	34	35	35
190	30	31	32
200	27	28	28
210	24	25	25
220	22	23	23
230	20	20	21
240	18	19	19
250	16	17	17
300	11	11	11
350	7	7	7
	IN BENDING TENSION AND COMPRESSION		
	140	170	205
	IN AXIAL TENSION		
	125	150	190
	IN SHEAR		
	90	110	135
	IN BEARING		
	170	190	250

❖ ❖ ❖ ❖

Total No. of Questions : 6]

P1425

SEAT No. :

[Total No. of Pages : 2

[4265] - 40

M.E. (Civil-Structures)

NONLINEAR ANALYSIS OF STRUCTURE

(2002 Course) (Elective - I (c))

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in two separate answer books.***
3) ***Assume suitable data, if required.***

SECTION - I

Q1) a) Explain with appropriate examples types of Non linearities. **[8]**

b) Derive the governing equation for non linear behaviour of beam. **[8]**

c) Derive expression for M - ϕ nonlinearity for simply supported beam with concentrated point load at centre. **[9]**

Q2) a) State strain - displacement relation for Geometrically non linear behaviour of plate. **[8]**

b) State expression that show non linear behaviour of material for two dimentional plate in terms of stresses and strains. **[8]**

c) Explain stress function approach for nonlinear behaviour of plates. **[9]**

Q3) a) Explain combination of out of plane boundary condition for solution of plate problem. **[10]**

b) Explain governing equations for solution of large deflections of rectangular plates. **[15]**

P.T.O.

SECTION - II

Q4) Derive expression for large deflection of column with both ends hinged condition. **[25]**

Q5) Calculate sway deflection of portal frame as shown in fig. 5. The members are all 100 mm × 100 mm square. **[25]**

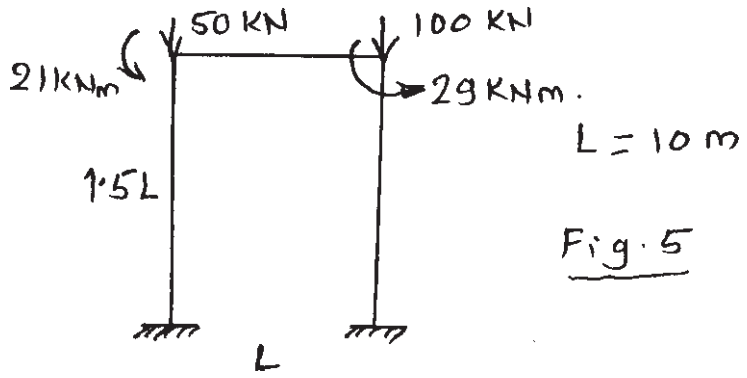


Fig. 5

Q6) Calculate vertical deflection of propped cantilever as shown in fig. 6. take $\lambda = 0.847$, P = 121N L = 500m. **[25]**

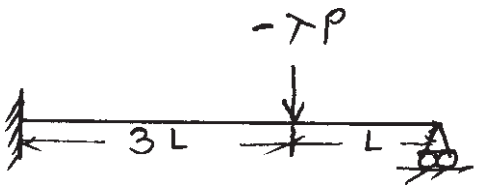


Fig 6

❖❖❖❖

Total No. of Questions : 8]

P1426

SEAT No. :

[Total No. of Pages : 3

[4265] - 53

M.E. (Mechanical Engg.) (Heat Power)

I.C. ENGINES - I (Spark Ignition Engines)

(2002 Course) (Elective - I (a))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicates full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***

SECTION - I

Q1) a) Explain the importance of following parameters on the performance of S.I. engines : **[8]**

i) Stroke / Bore ratio.

ii) Temperature and pressure in a cycle.

iii) Compression ratio.

iv) Air fuel ratio.

b) Write short note on valve timing diagram. **[8]**

Q2) a) What is the effect of high sulphur content on the performance of S.I. engine? **[8]**

b) Fuel injection systems are replacing carburetors in automobile spark-ignition engines. Explain major advantages and any disadvantages of fuel metering with fuel injection relative to carburetion. **[8]**

P.T.O.

Q3) a) A six-cylinder 3.6 liter SI engine is designed to have a maximum speed of 6000 RPM. At this speed the volumetric efficiency of the engine is 0.92. The engine will be equipped with a two-barrel carburetor, one barrel for low speeds and both barrels for high speed. Gasoline density can be considered to be 750kg/m^3. Calculate : **[10]**

i) Throat diameters for the carburetor
(Assume discharge coefficient = 0.94).

ii) Fuel capillary tube diameter (Assume discharge coefficient = 0.74).

b) What are the assumptions made in analyzing the air standard cycle? **[8]**

Q4) a) What do you understand by spark Ignition advance? Describe any spark ignition advance mechanism used in automobile engines. **[8]**

b) Write short note on MPFI system. **[8]**

SECTION - II

Q5) a) A four cylinder petrol engine with 70 mm bore and 100 mm stroke length working on four stroke principle develops torque of 140 N-m at 4000 RPM. The clearance volume per cylinder is 0.065 liters. Fuel consumption is 14 kg/hr. Calculate:

i) BP

ii) bmep

iii) Brake thermal efficiency

iv) Relative efficiency

Take C.V. of fuel = 42500 kJ/kg, γ = 1.4 for air. **[8]**

b) Explain the different methods of improving engine performance. **[8]**

Q6) a) Why is the compression ratio of an SI engine often reduced when the engine is redesigned to be used with a turbocharger? Explain the phenomenon. **[8]**

b) Explain any five reasons for HC emissions in the exhaust of an automobile. **[8]**

Q7) a) The following observations were recorded in a test of one hour duration on a single cylinder engine working on four stroke cycle: **[12]**

Bore = 300 mm
Stroke = 450 mm
Fuel used = 8.8 kg
Calorific value = 41800 kJ/kg
Speed = 200 rpm
Spring constant = 2.9 bar / cm
Area of indicator diagram = 12 cm^2
Length of indicator diagram = 6 cm
Brake friction load = 1860 N
Quantity of cooling water = 650 kg
Temperature rise = 22°C
Diameter of brake wheel = 1.22m

Calculate: i) mep
ii) Mech. efficiency
iii) Brake thermal efficiency and
iv) Draw heat balance sheet

b) Write short note on supercharging in S.I. engines. **[4]**

Q8) Write short note on (any three) : **[18]**

a) LPG and Petrol as a fuel for S.I. engines.
b) Catalytic convertors.
c) EGR
d) Principles of combustion chamber designing for petrol engines.

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Total No. of Questions : 8]

P1427

SEAT No. :

[Total No. of Pages : 2

[4265] - 57
M.E. (Mechanical) (Heat Power Engg.)
I.C. ENGINES - II
(2002 Course) (Elective - II (a))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic calculator and steam table is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Compare with reference to compression ratio and thermal efficiency of diesel and otto cycles. Explain which cycle is more efficient for the same compression ratio. **[8]**

b) An I C Engine operated on the dual cycle the temperature of the working fluid (air) at the beginning of compression is 27°C. The ratio of the maximum and minimum pressures of the cycle is 70 and compression ratio is 15. The amounts of heat added at constant volume and at constant pressure are equal. Compute the air standard thermal efficiency of the cycle. State three main reasons why the actual thermal efficiency is different from the theoretical value. Take γ for air is 1.4. **[10]**

Q2) a) Explain the stages of Combustion in C I engines. **[8]**

b) The output of an I.C. Engine is measured by a rope brake dynamometer. The diameter of the brake is 400 N and the spring balance reading is 50 n. The engine consumes 4.2 kg/h of fuel at rated speed of 1000 rpm. The calorific value of fuel is 43900 kJ/kg. Calculate: **[8]**

i) Brake specific fuel consumption.

ii) Brake thermal efficiency.

P.T.O.

Q3) a) Explain petroleum refinery processes and name the products evolved from the same. **[8]**

b) Discuss Biodiesel as an alternate fuel for diesel engine. **[8]**

Q4) a) Describe the construction and working of a CRDI system in brief with the help of a diagram. **[8]**

b) Describe the phenomenon of knock in CI engine. State different methods to control knock in C.I. engine. **[8]**

SECTION - II

Q5) a) Draw a schematic diagram of a Fuel Injector and explain its working. **[8]**

b) A 2-cylinder C.I. Engine with a Compression ratio 13:1 and cylinder diameter of 200 mm × 250 mm works on two stroke cycle and consumes 14kg/h of fuel while running at 300 rpm. The relative and mechanical efficiencies of engine are 65% and 76% respectively. The fuel injection is effected up to 5% of stroke. If the calorific value of the fuel used is given as 41800 kJ/kg. Calculate the mean effective pressure developed. **[10]**

Q6) a) Describe various fuel injection systems for Diesel Engine. **[8]**

b) What is Indirect injection type combustion chamber for a CI engine? What are the different types of this combustion chamber? **[8]**

Q7) a) What do we mean by supercharging? Differentiate supercharged and non-supercharged engines. **[8]**

b) Explain Exhaust Gas Recirculation. **[8]**

Q8) Write short notes on (any three) : **[16]**

a) Trade-off between PM and NO_x emissions.

b) CI engine fuel rating.

c) Solid fuels for IC engines.

d) Thermodynamic analysis of Turbocharged Engine.

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Total No. of Questions : 10]

P1428

SEAT No. :

[Total No. of Pages : 3

[4265] - 68
M.E. (Mechanical) (Design Engg.)
MACHINE TOOL DESIGN
(2002 Course) (Elective - I (a))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data, if necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of non-programmable electronic calculators is allowed.***

SECTION - I

Q1) a) Discuss in brief how design considerations of feed gear box differ from speed gear box. **[4]**

b) Design a speed gear box for a machine tool to have speed variation from 100 to 1200 rpm in nine steps. The input shaft of a gear box runs at a constant speed of 300 rpm and output speeds are to be in geometric progression. Draw the best possible structural diagram and the speed chart to design the speed box compact and economical. Also sketch the schematic layout of the gear box. **[12]**

Q2) a) Explain the principle of obtaining stepless variation in speeds using a conical pressure variator. **[4]**

b) Discuss, in brief, design considerations of variators. **[6]**

c) Give classification of electric motors used in machine tools with illustrations. **[6]**

Q3) a) Explain clearly the term 'dynamic rigidity' of a machine tool. State the factors affecting it. **[6]**

b) Discuss the design considerations of a rectangular column of drilling machine. **[6]**

c) Explain the effect of stiffener arrangement on bending and torsional stiffness of box type structure. **[4]**

P.T.O.

Q4) a) What are the characteristic advantages of a recirculating ball screw in comparison to traditional sliding friction lead screw? **[6]**

b) What are the major requirements of guideways suitable for machine tools? **[6]**

c) Show that rigidity of hydrostatic guideways is 50% higher than the rigidity of the same under hydrodynamic lubrication. **[4]**

Q5) Write short notes (any three) : **[18]**

a) Methods of wear compensation in guides.

b) PIV drives.

c) Preloading of recirculating ball screw.

d) Vertical roller feed screw.

e) Recent trends in development of machine tools.

SECTION - II

Q6) a) Discuss the steps followed in design of power screws of machine tools? Why 'Pitch Error' restriction is much important in the lead screw design? **[6]**

b) How is optimum spacing between spindle supports determined? **[2]**

c) Explain with sketch, construction of a typical spindle unit with mounting used on machine tool. **[8]**

Q7) a) Classify NC, CNC machines as against traditional machines, based on, functional movements etc. **[4]**

b) Explain types of FMS and their field of applications. **[6]**

c) Describe the procedure of retrofitting traditional machine into a CNC machine. **[6]**

Q8) a) With a neat sketch explain the operation of a thermal relay and push button control of a driving motor of a machine tool. **[10]**

b) What is meant by 'Stick slip' vibration in a machine tool? Enumerate commonly adopted methods in reducing the positional error due to stick-slip vibrations. **[6]**

Q9) a) With the help of neat sketch, describe hydrostatic power pack used on machine tools with typical uses. **[8]**

b) Discuss the method of 'Dynamic Acceptance tests' of machine tool and its importance. **[8]**

Q10) Write short notes on (any three) : **[18]**

a) Auto tool changer.

b) Modular design concept in machine tools.

c) Electrical Brake in machine tool.

d) Reliability based design.

e) Ergonomic considerations for machine tools.

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Total No. of Questions : 6]

P1429

SEAT No. :

[Total No. of Pages : 2

[4265] - 179
M.E. (Electrical) (Power Systems)
COMPUTER APPLICATIONS IN POWER SYSTEMS
(2002 Course)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***All questions carry equal marks.***
6) ***Use of logarithmic tables slide rules, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Write a note on classification of optimization problems. Explain any one in details. **[12]**

b) Explain multivariable optimization with equality constraints by Lagrange multiplier method. **[13]**

Q2) a) Explain random walk method for unconstrained minimization. Draw flowchart. **[13]**

b) Describe Unrestricted search elimination method with a limited step size. **[12]**

Q3) Explain the following :

a) Steepest Descent method along with its flow chart. **[8]**

b) Kuhn Tucker conditions. **[5]**

c) Z-bus building algorithm for addition of a branch to already existing bus. **[12]**

P.T.O.

SECTION - II

Q4) a) Explain the Newton Raphson method of load flow analysis (Rectangular form). **[13]**

b) Explain the fast decoupled method along with its flowchart. State the assumptions. **[12]**

Q5) a) Explain the formulation of problem for A.C.-D.C. load flow along with D.C. system model, converter variables and derivation of equations. **[13]**

b) Explain three phase load flow analysis in details. **[12]**

Q6) Explain the following :

a) Formulation of Y-bus matrix from the primitive network. **[12]**

b) Derivation of sequence impedance matrix by using transformation matrix. **[13]**

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Total No. of Questions : 6]

P1430

SEAT No. :

[Total No. of Pages : 2

[4265] - 180
M.E. (Electrical-Power Systems)
POWER SYSTEM OPERATION AND CONTROL
(2002 Course)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Give answers of following questions on Generation scheduling. What is the necessity of generation scheduling task? Explain the optimum generation scheduling when transmission losses are included. Explain various constraints to be considered while optimizing the generation scheduling task. Derive the exact coordination equation. Express the transmission loss in terms of B coefficients. Obtain the solution for generator power through iterative method. **[25]**

Q2) a) What is the necessity of Unit Commitment task? Explain with appropriate example, the use of dynamic programming for unit commitment of thermal units. **[13]**

b) Explain economic dispatch by Gradient method and Newton's method. **[12]**

Q3) Write short note on following : **[25]**

a) Genetic algorithm for unit commitment.

b) Various operational as well as device constrains on Unit commitment.

c) Economic dispatch with piecewise linear cost function.

P.T.O.

SECTION - II

Q4) a) Explain the concept of real time control. Draw the functional block diagram of real time computer. State the functions performed by this computer. **[12]**

b) What is Supervisory Control and Data Acquisition System (SCADA)? With block diagram, explain in detail the functions of each block.**[13]**

Q5) a) Explain the following with mathematical equations and block diagram with respect to single area case. **[12]**

i) Speed governing system.

ii) Turbine Model.

iii) Generator-load model.

b) Explain the load frequency control of single area case with complete block diagram. Also explain the steady state and dynamic frequency response. **[13]**

Q6) a) Explain various reactive power control methods. **[12]**

b) Explain various types of energy interchange between interconnected utilities. **[13]**

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Total No. of Questions : 6]

P1431

SEAT No. :

[Total No. of Pages : 2

[4265] - 183

M.E. (Electrical) (Power Systems)

SPECIAL TOPICS IN HIGH VOLTAGE ENGINEERING

(2002 Course) (Elective (a))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain with neat schematic diagram, the partial discharge measurement using straight detection method. Explain functions of each component. **[13]**

b) Explain Artificial Pollution Test on high voltage insulators. **[12]**

Q2) Write short note on following : **[25]**

a) Testing facilities provided in high voltage lab.

b) Size and dimensions of the equipments in high voltage laboratory.

c) Importance of electromagnetic shielding and earth return in high voltage laboratory.

Q3) a) Explain the capacitance and dielectric loss measurement. **[13]**

b) Explain the radio interference, its effect and its measurement. **[12]**

P.T.O.

SECTION - II

Q4) a) State and explain any three mechanisms or reasons by which breakdown can occur in solid insulating materials. **[15]**

b) Explain breakdown mechanisms in liquid dielectric material. **[10]**

Q5) Write short note on : **[25]**

a) Voltage Multiplier Circuit.

b) Marx Circuit for impulse voltage generation.

c) Van De Graff generator.

Q6) a) What is a Tesla Coil? How are damped high frequency oscillations obtained from Tesla coil? **[12]**

b) Explain the working of Impulse current generator. **[13]**

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Total No. of Questions : 8]

P1432

SEAT No. :

[Total No. of Pages : 2

[4265] - 194

M.E. (Production)

CIM AND ADVANCED MANUFACTURING PROCESSES

(2002 Course)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Solve any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Draw neat sketches wherever required.***

SECTION - I

Q1) a) Explain any two module related to manufacturing application for MRP-II. **[8]**

b) What is FMS? How it is implemented in engineering industries? Explain different layouts in FMS. **[8]**

Q2) a) Explain necessary information required for preparation of data file for a component. **[8]**

b) Discuss different Network topology in CIMS. **[8]**

Q3) a) Discuss Opitz system for classification and codification of parts. **[8]**

b) What is meant by CAE? Compare it with CIMS and list advantages of both of them. **[8]**

Q4) Write short notes on any three : **[18]**

a) Use of computer at shop floor activities.

b) AGV guidance and control.

c) CAPP.

d) Computer aided quality control.

P.T.O.

SECTION - II

Q5) a) Explain with neat sketch LBM along with its process parameters. **[8]**

b) What is meant by High speed machining? Explain different factors affecting on HSM Explain building block concept for used in setting up aggregate machines. **[8]**

Q6) a) Discuss environmentally conscious manufacturing process. **[8]**

b) What is micromachining? Explain any one method to achieve it. **[8]**

Q7) a) What is meant by Rapid tooling? Explain fused deposition RP method. **[8]**

b) Discuss methods for auto inspection on-line. **[8]**

Q8) Write short notes on any three : **[18]**

a) Water jet machining.

b) Chemical milling process.

c) ATC devices.

d) Agile manufacturing.

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Total No. of Questions : 6]

P1433

SEAT No. :

[Total No. of Pages : 1

[4265] - 222
M.E. (Petroleum)
ADVANCED NATURAL GAS ENGINEERING AND TECHNOLOGY
(2002 Course) (Elective - II (a))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answers to the two sections must be written in separate answer books.***
2) ***Answer two questions from each section.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams should be drawn wherever necessary.***
5) ***Use of a non-programmable calculator is allowed.***
6) ***Assume suitable data if necessary and clearly state it.***

SECTION - I

Q1) Define any four properties of a gas and explain the procedure to obtain it. **[25]**

Q2) Derive the pipe line flow equation for series and parallel flow. **[25]**

Q3) Draw and explain the centrifugal compressors and its parts. **[25]**

SECTION - II

Q4) Explain phase behavior of a gas reservoir. **[25]**

Q5) Draw a process flow diagram to show two methods how water is removed from a natural gas stream. **[25]**

Q6) Derive the equation used to calculate flow rate in a orifice meter. **[25]**

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Total No. of Questions : 6]

SEAT No. :

P1434

[Total No. of Pages : 1

[4265] - 228
M.E.(Petroleum Engineering)
WELL TESTING AND ANALYSIS
(2002 Course) (Elective - I (b))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) ***Answers to the two sections must be written in separate answer books.***
2) ***Answer two questions from each section.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams should be drawn wherever necessary.***
5) ***Use of a non-programmable calculator, log-log, semi-log paper is allowed.***
6) ***Assume suitable data, if necessary and clearly state it.***

SECTION - I

Q1) Derive the diffusivity equation in cartesisan coordinate system. **[25]**

Q2) Explain DST and its interpretation. **[25]**

Q3) Derive the Laplace solution to the diffusivity equation. **[25]**

SECTION - II

Q4) State the complete methodology in analysis of a gas well. **[25]**

Q5) Explain the flow regimes in the analysis of horizontal wells. **[25]**

Q6) Define and explain the Derivative Plot. **[25]**

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Total No. of Questions : 6]

SEAT No. :

P1435

[Total No. of Pages : 2

[4265] - 236

M.E.(Instrumentation) (Process and Bio-Medical)

ADVANCED ELECTRONIC INSTRUMENTATION

(2002 Course)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answer will be valued as a whole.***
6) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam table is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Explain Successive Approximation Register type ADC with the help of internal schematic diagram. What are the different control signals provided for performing the operation. **[25]**

Q2) How does "+/– 1 count getting error" minimized in frequency measurement by using universal counter? Explain with the help of mathematical proof. Explain benefits of multiple period used in universal counter. **[25]**

Q3) Explain the following controls of a dual trace oscilloscope with an application.

a) Trigger Level.

b) Trace position.

c) Line trigger.

d) X10 magnification.

e) Compensated attenuator. **[25]**

SECTION - II

Q4) Explain principle and working of Strip chart recorder with the help of neat block schematic. How does the accuracy of the pen drive mechanism of the recorder checked? **[25]**

P.T.O.

Q5) What are the different excitation techniques used for semiconductor pressure sensor? Explain the calibration procedure followed for the same. **[25]**

Q6) Write short notes on trigger modes of double sweep oscilloscopes : **[25]**

a) Switched sweep.

b) Delayed sweep.

☒☒☒☒

Total No. of Questions : 8]

SEAT No. :

P1436

[Total No. of Pages : 2

[4265] - 237

M.E.(Instrumentation) (Process and Bio - Medical)

APPLICATIONS OF DIGITAL SIGNAL PROCESSING

(2002 Course)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) *Answer any three questions from each section.*
2) *Answers to the two sections should be written in separate books.*
3) *Neat diagrams must be drawn wherever necessary.*
4) *Assume suitable data if necessary.*
5) *Use of electronic pocket calculator is allowed.*

SECTION - I

Q1) a) State and prove the properties of convolution. **[10]**

b) Write the short note different types of standard test signals. **[8]**

Q2) a) Explain in detail the Gibb's phenomenon. **[8]**

b) Find the auto correlation of the following sequence using graphical method. **[8]**

$x(n) = \{1, -2, 1, 0\}$

Q3) a) Find the 8-point DFT of the following sequence using DIF FFT algorithm : **[8]**

$x(n) = \{1, 2, 2, 1\}$

b) Write a short note on overlap add method. **[8]**

Q4) a) Compare different types of windows. **[8]**

b) Give the advantages of Digital Processor over Microprocessor and Analog Processor. **[8]**

SECTION - II

Q5) a) Explain the symmetric and anti-symmetric conditions in case of FIR filters. **[10]**

b) Write a short note on Kaiser Windowing technique. What are the advantages of Kaiser window over other windows? **[8]**

P.T.O.

Q6) a) Explain in detail the architecture of TMS 320c67XX DSP processor with neat diagram. **[8]**

b) Write the program for generating a square wave using TMS 320c67XX DSP processor with frequency 5 kHz. **[8]**

Q7) a) Write short note on Image Enhancement. **[8]**

b) Explain in detail the different types of scanners used digital image processing. **[8]**

Q8) a) Write the short note on ECG analysis in image processing. **[8]**

b) Compare the Gabor Transform with Short Time Fourier Transform. **[8]**

Total No. of Questions : 8]

SEAT No. :

P1437

[Total No. of Pages : 2

[4265] - 257
M.E. CSE (IT)
INTELLIGENT SYSTEMS
(2002 Course) (Elective - I (b))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections must be written on separate answer books.***
3) ***Assume suitable data if necessary.***
4) ***Draw sketches wherever necessary.***
5) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Prove that if a heuristic is consistent, it must be admissible. Construct an admissible heuristic that is not consistent. **[8]**

b) What do you mean by agent program? Explain with schematic diagram, four basic kinds of agent program. **[8]**

Q2) a) Solve Blocks world problem using hill climbing search method. (Choose proper heuristic function for the same). **[8]**

b) Consider a state space where the start state is number 1 and the successor function for state n returns two states, numbers 2n and 2n + 1. **[8]**

i) Draw the portion of the state space for states 1 to 15.

ii) Suppose the goal state is 11. List the order in which nodes will be visited for breadth first search, depth limited search with limit 3, and iterative deepening search.

iii) Would bidirectional search be appropriate for this problem? If so, describe in detail how it would work.

P.T.O.

Q3) a) Explain Best first search algorithm with the help of suitable example. **[8]**

b) What is memory bounded search? Explain IDA* with suitable example. **[8]**

Q4) Write short notes on any three: **[3 x 6 = 18]**

a) Contingency Problems.

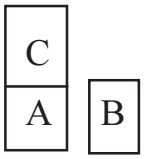
b) A* Algorithm.

c) Properties of task environments.

d) Bidirectional Search.

SECTION - II

Q5) a) What is goal stack planning? Solve the following blocks world problem with goal stack planning using STRIPS notation. **[8]**



Start State

Goal State

b) What is Hierarchical Task Network (HTN) Planning? Explain with algorithm, the basic HTN procedure. **[8]**

Q6) a) Explain Continuous planning with suitable example. **[8]**

b) Using the axioms of probability, prove that any probability distribution on a discrete random variable must sum to 1. **[8]**

Q7) a) Explain Conditional Planning in partially observable environments. **[8]**

b) Explain the inferences in first order logic. **[8]**

Q8) Write short notes on any three: **[3 x 6 = 18]**

a) Decision Networks.

b) Probabilistic Reasoning.

c) Bay's Theorem.

d) Utility Theory.

Total No. of Questions : 8]

SEAT No. :

P1438

[Total No. of Pages : 3

[4265] - 258
M.E. (CSE & IT)
OBJECT ORIENTED SYSTEMS
(2002 Course) (Elective - I (c))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) ***Q. 1 and Q. 5 are compulsory. Of the remaining attempt any two in Section-I and any two in Section-II.***
2) ***Draw neat diagrams wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Make suitable assumptions, wherever necessary.***

SECTION - I

Q1) A Home Finance Company requires automation of their loan lending system. The company can lend home loan, home extension loan, home improvement loan, loan against home. For any kind of loan following criteria are applicable : **[18]**

a) Loan application eligibility is 21 years.

b) Loan amount limit is 85% of the cost of property.

c) Flat loan amount will be Rs.10000 to Rs.1000000.

d) Loan amount for polt and home construction will be maximum 100% of cost of production.

e) Security against loan will be through individual guarantor or assignment of life policy extendible up to maximum 15 years.

f) Loan disbursement depends on selection and submission of legal and property documents, initial payment of own contribution, payment of processing fees and administrative charges.

The salaried individuals will be producing latest salary slip and form 16 from the employer whereas the self employed individuals will be producing certified copies of balance sheet, profit and loss account, income tax return acknowledgement and partnership profile.

Trace the possible queries and reports regarding the above problem. Clearly state scope, problem partitions and analyze the problem and develop use case diagrams for all scenarios, sequence diagrams for any three scenarios and class diagram for the target system.

P.T.O.

Q2) a) Draw a full detailed Activity diagram for following Scenario : **[12]**

A system for Course Administration System is to be developed. These are various branches consisting various courses offered on semester basis. The student can select courses for a particular semester on yearly basis. The staff can suggest the choices for courses offered and accordingly allocated. The time-table need to be generated automatically after furnishing necessary details. There exists a provision for attendance maintenance of students and notification of the same to the parents. The system should support query processing and report generation.

b) What is the relationship between Use Cases and Functional requirements? What are the structuring mechanisms in Use Case diagrams? **[4]**

Q3) a) Draw a full detailed Sequence diagram for following Scenario : **[10]**

A system for sales process is to be developed. The system should able to provide quotations to the customer. According to the quotations, system will check whether required products are available or not. If not, then notice is send to manufacturing unit. Manufacturing dept produce the products within time and then it is notified to sales dept to sell these products to customer and also take a feedback from them. The system should able to fix meeting date and time with customer and should give reminder to sales dept for meeting. It should able to generate reports.

b) Draw a neat diagram showing CORBA client and server side bolcks.**[6]**

Q4) a) Draw a full detailed Collaboration diagram for following Scenario : **[12]**

A system for Inventory Control System (ICS) is to be developed. The system should able to monitor the quantity, location and status of inventory as well as related shipping, receiving, picking and put away processes. Inventory objects may contain any kind of physical assets like consumables, books or circulating tools. To record ICS uses a barcode scanner.

An ICS system contains a list of orders to be filled and then prompts wokers to pick necessary items and provide them with packaging and shipping info. The system should support query processing and report generation.

b) Explain forward and reverse engineering a USE CASE diagram. **[4]**

SECTION - II

Q5) A product information system is to be developed for XYZ Company. The company has several products and they are categorized in different areas. There is a product catalogue maintained for registering existing products and new products. Every product has a warranty period within which a record sheet covering the after Sales Services details is recorded. The product may have raw material purchasing, issuing, stocking, rejections and performance details.

The company has appointed several dealer and distributors who are marketing the products. The company monitors the sale and servicing of the products by itself and the dealers by studying the survey report. The customer details are also need to be maintained.

Trace the possible queries and reports regarding the above problem. Clearly state scope, problem partitions and analyze the problem and develop use case diagrams for all scenarios, sequence diagrams and Collaboration diagrams for any two scenarios each and class diagram for the target system. **[18]**

Q6) a) For a manufacturing company, inventory control system is to be automated. The system incorporates the details for requirements of products, maintenance of its catalogue, product sales and demand. The system generates reports on demand and able to process queries from users. Clearly indicate the problem partitions. Draw a detailed software class diagram. **[12]**

b) What do you mean by visibility of elements in class diagrams? How it supports access mechanisms? **[4]**

Q7) a) How Objects are identified? What are the categories of Objects? How Object behaviour is determined? **[8]**

b) What is the significance of Incremental and Evolutionary approach? How it supports component building? **[8]**

Q8) a) What is the importance of Workflows in a development process? What activities are performed in Elaboration and Construction phases of Unified Process? What is meant by Major and Minor milestone? **[10]**

b) Explain 'Life of Unified Process'. **[6]**

Total No. of Questions : 8]

SEAT No. :

P1439

[Total No. of Pages : 2

[4265] - 261

M.E. (Computer Science & Engg.) (I.T.)

DATA WAREHOUSING AND DATA MINING

(2002 Course) (Elective - II (b))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) ***Q. 1 and Q. 5 are compulsory. Of the remaining solve any two in section-I and any two in section-II.***
2) ***Draw labelled diagrams if necessary.***
3) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) Design a STAR schema to track the shipments for a distribution company, the following dimension tables are found : **[10]**

i) Time,
ii) Customer ship-to,
iii) Ship-from,
iv) Product,
v) Type of deal and
vi) Mode of shipment.

Review these dimensions and list the possible attributes for each of the dimension tables. Also, designate a primary key for each table.

b) Explain the difference between primary keys, Surrogate keys and Foreign keys in the context of a STAR schema. **[8]**

Q2) a) Explain in detail Projection Index and Bit Map Index with suitable examples, figures. **[10]**

b) Discuss issues in problems in storage and retrieval of data from DSS. **[6]**

Q3) a) Explain application and subject orientation with respect to Data Warehousing. **[6]**

b) With the help of a neat diagram explain the general architecture of a Data Warehouse. **[10]**

Q4) a) Discuss data warehouse life cycle. **[4]**

b) Explain data transformation and cleansing in a Data Warehouse with suitable examples. **[8]**

c) With an example explain Fact Tables. **[4]**

P.T.O.

SECTION - II

Q5) Draw the fact constellation schema diagram for following tables by identifying fact and dimension tables. **[18]**

Sales = (time_key, item_key, branch_key, location_key, dollars_sold, units_sold)

Shipping = (item_key, time_key, shipper_key, from_location, to_location, dollars_cost, units_shipped)

Time = (time_key, day_of_week, month, quarter, year)

Branch = (branch_key, branch_name, branch_type)

Location = (location_key, street, city, country)

Item = (item_key, item_name, brand, type, supplier)

Shipper = (shipper_key, shipper_name, location_key, shipper_type)

a) How many subjects this fact constellation schema handles? Why?

b) How many fact tables are there? Which?

c) What tables are shared by all the fact tables?

Q6) a) Distinguish between Star Schema and Snowflake schema. **[8]**

b) Distinguish between OLTP and Data Warehousing system **[8]**

Q7) a) Which Indexing technique is best suitable for Data Warehouse? **[8]**

b) Explain an algorithm to find association rules. **[8]**

Q8) Write short notes on : **[16]**

a) Web Mining.

b) Text Data Mining.

c) Temporal Data Mining.

Total No. of Questions : 8]

SEAT No. :

P1440

[Total No. of Pages : 2

[4265] - 262
M.E. (CSE & IT)
ENTERPRISE RESOURCE PLANNING - EC
(2002 Course) (Elective - II (c))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections must be written on separate answer books.***
3) ***Assume suitable data if necessary.***
4) ***Draw sketches wherever necessary.***
5) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Define Enterprise and ERP. What are the facilities, which form "multi-facility" environment of ERP? **[8]**

b) Discuss any Two application domains in service sector where ERP can be implemented. **[8]**

Q2) a) What are tangible and non-tangible benefits of ERP? **[8]**

b) What is business process engineering? Explain role of IT in implementation of it. **[8]**

Q3) a) What are short-term and long-term management concerns about ERP? **[8]**

b) What are different core processes in automobile sector? Explain their importance in accordance with ERP for Institute Management. **[8]**

Q4) Write short notes on : **[18]**

a) Inventory Management.

b) Role of consultants, vendors and users in implementation of ERP.

c) Technology Management.

SECTION - II

Q5) a) What are the key issues in determining the success of implementation of ERP? **[8]**

b) What is gap analysis? What are post-implementation options? **[8]**

P.T.O.

Q6) a) Why is there a need to understand the markets to implement ERP solution? **[8]**

b) What is market strategy? How is it represented in documentation? **[8]**

Q7) a) Explain the process of material management. **[8]**

b) How is ERP package evaluated? Discuss with suitable examples. **[8]**

Q8) Write short notes on : **[18]**

a) Financial Management.

b) SAP R/3.

c) Order - Winners and Qualifiers.

Total No. of Questions : 8]

SEAT No. :

P1441

[Total No. of Pages : 2

[4265]-293
M.E. (Chemical)
PROCESS MODELING & SIMULATION
(2002 Course)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Classify modeling emphasizing on details of mathematical modeling. **[10]**

b) Discuss the various aspects involved in physical modeling. **[6]**

Q2) a) What is the black box principle?

b) Distinguish among independent variables, dependent variables and parameters with suitable examples. **[16]**

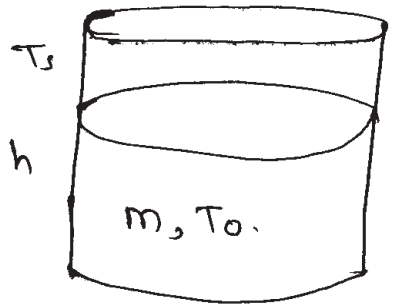
Q3) Develop a model and obtain an expression for the extraction of BA in a steady state operation. BA ie, Benzoic Acid is continuously extracted from Toluene using water as the solvent. The two streams are fed into tank A (mixer) where they are stirred and the mixture is then pumped into tank B (settler) where it is allowed to settle in two layers. Model the system to find out what fraction of BA passed into the solvent phase. **[16]**

Q4) A stream of solution containing dissolved salt flows at a constant volumetric flow rate Q, m^3/s into a tank of constant hold up volume V. The concentration of the salt in the entering system, x kg/m^3, varies with time. Develop a model for the outlet concentration y, kg/m^3, when there is a sinusoidal input change in the inlet concentration. Assume density of the solution to be constant. **[18]**

P.T.O.

SECTION - II

Q5) A closed kettle shown below of total surface area Am^2 is heated through this surface by condensing steam at temperature $T_s K$. The kettle is charged with M kg of liquid of heat capacity C_p J/kg at a temperature of ToK. If the process is controlled by a heat transfer coefficient h w/m^2K, how does the temperature of liquid vary with time? **[16]**



Q6) Define simulation. Enlist different process simulation softwares and discuss any one in detail. **[18]**

Q7) Derive a model for binary distillation column with suitable notations. **[16]**

Q8) Classify the sources of errors. Explain each of the error with suitable example. **[16]**

Total No. of Questions : 6]

SEAT No. :

P1457

[Total No. of Pages : 2

[4265]-614

M.E. (Electrical - Power Systems)

ARTIFICIAL INTELLIGENCE AND ITS APPLICATIONS IN POWER SYSTEMS

(Elective - II (a)) (2008 Course) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is Fuzzy Logic? Explain different fuzzy relations and operations on fuzzy sets. **[10]**

b) With examples explain following concepts associated with fuzzy set. **[15]**

i) Height of a fuzzy logic.
ii) Normalization of a fuzzy set.
iii) Core of a fuzzy set.
iv) Support of a fuzzy set.
v) α-cuts of a fuzzy set

Q2) a) Explain following methods of generation of membership function. **[10]**

i) Choice based on intuitive understanding.

ii) Generation of membership function based on subjective perception and inductive reasoning.

b) Evaluate following relations when data is given. **[15]**

A and B are the fuzzy set of U.
A = (0.5, 0.8, 0, 0.3), B = (0.2, 1, 0.1, 0.7), $\alpha = 0.3$, $\beta = 0.5$ then prove that

i) $\alpha(A \cup B) = (\alpha A) \cup (\alpha B)$

ii) $\alpha(A \cap B) = (\alpha A) \cap (\alpha B)$

P.T.O.

iii) $(\alpha\beta)\ A = \alpha(\beta A)$
iv) $1.A = A$
v) αA is a subset of A

Q3) Explain 'Propositional Logic' PL (1) with reference to following points giving appropriate examples. **[25]**

a) Syntax of PL (1)
b) Semantics of PL (1)
c) Semantic Properties
d) Inference Rules
e) Derivation
f) Resolution in PL (1)

SECTION - II

Q4) a) Explain basic McCullock Pitts' non linear model of a neuron with schematic diagram. Give basic rules of signal flow graph presentation of ANN. **[9]**

b) Write short note on different transfer functions with mathematical equation, graphical presentation. Explain the effect of bias and transfer function on output of neural network. **[8]**

c) Explain the functional and computational properties of Artificial Neural Network (ANN) and Fuzzy Logic. **[8]**

Q5) a) Define learning of artificial neural network. Compare between "learning with a teacher" and "learning without a teacher". **[10]**

b) Explain algorithm of 'Competitive learning of neural network' and 'Perceptron learning Rule'. Explain 'learning rate' and 'momentum coefficient'. **[15]**

Q6) a) With neat diagram explain the architecture of Multi-Layer Perceptron (MLP). Also compare 'single layer perceptron network' with 'multilayer perceptron'. **[10]**

b) Explain with flow chart and mathematical formulae, the error back propagation algorithm. **[15]**

Total No. of Questions : 6]

SEAT No. :

P1458

[Total No. of Pages : 2

[4265] - 615

M.E.(Electrical) (Power System)

RENEWABLE ENERGY SOURCES

(Semester - I) (2008 Course) (Elective - II (b))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate answer books .***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Explain the energy resources and their status as per Indian scenario. **[10]**

b) Write a note on Energy and its environmental impacts. **[5]**

c) High light on standalone and grid connected operation of wind energy. **[10]**

Q2) a) Discuss on solar collectors collection systems and its efficiency calculation. **[10]**

b) Explain the characteristics of PV cells. **[5]**

c) Explain the concept of Clean of Clean Development Mechanism and Prototype Carbon Funds. **[10]**

Q3) a) Discuss on wind distribution and wind speed predictions. **[10]**

b) List the system design factors for wind energy. **[5]**

c) High light on standalone and grid interactive system for solar energy. **[10]**

SECTION - II

Q4) a) Discuss on selection criteria of resources for Hybrid system and its sizing. **[10]**

b) Write a note on micro hydel plant. **[8]**

c) Explain the Ocean-thermal energy conversion systems. **[7]**

P.T.O.

Q5) a) Explain the generation technique from the municipal solid waste. **[10]**

b) Explain the Fly wheel energy components and its advantages over battery. **[10]**

c) Write a note on, Fuel Cell. **[5]**

Q6) a) Explain the battery management and battery performance characteristics. **[10]**

b) High light on the concept load scheduling. **[5]**

c) How does power quality gets affected due to voltage sags and flickers. **[10]**

Total No. of Questions : 8]

SEAT No. :

P1479

[Total No. of Pages : 2

[4265] - 816
M.E. (Chemical)
PROCESS MODELING AND SIMULATION
(2008 Course) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) What is model and modeling? Give the example of each. Discuss the types of process models in detail. **[16]**

Q2) Derive a model for Reverse Osmosis Unit, which contains membrane module. Assume suitable assumption and draw a neat figure with proper notations. **[18]**

Q3) What is Linear and Non-Linear Regression analysis? Discuss it with example. **[16]**

Q4) Derive the equations for liquid and vapour dynamics model of single component vaporizer. **[16]**

SECTION - II

Q5) a) Explain the concept of design of experiments.

b) Discuss central factorial design. **[16]**

Q6) Write notes on : **[16]**

a) Optimization in energy conservation.

b) Optimization in Chemical Reactor Design.

P.T.O.

Q7) The liquid phase hydrolysis reaction of acetic anhydride from acetic acid is carried out in a constant volume adiabatic batch reactor. The reaction is exothermic with following stoichiometry.

$(CH_3C)_2O + H_2O \longrightarrow 2CH_3COOH + Heat$

Derive mass and energy balances for the system assuming the reaction as first order. **[18]**

Q8) Discuss the general Newton Raphson algorithm to determine the bubble point temperature for a binary system of component 1 and 2. Assume the system is ideal. Raoult's and Dalton's laws are applicable. **[16]**

Total No. of Questions : 8]

SEAT No. :

P1480

[Total No. of Pages : 2

[4265] - 823
M.E. (Chemical)
CATALYSIS AND SURFACE PHENOMENON
(2008 Course) (Elective - IV (a)) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Discuss the preparation of alumina and silica as catalyst supports and give a comparison between them. What is Hedball effect? **[10]**

b) Describe chemisorption method for determining metal surface area in supported metal catalyst. **[6]**

Q2) Give various aspects of surface acidity and source and strength of acid sites. Describe the methods for determination of acid strengths and indicator for acid types. **[16]**

Q3) Describe the following methods of catalyst characterization. **[18]**

a) Mossbaur spectroscopy b) PIXE c) XRD

Q4) When nitrogen was employed to determine the surface area of a 0.5gm sample of silica gel, the following results were obtained. **[16]**

Equilibrium pressure, P kP*a*	Volume adsorbed (STP) V × 10^6 (m^3)	Equilibrium pressure, P kP*a*	Volume adsorbed (STP) V × 10^6 (m^3)
0.8	3.4	9.0	7.4
3.3	6.4	11.2	7.7
5.0	6.7	18.7	8.5
6.3	7.0	30.7	9.9
7.5	7.2		

P.T.O.

The sample of silica gel was maintained at the normal boiling point of liquid nitrogen (77 K). The area of plane surface which is a single molecule of nitrogen would occupy is 16.2×10^{-20} m^2. Calculate the specific surface area of silica gel.

SECTION - II

Q5) a) What are spinnels? State their characteristics. **[8]**

b) Explain volcano plots. **[8]**

Q6) a) Give classification, description and applicability of adsorption isotherms. **[10]**

b) Explain how heat of adsorption can be found from thermodynamic data. **[8]**

Q7) a) Explain effectiveness factor and Thiele modulus. **[8]**

b) Write a note on kinetics of deactivation. **[8]**

Q8) Derive equation for temperature rise in interphase - intraphase nonisothermal transport processes. **[16]**

Total No. of Questions : 8]

SEAT No. :

P1481

[Total No. of Pages : 2

[4265] - 829

M.E. (Chemical) (Environmental Engg.)

ENVIRONMENTAL GEOSCIENCES

(2008 Course) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) ***Question Nos. 1, 2 and 5, 6 are compulsory. Out of the remaining attempt 1 question from Section-I and 1 question from Section-II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Describe structure of Atmosphere around the Earth. Explain its significance on the life systems existing on this planet. **[10]**

b) List out any four types of ecosystems and give salient features of pond ecosystem. **[6]**

Q2) a) Define Air Pollution. Explain in detail four causes of Air Pollution and enlist four sources of Air Pollution. **[9]**

b) Define Earthquakes and Tsunamis. Describe origin of Tectonic earthquakes. **[7]**

Q3) Explain with case histories environmental impact of surface and subsurface mining for exploration of minerals. **[18]**

OR

Q4) Define Mass Movement. Give its classification. What are causes of Landslides? How the Landslides can be predicted? Give one case history. **[18]**

SECTION - II

Q5) Give detailed account of Geochemical cycles. **[16]**

Q6) Describe in detail Acid mine drainage. **[16]**

P.T.O.

Q7) What is Remote Sensing? Where are stages of Remote Sensing? Explain interaction of EMR with Earth Surface. **[18]**

OR

Q8) Write an essay on Applications of Remote Sensing and GIS in Environmental Management. **[18]**

Total No. of Questions : 8]

SEAT No. :

P1482

[Total No. of Pages : 2

[4265] - 830

M.E. (Chemical) (Environmental Engg.)

ENVIRONMENTAL CHEMISTRY

(2008 Course) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Give the concept and scope of environmental chemistry, in detail. **[16]**

Q2) Explain the role of surfactants along with their classification. **[18]**

Q3) a) Explain the functions of soil. Discuss the factors affecting soil development.

b) Explain the steps involved in collection of soil samples for analysis. **[16]**

Q4) Write short notes on : **[16]**

a) Biosynthesis of DNA & RNA.

b) Classification of Enzymes.

SECTION - II

Q5) a) Give the classification of pesticides.

b) Write about pollution due to pesticides. **[16]**

Q6) Define : **[16]**

a) Cationic and anionic detergents.

b) Surface Tension.

c) TOC.

d) TDS.

P.T.O.

Q7) Explain the principle and working of **[18]**

a) Gas chromatograph.

b) Atomic Absorption spectroscope.

Q8) Write notes on : **[16]**

a) Ion Exchange.

b) Polarography.

Total No. of Questions : 8]

SEAT No. :

P1483

[Total No. of Pages : 2

[4265] - 834

M.E. (Chemical) (Environmental Engg.)

AIR AND NOISE POLLUTION CONTROL

(2008 Course) (Elective - I (d)) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Discuss the sources, classification and effects of air pollutants. **[18]**

Q2) What are the ambient air quality standards? How the ambient air quality be determined? **[16]**

Q3) What are the various atmospheric stability conditions and discuss their effect on dispersion of air pollutants? Explain the purpose of stack sampling. **[16]**

Q4) Write in detail on Air Pollution laws and regulations. **[16]**

SECTION - II

Q5) Explain the principle, working and design of following : **[18]**

a) Electro-static precipitator.

b) Cyclone separator.

Q6) Explain the method for the removal of SOX with neat figure in detail. **[16]**

Q7) Measurement of dust distribution of a certain industrial operation yields the results shown in table below. These results are to be used to design a settling chamber.

The horizontal velocity is to be 0.3 m/s.

The temperature is 77ºC.

The sp.gr. of particle is 2.0.

P.T.O.

and the chamber length and depth equal 7.5m and 1.5m. respectively.

a) What is the terminal settling velocity of the particle that is removed 100%?

b) Determine the expected percentage removal of the particle. Assume β is 0.90. **[16]**

Particle size (μm)	wt %
0 - 10	8
10 - 20	10
20 - 30	12
30 - 40	15
40 - 50	19
50 - 60	14
60 - 70	13
70 - 80	9

Q8) a) The amount of sound power from a vehicle is 0.001w. What is the sound power level? What are the sound intensity? What are the sound pressure, and the sound pressure level at a distance 6m from the source? **[10]**

b) What are the sources of Sound/Noise pollution in a typical chamical industry? Write the effects of Noise Pollution. **[6]**

Total No. of Questions : 8]

SEAT No. :

P1484

[Total No. of Pages : 2

[4265] - 835

M.E. (Chemical) (Environmental Engg.)

MEMBRANE TECHNOLOGY IN ENVIRONMENTAL ENGINEERING

(2008 Course) (Elective - II (a)) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answers will be valued as a whole.***
6) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Write down the classification of membrane separation processes. **[6]**

b) Discuss essential features of membrane process. **[6]**

c) Explain industrial applications of membrane processes. **[6]**

Q2) a) Explain phase inversion process on a ternary diagram. **[8]**

b) Explain symmetrical, asymmetrical, dense and thin film structure of membrane. **[8]**

Q3) a) Give comparison between RO, UF, NF and MF processes. **[8]**

b) Explain the use of membrane technology in fruit duice concentration. **[8]**

Q4) a) What is pervaporation process. Explain it with applications. **[6]**

b) What is electrodialysis and explain it with applications. **[6]**

c) Draw and give the construction of plate-frame membrane module. **[4]**

SECTION - II

Q5) a) Explain the process of membrane bioreactor and its advantages in waste water treatment. **[8]**

b) Explain symmetrical, asymmetrical and thin film structure of membrane. **[6]**

c) Write short note on liquid membrane. **[4]**

P.T.O.

Q6) a) Explain various methods used for membrane preparation. **[8]**

b) Explain Sol-Gel process for inorganic composite membrane. **[8]**

Q7) a) What are the different polymeric materials used for membranes and how they are selected for specific use. **[8]**

b) What is concentration polarization and fouling of membrane. Give their effects on membrane performance and how to control them. **[8]**

Q8) a) Explain the process membrane distillation and it's applications. **[8]**

b) Explain the use of membrane technology in Dairy Industry. **[8]**

Total No. of Questions : 8]

SEAT No. :

P1485

[Total No. of Pages : 2

[4265] - 839

M.E. (Chemical) (Environmental Engg.)

WASTEWATER TREATMENT AND DESIGN

(2008 Course) (Sem. - II) (Theory)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) ***Question Nos. 1 and 5 are compulsory. Out of the remaining attempt 2 questions from Section-I and 2 questions from Section-II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answers will be valued as a whole.***
6) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain why hydraulic detention time changes in a real reactor? **[6]**

b) How mean residence time of a flow in a reactor is determined? **[6]**

c) Explain why a number of CSTR are required to be used in series in wastewater treatment. **[6]**

Q2) a) How soluble oxygen in a pond is determined? How total oxygen demand of waste water is considered? **[8]**

b) How rate of BOD is modeled? **[8]**

Q3) a) Explain factors responsible for water pollution and laboratory tests for deterring its quality. **[8]**

b) Explain the order of waste water treatment with significance of unit operations involved. **[8]**

Q4) Write short notes on the following : **[16]**

a) E and F curves.

b) Tracer analysis.

c) Reactors in wastewater treatment.

d) Flow regimes and reactor combinations.

P.T.O.

SECTION - II

Q5) a) Structures of the activated carbon and mass transfer process. **[6]**

b) Give experimental procedure for adsorption isotherms and develop mass transfer equation for the quantity of adsorbent required for the given load. **[6]**

c) Classification of bioprocesses as per metabolic functions. **[6]**

Q6) a) Explain Bacterial growth pattern in a batch reactor. **[8]**

b) Suspended and aerobic attached growth process for biological wastewater treatment. **[8]**

Q7) a) Advanced wastewater treatment. **[8]**

b) Explain the use of mixers in wastewater treatment. **[4]**

c) Forces responsible for settling particles in wastewater treatment. **[4]**

Q8) Write short notes on the following : **[16]**

a) SRT in Bioreactors.

b) Power number for mixers.

c) Peclet Number.

d) Dispersion coefficient.

Total No. of Questions : 8]

SEAT No. :

P1486

[Total No. of Pages : 2

[4265] - 910

M.E. (Instrumentation & Control) (Process & Biomedical Instru.)

MATHEMATICAL METHODS IN INSTRUMENTATION

(2008 Course) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data if necessary.***

SECTION - I

Q1) Find Singular Value Decomposition of the following : **[18]**

$$A=\begin{bmatrix}-1\\2\\2\end{bmatrix}$$

Q2) a) Consider a = (1, – 1), b = (1, 1) and c = (2, 1) in R_2. **[8]**
Is set {a, b, c} linearly dependent or not?

b) Obtain the orthogonal projections on X, Y and Z axis of the following vectors : **[8]**

i) (1, 2, 3)
ii) (4, 5, 6)
iii) (7, 8, 9)
iv) (10, 11, 12)

Q3) Find Orthonormal vectors for the given vector set A using Gramm-Schimmt Method. **[16]**

$$A=\begin{bmatrix}1 & 1 & 1\\1 & 2 & -3\\1 & 4 & -4\\1 & 5 & -2\end{bmatrix}$$

P.T.O.

Q4) a) Discuss applications of SVD. **[8]**

b) Discuss applications of Orthogonal and Unitary transformations. **[8]**

SECTION - II

Q5) a) Using Newton's iterative method, find the real roots of $x^* \log_{10}(x) = 1.2$ correct to five decimal places. **[8]**

b) Solve the following equations by Gauss-Seidal iteration method. **[10]**

$$10x_1 - 2x_2 - x_3 - x_4 = 3$$
$$-2x_1 + 10x_2 - x_4 - x_4 = 15$$
$$-x_1 - x_2 + 10x_3 - 2x_4 = 27$$
$$-x_1 - x_2 - 2x_3 + 10x_4 = -9$$

Q6) In certain PLC manufacturing plant, 3 divisions D1, D2 and D3 make 30%, 45% and 25%, respectively, of the total PLCs. It is known from past experience that 2%, 3% and 2% of the total PLCs made by each division, respectively, are defective. Now suppose that random PLC is selected from total PLCs. **[16]**

a) What is the probability that it is defective?

b) If selective PLC is defective, what is the probability that it is made by division D3? Use Bay's rule.

Q7) a) If the probability that an individual will suffer a bad reaction from injection of a given serum is 0.001, determine the probability that out of 2000 individuals. **[10]**

i) Exactly 3

ii) More than 2

individuals will suffer a bad reaction.

b) Discuss the role of probability distributions in Biomedical/Process Instrumentation. **[6]**

Q8) a) Let x be a random variable with density function. **[10]**

$f(x) = x^3/3$ for $-1 <= x <= 2$

$= 0$ otherwise.

Find expected value and variance of $g(x) = 4x + 3$.

b) Define : **[6]**

i) Conditional Probability.

ii) Mean.

iii) Variance.

Total No. of Questions : 8]

SEAT No. :

P1487

[Total No. of Pages : 2

[4265] - 911

M.E. (Instru. & Control) (Process Instru. Biomedical Instru.)

COMMUNICATION PROTOCOLS FOR INSTRUMENTATION

(2008 Course) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) With respect to Fieldbus, answer the following points :

a) Function Blocks, its uses and list any 5 function blocks. **[10]**

b) The topologies used with neat figures. **[6]**

Q2) With respect to Communication Basics, explain the following :

a) Asynchronous Communication and serial ports. **[4]**

b) Synchronous Communication and Manchester Encoding. **[4]**

c) Parity. **[2]**

d) Cyclic Redundancy Codes. **[2]**

e) Analog Signalling. **[4]**

Q3) Considering the MODBUS Protocol, explain the following :

a) Query and Response structure. **[4]**

b) Transmission modes. **[8]**

c) Message frame in each transmission mode. **[6]**

Q4) Write short notes on : **[16]**

a) Grounding Schemes for IC 61158-2 segment.

b) Token passing Bus arbitration method.

P.T.O.

SECTION - II

Q5) a) Explain the steps involved in commissioning of HART networks. **[10]**

b) Explain the Data Highway Plus Protocol in brief. **[8]**

Q6) What are Virtual Communication Relationships? Explain the different types of VCRs used in Fieldbus. **[16]**

Q7) a) What is Frequency Hopping Spread Spectrum in Bluetooth devices? **[8]**

b) What is Wi-Fi? Explain the necessity and applications of Wi-Fi. **[8]**

Q8) a) With neat sketch, explain the mapping of PROFIBUS and its variants (FMS, DP and PA) on the OSI/ISO model. **[5]**

b) Compare the Profibus DP and Profibus PA networks. **[5]**

c) With neat sketches explain the topologies used in ProfiBus. **[6]**

Total No. of Questions : 6]

SEAT No. :

P1488

[Total No. of Pages : 4

[4265] - 922

M.E. (Instru. & Control) (Process Instru. Biomedical Instru.)

MODERN CONTROL THEORY

(2008 Course) (Elective - II (a)) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) ***Answer any two questions from each section.***
2) ***Assume suitable data, if necessary.***
3) ***Figures to the right indicates full marks.***

SECTION - I

Q1) Solve following : **[10]**

a) Obtain Transfer Function from given plant model.

$\dot{x}(t) = Ax(t) + Bu(t)$

$y(t) = Cx(t)$ where

$$A=\begin{bmatrix}0 & -1 & 0\\ 0 & -1 & 1\\ 0 & -1 & -10\end{bmatrix} \quad B=\begin{bmatrix}0\\ 1\\ 10\end{bmatrix} \quad C=\begin{bmatrix}1 & 0 & 0\end{bmatrix}$$

b) Consider the system with state equation. **[10]**

$$\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\\ \dot{x}_3\end{bmatrix}=\begin{bmatrix}0 & 1 & 0\\ 0 & 0 & 1\\ -6 & -11 & -6\end{bmatrix}\begin{bmatrix}x_1\\ x_2\\ x_3\end{bmatrix}+\begin{bmatrix}0\\ 0\\ 1\end{bmatrix}u$$

Estimate the state controllability by

i) Kalman's test and

ii) Gilbert's test.

c) Apply Jury stability for characteristics polynomial. **[5]**

$F(z) = 2Z^4 + 7z^3 + 10z^2 + 4z + 1$

P.T.O.

Q2) Solve following : **[10]**

a) For a given transfer function of system.

$$G(s)=\frac{s+3}{s^3+9s^2+24s+20}$$

Obtain :

i) First companion form.

ii) Second companion form and

iii) Jordan canonical form.

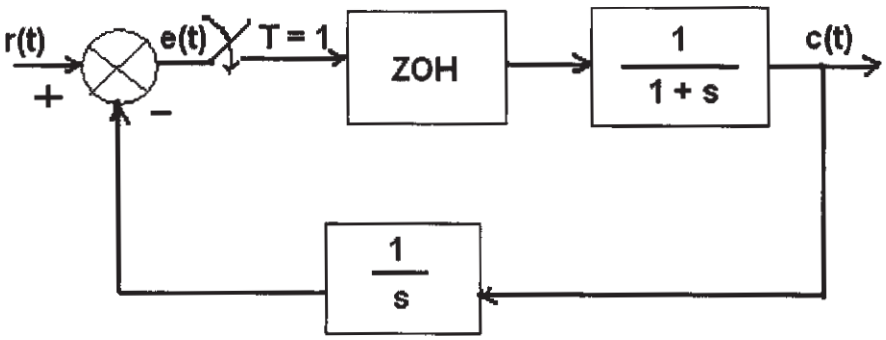
b) For a LTI system find x (t) for u (t) = 1 for $t \geq 1$. **[10]**

$$\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\end{bmatrix}=\begin{bmatrix}0 & 1\\ -2 & -3\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix}+\begin{bmatrix}0\\ 1\end{bmatrix}u$$

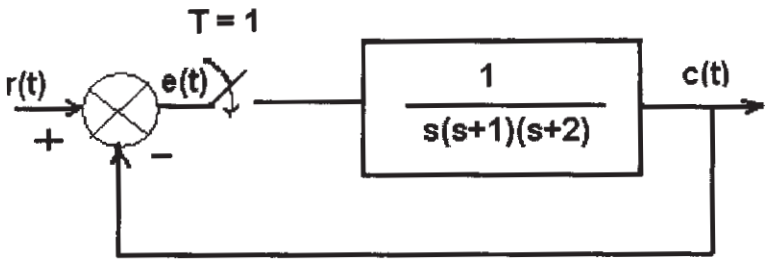
c) Explain significance of zero order hold in digital control system and also draw it frequency response. **[5]**

Q3) Solve following :

a) A closed loop control system is described in figure below. Determine the output c (z) when a unit step is applied to the input. **[10]**



b) Find the stability of system with the help of Bilinear transformation. **[10]**



c) Determine pulse transfer function for PID controller. **[5]**

SECTION - II

Q4) Solve following :

a) Obtain the discrete time state and output equations and the pulse transfer function (T = 1) of the following continuous time system. **[10]**

$$G(s)=\frac{1}{s(s+2)}$$

b) Obtain the state transition matrix of the following discrete time system. **[10]**

$x(k+1) = Gx(k) + Hu(k)$

$y(k) = Cx(k)$ where

$$G=\begin{bmatrix} 0 & 1 \\ -0.16 & -1 \end{bmatrix} \quad H=\begin{bmatrix} 1 \\ 1 \end{bmatrix} \quad C=\begin{bmatrix} 1 & 0 \end{bmatrix}$$

c) Write short note on smith McMillan form. **[5]**

Q5) Solve following :

a) Consider a multiple input multiple output system having the transfer function. **[10]**

$$G(s)=\begin{bmatrix} \frac{4}{(s+1)(s+2)} & \frac{-0.5}{(s+1)} \\ \frac{1}{(s+2)} & \frac{2}{(s+1)(s+2)} \end{bmatrix}$$

i) Find the Smith McMillan form by performing elementary row and column operations.

ii) Find poles and zeros.

iii) Build a RMFD for the model.

b) For a nominal plant model **[10]**

$$Go(s)=\frac{s-4}{(s-1)(s+4)}$$

consider all closed loop poles to lie to the left of – 0.5 in the complex plane also controller include integral action.

i) Find a particular controller satisfying these conditions.

ii) Parameterize all controllers satisfying this condition.

c) Solve the following difference equation by use of the z transform. **[5]**

$x(k+1) + 3x(k+1) + 2x(k) = 0,\ x(0) = 0,\ x(1) = 1$

Q6) Solve following :

a) A diagonal controller C (s) is proposed to control a MIMO plant with nominal model Go (s). If C (s) and Go (s) are given by **[10]**

$$Go(s)=\begin{bmatrix} \frac{2}{(s+1)} & \frac{1}{(s+1)(s+2)} \\ \frac{1}{(s+1)(s+2)} & \frac{2}{(s+2)} \end{bmatrix} C(s)=\begin{bmatrix} \frac{2}{s} & 0 \\ 0 & \frac{1}{s} \end{bmatrix}$$

Determine whether the closed loop is stable.

b) Obtain the block diagrams for the following pulse transfer function system by **[10]**

i) Direct,

ii) Standard and

iii) Ladder programming.

$$G(z)=\frac{2-0.6z^{-1}}{1+0.5z^{-1}}$$

c) Explain Liapunov theorem on stability. **[5]**

Total No. of Questions : 8]

SEAT No. :

P1489

[Total No. of Pages : 2

[4265]-926

M.E. (Instrumentation & Control) (Biomedical Instrumentation)

BIO - SIGNAL PROCESSING

(Elective - II (a)) (2008 Course) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer any three questions from Section - I and Section - II.***
2) ***Answer to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Determine the resultant impulse response of the following cascading systems by the linear convolution

$$h_1(n)=\left\{\frac{1}{2},\frac{1}{4},\frac{1}{2}\right\} \text{ and } h_2(n) = \delta(n-1)$$ **[8]**

b) Determine the cross - correlation of the sequences,

$x(n) = \{1, 2, 1, 1\}$

$h(n) = \{1, 2, 2, 1\}$ **[8]**

Q2) a) Determine the transfer function of the system described by,

$$y(n)=\frac{5}{6}y(n-1)-\frac{1}{6}y(n-2)+x(n)$$

to the input, $x(n)=\delta(n)-\frac{1}{3}\delta(n-1)$ **[8]**

b) State any four properties of Z - transform. **[8]**

Q3) a) Explain the 8 - point DIT FFT algorithm using signal flow graph. **[8]**

b) Compute the 4 - point DFT of

$$x(n)=1+\cos\left(\frac{2\pi n}{4}\right)$$ **[8]**

P.T.O.

Q4) Write short notes on **any two** : **[18]**

a) Linear phase FIR filter.

b) Frequency sampling method of FIR filter design.

c) FIR filter design using windows.

SECTION - II

Q5) A Butterworth analog filter has the cut - off frequency

$\Omega c = 1/\sqrt{2}$ rad/sec and order N = 3.

a) Obtain the transfer function of this analog filter. i.e. H(s) **[4]**

b) Plot the poles on the Butterworth circle. **[4]**

c) Using the bilinear transformation method, transform this analog filter H(s) to a digital filter H(z). **[4]**

d) State whether this transfer function H(z) is a stable filter or otherwise. Assume T = 1 sec. **[4]**

Q6) Write short notes on **any two** : **[18]**

a) LMS algorithm.

b) RLS algorithm.

c) Applications of adaptive filtering.

Q7) a) Describe the modified Huffman coding. **[8]**

b) Explain the quantization error and finite word length register effects. **[8]**

Q8) Write short notes on :

a) Architecture of Digital Signal Processor. **[8]**

b) Floating point and fixed point registers. **[8]**

Total No. of Questions : 8]

SEAT No. :

P1490

[Total No. of Pages : 2

[4265]-931

M.E. (Instru. & Control) (Process Instru. & Biomedical Instru.) (Biomedical Instrumentation)

BIO-IMAGING MODALITY

(2008 Course) (Elective - III (a)) (Semester - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) State the use of Bucky Diaphragm. Why aluminum filter is used in X-Ray tube. Explain the function of X-ray collimators. Why collimator is best restrictor in X-ray system. **[10]**

b) Specify the target material used in generation of X-ray? Give its technical reason for the used. Specify the factors deciding quality of X-rays. **[8]**

Q2) a) Explain the operation of X-ray fluoroscopic system that is used for real time imaging. List out its application. **[8]**

b) What is the difference between diagnostic and screening mammography? What is magnification Mammography? **[8]**

Q3) a) Explain the principle of CT-scanning. Explain various gantries in CT scanning and also mentioned how time is reduced with advancement in gantries? **[8]**

b) Write short note on "Hounsfield Numbers" in CT scanning. Why window selection switch is available on CT scanning machine? **[8]**

Q4) a) What are collimators? Enlist various Gamma camera collimators with their specific clinical applications. **[8]**

b) What is mammography? What can Diagnostic Mammography show? **[8]**

P.T.O.

SECTION - II

Q5) a) Explain the relationship of resolution, depth of penetration and Frequency in connection with ultrasound image. Explain the advantages and biological effects of ultrasound imaging. **[8]**

b) Specify the frequency ranges for abdominal, Brain Examination and for ophthalmic & pediatric study in M-scan Mode. Explain the advantages of ultrasound imaging over the other imaging modalities. **[10]**

Q6) a) Why Nal (Ti) is most popular in radionuclide imaging? Explain the principle of PET imaging. What is the main advantage offered by PET over other medical imaging modality? Why the PET is costlier imaging system? **[10]**

b) Enlist clinical applications of SPECT and give the reason why SPECT is accepted instead of conventional nuclear medical imaging. **[6]**

Q7) a) Explain basic imaging principle of MRI techniques. **[8]**

b) Discuss on magnets used in MRI? Why resistive magnets are less important? **[8]**

Q8) a) Explain Medical thermography with neat block diagram. **[8]**

b) Discuss various benefits of the thermal imaging. **[8]**

Total No. of Questions : 10]

SEAT No. :

P1491

[Total No. of Pages : 4

[4265]-934

M.E. (Polymer Engg.)

PRINCIPLES OF MANAGEMENT

(2008 Course) (Semester - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Q.No. 1 from Section I and Q.No. 6 from Section II are compulsory. Answer any other two questions from Section I and answer any other two questions from Section II.***
2) ***Answers to the two sections must be written in two separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Use of statistical charts, scientific calculator and graph paper is allowed.***
5) ***Assume suitable data, if required.***

SECTION - I

Q1) Answer any four : **[20]**

a) In a factory there are five jobs, each of which must be processed on two machines A and B in the order AB. The processing time, in hour, are given below.

Job	1	2	3	4	5
Machine A	5	1	9	3	10
Machine B	2	6	7	8	4

Determine a sequence for the five jobs that will minimize the total time required to process the jobs.

b) In a bank, eight customers arrive on an average very four minutes, while the cashier can serve 9 customers in 4 minutes. Assuming that the arrival rate and service rate follow the Poisson's distribution, find

i) Average time a customer spends in the system.
ii) Average number of customers in the queue.

c) You want to take a world tour which costs Rs. 20,00,000/- the cost is expected to remain unchanged in nominal terms. You are willing to save annually Rs. 80,000/-. How long will you have to wait if your savings earn a return of 14 percent per annum?

P.T.O.

d) Explain in short about the components of balance sheet.

e) Write a short note on "Profit and loss account".

f) A shopkeeper has a uniform demand of an item at the rate of 600 items per year. He buys from a supplier at a cost of Rs. 8 per year and the cost of ordering is Rs. 12 each time. If the holding cost is 20% per year of the stock value, how frequently, should he replenish his stocks and find the optimum order quantity.

Q2) a) The activity durations in days are given below. Draw the network. Find expected time, critical path and variance of the network.

Activity	Optimistic time	Most likely time	Pessimistic time
1–2	5	7	9
1–3	10	12	15
1–4	8	9	10
2–5	5	6	7
2–6	4	5	6
3–4	2	3	4
3–5	1	2	3
4–5	5	6	7
5–7	2	3	4
6–7	1	2	3
7–8	3	4	5

Find expected time of the PERT network. Also find critical path and variance of the network. **[6]**

b) A company produces a single article and sells at Rs. 10 each. The marginal cost of production is Rs. 6 each and total fixed cost of the concern is Rs. 400 per annum. **[9]**

Construct break even chart and show :

i) Break even point.

ii) Marginal safety at sales of Rs. 1,500.

iii) Increase in selling price if the breakeven point is reduced to 80 units.

Q3) a) A factory produces two products A and B, the cost of production and gross profit in respect of each is given below. Comment on the profitability of the products and state which product will give more profit during the heavy demand. **[8]**

		Product A	Product B
Units produced	Units	400	100
Direct material cost	Rs/unit	100	350
Direct wages	Rs/unit	200	100
Variable overhead	Rs/unit	100	50
Fixed overhead	Rs/unit	400	200
Cost of production	Rs/unit	800	700
Gross profit	Rs/unit	200	300
Sales price	Rs/unit	100	1000

b) Discuss any one deterministic economic batch size model mentioning clearly assumptions of the model. Obtain also the expression for calculating optimum batch size. **[7]**

Q4) a) A manufacturer has distribution centers at X, Y and Z. These centers have availability 40, 20 and 40 units of his product. His retail outlets at A, B, C, D and E require 25, 10, 20, 30 and 15 units respectively. The transportation cost in rupees per unit between each center outlet is given below : **[8]**

Distribution Center	Retail outlets				
	A	B	C	D	E
X	55	30	40	50	50
Y	35	30	100	45	60
Z	40	60	95	35	30

Determine the optimum distribution to minimize the cost of transportation.

b) Two competitors A and B are competing for the same product. Their strategies are given in the following pay-off matrix. **[7]**

	I	II	III	IV
I	3	2	4	0
II	3	4	2	4
III	4	2	4	0
IV	0	4	0	8

Using the principle of dominance, find the optimal strategies.

Q5) a) A department has five employees with five jobs to be performed. The time in hours each man will take to perform each job is given in the matrix.

	I	II	III	IV	V
A	10	5	13	15	16
B	3	9	18	13	6
C	10	7	2	2	2
D	7	11	9	7	12
E	7	9	10	4	12

How should the jobs be allocated, one for employee, so as to minimize the total man hours? **[8]**

b) A project has following time schedule **[7]**

Activity	Duration in days
1–2	2
2–5	3
2–4	4
5–6	6
1–3	2
3–6	8

Find critical path and total project duration. Find also free float, independent float and total float.

SECTION - II

Q6) Answer any two : **[20]**

a) Discuss various cultural, social, personal and psychological factors influencing buyer behavior.

b) Explain the use and importance of SWOT analysis in business unit strategic planning.

c) Discuss the difference between sales and marketing.

Q7) a) Discuss in detail various direct marketing channels to reach individual customers. **[10]**

b) What is meant by brand? **[5]**

Q8) a) Discuss in detail various important components of modern marketing information systems. **[7]**

b) Write in short about product life cycle and various marketing strategies at various stages of product life. **[8]**

Q9) a) What are the different product pricing methods? Elaborate each in short. **[10]**

b) What are the various ways in which a physical product can be differentiated? **[5]**

Q10) Write short notes on any three : **[15]**

a) Packaging and labeling.

b) Public relations.

c) Customer perceived value.

d) Customer Relationship Management.

e) Just in time concept.

Total No. of Questions : 10]

SEAT No. :

P1492

[Total No. of Pages : 4

[4265]-935

M.E. (Polymer Engg.)

POLYMER PROCESSING AND TESTING

(2008 Course) (Semester - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Q.No. 1 from Section I and Q.No. 6 from Section II are compulsory. Answer any other two questions from Section I and also any other two questions from Section II.***
2) ***Answers to the two sections must be written in two separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Use of scientific calculator and graph paper is allowed.***
5) ***Assume suitable data, if required.***

SECTION - I

Q1) Answer any four : **[20]**

a) Explain the limitations of measurement of MFI as an indicator of fluidity or viscosity.

b) What are the various requirements the given material should satisfy in order to qualify as an insulator?

c) What do you understand by "Intrinsic Viscosity"? How is it measured?

d) Enlist various environmental factors affecting polymers significantly.

e) Discuss different specimen types for tensile testing specified by ASTM D638.

Q2) a) Explain gel time test for determining curing characteristics of resin-catalyst combination. **[7]**

b) Explain the following terms - Refractive Index, Luminous Transmittance, and Haze. **[8]**

Q3) a) Explain in detail Torsion Pendulum test used to find out dynamic modulus of plastics at elevated temperatures. **[7]**

b) Explain how DSC can be used to find out degree of cross linking in case of a thermoset material. **[8]**

P.T.O.

Q4) a) Explain the importance of gas permeability and water vapour permeability for food packaging application. **[8]**

b) Explain ultrasonic non destructive testing method for plastic products. **[7]**

Q5) Write short notes on (any three) : **[15]**

a) Volume resistivity and Surface resistivity.

b) Dielectric strength and Dielectric constant.

c) Hydrostatic pressure tests for plastic pipes.

d) Oxygen index test.

SECTION - II

Q6) Answer any four : **[20]**

a) Discuss contiguous melting model (CSM) in short.

b) Explain why gear pumps are used. Write in short about pulsations while using gear pump in extrusion.

c) What is parison sag and in what situation accumulator type extrusion blow moulding is recommended?

d) The check valve system used on a screw in case of injection moulding has leakage and cannot be replaced immediately. Which "v-p" switchover technique is preferred in such situation?

e) Write in short about chemical kinetics of step growth polymerization in case of reactive extrusion.

f) Draw indicative pressure profile for devolatizing single screw extruder and discuss in short issue related to screw design.

Q7) a) Discuss process conditions, machine design requirement and die head requirements of ABS extrusion blow moulding. Also discuss how it is different from Polyolefins. **[8]**

b) Explain the use of extruder screw and die characteristic for process control on shop floor? **[7]**

Q8) a) Discuss various models suggested for the thermoforming process and discuss in detail viscoelastic model. **[7]**

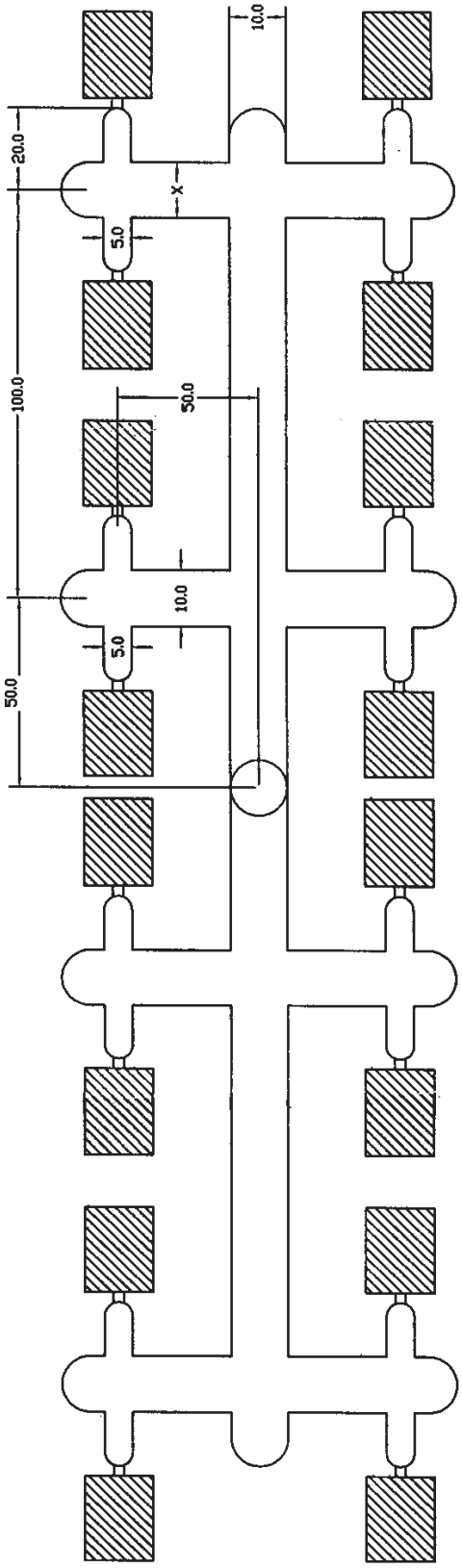
b) Explain the Tadmore melting model for single screw extrusion and explain the significance of melt film thickness as well as temperature of the melt film. **[8]**

Q9) a) Obtain an expression for time taken to inflate a bottle in case of extrusion blow moulding. **[7]**

b) Draw a neat sketch of entire extrusion line for manufacture of flat film and explain each unit of the line with respect to its functions. **[8]**

Q10) Polymer follows power law of the form $\tau = 190000\gamma_a^{0.5}$ where τ is in N/m^2 and γ_a is in sec^{-1} Balance the runner system shown in Fig No.1 by finding out unknown dimension "X" if the injection rate is 50 gms/sec and melt density is 0.8 gms/cm^3.

It is also required to find out total injection pressure at injection cylinder by calculating ΔP in runner system, gates, nozzle and sprue. Assume ΔP across nozzle as $50kg/cm^2$. Assume cylinder ratio of 10 and average cavity pressure at each cavity as $300kg/cm^2$. Each cavity area is 2 cm^2 Circular gate cross section area is 1 mm^2 and has length equal to 1 mm. Sprue smaller diameter is 3 mm and larger diameter is 10 mm and total length of the sprue is 50 mm. Calculate the tonnage required for this moulding. **[15]**



ALL DIMENSIONS ARE IN mm.

FIG.1

* * *

Total No. of Questions : 10]

SEAT No. :

P1493

[Total No. of Pages : 3

[4265]-939

M.E. (Polymer)

POLYMER RHEOLOGY

(2008 Course) (Sem. - I) (Elective - II (a))

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer three questions from Section I and three questions from Section II.***
2) ***Answers to the two sections should be written on separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Use of pocket calculators is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Answer any 4 : **[20]**

a) Derive an expression for velocity profile flow of a Newtonian fluid through a circular cross section.

b) Explain the terms stress relaxation and creep.

c) Explain the terms storage modulus and loss modulus.

d) Explain Weissenberg's effect.

e) Write a note on any four parameter viscosity model.

Q2) a) Determine the components of the Finger tensor for a rectangular block subjected to uniaxial extension and simple shear. **[8]**

b) Derive an expression for work done during cyclic deformation of a viscoelastic solid. **[7]**

Q3) a) Derive an expression for velocity profile and volumetric flow rate for flow of power law fluid through a slit. **[8]**

b) Derive an expression for a dimensional less parameter indicating transition between laminar flow and turbulent flow for a power law fluid. **[7]**

Q4) a) For steady simple shear flow, determine the components of the 2D tensor. Also indicate its invariants. **[8]**

b) Explain the terms dynamic compliance and dynamic viscosity. **[7]**

P.T.O.

Q5) a) Viscoelastic behavior of a plastic material is represented by a Maxwell model. The model constants are $5GN/m^2$ and $100G/Nm^2$. If a stress of 15MPa is applied for 80 seconds and completely removed, determine the strain values at 60 seconds and 90 seconds. **[6]**

b) Write a note on Boltzman Superposition Principle. **[6]**

c) Describe rheopectic fluids. **[3]**

SECTION - II

Q6) Answer any 4 : **[20]**

a) What are the various geometries used to generate drag flow?

b) Discuss the effect of molecular weight on melt rheology.

c) Write a note on Bagley's correction.

d) Discuss the effect of plasticizers on melt rheology.

e) Discuss the effect of fillers on melt rheology.

Q7) a) Derive the equation relating the torque and geometry of a cone and plate viscometer. **[5]**

b) Explain the various geometries used in extensional rheometers. **[7]**

c) Discuss thixotropic fluids. **[3]**

Q8) a) Discuss "Simple extensional" and "Planar extensional flow". Explain at least two processing situations where extensional flows results. **[8]**

b) A cone and plate rheometer is used to study the flow behavior of a polymer melt. Diameter of the plate is 14cm and angle 1.5°. Frequency and apparent viscosity data are given below. Determine the power law constants using analytical technique. **[7]**

Ω (rpm)	10	20	30	40	50	60	70	80
η(N-s/m^2)	0.120	0.135	0.150	0.160	0.170	0.178	0.185	0.190

Q9) a) For a melt obeying the power law $\tau = 1,20,000\gamma^{0.33}$, determine the pressure drop through a circular conduit of diameter 12mm and length 50mm if volumetric flow rate is 12×10^{-6} m^3/s. Compare it with that for a square conduit of the same length and side 12mm. **[8]**

b) Discuss the effect of temperature on viscosity. Explain the term activation energy. **[7]**

Q10) a) LDPE melt obeying the power law $\tau = 1{,}15{,}000\gamma^{0.3}$, is flowing through an annular die as shown in figure 1. Determine the pressure drop through section A and section B if the volumetric flow rate is $10 \times 10^{-6} m^3/s$, and λ = extensional viscosity = 2.25×10^5 N-s/m^2. **[9]**

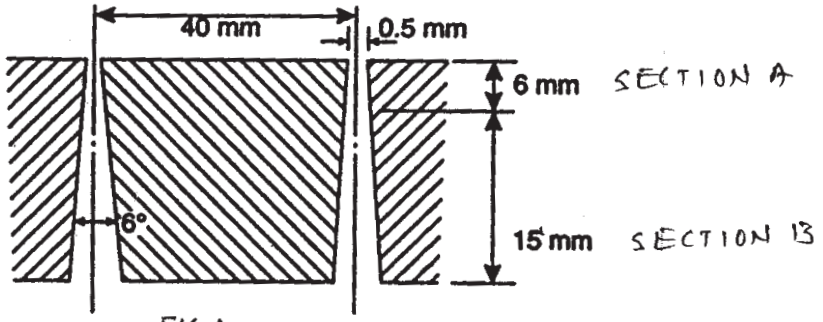


FIG 1

b) Explain the term wall slip and melt fracture during melt flow. **[6]**

Total No. of Questions : 10]

SEAT No. :

P1494

[Total No. of Pages : 3

[4265]-944

M.E. (Polymer Engg.)

PROCESSING AND MECHANICS OF COMPOSITES

(2008 Course) (Semester - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Q.No. 1 from Section I and Q.No. 6 from Section II are compulsory. Answer any other two questions from Section I and also any other two questions from Section II.***
2) ***Answers to the two sections must be written in two separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Use of scientific calculator and graph paper is allowed.***
5) ***Assume suitable data, if required.***

SECTION - I

Q1) Answer any four : **[20]**

a) Engineering properties of a unidirectional lamine are :
$E_1 = 160$ GPa $E_2 = 6$ GPa $G_{12} = 5$ GPa $\upsilon_{12} = 0.2$
Calculate stiffness and compliance matrix for plane stress condition assuming that the lamina is especially orthotropic and calculate also for generally orthotropic with angle of orientation as $\theta = 15°$.

b) Define coefficient of mutual influence of the first kind.

c) Write compliance matrix in terms of engineering constants for -
   i) Transversely isotropic lamina.
   ii) Specially orthotropic lamina.

d) State Hoffmans failure criterion and discuss the conditions under which it reduces to Tsai-Hill criterion.

e) Discuss various winding techniques of filament winding.

Q2) a) Prove that the reduced transformed compliance matrix for orthotropic lamina is given by $[\bar{S}]=[T]^T [S][T]$
Where T represents transformation matrix and S represents reduced compliance matrix. **[8]**

P.T.O.

b) Prove that for an orthotropic lamina under plane stress condition the shear modulus in global co-ordinate system is given by

$$\frac{1}{G_{xy}}=\frac{1}{E_{11}}+\frac{2\upsilon_{12}}{E_{11}}+\frac{1}{E_{22}}-\left[\left\{\frac{1}{E_{11}}+\frac{2\upsilon_{12}}{E_{11}}+\frac{1}{E_{22}}-\frac{1}{G_{12}}\right\}\cos^2(2\theta)\right] \quad \textbf{[7]}$$

Q3) a) Discuss at least four methods of incorporation of fibers into thermoplastic matrix. **[8]**

b) Show that transverse composite modulus can be given by

$$\frac{1}{E_2}=\frac{V_f}{E_{2f}}+\frac{V_m}{E_m}$$

Where *f* stands for fiber and *m* stands for matrix. **[7]**

Q4) a) State Tsai-wu failure theory and give complete stepwise experimental procedure for finding out the second order as well as forth order strength tensors as defined in the theory. **[10]**

b) Write Tsai-Hill failure criterion for application of pure shear for a lamina oriented to angle θ to principle material direction. **[5]**

Q5) a) Write in detail about application of pultruded products. **[5]**

b) Discuss in detail any one mathematical process model applicable to pultrusion process and explain how the model can be used for process control and product design. **[10]**

SECTION - II

Q6) Answer any two : **[20]**

a) Discuss the statement - "For a regular anti symmetric laminate, it can be shown that $A_{16} = A_{26} = D_{16} = D_{26} = 0$ where A and D represent elements of extensional stiffness and bending stiffness matrix respectively".

b) Write governing differential equation for bending of the symmetric laminated composite beams and discuss the assumptions.

c) Discuss in details the consequences and implications of Kirchhoff's hypothesis about laminate strains and displacements as considered in classical lamination theory.

Q7) a) A laminate having configuration [0 |±45°|90°] is loaded with load per unit width as :

$N_x = 2N_0$; $N_y = 4N_0$; $N_s = 0$. The resulting strains are :

$\varepsilon_y^0 = 10\times10^{-3}$ $\varepsilon_s^0 = 10\times10^{-3}$. Determine effective Poisson's ratio, $\bar{\upsilon}_{xy}$. **[9]**

b) Write governing differential equation for vibration of simply supported specially orthotropic lamina. **[6]**

Q8) a) Engineering properties of the lamina are :

$E_1 = 180$ GPa $E_2 = 10$ GPa $G_{12} = 8$ GPa $\upsilon_{12} = 0.4$

Find elements of [A], [B] and [D] matrices for specially orthotropic lamina with thickness equal to 1 mm. **[6]**

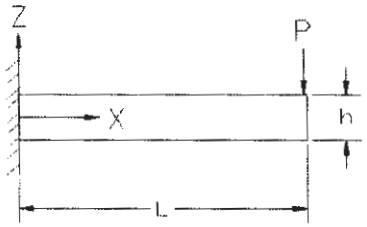
b) For a quasi-isotropic laminate with configuration $[0\,|+45^\circ|\,-45^\circ|90^\circ]_s$ Engineering properties are :

$E_1 = 140$ GPa $E_2 = 5$ GPa $G_{12} = 5$ GPa $\upsilon_{12} = 0.5$

Find [A], [B] and [D] matrices. Take thickness of each ply as 1 mm. **[9]**

Q9) a) Write force per unit width and moment per unit width resultant equations for regular symmetric cross ply laminate using classical lamination theory. **[5]**

b) Derive an expression for the deflection of cantilever beam made up of symmetric laminate under tip loading as shown in fig. below. **[10]**



Q10) a) A $[0\,|90^\circ]_s$ symmetric laminate with each ply having thickness equal to 0.150 mm is subjected to following loading conditions. **[10]**

$$\begin{bmatrix} \sigma_x \\ \sigma_y \\ \tau_{xy} \end{bmatrix} = \begin{bmatrix} 155.7 \\ 3.02 \\ 0 \end{bmatrix} \text{MPa}$$

If lamina properties are :

$E_1 = 155$ GPa $E_2 = 12$ GPa $G_{12} = 4.4$ GPa $\upsilon_{12} = 0.248$

Calculate the strain and stress distribution through the thickness of laminate.

b) Discuss any one method of finding out shear modulus G_{12} of composite lamina clearly indicating strain rosette arrangement. **[5]**

Total No. of Questions : 6]

SEAT No. :

P1495

[Total No. of Pages : 2

[4265]-953

M.E. (Printing)

MODERN TRENDS IN PRINTING

(2008 Course) (Semester - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Draw neat diagram wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Explain the impact of nip on offset printability. **[10]**

b) Explain the selection criteria of substrate for Web offset process. **[8]**

c) Describe the types of ink for publication and packaging. **[7]**

Q2) a) Explain the configurations of a flexo press. **[10]**

b) Explain the cell geometry of anilox roller. **[8]**

c) Explain the open and closed loop inking system for flexography. **[7]**

Q3) a) Explain the plating variables for Gravure cylinder making. **[9]**

b) Explain the importance of proofing a Gravure cylinder. **[7]**

c) Explain the effect of cell structures in ink transfer. **[9]**

SECTION - II

Q4) a) Explain in detail ESA technology for a Gravure process. **[9]**

b) Explain the impact of roller hardness on dot fidelity. **[10]**

c) Explain the relationship between speed and impression pressure. **[6]**

Q5) a) Explain the working principle of Shaftless system for a press. **[10]**

b) Mention the features of Electronic Line Shaft system. **[7]**

c) Mention the limitations of a Mechanical Line Shaft System. **[8]**

P.T.O.

Q6) a) Explain the effect of temperature on print quality. **[10]**

b) Mention the safety precautions and maintenance for a press. **[8]**

c) Mention the handling and care for a Gravure cylinder. **[7]**

Total No. of Questions : 6]

SEAT No. :

P1496

[Total No. of Pages : 2

[4265]-963

M.E. (Printing)

MULTIMEDIA SYSTEMS & COMMUNICATION

(2008 Course) (Elective - III (a)) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***

SECTION - I

Q1) Illustrate the application which is generated using any 3 media such as graphics, animation etc. Give the technical details as to how the illustration is designed. **[18]**

OR

Why collaboration of different media is significant? Justify with suitable example.

Q2) Which are the specific requirements for images in multimedia? Give suitable example. **[16]**

OR

Explain in details application of object design to the animation process.

Q3) Which are the common formats for multimedia application? Why these formats are suitable for the same? Explain in details. **[16]**

OR

What are multimedia standards? Explain in details.

SECTION - II

Q4) Explain following in brief : **[18]**

a) Internet chat.

b) Online shopping.

OR

P.T.O.

Explain following :

a) Internet chat.

b) Software agents.

Q5) Explain following term : **[16]**

Web publishing.

OR

What is web page creation? Explain basics of it using any concerned language.

Q6) What is camera RAW? Explain in details. **[16]**

OR

Why and how resolution of digital camera is significant? Explain in greater details.

Total No. of Questions : 6]

SEAT No. :

P1497

[Total No. of Pages : 2

[4265]-967

M.E. (Printing Engineering)

ADVANCES IN CONVERTING AND PACKAGING

(2008 Course) (Elective - IV (b)) (Semester - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Draw neat diagrams wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Explain the process of making PS labels. **[12]**

b) State the benefits of Holograms in Packaging. **[8]**

c) State the features of CIP4. **[5]**

Q2) a) Explain the process of integration in packaging. **[9]**

b) Explain the coating techniques used for packaging. **[9]**

c) Mention the purpose and applications of Varnishes in packaging. **[7]**

Q3) a) Explain in detail Wet Lamination Technique. **[9]**

b) State the benefits of solvent-less lamination over solvent based lamination. **[7]**

c) Explain in detail Corona Treatment process. **[9]**

SECTION - II

Q4) a) Explain in detail Co-extrusion technology. **[10]**

b) Compare between Shrink and Stretch wrapping. **[10]**

c) Mention the role of computers in package development. **[5]**

P.T.O.

Q5) a) Mention the selection criteria of package for food applications. **[7]**

b) Explain the Bag-in-Box technique for liquid products. **[9]**

c) Explain in detail the making of PET bottles. **[9]**

Q6) a) Explain in detail Aseptic Packaging. **[9]**

b) Explain in detail Retort Packaging. **[9]**

c) Explain in detail Form-Fill-Seal machines. **[7]**

✷ ✷ ✷

Total No. of Questions : 6]

SEAT No. :

P1498

[Total No. of Pages : 2

[4265]-968

M.E. (Printing Engineering)

ANALYSIS OF SPOT AND PROCESS INKS

(2008 Course) (Elective - IV (C)) (Semester - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Draw neat diagrams wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Explain in detail Oil based Inks. **[8]**

b) Explain in detail solvent based inks. **[10]**

c) Mention the purpose and applications of specialized inks. **[7]**

Q2) a) Explain the properties of pigments used in flexography inks. **[9]**

b) Explain the properties of ink vehicles. **[9]**

c) Mention the purpose and properties of Resins. **[7]**

Q3) a) Mention the characteristics of Gravure inks. **[8]**

b) Explain the effect of surface properties of ink on print quality. **[8]**

c) Explain the selection criteria of Resins in Gravure printing. **[9]**

SECTION - II

Q4) a) Explain the role of tack in Offset printability. **[9]**

b) Classify the offset inks used for publication and packaging. **[9]**

c) Mention the components of offset inks in product printing. **[7]**

Q5) a) Viscosity plays an important role in Gravure printability. Explain. **[9]**

b) Explain the effect of substrate surface roughness on print quality. **[7]**

P.T.O.

c) Write notes on : **[9]**

i) Gloss
ii) COF
iii) Adhesion Test

Q6) a) Explain the process of analyzing print color variation. **[9]**

b) Mention the process for evaluation of dot fidelity. **[7]**

c) Write notes on : **[9]**

i) Mottling
ii) Screening
iii) Pinholing

Total No. of Questions : 6]

SEAT No. :

P1499

[Total No. of Pages : 2

[4265] - 32

M.E. (Civil) (Structures)

EARTHQUAKE RESISTANT DESIGN OF STRUCTURES

(2002 Course)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections must be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***
7) ***Use of IS 1893-2002 (Part - 1) is permitted.***

SECTION - I

Q1) a) Explain philosophy behind earthquake resistant design of the structure? **[7]**

b) Classify and describe with suitable sketches different types of waves generated by an earthquake and their effects on structure? **[8]**

c) Explain various soil models for dynamic analysis of soil-structure system. **[10]**

Q2) a) Discuss the desirable properties of construction material for the purpose of earthquake resistant in zone III and IV. **[6]**

b) What are non-structures? How do they affect overall behavior of building in an earthquake? **[7]**

c) Write short notes on : **[12]**

i) Soft and Weak Storey.

ii) Simplicity and symmetry.

iii) Stiff and flexible building.

Q3) a) The plan of five storey SMRF building for Commercial Complex is as shown in figure 3.0. The Dead Load including self weight of slab etc. is 5 kN/m^2 and Live Load 4 kN/m^2 on each floor and 2.0 kN/m^2 on the roof. The building is situated in Zone IV. Assuming soil type II and storey height 4.0 m, determine lateral forces and shears at different storey levels.

P.T.O.

b)

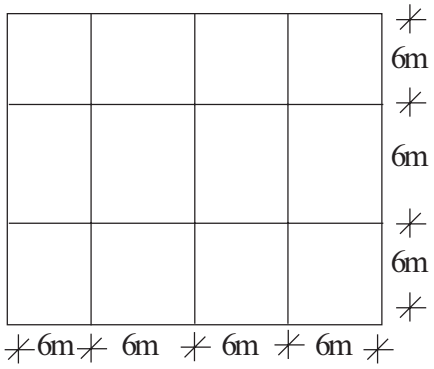


Fig. 3.0

[25]

SECTION - II

Q4) a) What are the causes of instability of steel buildings? Discuss in detail the P - Δ Effect. **[10]**

b) Describe the procedure to carry out dynamic analysis to obtain the designed seismic forces and its distribution along the height of multistory building. **[15]**

Q5) a) How would you carry the assessment of RC building to ascertain the requirements and level of retrofitting. **[10]**

b) Design an unreinforced masonry wall from the data : **[15]**

i) Unit weight of wall = 20 kN/m^2.

ii) Prism strength of masonry = 7.5 N/m^2.

iii) Seismic weight at roof level at height 4m from base.

iv) Height of wall = 4.6 m

v) Length of wall 4.5 m.

Q6) Write notes on : **[25]**

a) Ductile Detailing of beams and Columns.

b) Learning's from past earthquakes in India.

c) Failure Mechanism of In filled Frames.

d) Describe with suitable sketches the various methods of retrofitting.

e) Seismic Dampers.

Total No. of Questions : 6]

SEAT No. :

P1500

[Total No. of Pages : 2

[4265] - 35
M.E. (Civil) (Structures)
REINFORCED CONCRETE AND PRESTRESSED CONCRETE DESIGN
(2002 Course)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Use of IS 456, IS 1343, IS 3370 & non programmable calculator is allowed.***
5) ***Neat diagrams must be drawn wherever necessary.***
6) ***Assume any other data if necessary.***

SECTION - I

Q1) a) Design a grid slab for a floor of hall 12 m x 13.5 m c/c having square grid of 1.5 m. Use M20 Fe500 take Live load = 4 kN/m^2 & floor finish load = 1.5 kN/m^2. Apply the required check & draw details of reinforcement. **[15]**

b) Design a slab for a hall of size 5m x 5m c/c simply at all sides using yield line theory. Use M20 Fe500 take Live load = 5 kN/m^2 & floor finish load = 1.2 kN/m^2. Draw details of reinforcement. **[10]**

Q2) Design a bell type RCC shear wall for length 3.6m, thickness 230 mm for the following Axial forces of 1500 kN & 400 kN due to dead & live load & due to seismic load respectively bending moment of 500 kN-m & 3600 kN-m due to dead & live load & due to seismic load Respectively Use M25 Fe500, Draw details of reinforcement. **[25]**

Q3) Design a Intze type ESR for 5 lakh liters with staging height 15m using M25, Fe500 Design must include Analysis and Design calculations of Top dome, top ring beam, cylindrical wall, Middle level ring beam, Conical & bottom dome of the tank. Draw details of reinforcement. **[25]**

P.T.O.

SECTION - II

Q4) Design intermediate post tensioned prestressed concrete unsymmetrical 'I' or 'T' section roof beam of a hall for flexure and shear for the following.

Clear span = 16m, width of support = 450 mm, spacing of beams 2.8m c/c, RCC slab thickness 120mm, live load on slab 2kN/m^2, water proofing load on slab = 1.2 kN/m^2, concrete grade M40 HT steel is Multi-strand cables with fy = 1900 N/mm^2, stressed up to 75% of fy do not consider the composite action Design must include detail load, bending moment calculation, Check fiber stresses in concrete and deflection. Draw sketches showing cable profiles. **[25]**

Q5) a) Explain in detail with proper sketches, what are the different measures for reducing the loss of prestress due to friction. **[8]**

b) The cross section a composite beam of a T section having a pre-tensioned rib of 200 mm wide and 500 mm depth with M40 and cast in situ slab (flange) 1000 mm wide and 100 mm thick with M20. The rib is prestressed with 20 wires of 7 mm dia. with ultimate tensile stress of 1500 N/mm^2. Calculate the moment of resistance of the composite section assuming that there is sufficient vertical reinforcement at the junction to avoid the shear failure of the beam. **[17]**

Q6) a) Explain in detail with proper sketches, manufacturing process of prestressed concrete sleepers. **[7]**

b) Design post tensioned prestressed concrete slab for a floor of shopping mall for the following Isolated clear spans of 7.5 x 7.5 m width of supporting beam on all sides 300 mm, live load on slab 5 kN/m^2, floor finish load on slab = 1.5 kN/m^2, concrete grade M50 and multi-strand cables of cross sectional area 100 mm^2 with fy = 1900 N/mm^2 stressed up to 75% of fy. Design must include check fiber stresses in concrete and deflection design of end block. Draw sketches showing cable. **[18]**

Total No. of Questions : 8]

SEAT No. :

P1508

[Total No. of Pages : 3

[4265]-218

M.E. (Petroleum)

HORIZONTAL AND MULTILATERAL DRILLING

(2002 Course)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Q.1 and Q.5 are compulsory. Out of the remaining attempt two questions from Section I and two questions from Section II.***
4) ***Use of cm scale graph paper is allowed.***
5) ***Figures to the right indicate full marks.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Discuss various loading conditions and equations for casing string design. **[8]**

b) Design a casing setting program for all casing shoe depths and indicate the same using graphical procedure. Well depth 11,200 ft., using a 7 inch production casing. The pore-pressure and fracture gradient data are given below. Assume suitable safety margin and other data. **[10]**

Depth (ft.)	Pore-Pressure gradient (lbm/gal)	Fracture gradient (lbm/gal)
1,000	9.0	12.0
2,000	9.0	12.9
3,000	9.0	13.6
4,000	9.0	14.2
5,000	9.0	14.8
6,000	9.0	15.2
7,000	9.0	15.6
8,000	9.0	15.9
9,000	12.0	16.8
10,000	14.0	17.4
11,200	15.0	17.8

P.T.O.

Q2) It is desired to drill under the lake, using a build and hold trajectory. Horizontal departure to the target is 2,755 ft. at a TVD of 9,650 ft. The recommended rate of build is 2.0°/100 ft. The kick off depth is 16.00 ft. Determine, **[16]**

a) the radius of curvature, R_1

b) the maximum inclination angle, θ

c) the measured depth to the end of the build

d) the total measured depth

e) the horizontal departure to the end of build.

Q3) a) An exploration rig has the following grades of drill pipe to be run in 15,000 ft. deep well. **[10]**

Grade E: OD/ID 5/4.276, 19.5 lbm/ft. yield strength = 395600 lb.
Grade G: OD/ID 5/4.276, 19.5 lbm/ft. yield strength = 553830 lb.
If total length and weight of drill collars plus heavy-wall drill pipe is 984 ft. and 157374 lb respectively. The maximum expected mud weight at given depth is 100 pcf (13.4ppg). Given : steel density = 489.5 pcf.

Calculate :

i) maximum length that can be used from each grade of drillpipe, if an MOP of 50,000 lb is to be maintained for the lower grade.

ii) the MOP of the heavier grade.

b) Write the six important variables affecting penetration rate during drilling. **[6]**

Q4) Write short notes on : **[16]**

a) Horizontal drilling technology.

b) Well completion technique.

c) Bit design considerations.

d) Mud motor and bent sub.

SECTION - II

Q5) a) Explain in brief criteria to decide bit hydraulics. **[4]**

b) Define following fundamental properties of drilling fluid. **[4]**

i) mud weight

ii) plastic viscosity

c) From the data listed below, determine the following, **[10]**

i) Height of cement in ft., in the annulus

ii) Amount in $ft.^3$ of cement in the casing

iii) Depth in ft. of the top of the cement in the annulus

Data :

Casing Setting depth = 2900 ft. Hole size = 17 – ½ in.
Casing 54.5 lb/ft = 13-3/8 in. Casing ID = 12.615 in.
Drill pipe (5.0 in. – 19.5 lb/ft) = 0.01776 bbl/ft
Pump (7 in. by 12 in. triplex @ 95% eff.) = 0.31 bbl/stk
Cementing tool (no. of feet above shoe) = 110 ft.
Cementing program: Neat Cement = 500 sack
Slurry yield = 1.14ft^3/sack excess volume = 40%

Q6) Use the following points and describe one case study of horizontal drilling technology application for an onshore field development program. **[16]**

a) Objectives
b) Reservoir aspects of drilling methodology
c) Drilling tools and technique
d) Drilling optimization methods

Q7) a) If the operating cost of the rig is $400.hr., the trip time is 7 hours and connection time is 1 minute per connection determine bit of lowest drilling cost. **[4]**

Bit	Bit Cost $	Rotating Time (hours)	Connection Time (hours)	Mean Penetration Rate (ft./hr.)
A	900	14.8	0.1	13.8
B	6900	57.7	0.4	12.6
C	8500	95.8	0.5	10.2

b) Draw the generic nature of following graphs. **[6]**

i) Depth Vs Penetration rate.
ii) Depth Vs Cumulative drilling time.

c) Explain and calculate cycle speed and commercial speed of a drilling rig if rig move and rig building time is 22 days, total drilling days = 120 days and production testing days = 10 days. **[6]**

Q8) Write short notes on : **[16]**

a) LWD
b) Uses of BHA
c) Hole Problems
d) Deflection equipment

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Total No. of Questions : 10]

SEAT No. :

P1509

[Total No. of Pages : 3

[4265] - 219
M.E. (Petroleum)
ARTIFICIAL LIFT AND STIMULATION TECHNIQUES
(2002 Course)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Question numbers One and Six are compulsory. Out of the remaining solve 2 questions from Section - I and 2 questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, and electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Use the following data and decide depth for point of gas injection. Also prove that, for a continuous flow injection, **[12]**

P_{wh} + Gfa.L + Gfb (D-L) = Pwf.

Data:

Depth = 8589 ft. Expected rate = 980 bbls/day. Tubing size = $2\frac{3}{8}$ inch.

P_{wh} = 157 psig, SBHP = 2956 psig. P.I. = 2.8, solution GOR = 290, SCF/STB, Sp. Gravity of injection gas = 0.65, S/C available pressure = 980 psig, °API = 40, S/C Temp. = 122 °F B.H. Temp. = 222 °F. 275 psi/1000 ft = flowing gradient of FBHP. 22.5 psi/1000ft = casing pressure gradient. Subtract 100 psi from point of balance.

b) State and explain the equations to calculate pressure drop due to formation damage of horizontal well. **[6]**

Q2) a) Define pump efficiency. **[4]**

b) Explain all the PVT properties in brief. **[12]**

P.T.O.

Q3) a) A pump with a $1\frac{3}{4}$ inch plunger is set on 4560 ft of $\frac{3}{4}$ inch rods. The fluid level is known to be low and the tubing anchored with pumping at 20.5 SPM and 64 inch stroke length. The production is to the tune of 350 BOPD of specific gravity of 0.87. Calculate the effective plunger stroke. Assume, elasticity of steel is 30×10^6 psi. **[8]**

b) Explain with typical graph, the step wise procedure for intermittent gas lift design, in brief. **[8]**

Q4) Draw and explain the generic nature of graph to indicate the trend of GOR, PI and pressure variation against time for all the drive mechanisms of a typical reservoir system. **[16]**

Q5) Write short notes on: **[16]**

a) Dynagraph.

b) Gas lift valves.

c) Jet pump.

d) Gilbert graphs.

SECTION - II

Q6) a) Following data is given for hydraulic fracturing job: **[10]**

Specific gravity of fracturing fluid = 1.11

Viscosity of fracturing fluid = 22 cp

Tubing inner diameter = 3.0 in.

Fluid injection rate = 10 bbls/minute.

Calculate the maximum expected surface injection pressure.

b) Explain in brief general reactions involved in matrix acidizing. **[8]**

Q7) a) Describe in brief any one mathematical model to explain process of matrix acidization. **[10]**

b) Calculate the total injection gas necessary if, optimum GLR = 650 SCF/STB, Formation GLR = 289 SCF/STB while desired oil production (100% oil) is 1000 bbls/day. **[6]**

Q8) a) Discuss in brief Hydraulic fracturing process in brief. **[12]**

b) Write in brief remedial measures to any three work over problems. **[4]**

Q9) Draw the neat schematic sketch of surface and sub-surface set-up of ESP and calculate total dynamic head, no. of stages required and motor horsepower required for following ESP. **[16]**

Data :

Desired rate = 9,000 b/d.

P.I. = 8 b/d ft. of drawdown.

Static fluid level 300 ft. from the S/C.

Surface flow line = 2,400 ft. of 6 inch, with elevation rise of 40 ft., For this friction loss is 40 ft./1000ft.

Perforations = 1850 - 2350 ft.

Wellbore depth = 2400 ft.

Tubing friction loss given = 20 ft./1000ft.

From the performance curve, it is recommended to use the pump which gives 60 ft., of head per stage; while horsepower required is 10 hp per stage.

Q10) Write a short note on: **[16]**

a) Gravel packing.

b) Optimum GLR.

c) Selection of ALT methods.

d) PCP.

Total No. of Questions : 8]

SEAT No. :

P1515

[Total No. of Pages : 2

[4265] - 819
M.E. (Chemical)
CATALYSIS AND SURFACE PHENOMENON
(Semester - II) (2008 Course) (Elective - III (a))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Give examples of micro and mesoporous molecular sieves. Discuss in brief formation of zeolites obtained from inorganic sources and organic templated ones. Give structural aspects of Zeolites with added reference to Lewis and Bronsted acidity. **[16]**

Q2) Give the classification of catalysts and explain the preparation of catalysts using laboratory techniques and industrial methods. **[18]**

Q3) a) Explain the effect of external transport on isothermal and non-isothermal series reactions. **[8]**

b) Compute the rates of homogeneous reactions and heterogeneous reactions on the basis of transition state theory. **[8]**

Q4) Explain the following catalyst characterisation techniques. **[16]**

a) ESR

b) XPS

c) XRD

P.T.O.

SECTION - II

Q5) a) What is the dynamic model for deactivation? Find the equation for the rate at which the core radius decreases. **[12]**

b) Give different reactions involved in Fischer-Tropsch Process. **[4]**

Q6) a) State Polanyi theory for determination of micropore volume with the help of equations involved. **[8]**

b) Explain heat transfer and mass transfer in fluidized bed reactors. **[8]**

Q7) Discuss the various adsorption isotherms and derive the equation for adsorption enhancement. **[18]**

Q8) a) Discuss various models for determining crystallite growth and particle growth in deactivation by sintering. **[8]**

b) Write a note on catalyst regeneration. **[8]**

Total No. of Questions : 6]

SEAT No. :

P1523

[Total No. of Pages : 2

[4265] - 463
M.E. (Civil) (Structures)
THEORY OF PLATES AND SHELLS
(2008 Course) (Semester - II)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) ***Attempt any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of non programmable electronic calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) State and explain various assumptions made in small deflection theory. **[5]**

b) For isotropic plates, under the action of lateral loading determine the stress-strain relations and hence the moment curvature relations in Cartesian coordinate system. **[8]**

c) A rectangular plate of size a × b with four edges simply supported carries a central concentrated load 'P'. Derive the expression for the deflection of the plate. **[12]**

Q2) a) Derive Levy's solution for a rectangular plate with two opposite edges simply supported and the other two edges subjected to an action of distribution moment. **[16]**

b) For a simply supported isotropic plate subjected to uniform intensity of loading q, apply Ritz's method to obtain the expression for deflected shape of the plate. **[9]**

Q3) An isotropic circular plate of radius 'a' carries uniform loading of intensity q and is supported on a column at its centre. Find the expression for the maximum deflection. **[25]**

P.T.O.

SECTION - II

Q4) A thin spherical tank is completely filled with liquid of density 'w'. The tank is supported on ring beam along a parallel circle at angle 'ϕ_1'. Using membrane theory derive the expression for the membrane stresses N_θ and N_ϕ.

Explain how membrane theory fails at the supporting ring in the above problem. **[25]**

Q5) a) For a cantilever cylindrical open shell of length L, radius a and half angle ϕ_o subjected to self weight, obtain the expression membrane stresses N_x, N_ϕ and $N_{x\phi}$. **[20]**

b) State the advantages of the shell structure as compared to plates. **[5]**

Q6) a) Explain Beam theory of cylindrical shells. Discuss the advantages and limitations of the theory. **[8]**

b) Analyze a semicircular cylindrical shell of 3.2 m radius and simply supported over a span of 8 m. The shell is subjected to a uniformly distributed load of intensity (inclusive of the self weight) of $3kN/m^2$. Calculate the maximum compressive stress at the crown in the mid-span section using Lundgren's beam theory. Compare the value with the value obtain by membrane theory. Comment on the results by both theories. **[17]**

Total No. of Questions : 10]

SEAT No. :

P1526

[Total No. of Pages : 2

[4265] - 490

M.E. (Civil) (Water Resource and Environmental Engineering)

ENVIRONMENTAL CHEMISTRY AND MICROBIOLOGY

(2012 Course) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) ***Answer three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Assume suitable data if necessary.***

SECTION - I

Q1) Explain the concept, scope and segments of Environmental Chemistry. Also explain the effect of temperature, solar radiation and wind current on the various pollutants. **[18]**

Q2) Discuss the following in detail : **[16]**

a) Interaction of water with organic and inorganic species.

b) Characteristics of water as a solvent.

Q3) Discuss the properties and constituents of the soils mostly available in India. **[16]**

Q4) Explain the principle and mechanism of the methods for estimation of trace pollutants in the industrial waste water. Also give their advantages and disadvantages. **[16]**

Q5) Write short notes on : **[16]**

a) Carcinogenic compounds and their effects.

b) Pollution due to surfactants and pesticides.

SECTION - II

Q6) Discuss in detail about classification and characteristics of bacteria. Also explain culture techniques. **[18]**

Q7) Enlist various enzymes and explain their role in the field of Environmental Microbiology. **[16]**

P.T.O.

Q8) a) Explain significance of F/M ratio and role of microbes in biological waste water treatment. **[8]**

b) Discuss facultative respiration in wastewater treatment. **[8]**

Q9) Draw neat sketches and explain the structure of prokaryotic and eukaryotic cells. **[16]**

Q10) Write notes on : **[16]**

a) Structure of DNA and RNA.

b) Cell Morphology.

☒☒☒☒

Total No. of Questions : 8]

SEAT No. :

P1527

[Total No. of Pages : 2

[4265] - 491

M.E. (Civil) (Water Resources and Environmental Engineering)

ENVIRONMENTAL MANAGEMENT

(2012 Course) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Define EIA. What is the use of conducting Environmental Impact Assessment? Discuss rapid environment assessment for a thermal power plant. **[12]**

b) "Environmental education and awareness is shaping the actions of today's leading corporations" comment with suitable example. **[6]**

Q2) Write note on : **[16]**

a) EI, EIA and EIS.

b) Socio-economic environment.

c) Cost benefit analysis.

d) Economics of pollution control.

Q3) a) What is tradable pollution permits? Explain the detailed report of a meeting held by an Industry on "Eco-labeling and Green Procurement" and how it helps the industries during trading at global level? **[10]**

b) With a suitable example, explain checklist method of EIA. **[6]**

Q4) What do you mean by vehicular pollution? What precaution should be taken at the time of manufacturing of vehicles to reduce the pollution further? What are the factors that affect the tax on emissions? How to apply tax on pollution to vehicles? Bring out the problems with pollution taxes. Is there any transboundary pollution problem? Comment? **[16]**

P.T.O.

SECTION - II

Q5) a) Differentiate between EIA, EMS, EMP and ESR. **[8]**

b) USEPA established NEPA in 1969 and implemented from Jan., 1970, discuss the issues raised and provisions made for protection of the environment. **[8]**

Q6) a) Bring out the issues and challenges for environment management in the globalized world. **[7]**

b) Write short notes on : **[9]**

i) Environmental assets to achieve economy.

ii) Quantity rationing for environmental protection.

iii) OHSHAS 18001.

Q7) a) What are the environmental safety policies, and training provided in ISO certified Construction Company? **[6]**

b) "What is ecological equilibrium"? How it helps to keep the environment in equilibrium state. Design controlled environments to protect natural resources for sustainable environment. **[10]**

Q8) What are the key elements of an EMS? Is an EMS under ISO 14001 relevant to communities and organizations? How? What must a community or organization do to have an EMS that meets the ISO 14001 standard? Why is USEPA interested in promoting and testing EMS's under ISO 14001? **[18]**

Total No. of Questions : 8]

SEAT No. :

P1530

[Total No. of Pages : 4

[4265] - 502
M.E. (Mech.) (Heat Power)
ADVANCED THERMODYNAMICS
(2008 Course) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) ***Answer any three questions from each Section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Ethane gas ($C_2 H_6$) is placed in a container at a pressure of 34.2 bars and a specific volume of 0.0208 m^3/kg. It is heated at constant volume until the pressure reaches 46.4 bars. Estimate the temperature change for the process based on generalized Z-chart (supplied).

Given for ethane : P_c = 48.8 bars and T_c = 305K. **[8]**

b) Write down Vander Waals equation of state? How does it differ from the ideal gas equation of state? **[4]**

c) Explain the law of corresponding states with a suitable equation. **[4]**

Q2) a) Write notes on : **[9]**

i) Gibbs function and Helmholtz function.
ii) Law of degradation of energy.
iii) Availability function.

b) Why do the isobars diverge from one another on mollier diagram? Explain. **[7]**

Q3) a) 10 kg steam at 20 bars with 100ºC of super heat is stored in a container. Assuming the surroundings to be at 1 bar and 27ºC, calculate the availability of steam. **[6]**

P.T.O.

b) State the importance of clausius Claypeyron equation and find the following expression, from the same.

$$ln\ (P) = \left(-\frac{L}{RT} + C \right)$$

where L represents the latent heat of transformation and C is a constant. **[10]**

Q4) a) Write notes on (any two) : **[9]**

i) Isothermal compressibility (α) and coefficient of volume expansion (β).

ii) "P - T" diagram for pure substance.

iii) Gibb's phase rule.

b) At 500 K the values of v; β and K_T for solid copper are 7.115cm^3/gmol, (54.2×10^{-6}) K^{-1}, and (0.837×10^{-7}) cm^2/N, respectively. Determine the value of $(C_p - C_v)$ in J/gmol.ºC. **[5]**

c) An internal combustion engine has an OHO - Cycle efficiency of 56%. The engine works with a minimum and maximum temperature limits of 30ºC and 1500ºC. Find the second law efficiency of the cycle. **[4]**

SECTION - II

Q5) a) Explain the followings :

i) Adiabatic flame temperature.

ii) Law of mass action. **[8]**

b) Starting with n_o moles of NH_3, which dissociates according to the equation

$NH_3 \rightleftharpoons \frac{1}{2} N_2 + \frac{3}{2} H_2$. Show that at equilibrium,

$$K = \frac{\sqrt{27}}{4} . \left(\frac{\in_e^2}{1 - \in_e^2} \right) . p$$

Where notations carry usual meaning. **[10]**

Q6) a) Carbon monoxide and oxygen at 25ºC and 1 atm react at the same pressure and temperature as given below. If the reaction goes to completion, evaluate the entropy change in kJ/k per kg-mole of Co.

Given the values of entropy, s_i^o at 25ºC in $\left(\frac{kJ}{kg\ mol.k} \right)$ $CO_2 = 213.68$, $CO = 197.54$, $O_2 = 205.03$.

Reaction : $CO + ½\ O_2 \rightarrow CO_2$. **[10]**

b) Explain the followings (any one) : **[6]**

i) Enthalpy departure.

ii) Inversion curve.

Q7) a) Show that at the triple point, Gibbs function will have the same value in all the three phases of water. At triple point the enthalpy and entropy of ice are - 333.3 kJ/kg and – 1.22 kJ/kg k, respectively. **[6]**

b) A rigid, insulated tank is divided into two compartments by a partition. Initially 0.02 kgmol of Nitrogen fills one compartment at 2 bars and 100ºC. The other compartment contains 0.03kgmol of carbon dioxide (CO_2) at 1 bar and 20ºC. The partition is removed and the gases are allowed to mix. Determine the pressure and temperature of the mixture. Also find the entropy change for the mixing process. Given the values of C_v for N_2 and CO_2 as 0.744 kJ/kg k and 0.680kJ/kg k respectively. **[10]**

Q8) a) A gaseous fuel contains the following components on a volumetric or mole basis : hydrogen 2%, methane, 64% and ethane, 34%. Calculate the air-fuel ratio if 20% excess air is used. Also find the volume of air required per kg of fuel. **[10]**

b) Write a note on (any one) : **[6]**

i) Fugacity and activity.

ii) Fermi-Dirac statistics.

iii) Bose- Einstein statistics.

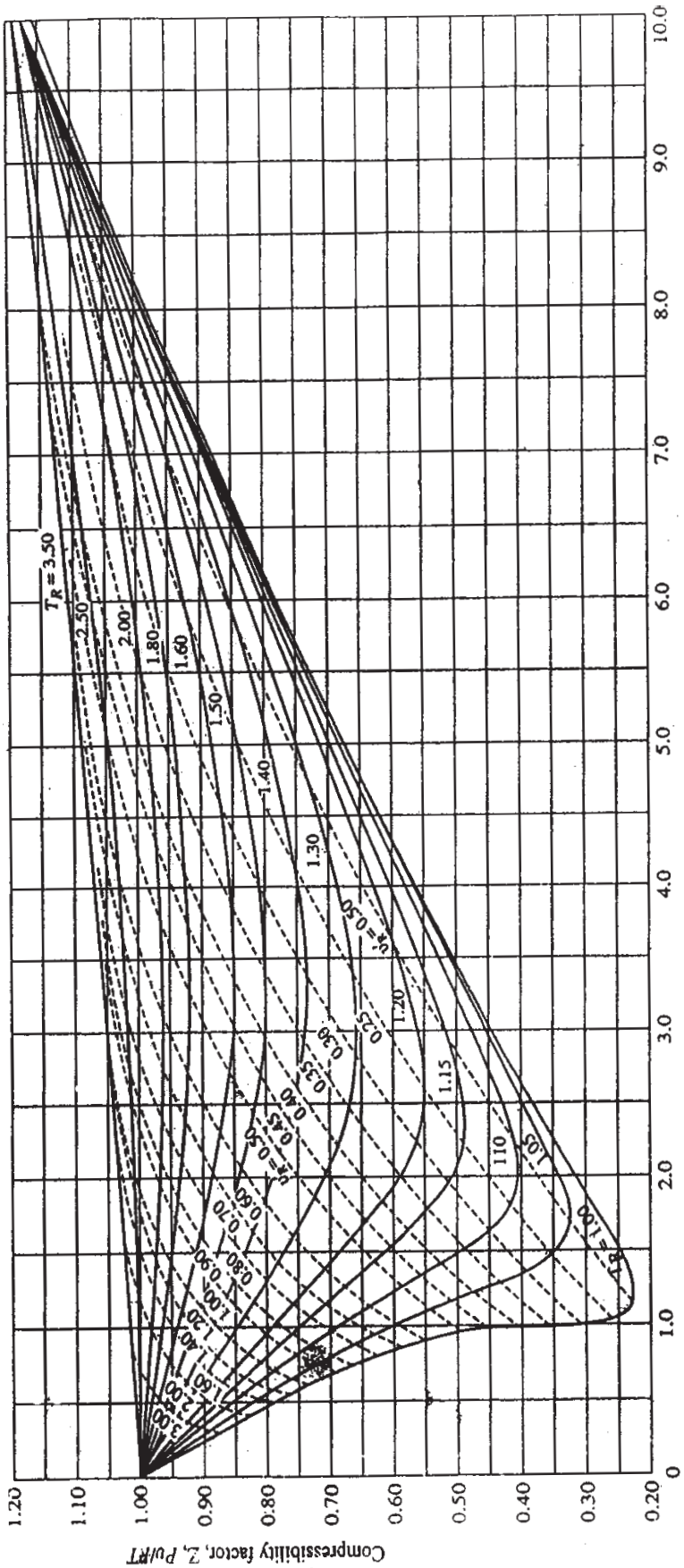

Fig. A.1 *Compressibility chart, low pressure range*

Total No. of Questions : 10]

SEAT No. :

P1538

[Total No. of Pages : 4

[4265]-539

M.E. (Mechanical) (Mechatronics)

APPLIED NUMERICAL METHODS AND COMPUTATIONAL TECHNIQUES

(2008 Course) (Semester - I) (Part - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Solve any three questions from Section I and any three questions from Section II.***
2) ***Answers to the two sections should be written in separate answer book.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data wherever necessary but mention it clearly.***
5) ***Use of scientific calculator is allowed.***

SECTION - I

Q1) For the system of equations **[16]**

$$\begin{bmatrix} 8 & 4 & -1 \\ -2 & 5 & 1 \\ 2 & -1 & 6 \end{bmatrix} \begin{Bmatrix} x \\ y \\ z \end{Bmatrix} = \begin{Bmatrix} 11 \\ 4 \\ 7 \end{Bmatrix}$$

Solve this system using LU decomposition method.

Q2) a) Integrate $\int_0^8 \int_0^4 \frac{dxdy}{x+y}$ with step size (h) along x as 2 and along y (k) as 1. (Put your calculators in Mode Fix 3). **[8]**

b) For the matrix $A = \begin{bmatrix} 8 & 4 & -1 \\ -2 & 5 & 1 \\ 2 & -1 & 6 \end{bmatrix}$ **[8]**

The L and U matrices are $U = \begin{bmatrix} 8 & 4 & -1 \\ 0 & 6 & 7.5 \\ 0 & 0 & 6 \end{bmatrix}$ and $L = \begin{bmatrix} 1 & 0 & 0 \\ -0.25 & 1 & 0 \\ 0.25 & -0.33 & 1 \end{bmatrix}$

Calculate A^{-1}

P.T.O.

Q3) a) Fit a straight line to the points (1, 0.5), (2, 2.5), (3, 2), (4, 4), (5, 3.5), (6, 6) and (7, 5.5) using linear regression. **[9]**

b) Use Lagrange's interpolation formula to fit a polynomial to the data. **[9]**

x	0	1	3	4
y	-12	0	6	12

Find the value of y when $x = 2$.

Q4) a) Table gives the distance in nautical miles of the visible horizon for the given heights in feed above the earth's surface. Calculate the value of y when $x = 218$. **[8]**

x = height	100	150	200	250	300	350	400
y = distance	10.63	13.03	15.04	16.81	18.42	19.90	21.27

Using Newton's forward difference formula.

b) The Gauss points and Gauss Weights for three point formula are as given in table below. **[8]**

Gauss Points	0.77459	0.00000	0.77459
Gauss Weights	0.55555	0.88888	0.55555

Evaluate the integral $\int_0^4 \frac{dx}{x^2+1}$

Q5) a) Use Double Interpolation to find the value of u corresponding to $x = 3.5$ and $y = 2.5$ from the following table. **[8]**

X→ / Y↓	0.00	1.50	3.00	4.50	6.00
1.00	3.50	13.70	23.90	34.10	44.30
2.00	14.00	24.20	34.40	44.60	54.80
3.00	31.50	41.70	51.90	62.10	72.30
4.00	56.00	66.20	76.40	86.60	96.80

Workout with linear interpolation

e.g. $X_{3.5} = (X_3 + X_{4.5})/2$ at $Y_{1.00} = (23.90 + 34.10)/2 = 30.70$

b) Table gives the distance in nautical miles of the visible horizon for the given heights in feed above the earth's surface. Calculat the value of y when $x = 410$. **[8]**

x = height	100	150	200	250	300	350	400
y = distance	10.63	13.03	15.04	16.81	18.42	19.90	21.27

Using Newton's backward difference formula.

SECTION - II

Q6) Figure Q6 shows a square mesh with nodal values. Using Laplace Equation $\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}=0$ and Libmann's method obtain the values of inside nodes. Compute three iterations with over relaxation ($\lambda = 1.5$), percent relative error ($\%\varepsilon_r$) and tabulate the result. **[18]**

Use $u^{Relaxed} = \lambda u^{Current} + (1-\lambda)u^{Previous}$

$$\%\varepsilon_r = \left|\frac{u^{New}-u^{Old}}{u^{New}}\right| * 100$$

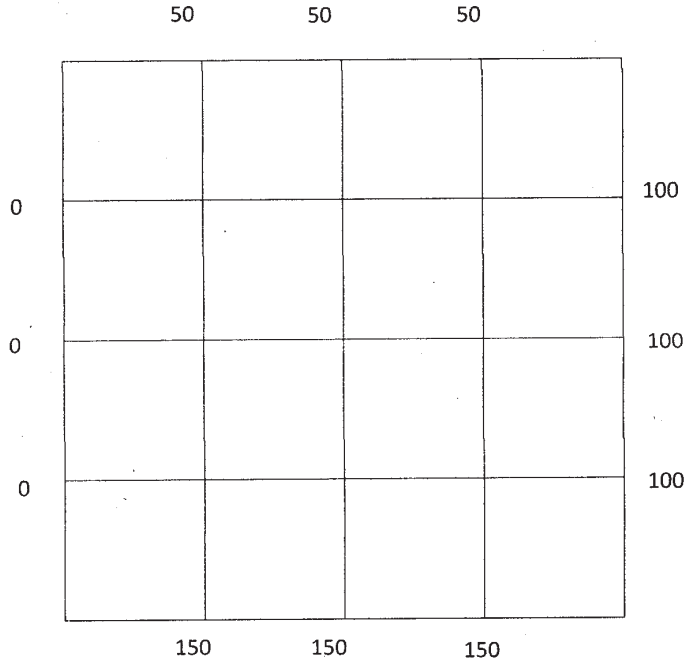

Figure Q 6

Q7) a) Use Modified Eular Method to calculate y at $x = 4$ with step size $h = 2$ and initial conditions as $y = 0$ at $x = 0$ for the differential equation **[8]**

$$\frac{dy}{dx} = 12x^2 - 20x + y^2$$

b) For certain function $y = f(x)$ the evaluation of integral 1 for various step sizes is as tabled below : **[8]**

h	I
0.250000	0.507100
0.125000	0.519800
0.062500	0.510253

Using Romberg's method evaluate this integral correct to three decimal places.

Q8) a) Compare Simpson's One Third rule and Simpsons 3/8 rule used for numerical integration. **[8]**

b) Discuss four steps of Finite Element Method. **[8]**

Q9) Evaluate the pivotal values for the wave equation. **[16]**

$$\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2}$$

Taking $\Delta x = 1$ up to $t = 1.25$. The boundary conditions are $u(0, t) = u(5, t) = 0$ and $u(x, 0) = x^2(5-x)$.

Q10) Find the values of $u(x, t)$ satisfying the parabolic equation $\frac{\partial u}{\partial t} = 4\frac{\partial^2 u}{\partial x^2}$ and the boundary conditions are $u(0,t) = 0 = u(8, t)$ and $u(x, 0) = 4x - \frac{1}{2}x^2$ at points $x = i$, $i = 0, 1, 2, ...,7$ and $t = (1/8)j$, $j = 0, 1, 2, ...5$. **[16]**

Total No. of Questions : 10]

SEAT No. :

P1539

[Total No. of Pages : 3

[4265]-542

M.E. (Mechanical) (Mechatronics)

DIGITAL SIGNAL PROCESSING

(Semester - I) (2008 Course) (Elective - I (b))

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Consider the analog signal. **[10]**

$x_a(t) = 3 \cos 2000\pi t + 5 \sin 6000\pi t + 10 \cos 12{,}000\pi t$.

i) What is the nyquist rate for this signal?

ii) Assume now that we sample this signal using sampling rate $F_s = 5000$ samples/sec. What is the discrete - time signal obtained after sampling? Comment on the result.

b) What is signal? Give the classification of signals. Explain it in brief. **[6]**

Q2) a) Determine the output response of discrete time system if input function is $x(n) = \{2, \underset{\uparrow}{3}, 4, 5\}$ and the impulse function is $h(n) = \{\underset{\uparrow}{1}, 2, 3, 4\}$ **[12]**

b) Mention the advantages of digital signal processing over analog signal processing. **[4]**

Q3) a) With suitable examples briefly explain the following systems. **[8]**

i) Linear and Non Linear.

ii) Causal and Non Causal.

iii) Static and Dynamic.

iv) Time variant and time invariant.

b) Determine the 'Z' transform showing ROC for the following finite duration sequences. **[8]**

P.T.O.

i) $x(n)=\{2,\underset{\uparrow}{-9},8,4\}$

ii) $x(n)=\{\underset{\uparrow}{1},2,5,7,0\}$

iii) $x(n)=\{2,-5,\underset{\uparrow}{4},8,9\}$

iv) $x(n)=\{-1,2,3,9,\underset{\uparrow}{3}\}$

Q4) a) Using Long division method, determine inverse 'Z' transform of **[10]**

$$X(Z)=\frac{1+2Z^{-1}}{1-2Z^{-1}+Z^{-2}}$$

if i) $x(n)$ is causal.
ii) $x(n)$ is anticausal.

b) Explain DIT-FFT for 4 point signal. **[6]**

Q5) Write short notes on (Any three) : **[18]**

a) Basic block diagram of DSP & its explaination.
b) DTMF.
c) Energy and power signal.
d) Application of DSP in mechatronics.
e) Properties of Linear convolution.

SECTION - II

Q6) a) Compute the DFT of the four point sequence **[8]**

$x(n)=\{\underset{\uparrow}{0},1,2,3\}$

b) State and explain any four properties of 'Z' transform. **[8]**

Q7) a) Perform the Circular convolution of the following two sequences. **[10]**

$x_1(n)=\{\underset{\uparrow}{2},1,2,1\}$

$x_2(n)=\{\underset{\uparrow}{1},2,3,4\}$

b) Give the comparison between FIR and IIR filters. **[6]**

Q8) a) Realize the following difference equation using DF-I and DF-II, after obtaining transfer function. **[10]**

$$y(n)-\frac{1}{3}y(n-1)=x(n)+\frac{1}{2}x(n-1)+\frac{1}{4}x(n-2)$$

b) Explain in detail the classification of filters with the help of frequency response. **[6]**

Q9) a) Distinguish between microprocessor and digital signal processor. **[6]**

b) With a neat block diagram, explain the architectural details of DSP chip. **[10]**

Q10) Write short notes on (Any three) : **[18]**

a) Filter structures.

b) Comparison between Analog and digital filters.

c) Harvard architecture.

d) Windowing techniques of FIR filter.

e) Barrel Shifter.

Total No. of Questions : 8]

SEAT No. :

P1540

[Total No. of Pages : 4

[4265]-545

M.E. (Mechanical - Mechatronics)

THEORY OF MACHINES AND MECHANISMS

(2008 Course) (Elective - II (b)) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer three questions from Section I and three questions from Section II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rules and electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What do you understand by kinematic pair? With the help of neat sketches explain different type of kinematic pair. **[5]**

b) Write short note on elliptical trammel. State and explain the condition for which it will trace a circle. **[5]**

c) Write short notes on Peaucellier's straight line mechanism. **[4]**

d) Determine number of degree of freedom of the mechanism as shown in Fig.1 **[4]**

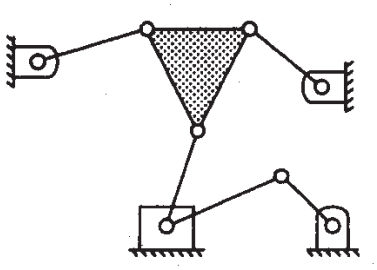

Fig. 1

Q2) a) State and prove Kennedy's theorem for three centre in line. **[4]**

P.T.O.

b) For the mechanism as shown in Fig.2, determine velocity of slider E, when link AB rotates with 150 rad/sec. Also determine angular velocity of link BC, OCD and DE. Link lengths are AB = 30 mm, BC = 62.5 mm, OC = 65 mm, CD = 50 mm, OD = 100 mm and DE = 75 mm. **[12]**

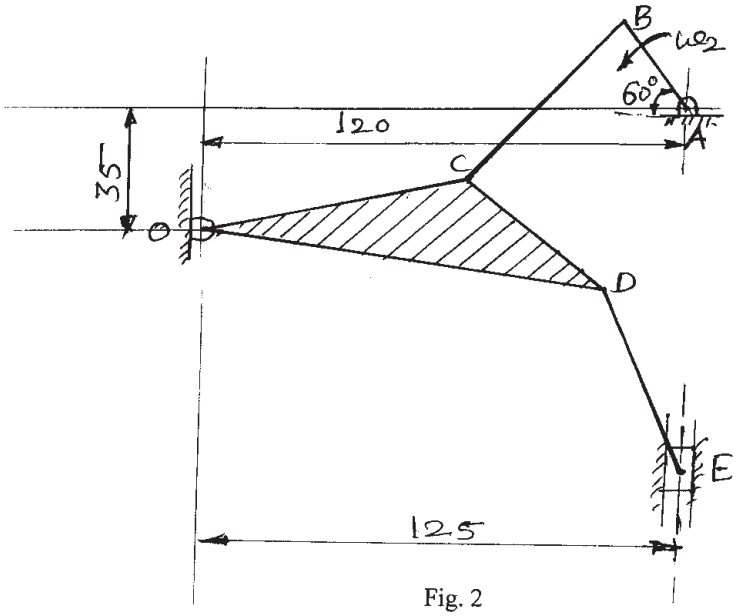

Fig. 2

Q3) a) In an I C Engine mechanism, stroke is 120 mm and connecting rod is 3 times the crank length. The crank rotates at 1200 rpm in counterclockwise direction. Using analytical method determine acceleration of the piston and angular acceleration of the connecting rod. **[6]**

b) Fig. 3 shows a quick return mechanism in which the driving crank OA rotates at 150 rpm in clockwise direction. For the position shown, determine the magnitude and direction of (i) the velocity and acceleration of block D, (ii) the angular velocity and angular acceleration of the slotted bar QB. Link lengths are CD = 500 mm, QC = 150 mm and OA = 200. **[10]**

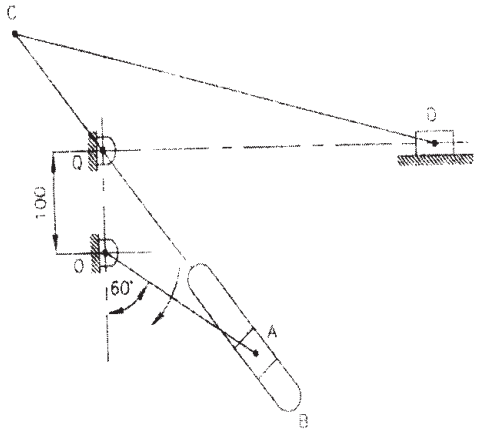

Fig. 3

Q4) a) Write short note on Bobillier construction. **[5]**

b) Explain the method of chace solution, when magnitudes of two different vectors are unknown. **[5]**

c) In an I C Engine mechanism the crank radius is 90 mm and connecting rod length is 450 mm. The crank is rotating in anticlockwise direction with angular velocity 20 rad/sec and angular acceleration of 125 rad/sec^2. Using complex number method, find the acceleration of the piston and angular acceleration of the connecting rod when the crank is at 60º from inner dead centre. **[6]**

SECTION - II

Q5) a) Explain the following terms related to synthesis. **[4]**

i) Body Guidance.
ii) Function Generation.

b) Explain three position synthesis for slider crank mechanism by using relative pole method. **[4]**

c) Synthesis a four bar mechanism to generate a function $y = \sin x$ for $0 \leq x \leq 90^\circ$. The range of the output crank may be chosen as 60º while that of input crank is 120º. Assume three precision points obtained from Chebyshev spacing. **[8]**

Q6) a) Explain the following terms : **[6]**

i) Under damping.
ii) Critical damping.
iii) Over damping.

b) A machine of mass 76 kg is mounted on a spring and is fitted with a dashpot to damp out vibrations. There are three springs each of stiffness 11 N/mm and it is found that the amplitude of vibration diminishes from 38.4 mm to 6.4 mm in two complete oscillations. Assuming that the damping force varies as the velocity, determine i) the resistance of the dash pot at unit velocity, ii) the ratio of the frequency of the damped vibration to the frequency of the undamped vibration and iii) the periodic of the damped vibration. **[10]**

Q7) a) Explain the Phenomenon of cam jump. **[4]**

b) A cam is to operate an offset roller follower. The least radius of the cam is 50 mm, roller diameter is 30 mm and offset is 20 mm. The cam is to rotate at 360 rpm. The angle of ascent is 48º, angle of dwell is 42º and angle of descent is 60º. The motion is to be SHM during ascent and uniform acceleration and retardation during descent. Draw the cam profile and calculate the maximum velocity and acceleration during descent. **[12]**

Q8) a) Derive expressions for displacement, velocity and acceleration for a circular arc cam operating on a radial – translating roller follower when the contact is on the straight flank. **[6]**

b) Explain the terms 'Logarithmic decrement' as applied to damped vibrations. **[6]**

c) Explain Overlay method for synthesis of a function generation. **[6]**

Total No. of Questions : 10]

SEAT No. :

P1543

[Total No. of Pages : 3

[4265]-521

M.E. (Mechanical) (Design Engg./Automotive Engg.)

MATHEMATICAL MODELLING AND ANALYSIS

(2008 Course) (Semester - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Solve any three questions from Section - I and any three questions from Section - II.***
2) ***Answers to each sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data wherever necessary but mention it, clearly.***
5) ***Use of scientific calculator is allowed.***

SECTION - I

Q1) a) Discuss Linear Graph Models. **[8]**

b) Define System, Environment and Variable in mathematical modeling. **[8]**

Q2) a) Define input node, output node, transmittance, non-touching loops, feed forward path and touching loops and explain Masson's Gain Formula. **[8]**

b) Obtain expression for Y(s)/X(s) using Masson's Gain formula from the signal flow graph shown in Figure Q2 (b). **[8]**

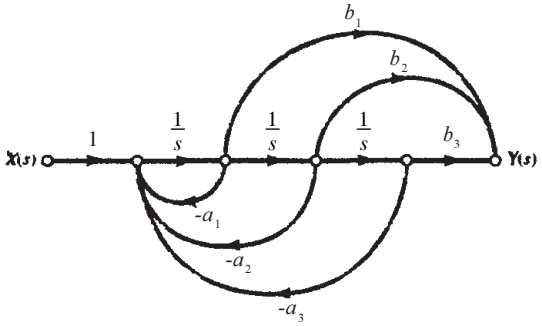

Figure Q2 (b)

Q3) a) Figure Q3(a) shows a block diagram. Apply block diagram algebra to evaluate C/R. **[9]**

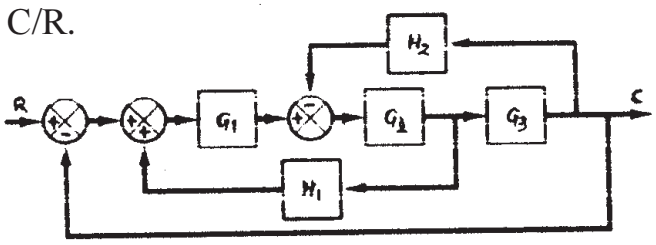

Figure Q 3 (a)

P.T.O.

b) Construct signal flow graph for **[9]**

$$\begin{Bmatrix} x_1 \\ x_2 \\ x_3 \end{Bmatrix} = \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix} \begin{Bmatrix} x_1 \\ x_2 \\ x_3 \end{Bmatrix} + \begin{Bmatrix} b_1 \\ b_2 \\ b_3 \end{Bmatrix} u$$

Q4) For Series Programming used in State Space Methods it follows that for **[16]**
$(D^3 + a_1D^2 + a_2D + a_3)\, y(t) = (b_1D^2 + b_2D + b_3) f(t)$
The matrix relationships are

$$\begin{Bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{Bmatrix} = \begin{bmatrix} -a_1 & 1 & 0 \\ -a_2 & 0 & 1 \\ -a_3 & 0 & 0 \end{bmatrix} \begin{Bmatrix} x_1 \\ x_2 \\ x_3 \end{Bmatrix} + \begin{Bmatrix} b_1 \\ b_2 \\ b_3 \end{Bmatrix} f(t)$$

and $y(t) = x_1$ Apply to $y(t) = \dfrac{(D+5)}{(D+1)^2 (D+4)} f(t)$ to obtain matrix relationships. Draw block diagrams for these equations.

Q5) a) Write short note on Cause variables and Effect variable with suitable example. **[8]**

b) Write a short note on Lumped and Distributed parameter systems. **[8]**

SECTION - II

Q6) Solve the equation $\dfrac{\partial u}{\partial t} = \dfrac{\partial^2 u}{\partial x^2}$ subject to conditions $u(x, 0) = \sin(\pi x)$, $0 \le x \le 1$; $u(0, t) = u(1, t)$, using **[8]**

a) Schmidt method.

b) Crank Nicolson method. **[8]**

Q7) a) Define Z transform and find the Z transform whose Laplace transform is

$$\frac{1}{s(s+5)}$$ **[6]**

b) The Z transform of a digital control system is $C(z) = z \dfrac{z+2}{(z-0.5)^2 (z-1)}$

Determine the inverse Z transform. **[10]**

Q8) For the transformed equation $C(s)=\frac{3V(s)-3sU(s)}{s^2+4s+3}$. Determine the response when

a) $V(s) = 1/s$ and $U(s) = 0$ **[8]**

b) $V(s) = 0$ and $U(s) = \frac{1}{s+5}$ **[8]**

Q9) a) For $\frac{dy}{dx}=f(x)=x^2+x+1$, from $x = 0$ to $x = 2$, using 4^{th} order RK method evaluate the integral with $h = 2$; $x_0 = 0$, $y_0 = 0$. **[8]**

b) Comment on relation between Z transforms and Laplace Transforms. **[8]**

Q10) Figure Q 10 shows a square mesh with nodal values. Using Laplace Equation $\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}=0$ and Libmann's method obtain the values of inside nodes. Compute three iterations with over relaxation ($\lambda = 1.5$), percent relative error ($\%\varepsilon_r$) and tabulate the result. **[18]**

Use $u^{Relaxed} = \lambda u^{Current} + (1 - \lambda)u^{Previous}$

$$\%\varepsilon_r = \left|\frac{u^{New}-u^{Old}}{u^{New}}\right| * 100$$

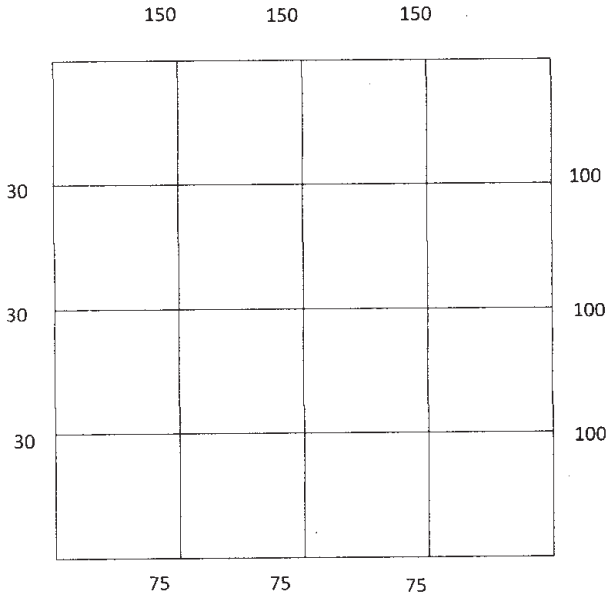

Figure Q 10

Total No. of Questions : 8]

SEAT No. :

P1546

[Total No. of Pages : 3

[4265] - 582
M.E. (Mechanical) (CADME)
MATHEMATICAL MODELLING
(2012 Course) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) A tightly stretched string with fixed end points $x = 0$ and $x = l$ is initially in a position given by $y = y_0 \sin^2 (\text{Tix}/l)$. If it is released from rest from this position, find the displacement $y(x, t)$. **[8]**

b) Solve the Laplace equation $\frac{\partial^2 u}{dx^2}+\frac{\partial^2 u}{\partial y^2}=0$ subject to the condition $u(0, y) = u(l, y) = u(x, 0) = 0$ and $u(x, a) = \sin n\pi x/l$. **[8]**

Q2) a) Find the extremals of the following functional : **[6]**

i) $\int_{x_0}^{x_1}(x+y')\,y'\,dx$.

ii) $\int_{x_0}^{x_1}(y'^{2}/x^3)\,dx$.

b) Solve the boundary value problem $x^2\frac{d^2y}{dx^2}+x.\frac{dy}{dx}-y=2x^2$ subject to the conditions $y(0) = 0$ and $y(1) = 1$ by using Ritz method. **[10]**

Q3) a) Using Jacobi's method, find all the eigen values and the eigen vectors of the matrix. **[10]**

$$\begin{bmatrix} 1 & \sqrt{2} & 2 \\ \sqrt{2} & 3 & \sqrt{2} \\ 2 & \sqrt{2} & 1 \end{bmatrix}$$

P.T.O.

b) Using Given's method, reduce the following matrix to the tridiagonal form : **[6]**

$$A=\begin{bmatrix} 2 & 1 & 3 \\ 1 & 4 & 2 \\ 3 & 2 & 3 \end{bmatrix}$$

Q4) a) Find the extremal of the function $\int_0^1 \left[(y')^2 + 12x.y\right]dx$ with $y(0) = 0$ & $y(1) = 1$. **[6]**

b) Find the deflection of the vibrating string of unit length having fixed ends with initial velocity zero and initial deflection $f(x) = k(\sin x - \sin 2x)$. **[6]**

c) Find the number of real and complex roots of the polynomial equation $P_3(x) = x^3 - 5x + 1 = 0$. **[6]**

SECTION - II

Q5) a) Given : **[10]**

Weights	0.5555	0.8888	0.5555
Function Arguments	– 0.7745	0.0	0.7745

Calculate the integral value $\int_0^3 x.e^x\,dx$ using Gauss Quadrature three point formula.

b) Find the smallest eigenvalue by inverse iteration method. **[6]**

$$\begin{bmatrix} 4 & -2 & 0 & 0 \\ -2 & 4 & -2 & 0 \\ 0 & -2 & 4 & -2 \\ 0 & 0 & -2 & 2 \end{bmatrix} \{x\} = \begin{bmatrix} 0 & & & \\ & 2 & & \\ & & 0 & \\ & & & 1 \end{bmatrix} (x)$$

using starting vector $\{x\}_0^T$ <1111>.

Q6) Consider the following data on the variation of tensile strength of a plastic as a function of time it is heat treated. **[18]**

Time (min)	10	15	20	25	40	50	55
Tensile Strength	5	20	18	40	33	54	70

a) Fit a straight line to the data.

b) Use the same to determine tensile strength at a time of 32 min and 42 min.

Q7) a) Write the characteristics of hypothesis. **[6]**

b) Genetic theory states that children having one parent of blood type A and the other of blood type B will always be of three types A, AB, B and that the portion of three types will on an average be as 1 : 2 : 1. A report states that out of 300 children having one A parent and B parent, 30% were found to be types A, 45% AB and the remainder type B, Test the hypothesis by χ^2 test at 5% level of significance. **[10]**

Q8) a) What should be the size of sample if a simple random sample from a population of 4000 items is to be drawn to estimate the per cent defective within 2% of the true value with 95.5% probability? What would be the size of the sample if the population is assumed to be infinite in the given case? Assume proportion of defectives in the universe P = 0.02, Take z = 2.005. **[10]**

b) Using Lanczo's method, calculate two smallest eigenvalues & eigen vectors of **[6]**

$$\begin{bmatrix} 4 & -2 & & & \\ -2 & 4 & -2 & & \\ & -2 & 4 & -2 & \\ & & -2 & 4 & -2 \\ & & & -2 & 2 \end{bmatrix} \{x\} = \lambda \begin{bmatrix} 2 & & & & \\ & 2 & & & \\ & & 2 & & \\ & & & 2 & \\ & & & & 1 \end{bmatrix}$$

Using starting vector $\{x\}_0^T$ <11111>.

☒☒☒☒

Total No. of Questions : 10]

SEAT No. :

P1547

[Total No. of Pages : 2

[4265]-583
M.E. (Mechanical) (CADME)
COMPUTER AIDED DESIGN
(2012 Course) (Semester - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***

SECTION - I

Q1) a) Explain the concept of model coordinate system, screen coordinate system & working coordinate system in detail with their interactions. **[8]**

b) Discuss various graphics standards used in CAD/CAM systems. **[8]**

Q2) a) What is difference between analytic & synthetic curves? Explain general representation of curve in parametric & non parametric schemes. **[8]**

b) Derive the parametric representation of line. **[8]**

Q3) a) An ellipse has major axis of 12 units & minor axis of 8 units. The centre of ellipse is (4, 5, 6). Find four consecutive points on ellipse starting from $u = 0$ with $\Delta u = 10$ degree. **[8]**

b) Explain concept of Reflection in detail with suitable example about planes & axes. **[8]**

Q4) a) Derive the parametric representation of B-spline. **[8]**

b) Explain the parametric representation of ruled surface with neat sketch. **[8]**

Q5) a) Explain in detail parametric representation of Bezier surface in detail. **[9]**

b) A triangle with vertices P (20, 30), Q (50, 30) & R (20, 100) is to be enlarged twice in X-direction & reduced to half in Y-direction. The scaled triangle is rotated by 30^o about point 'P' in anticlockwise direction. Find the coordinates of rotated triangle. **[9]**

P.T.O.

SECTION - II

Q6) a) Explain the concept of boundary representation in detail. **[8]**

b) Discuss the concept of nonuniform rational B-splines [NURBS] in detail with reference to modeling. **[8]**

Q7) What is constructive solid geometry? Discuss in detail with basic primitives & building operations. **[16]**

Q8) a) Explain priority algorithm for hidden line removal. **[8]**

b) Discuss constant shading, Gourand shading & phong shading for surfaces. **[8]**

Q9) a) Explain STEP format with architecture & implementation. **[8]**

b) Explain RGB & CMY color models in detail. **[8]**

Q10) a) Explain the concept of product Data Management. **[9]**

b) A triangle A (2, 3), B (4, 5) & C (3, 5) has undergone following operations.

i) Mirrored about line y = x

ii) Scaled with respect to point (2, 3) &

iii) Rotated by 35° in clockwise about (2, 3).

Find coordinates of new position of triangle. **[9]**

Total No. of Questions : 12]

SEAT No. :

P1548

[Total No. of Pages : 2

[4265] - 592

M.E. (Electrical) (Control System)

ADVANCED MATHEMATICAL TECHNIQUE FOR CONTROL SYSTEM

(2008 Course) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) ***Answer Q.No. 1 or 2, 3 or 4, 5 or 6, 7 or 8, 9 or 10, 11 or 12.***
2) ***Answer 3 questions from section-I and 3 questions from section-II.***
3) ***Answers to the two sections should be written in separate books.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain what do you understand by Euclidian space, space vector and vectors. **[9]**

b) Write the concept of local and global extrema. **[9]**

OR

Q2) a) Explain what do understand by real valued function. **[9]**

b) Explain the concept of directional derivatives and direction of steepest descent. **[9]**

Q3) Maximise the function and also find the maximum value of function. **[16]**

$$f(x) = 20x_1 + 26x_2 + 4x_1x_2 - 4x_1^2 - 3x_2^2$$

OR

Q4) Explain the method of obtaining extremum point of multivariable optimization with equality constraints. **[16]**

Q5) a) Explain what do you understand by dual simplex method. **[8]**

b) Write and explain the congugate gradient method of obtaining the extremum. **[8]**

P.T.O.

OR

Q6) Consider the linear programming problem **[16]**

maximize $f = 50x_1 + 100x_2$

subject to

$2x_1 + x_2 \overline{<}, 1250, \quad 2x_1 + 5x_2 \leq 1000$

$2x_1 + 3x_2 \leq 900, \quad x_2 \leq 150$

where $x_1 \geq 0, \quad x_2 \geq 0.$

SECTION - II

Q7) Find the maxima of $f = x\,(1.5 - x)$ in the interval (0.0 to 1.0) to within 10% of exact value by Dichotomous search method. **[18]**

OR

Q8) Locate the minimum point of function $f(x) = x^5 - 5x^3 - 20x + 5$ in the interval of (0, 5) within accuracy of 0.1 by fibonacci method. **[18]**

Q9) Explain the concept of suboptimization and principle of optimality used in multistage decesion problem. **[16]**

OR

Q10) Explain the computational procedure in dynamic programming. **[16]**

Q11) Explain what do you understand by zero one programming and integer linear programming. **[16]**

OR

Q12) a) Explain the Gomory's cutting plain method. **[8]**

b) Explain the graphical representation integer linear programming. **[8]**

Total No. of Questions : 6]

SEAT No. :

P1549

[Total No. of Pages : 2

[4265] - 593
M.E. (Electrical) (Control System)
PROCESS CONTROL MANAGEMENT
(2008 Course) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Solve any two :

a) How motives can be classified? Give examples of different types of motives. **[9]**

b) Explain Autocratic, Democratic and Free-rein Leadership styles. **[9]**

c) What do you mean by Group Dynamics? Explain the impact of Groups on : **[9]**

i) Organizational effectiveness and

ii) Individual effectiveness.

d) With suitable example explain that conflict is necessary for organizational activity. **[9]**

Q2) Solve any two :

a) Develop a mathematical model for stirred tank reactor as shown in figure with heat balance equation. **[8]**

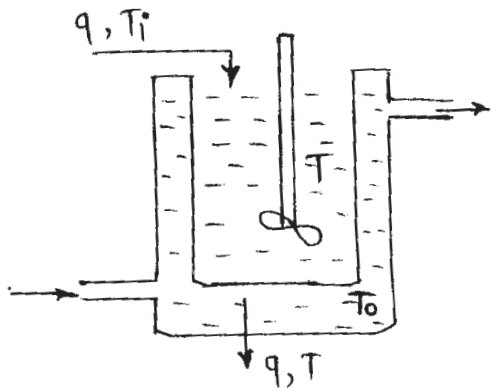

Fig. Stirred tank reactor

q = feed rate

T = Temperatures

ρ = density

V = volume of reactor.

P.T.O.

b) Describe your views about requirement of process control in Industry regarding : safety, production, specification, Environmental regulations, operational constraints and Economics. **[8]**

c) What are state variables? And what are the state equations? What are they used for? **[8]**

Q3) Solve any two :

a) Compare PD, PI and PID control actions in detail. **[8]**

b) What is reset windup problem? Explain how to avoid reset windup problem? **[8]**

c) Explain Ziegler-Nichols closed loop method used for PID Tunning in detail. Give its advantages over the other methods. **[8]**

SECTION - II

Q4) Solve any two :

a) Explain block diagram of Digital control System in detail. Give its advantages and disadvantages over analog control system. **[9]**

b) Explain temperature control of stirred tank heater with feed back as well as feed forward control with suitable diagrams. **[9]**

c) With proper block diagrams differentiate between feedback and feed forward control system. **[9]**

Q5) a) Explain feed forward control of a distillation column with suitable diagram. **[8]**

b) Draw and explain generalized combined block diagram for feed forward-feedback control. **[8]**

Q6) Solve any two :

a) Explain the Relative Gain Array for a process with two inputs and two outputs. **[8]**

b) Explain effect of Interaction on stability of the process control system. **[8]**

c) Explain how you can use the RGA to select the loops with minimum interaction. **[8]**

Total No. of Questions : 12]

SEAT No. :

P1550

[Total No. of Pages : 3

[4265]-594

M.E. (Electrical) Control System

NONLINEAR CONTROL SYSTEM

(2008 Course) (Semester - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer any Three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Write short notes on : **[18]**

a) Different types of nonlinearities present in the system.

b) Comparison of nonlinear control system and linear system.

OR

Q2) Explain clearly the following terms in connection with the nonlinear control systems. **[18]**

a) Hysterisis.

b) Regional Stability.

c) Subharmonic generation.

d) Jump Resonance.

e) Limit Cycle.

f) Amplitude - frequency dependance.

Q3) Explain the methods of plotting phase plane trajectories. **[16]**

a) Delta method.

b) Pell's method.

P.T.O.

OR

Q4) In unity feedback control system an amplifier is connected in cascade with the forward path transfer function. **[16]**

$$G(s)=\frac{10}{s(s+1)}$$

The amplifier has unity gain and saturated at input equal to ± 5V. Using isocline method, plot phase plane trajectory for step input 10 volts. From phase plane trajectory, also calculate the peak overshoot and comment on stability.

Q5) a) Derive the describing function of relay with dead zone. **[8]**

b) In unity feedback control system the relay with output equal to ± 2 is connected in cascade with forward path transfer function $G(s)=\frac{100}{s(s+1)(s+5)}$. Determine the frequency and amplitude of limit cycle if it exists. **[8]**

OR

Q6) Write short notes on any Two : **[16]**

a) Popov criterion.

b) Describing function of saturation.

c) Stability analysis using describing function.

SECTION - II

Q7) a) With reference to Liapunov's stability explain asymptotic stability, instability asymptotic stability in large, stability. **[8]**

b) An autonomous system is given below. **[9]**

$$\dot{x}=\begin{bmatrix}0 & 1\\ -2 & -3\end{bmatrix}x$$

Select Liapunov function and examine stability.

OR

Q8) a) Explain : **[8]**

i) Positive and negative definite scalar.

ii) Positive and negative semidefinite scalar.

b) Express the scalar function given below in qudratic form and test it for definiteness $V(x)=2x_1^2+3x_2^2+4x_3^2+x_1x_2-x_1x_3+2x_2x_3$ **[9]**

Q9) a) For linear time invariant system

$\dot{x} = Ax$, derive expression

$A^T P + PA = -Q$

Where P & Q are real symmetric and positive definite matrices. **[9]**

b) Explain Liapunov direct method to determine stability. Also explain Liapunov function. **[8]**

OR

Q10) a) Explain Liapunov indirect method to determine stability. **[8]**

b) Apply Liapunov direct method to determine stability of the system given below : **[9]**

$$\dot{x}_1 = -x_1 - x_2$$

$$\dot{x}_2 = -\tfrac{1}{2} x^2$$

Q11) Explain input-output linearization and input state linearization for the system given as below : **[16]**

$$\dot{x}_1 = x_1^2 + 2x_2^2 + 2u$$

$$\dot{x}_2 = -u$$

OR

Q12) Write short notes on any Two : **[16]**

a) Input-output linearization.

b) Input state linearization.

c) Sliding mode control.

Total No. of Questions : 12]

SEAT No. :

P1551

[Total No. of Pages : 3

[4265] - 600

M.E. (Electrical) (Control Systems)

MULTIVARIABLE AND OPTIMAL CONTROL SYSTEMS

(2008 Course) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the method of obtaining equivalent transformation from state space form to transfer function form for multivariable control system represented by usual notations. **[8]**

b) Differential equations of multivariable control system are given by : **[9]**

$$2\ddot{y}_1 + 2\dot{y}_2 + y_1 = u_1$$

$$2\ddot{y}_2 + 2\dot{y}_1 + y_2 = 2u_2$$

where y_1 and y_2 are outputs and u_1 and u_2 are inputs. Obtain state space representation of the system.

OR

Q2) a) The overall transfer function of multi-variable control system is given by

$$T(s) = \begin{bmatrix} \frac{1}{s+1} & \frac{1}{s+2} \\ \frac{1}{s+3} & \frac{1}{s+4} \end{bmatrix}$$

obtain state model of the system. **[10]**

b) Discuss the advantages and disadvantages of representing the multivariable control systems into : **[7]**

i) State space form ii) Transfer matrix form

iii) Differential form

P.T.O.

Q3) a) Explain complete observability for multi-variable system. **[8]**

b) Determine observability of multivariable control system represented by state space. **[9]**

$$A=\begin{bmatrix}1 & 0 & 0\\ 0 & 3 & 0\\ 0 & 0 & 2\end{bmatrix} \quad B=\begin{bmatrix}1 & 1\\ 1 & 0\\ 1 & -1\end{bmatrix} \quad C=\begin{bmatrix}1 & 1 & 1\\ 0 & 1 & 1\end{bmatrix}$$

OR

Q4) a) Explain full state controllability for multivariable control system. **[8]**

b) Determine full state controllability for the given multivariable control system as : **[9]**

$$A=\begin{bmatrix}2 & 0 & 0\\ 0 & 1 & 0\\ 0 & 0 & 3\end{bmatrix} \quad B=\begin{bmatrix}1 & -1\\ 0 & 1\\ -1 & 1\end{bmatrix} \quad C=\begin{bmatrix}1 & 0 & 0\\ 1 & 1 & 1\end{bmatrix}$$

Q5) Explain with neat block diagram state estimation problem using observer. **[16]**

OR

Q6) A linear time - invariant control system is represented in state space form

$$\dot{x}(t)=\begin{bmatrix}0 & 1 & 0\\ 0 & 0 & 1\\ 2 & 1 & 3\end{bmatrix}x(t)+\begin{bmatrix}1\\ 1\\ 1\end{bmatrix}u(t)$$

Design the linear state variable feedback to place poles at desired locations $S = -1 \quad S = -1 \pm j$. **[16]**

SECTION - II

Q7) a) Explain the infinite-time state linear regulator problem and also explain the procedure for the optimal control law for an infinite-time linear state regulator problem. **[10]**

b) Discuss any one method for the numerical solution of Matrix Riccati Equation. **[8]**

OR

Q8) a) Obtain the typical performance index for optimal control of **[12]**

i) Minimum fuel problem. ii) Minimum Time problem.

iii) Tracking problem.

b) State merits and demerits of optimal control. **[6]**

Q9) a) State and explain the 'pontryagin's minimum principle'. **[6]**

b) Explain the procedure for solving the optimal control problem using pontryagin's minimum principle. **[10]**

OR

Q10) Define Hamiltonian. Explain the procedure for solving optimal control problem using Hamiltonian method. State merits and demerits of it. **[16]**

Q11) Explain optimization by dynamic programming based on the optimality principle and the imbedding principle. Also discuss merits and demerits of the above mentioned principles. **[16]**

OR

Q12) a) Explain Bang-Bang method for solving the optimal control problem. **[8]**

b) Explain the relation between Dynamic Programming and pontrygin's minimum principle. **[8]**

Total No. of Questions : 6]

SEAT No. :

P1552

[Total No. of Pages : 2

[4265]-605

M.E. (Electrical) (Control System)

LARGE SCALE SYSTEM

(2008 Course) (Elective - III (c)) (Semester - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer any Two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***All questions carry equal marks.***
6) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***

SECTION - I

Q1) a) Explain the concept of Decentralized control. **[8]**

b) Explain large scale system modeling. **[8]**

c) Obtain Reduced order model using Davison Technique. **[9]**

Q2) a) Obtain reduced order model by model aggregation. **[15]**

$$\dot{x}=\begin{bmatrix}0.5 & 0.9 & 0\\ 0 & 1 & 0\\ 1 & -2 & -0.5\end{bmatrix}x+\begin{bmatrix}0.5\\ 1\\ 2\end{bmatrix}u$$

b) Write the properties of Aggregated system matrix. **[10]**

Q3) By using the technique of moment matching, obtained the order reduced model for $G(s)=\dfrac{s^2+13s+40}{s^3+13s^2+32s+20}$. **[25]**

P.T.O.

SECTION - II

Q4) a) Explain Generalized Routh algorithm. **[13]**

b) By using the generalized Routh algorithm, compute the quotients in the third matrix Cauer form for the system. **[12]**

$$G(s) = \frac{1}{s^2 + 2}\begin{bmatrix} 2s+1 & 2 \\ s-2 & s-3 \end{bmatrix}$$

Q5) a) Develop the Pade approximation for multivariable systems in frequency domain. **[12]**

b) Develop the simplified models using continued fraction expansions forms. **[13]**

Q6) Explain the techniques of singular value Decomposion along with its properties. **[25]**

Total No. of Questions : 6]

SEAT No. :

P1553

[Total No. of Pages : 2

[4265]-619

M.E. (Electrical) (Power System)

DIGITAL POWER SYSTEM PROTECTION

(2008 Course) (Elective - III(a)) (Semester - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer any Two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Draw and explain block diagram of numerical relay. **[10]**

b) State sampling theorem and explain its importance. **[5]**

c) Draw flow chart of numerical overcurrent protection. **[10]**

Q2) a) Explain digital protection scheme based upon fundamental signal. **[10]**

b) Explain different fault location schemes in connection with travelling wave relays. **[10]**

c) Compare distance relays with overcurrent relays. **[5]**

Q3) a) 'Injection of subsynchronous component can protect synchronous generator' - Explain. **[13]**

b) Explain second harmonic current injection method. **[12]**

SECTION - II

Q4) a) In digital protection of transformer, explain the phenomena of **[15]**

i) Magnetizing inrush current.

ii) Overvoltage inrush current.

b) Explain Gas - actuated relay. **[10]**

P.T.O.

Q5) a) Explain three - zone distance relay. **[13]**

b) Explain distance relay setting. **[12]**

Q6) a) Derive fundamental algorithm for S.C. studies. **[13]**

b) Explain and derive equations for transformation to symmetrical components. **[12]**

Total No. of Questions : 6]

SEAT No. :

P1554

[Total No. of Pages : 2

[4265]-624

M.E. (Electrical) (Power Electronics & Drives)

MODELING AND ANALYSIS OF ELECTRICAL MACHINES

(2008 Course) (Semester - I)

Time :3 Hours] *[Max. Marks :100*

Instruction to the candidates :

Solve any two full questions from each section.

SECTION - I

Q1) a) With necessary sketches, explain the conceptual representation of primitive machine and draw the primitive machine diagrams for : **[12]**

i) Poly phase induction machine

ii) DC compound machine

b) Obtain the expression for electrical torque of the primitive machine. Show that no torque is produced by interaction between the flux and current on the same axis. **[13]**

Q2) a) Explain 'Invariance of power' as applied to linear transformations in electrical machines. Illustrate the answer by giving an example of transformation. **[11]**

b) Derive the transformation matrix for currents between rotating axis (α, β, 0) to stationary axis (d, q, 0). **[14]**

Q3) a) With necessary sketches of response graphs, explain the dynamic response of 3 phase induction motor for sudden changes in load torque & speed. **[12]**

b) A three-phase induction motor has following parameters referred to stator: **[13]**

Stator resistance per phase : 0.31Ω

Rotor resistance per phase : 0.42Ω

Stator and rotor leakage reactance per phase : 3Ω each

Magnetising reactance : 35Ω

P.T.O.

Calculate the above parameters for its equivalent 2-phase induction motor if its per phase winding turns are :

i) same as that of 3-phase induction motor

ii) 3/2 times that of 3-phase induction motor.

SECTION - II

Q4) a) Explain how Park's transformation theory transform the equations from (a, b, c) variables to (d, q, 0) variables. **[14]**

b) A 3 phase, 50 Hz cylindrical synchronous machine has the following parameters: **[11]**

Self inductance for phase = 2.9 mH.
Armature leakage inductance = 0.296 mH

Calculate the mutual inductance between armature phase and its synchronous reactance.

Q5) a) Starting from the impendence matrix of 3 phase salient-pole synchronous machine, derive the expression for the instantaneous electromagnetic torque. Identify & explain the significance of various terms in the torque expression. **[12]**

b) From the generalized mathematical model of polyphase induction machine, derive the steady state voltage equations in phasor form and steady state torque. Comment on various torque terms in the generalized torque expression. **[13]**

Q6) a) Write short notes on theory of small displacement stability and typical Eigen values of induction machine. **[12]**

b) From the basic dynamic model of induction machine, develop the Linearised machine equations. **[13]**

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Total No. of Questions : 6]

SEAT No. :

P1557

[Total No. of Pages : 2

[4265]-632

M.E. (Electrical) (Power Electronics & Drives)

CONTROLLED ELECTRICAL DRIVES

(2008 Course) (Semester - II)

Time :3 Hours] *[Max. Marks :100*

Instruction to the candidates :

Solve any two full questions from each section.

SECTION - I

Q1) a) Explain with neat sketches, speed control of dc series motor by using single phase fully controlled bridge converter. Write the expression for average output current of converter for both continuous and discontinuous mode of operation. **[12]**

b) A separately excited dc motor: 125 hp. 600V, 1800 rpm is controlled by a 3 phase full-converter and is operated from 415V, 50 Hz supply. The rated armature current of motor is 175 A. The motor parameters are Ra = 0.087Ω, La = 6.5 mH and $K_a\phi$ = 0.33 V/rpm. **[13]**

i) Find no-load speeds at firing angles $\alpha = 0^\circ$ and $\alpha = 30^\circ$, assuming that at no load the armature current is 10% of the rated current and is continuous.

ii) Find firing angle to obtain rated speed at 1800 rpm at rated motor current and also determine supply power factor.

Q2) a) Discuss on the design of values of capacitor and inductor used in voltage commutation circuit for chopper fed dc drive. **[12]**

b) The speed of separately excited dc motor is controlled by a chopper. The dc supply voltage is 120V, armature resistance is 0.5Ω, armature circuit inductance is La = 20mH and motor constant is K_a = 0.33 V/rpm. The motor drives a constant-torque load requiring an average armature current of 20 A. Assume that motor current is continuous. **[13]**

Determine:

i) the range of speed control

ii) the range of duty cycle α

P.T.O.

Q3) a) Discuss the effect of voltage variation on induction motor performance by ac voltage controllers. **[12]**

b) Draw the speed control schematic block diagram for CSI fed induction motor. Give the comparison of VSI and CSI fed drives. **[13]**

SECTION - II

Q4) a) With necessary sketches, explain the Principle of field oriented control of Induction motor and dc motor analogy. **[11]**

b) What is direct vector control? Discuss and derive the flux vector estimation using machine voltages and currents. **[14]**

Q5) a) Draw necessary diagrams and explain the construction, principle of operation and the performance of Switched reluctance motor. **[12]**

b) Discuss vector control principle of permanent magnet synchronous machine. Using the phasor diagram explain field weakening control. **[13]**

Q6) a) Derive the transfer function $G(s) = \frac{Va(s)}{\theta(s)}$, for the separately excited dc motor with armature voltage as the input and speed $\left(\frac{d\theta}{dt}\right)$ as the output. Assume necessary constants required in the mathematical model. **[15]**

b) Write short note on Phase Locked Loop (PLL) control. **[10]**

Total No. of Questions : 8]

SEAT No. :

P1566

[Total No. of Pages : 2

[4265] - 658

M.E. (E & TC) (VLSI & Embedded Systems)

ANALOG AND DIGITAL CMOS IC DESIGN

(2008 Course) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) How does MOSFET act as switch? How to ensure it in saturation/diode operation region? **[8]**

b) Explore current sink/source. How to improve its output resistance? **[8]**

Q2) a) Design current sink for 10μA and R_{OUT} = 1MΩ. Assume suitable data. **[8]**

b) Design current mirror for current ratio of 2. Assume suitable data. **[8]**

Q3) a) What is need of voltage/current references? Explore temperature independent current reference. **[8]**

b) Carry out large signal analysis of differential amplifier. Derive the expressions for ranges of output voltage and ICMR. **[8]**

Q4) Write short notes on any three : **[18]**

a) Cascode configuration; its merits and demerits.

b) Voltage reference ckts and their performance parameters.

c) Push pull inverter.

d) Current source load differential amplifier.

SECTION - II

Q5) a) Explain differential output opamp and its characteristics. **[8]**

b) What are the techniques of low power opamp design? Explore any one in detail. **[8]**

P.T.O.

Q6) a) List dominant types of noise in opamp design. What are the techniques to minimize them? **[8]**

b) What are different technology scaling? Explain any one in detail. **[8]**

Q7) a) Draw FSM diagram and write VHDL code for 8 bit password Moore sequence detector machine. Assume suitable data. **[8]**

b) Design CMOS logic for $Y = ABC + \overline{D} + E(F + \overline{G})$. **[8]**

Q8) Write short notes on <u>any three</u> : **[18]**

a) Constraints in lowering V_{DD}.

b) Dynamic dissipation and power delay product.

c) Materials and techniques for ultra fast circuits.

d) Hazards.

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Total No. of Questions : 8]

SEAT No. :

P1573

[Total No. of Pages : 4

[4265] - 677

M.E. (E & TC) (Signal Processing)

LINEAR ALGEBRA AND RANDOM PROCESSES

(2008 Course) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) ***Answer three questions from section-I and three questions from section-II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Show that Matrix $A=\begin{bmatrix} 1 & 0 & -4 \\ 0 & 5 & 4 \\ -4 & 4 & 3 \end{bmatrix}$ satisfies Caley Hamiton theorem.

Also determine the characteristic roots and corresponding characteristic vectors of matrix A. **[8]**

b) Show that the vectors $X_1 = [1, 2, -1, 0]$, $X_2 = [1, 3, 1, 2]$, $X_3 = [4, 2, 1, 0]$, $X_4 = [6, 1, 0, 1]$ form a linearly independent system. **[4]**

c) Prove that every orthonormal set of vectors is linearly independent. **[4]**

Q2) a) Examine for consistency and if consistence then solve it. **[6]**

$$2x_1 + x_2 - 5x_3 + x_4 = 8$$
$$x_1 + 3x_2 - 6x_4 = -15$$
$$2x_2 - x_3 + 2x_4 = -5$$
$$x_1 + 4x_2 - 7x_3 + 6x_4 = 0$$

b) Find the Rank of following matrix. **[6]**

i) $\begin{bmatrix} 1 & 2 & -1 & 3 \\ 3 & 4 & 0 & -1 \\ -1 & 0 & -2 & 7 \end{bmatrix}$ ii) $\begin{bmatrix} 1 & 2 & 3 & 4 \\ 2 & 1 & 4 & 3 \\ 3 & 0 & 5 & -10 \end{bmatrix}$

P.T.O.

c) If A is non-singular, prove that eigen values of A^{-1} are the reciprocals of the eigen values of A. **[4]**

Q3) a) Find the inverse of the matrix. **[6]**

$$A=\begin{bmatrix}9 & 7 & 3\\ 5 & -1 & 4\\ 3 & 5 & 1\end{bmatrix}$$

b) Find non-singular matrices P & Q such that PAQ is in normal form. Hence find the rank of A & also find A^{-1}. **[6]**

$$A=\begin{bmatrix}2 & -2 & 3\\ 3 & -1 & 2\\ 1 & 2 & -1\end{bmatrix}$$

c) Show that if A is an orthogonal matrix the A^1 & A^{-1} are also orthogonal matrices. **[4]**

Q4) a) Prove that **[6]**

$$\Delta=\begin{vmatrix}(b+c)^2 & a^2 & a^2\\ b^2 & (c+a)^2 & b^2\\ c^2 & c^2 & (a+b^2)\end{vmatrix}=2abc(a+b+c)^3$$

b) For the given Toeplitz matrix prove that inverse of a Toeplitz matrix is not in general Toeplitz. **[6]**

$$A=\begin{bmatrix}1 & 3 & 5\\ 2 & 1 & 3\\ 4 & 2 & 1\end{bmatrix}_{3\times 3}$$

c) Prove that the characteristic roots of a Hermitian matrix are real. **[6]**

SECTION - II

Q5) a) State and explain Bay's Rule for conditional probability. Based on the Bay's Rule, illustrate condition for statistical independence of two random events 'A' & 'B'. **[5]**

b) Each letter of word "ATTRACT" is written on a separate card. The cards are then thoroughly shuffled and four cards are drawn in succession. Determine the probability of getting following results. **[5]**

i) TACS ii) TACT

c) The random variable "X" denotes the time in milliseconds until the main server connects to your PC and random variable "Y" denotes the time in milliseconds until the main server authorises the PC as valid user. Joint probability density function is given as

$f(X, Y) = 6 \times 10^{-6} \exp - [0.001\ X + 0.002\ Y]$

Assuming both X & Y are measured from the same reference X = Y = 0 and X < Y always holds true, determine :

i) Marginal density functions for X and Y.

ii) Probability of Y > 2000 milliseconds. **[8]**

Q6) a) Cumulative distribution function of discrete random variable 'z' is given as

$$F_z(z) = \sum_{n=1}^{12} \frac{n^2}{650} \cup (z - n)$$

where $0 < z \leq 12$

Determine following probabilities.

i) Prob ($z > 4$) ii) Prob ($6 < z < 9$)

iii) Prob ($-\infty < z < 6.5$). **[6]**

b) Define and explain the meaning of mean and variance of random variable. Derive the relation between mean, variance and second central moment of the random variable. **[4]**

c) Random variable 'q' has the probability density function given by : **[6]**

$$f(q) = \frac{3}{32}\ [8q - q^2 - 12] \text{ for } 2 < q < 6 = 0 \quad \text{otherwise}$$

calculate the mean value of Random Variable 'q'.

Q7) a) Explain the meaning of terms joint probability density and marginal probability functions for two random variables. State the relationship between the two functions. **[4]**

b) The joint probability function is given as $f(X, Y) = C\ (X + Y)$ where both X & Y are discrete variables taking values 1, 2 or 3 & C is constant determine values of

i) Constant 'C' ii) Mean of X, iii) Variance 'X' **[6]**

c) A random variable 'z' is uniformly distributed over the interval $[-5 \rightarrow 15]$.

Another variable 'y' is defined as $y = \exp - (0.2\ z)$.

Determine the probability density function and mean value of variable 'y'. **[6]**

Q8) a) Explain the terms Autocorrelation and autocovariance for a random process and derive the relation between the two. **[5]**

b) Explain the meaning of terms, fully stationary process, wide sense stationary process and ergodic process. **[5]**

c) A quad combiner signal processor is shown in Fig.1. Assuming that signals received in all the four paths to be statistically independent Gaussian random signals, with zero mean and variances as $\sigma_1^2 = \sigma_2^2 = 4.0$ and $\sigma_3^2 = \sigma_4^2 = 1.0$ determine the relationship between the gain parameters g_1 & g_2 which minimises the variance of output signal $y(t)$. **[6]**

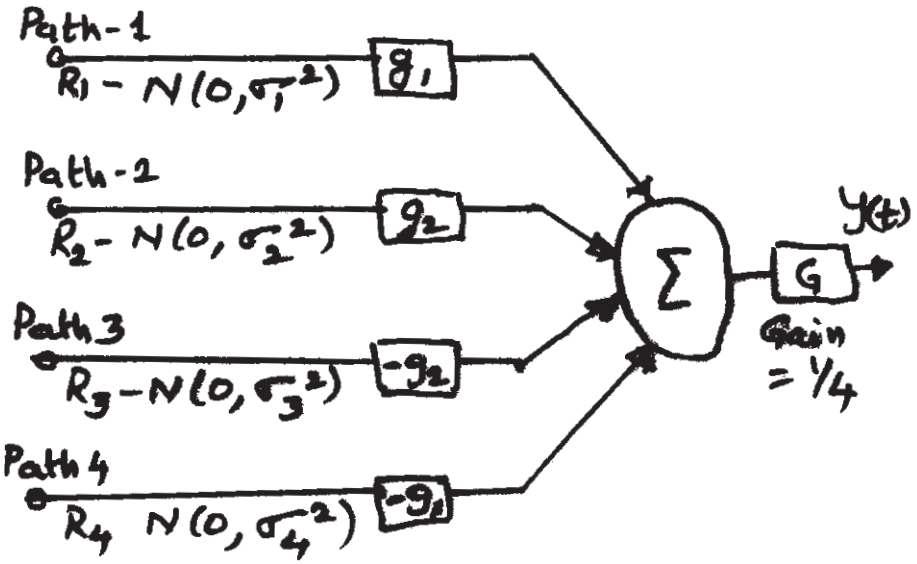

Fig – 1

Total No. of Questions : 8]

SEAT No. :

P1580

[Total No. of Pages : 2

[4265] - 695

M.E. (Electronics) (Digital Systems)

SIGNAL PROCESSING ARCHITECTURE

(2008 Course) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Use of scientific calculator is allowed.***
4) ***Assume suitable data wherever required.***
5) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Compare the decimation in time FFT algorithm with decimation in frequency FFT algorithm. How many iterations of FFT algorithm are required to find 128 point DFT? **[8]**

b) What is the use of double buffering for real time linear filtering? Explain the overlap and save algorithm to implement real time filtering. **[10]**

Q2) a) Why the ideal LPF can not be realized? What is the effect of truncating the Fourier series? Compare the performance of different window functions. **[8]**

b) Explain the frequency sampling method for design of FIR filter. Write a procedure to find the filter coefficients. **[8]**

Q3) a) What is parallel processing? How parallel processing improves the throughput of the system? Explain the use of folding transformation. **[8]**

b) What is effect of quantization of filter coefficients? What is product round of error? **[8]**

Q4) a) What are the properties of orthogonal basis matrix? Draw the basis matrix for 4 point DFT computation. **[8]**

b) Explain the mapping between S domain and Z domain for impulse invariant method for design of IIR filter design? **[8]**

P.T.O.

SECTION - II

Q5) a) Explain constant relative bandwidth property of wavelet transform? How will you resolve the closely spaced low frequency and closely spaced high frequency components using wavelet transform? **[8]**

b) What is short time Fourier transform (STFT)? Can you analyze the time variations in the signal using STFT? **[8]**

Q6) a) Explain the booth multiplier algorithm for multiplication of 4 with -3. **[8]**

b) What is super Harvard architecture? Explain the use of each block in the super Harvard architecture. **[8]**

Q7) a) What is a sampling rate converter? Explain the function of each block. How will you design a filter for I/D = 2/3. **[8]**

b) Explain a implementation of poly phase interpolator. Explain how the multiplication with zeros is avoided using a poly phase structure? **[10]**

Q8) a) What is a multiple access memory? Explain the use of circular buffering for FIR filter implementation. **[8]**

b) Explain the multistage filter design. What is the advantage of using multiple stages? **[8]**

Total No. of Questions : 8]

SEAT No. :

P1583

[Total No. of Pages : 2

[4265] - 702

M.E. (Electronics) (Digital Systems)

EMBEDDED SYSTEMS

(2008 Course) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, wherever necessary.***

SECTION - I

Q1) a) Explain the common design metrics for embedded system. **[8]**

b) Explain clearly difference between CPLD, FPGA, ASIC. Describe the IDE tools for developing system using above devices. **[10]**

Q2) a) With the help of suitable block diagram, describe the architecture of ARM 7 core processor. **[10]**

b) How 5 stage pipeline of ARM 9 improves performance as compared to 3 stage pipeline in ARM 7 processor? **[6]**

Q3) a) Which are the different interrupts in ARM processors? How they are handled? **[8]**

b) Explain 12C bus protocol and its features. **[8]**

Q4) a) What is IEEE 802.11 protocol? Explain the data transfer using this protocol. **[8]**

b) Draw a schematic arrangement for a typical CAN network containing a master and number of slaves. Explain the process of data transfer amongst them. **[8]**

SECTION - II

Q5) a) How does debuggers and emulators help in testing and debugging assembly language program and systems? **[8]**

b) Describe development cycle of Embedded system? Describe different development tools used in Embedded system. **[8]**

P.T.O.

Q6) a) Explain the need of scheduler. What are different methods of scheduling? Explain preemptive and non preemptive scheduling in detail. **[8]**

b) Explain Rate Monotonic Analysis (RMA) in scheduling. **[8]**

Q7) a) With suitable example, explain how shared data problem occurs when interrupt comes. How it can be overcome using semaphores? **[8]**

b) Explain the memory management functions of RTOS. **[8]**

Q8) a) What are the features of μCOS-II. Explain the following with respect to μCOS-II. **[10]**

i) Time related functions

ii) Mutex.

b) With suitable example explain inter process communication (IPC) using mailbox/queue in RTOS? **[8]**

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Total No. of Questions : 8]

SEAT No. :

P1588

[Total No. of Pages : 2

[4265]-710

M.E. (Electronics) (Digital System)

DIGITAL SIGNAL COMPRESSION

(2008 Course) (Semester - II) (Elective - IV (C))

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Consider a source emitting 5 letters with the probabilities given as $P(a_1) = P(a_2) = 0.1$, $P(a_3) = 0.4$, $P(a_4) = P(a_5) = 0.2$. Find the Huffman code for each alphabet and find average value of the code length. Also find minimum variance Huffman code for the same source. **[10]**

b) Explain what is meant by rate distortion bound. **[8]**

Q2) a) What is streaming audio? What are it's desirable features? Explain the use of MIDI. **[8]**

b) Explain speech compression using LPC. Is it a lossy compression? Explain any one method to isolate voiced and unvoiced speech segments? **[8]**

Q3) a) Explain the advantages of DPCM. Can we use prediction in DPCM? Explain it's working. How forward adaptive quantization can be used. **[8]**

b) Explain the effect of variance mismatch on the performance of a uniform quantizer. Plot SNR Vs ratio of input to design variance. **[8]**

Q4) a) What are the advantages of ADPCM over PCM? Explain with block schematic. **[8]**

b) Draw the block diagram of lossy predictive coding system and explain the same neatly. **[8]**

P.T.O.

SECTION - II

Q5) a) Consider output of the wavelet decomposition as a 4×4 matrix with 4 rows specified as [26, 6, 13, 10], [–7, 7, 6, 4], [4, –4, 4, –3] and [2, –2, –2, 0]. Find the EZW code. **[12]**

b) Explain the concept of JPEG standard in detail. **[6]**

Q6) a) Explain image coding for video compression? How a motion vector is detected. **[8]**

b) Explain any one motion estimation algorithm. **[8]**

Q7) a) Explain multiresolution analysis in Wavelet. **[8]**

b) Explain properties of Haar Wavelet. Explain the method of decomposition using Haar Wavelet. What are the advantages of using Wavelet. **[8]**

Q8) a) Explain the meaning of perfect reconstruction filters. Why perfect reconstruction is desirable. Explain image compression using coding of DCT coefficients. **[8]**

b) Explain different video formats. **[8]**

Total No. of Questions : 8]

SEAT No. :

P1589

[Total No. of Pages : 3

[4265] - 712

M.E. (E/TC) (Communication Networks)

MODELLING AND SIMULATION OF COMMUNICATION NETWORKS

(2008 Course) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answer to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain how simulation helps in performance studies of the following types of communication systems. **[10]**

i) Analytically tractable system.
ii) Analytically tedious system.
iii) Analytically intractable system.

b) What are the aspects for selection of sampling frequency for a simulation? **[8]**

Q2) a) Elaborate various methodologies used in mapping a problem into a simulation model. **[8]**

b) What is s up sampling and down sampling? Illustrate these concepts with reference to simulation of a communication system. **[8]**

Q3) a) What is direct component and quadrature component of a signal? Hence determine direct component $x_d(t)$ and quadrature component $x_q(t)$ for an angle modulated signal defined by

$x(t) = 10 \cos [2\pi (1000)t + 2\sin(2\pi(200)t)]$. **[6]**

b) Why is it necessary to generate random numbers of desired pdf in simulation of communication system? What are the various techniques to test random number generators? **[10]**

Compare and contrast the following algorithms

i) Scatter plots
ii) Minimum Standards algorithm

P.T.O.

Q4) a) What are the different mechanisms used to test performance of a communication system? Describe the situations when one will choose a particular performance estimation procedure based on the data generated by simulation process. **[8]**

b) What are uncorrelated and correlated Gaussian numbers? Why do we need them in system simulation? Explain any two techniques to generate correlated Gaussian numbers in detail. **[8]**

SECTION - II

Q5) a) What are PN sequence generators? Why do we need them? What are the components of a PN sequence generator? What are properties of a PN sequence? **[6]**

b) Write an algorithm for simple Monte Carlo simulation for $\pi/4$ DQPSK. Assuming AWGN channel, Data symbols at source output are independent and equally probable and No pulse shaping performed at transmitter. **[10]**

Q6) a) What is semi analytic simulation technique? Hence write an algorithm for semi analytic BER estimation for QPSK. **[8]**

b) Derive the LPE model for the nonlinearity $y(t) = |x(t)|$. **[8]**

Q7) a) What are the categories of a communication channel? Elaborate multipath fading channel. What are the various specifications to be considered while simulating a radio channel? **[8]**

b) Write an algorithm to simulate the BER performance of a QPSK system operating over a fixed 3 - ray multipath channel with AWGN, and compare the BER performance with an identical system operating over an ideal AWGN channel (no multipath). In order to simplify the simulation model assume :

- The channel has three paths consisting of an unfaded LOS path and two Rayleigh components. The received power levels associated with each path and the differential delays between the three paths, are simulation parameters.
- The Rayleigh fading in the channel affects only the amplitude of the transmitted signal. The instantaneous phase is not affected.
- The magnitude of the attenuation of each multipath component is constant over a symbol interval and has independent values over adjacent intervals (no Doppler spectral shaping required).

No transmitter filtering is used and the receiver model is an ideal integrate-and-dump receiver. **[10]**

Q8) a) What is tapped delay line model for LTV system? How various tap gains are generated? **[8]**

b) What are the different techniques used to reduce run-time of the Monte Carlo method? How pdf estimators are used to overcome lengthy run-time requirements of the Monte Carlo method? Hence explain importance sampling. **[8]**

Total No. of Questions : 10]

SEAT No. :

P1591

[Total No. of Pages : 4

[4265]-728

M.E. (Production)

MATHEMATICS AND STATISTICS

(2008 Course) (Semester - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer any three questions from Section I and three questions from Section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of Non-programmable electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Determine constant b such that $u = e^{bx} \cos 5y$ is harmonic. Find its conjugate harmonic. **[6]**

b) If $f(z)$ is analytic, show that **[5]**

$$\left[\frac{\partial}{\partial x}|f|\right]^2 + \left[\frac{\partial}{\partial y}|f|\right]^2 = [f']^2$$

c) Find the Taylor's series expansion of $f(z) = \dfrac{1}{z^2 - z - 6}$ about **[6]**

i) $z = -1$ ii) $z = 1$.

Q2) a) Find the Bilinear transformation which maps the points 0, 1, ∞ from z-plane on to the points -1, $-i$, 1 of w-plane. **[5]**

b) Evaluate $\oint_c |z|^2 \, dz$ around the square with vertices at (0, 0), (1, 0), (1, 1), (0, 1). **[6]**

c) Using Cauchy's residue theorem evaluate $\displaystyle\int_0^{2\pi} \frac{d\theta}{3 - 2\cos\theta + \sin\theta}$. **[5]**

P.T.O.

Q3) a) Find the values of $u(x, t)$ satisfying the parabolic equation $\frac{\partial u}{\partial t} = 2\frac{\partial^2 u}{\partial x^2}$ subject to the boundary conditions $u(0, t) = 10$, $u(6, t) = 18$ and $u(x, 0) = x^2$ with $h = 1$ and $t = \frac{1}{8}j$, $j = 0, 1, ...8$

$x = i$, $i = 0, 1, ... 5$ by explicit method. $\left(\text{take } \lambda = \frac{1}{4}\right)$ **[9]**

b) Evaluate the pivotal for $\frac{1}{2}$ period of vibration by solving

$25\frac{\partial^2 u}{\partial x^2} = \frac{\partial^2 u}{\partial t^2}$; $u(0, t) = 0$, $u(5, t) = 0$

$u(x,0) = 2x \qquad 0 \le x \le 5/2$

$\qquad = 10 - 2x \quad 5/2 \le x \le 5$ by taking $h = 1, t = \frac{1}{5}$ **[8]**

Q4) a) Solve the Poisson equation **[8]**

$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = -36(x^3 + y^3 + 5)$ subject to the conditions $u = 0$ at $x = 0$ and $x = 1$.

$u = 0$ at $y = 0$ and $u = 1$ at $y = 1$ in $0 \le x \le 1$. Find the solution taking $h = 1/3$ with a square mesh.

b) Using Cauchy's Integral formula evaluate $F(z_0) = \int_c \frac{4z^2 + z + 5}{z - z_0}$ where c is the ellipse $\frac{x^2}{4} + \frac{y^2}{9} = 1$. Find the value of **[8]**

i) F(3.5)
ii) F(i)
iii) F'(–1)
iv) F''(–i)

Q5) a) Find the curves on which the functional $\int_0^{\pi/2}\left[\left(\frac{dy}{dx}\right)^2 - y^2 + 2xy\right]dx$ with $y(0) = 0$ and $y(\pi/2) = 0$ can be extremised. **[8]**

b) Find the extermals of the functional $\int_0^{\pi/2}\left[\left(\frac{d^2y}{dx^2}\right)^2 - y^2 + x^2\right]dx$ that satisfies the conditions $y(0) = 1, y'(0) = 0,\ y(\pi/2) = 0,\ y'(\pi/2) = -1$. **[8]**

SECTION - II

Q6) a) Prove that $J_{-n}(x) = (-1)^n J_n(x)$. **[5]**

b) Using recurrence relations, show that

$$J_n''(x) = J_{n-2}(x) - 2J_n(x) + J_{n+2}(x).$$ **[5]**

c) Let $P_n(x)$ be the Legendre Polynomial of degree *n,* show that for any function $f(x)$ for which the n^{th} derivative is continuous. **[6]**

$$\int_{-1}^{1} f(x)P_n(x)dx = \frac{(-1)^n}{2^n n!}\int_{-1}^{1}(x^2-1)^n f^n(x)dx.$$

Q7) a) At a service station a study was made over a period of 25 days to determine both the number of automobiles being brought in the service and the number of automobiles serviced, the results are given as below: **[8]**

No. of automobiles arriving for service or completing service per day.	Frequency of arrivals for service	Frequency of daily completion
0	2	3
1	4	2
2	10	12
3	5	3
4	3	4
5	1	1

Simulate arrival and service pattern for ten day period. Use the following random numbers.

For Arrivals : 09, 54, 42, 01, 80, 06, 06, 26, 57, 79

For Service : 11, 30, 18, 11, 85, 52, 63, 18, 29, 01

b) A controlled manufacturing process is 0.2% defective. What is the probability of taking 2 or more defective from a lot of 100 pieces? **[9]**

i) By using Binomial distribution.

ii) By using Poisson approximation.

Q8) a) In a large institution 2.28% of employees receive income below Rs. 4500/- and 15.87% of employees receive income above Rs. 7,500/- per month. Assuming the income follows normal distribution, find the Mean and Standard deviation of the distribution. **[6]**

b) Fit a Binomial distribution to the following distribution. **[5]**

x:	0	1	2	3	4	5
f:	3	12	21	30	25	9

c) Fit a Poisson distribution to the set of observations: **[5]**

x:	0	1	2	3	4	5
f:	20	16	11	7	4	2

Q9) a) The data given below are the number of defectives of 10 samples of size 200 each construct a P-chart and NP-chart and comment on the results. **[9]**

Sample No. :	1	2	3	4	5	6	7	8	9	10
No. of defectives :	15	12	4	26	15	9	17	9	14	17

b) In an experiment on immunization of cattle from tuberculosis the following results were obtained : **[8]**

	Affected	Not Affected
Inoculated :	12	26
Non-inoculated :	16	06

Calculate χ^2 and discuss the effect of vaccine in controlling susceptibility to tuberculosis. (5% value of χ^2 for one degree of freedom = 3.84)

Q10) a) Find the Mean recurrence time for each state of the following Markov chain. **[8]**

$$P = \begin{bmatrix} 0.5 & 0.3 & 0.2 \\ 0.2 & 0.4 & 0.4 \\ 0.1 & 0.5 & 0.4 \end{bmatrix}$$

b) A student tries to be punctual for the classes. If he is late on a day he is 90 percent sure to be on time next day. Similarly, if he is on time then there is a 30 percent chance that he will be late on the next day. How often in the long run is he expected to be late for the class. (Hint: Use Markov chain). **[8]**

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Total No. of Questions : 10]

SEAT No. :

P1593

[Total No. of Pages : 2

[4265] - 730
M.E. (Production Engg.)
ADVANCED MANUFACTURING PROCESSES
(2008 Course) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Use non-programmable electronic calculators is allowed.***

SECTION - I

Q1) a) Explain the considerations in pouring/injecting the molten metal during casting. **[6]**

b) With suitable explain elements of gating system. Also state the design considerations of the gating system. **[10]**

Q2) a) Explain solidification mechanism in fusion zone. **[8]**

b) Discuss the methods of nondestructive testing methods of welds. **[8]**

Q3) a) Explain the phenomenon of welding distortion. Also state the methods to control welding distorsion. **[8]**

b) Explain the methods to relieve welding stresses. **[8]**

Q4) a) Explain the stages of EDM action with block diagram alongwith the scheme of EDM process in single discharge condition. **[8]**

b) Discuss the lasing materials with laser classification and their relationships. **[8]**

Q5) Write short note on following (any three) : **[18]**

a) Principle of operation of ECM.

b) Nano-Technology.

c) Vaccum Coating.

d) Mould filling defects in casting.

P.T.O.

SECTION - II

Q6) a) Explain with typical stress strain curves for slow strain rates and impact rates w.r.t. change in temperature from room temperature to intermediate to high temperature. **[8]**

b) Explain the upper bound analysis in material forming. **[8]**

Q7) a) Explain the process of peen forming alongwith advantages and disadvantages. **[8]**

b) How the process of High Velocity extrusion process is carried out? **[8]**

Q8) a) Explain the characteristic features of high energy rate forming. **[8]**

b) Explain the various process parameters of High Speed hot forging. **[8]**

Q9) a) What is meant by redrawing? Explain the process of redrawing with suitable sketch. **[8]**

b) Explain complex stamping process carried out in sheet metal forming. **[8]**

Q10) Write short notes on (any three) : **[18]**

a) Fine Blanking.

b) Electromagnetic Forming.

c) Plastic anisotropy.

d) Stretch forming.

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Total No. of Questions : 10]

SEAT No. :

P1597

[Total No. of Pages : 2

[4265]-750
M.E. (Production) (CAD/CAM)
COMPUTER AIDED DESIGN
(2008 Course) (Semester - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Attempt any Three from each section.***
2) ***Figures to the right indicate full marks.***
3) ***Draw neat self-explanatory sketches wherever required.***
4) ***Use of nonprogrammable pocket calculators is allowed.***
5) ***Assume suitable data, if necessary.***
6) ***Answers to the two sections should be written in separate answer books.***

SECTION - I

Q1) a) Describe briefly the various data exchange systems currently in use. **[8]**

b) Explain the role of Quality Function deployment in product design. **[8]**

Q2) a) Find the transformed co-ordinates when a square (1, 1), (1, 2), (2, 2) & (1, 2) is rotated by 65° anticlockwise about a line passing through one of its vertex (1, 1) & another arbitrary point (3, 4). **[8]**

b) What is rendering? What are the different stages of rendering an image? **[8]**

Q3) a) Derive generalised transformation matrix to mirror an object about an arbitrary line $y = x + 30$. **[8]**

A triangle ABC has vertices A(1, 1), B(2, 1) & C(2, 3). It is to be rotated by an angle of 60° anticlockwise direction about arbitrary point P(3, 2)

b) Determine : **[8]**

i) The composit transformation matrix.

ii) The co-ordinate of transformed triangle.

Q4) a) Four position vectors P1[0, 0], P2[1, 1], P3[2, –1] &P4[3, 0] are given with tangent vectors $P1'$ [1, 1] and $P2'$ [1, 1]. Determine the piecewise cubic spline curve through them. **[8]**

P.T.O.

b) Write the mathematical representation, application & limitations of the following surfaces. **[8]**

i) Spherical surfaces.
ii) Composite surface.

Q5) Write short notes (any three) : **[18]**

a) Manipulation techniques used in spline.

b) CAD-CAM product cycle.

c) Wire frame modelling.

d) Computer configuration for CAD application.

SECTION - II

Q6) a) Explain the detailed syntax (with modifiers) & uses of the 'measure' command. **[8]**

b) What is Z-buffer algorithm for B-REP & CSG models? **[8]**

Q7) a) What are the different techniques used to decide assembling sequences to generate assemblies. **[8]**

b) What is conventional animation & what are the different steps used in conventional animation in creating an animated film? **[8]**

Q8) a) Describe the generation process of sphere using cylinder as a primitive & torus using other natural quadics. **[8]**

b) Explain the basic fundamentals of solid modelling representation of any CAD software. **[8]**

Q9) a) Why Euler's formula is used in solid modelling? Verify it for a tetrahedron & a cube. Draw an arbitrary solid object & ascertain its validity using Euler's generalised rule. **[8]**

b) Explain the procedure of mass property calculations in CAD-software. **[8]**

Q10) Write short notes (any three) : **[18]**

a) Types of Animation.

b) Shading Algorithms.

c) Parametric Programming.

d) Virtual realism.

✷ ✷ ✷

Total No. of Questions : 8]

SEAT No. :

P1600

[Total No. of Pages : 2

[4265] - 773

M.E. (Computer) (Computer Networks)

EMERGING TRENDS IN COMPUTER ARCHITECTURE

(2008 Course) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain Parallel computer models : **[12]**

i) SMP

ii) MPP

iii) DSM

iv) COW/CLUMP

b) Give key characteristics of scalable parallel computers. **[4]**

Q2) a) Give the structure of the CPS-packet and CPS-PDU in AAL (ATM Layer). **[6]**

b) Give an ATM Cell-Header Format. **[4]**

c) Give description of PARAM 10000 with Multiple PARAMNet Switches. **[6]**

Q3) a) Explain thread Mixing technique for two threads with Control Flow Graph in multithreading of any type. **[8]**

b) Give the comparison of shared memory and message passing machines. **[8]**

Q4) Write short notes on (any three) :

a) Cell switching in an ATM network. **[6]**

b) Common architectures for SMP and CC_NUMA systems. **[6]**

c) Centralized Disk System. **[6]**

d) M-to-N K -block-cyclic communication. **[6]**

e) A shared medium switch architecture. **[6]**

P.T.O.

SECTION - II

Q5) a) Explain Impact of Gigabit Over Copper. **[4]**

b) Give the advantages and disadvantages of SAN. **[6]**

c) Discuss features and challenges Cluster of Computers. **[6]**

Q6) a) Explain a high level the grid security requirements with grid security model. **[10]**

b) Describe Data store with respect to following points in Grid Computing. **[6]**

i) Mirroring.

ii) Data replication.

iii) Parallel processing.

Q7) a) Write down any parallel sorting program (take any sorting e.g. Quicksort, Mergsort, bubble sort, or their cousins e.g. Bitonic Mergesort, Hyper Quicksort) in any language. **[12]**

b) How one can Compiling, Running and Debugging OpenMP Code. **[4]**

Q8) Give short notes on <u>any three</u> of following topics. **[3 × 6 = 18]**

a) SAN connectivity components.

b) Bridges and gateways, Arbitrated loop hubs, Switched hubs of SAN.

c) Hyper-cubes in MPS.

d) Collective communication in MPI.

e) Standards for Grid Environment.

Total No. of Questions : 8]

SEAT No. :

P1601

[Total No. of Pages : 2

[4265] - 774

M.E. (Computer Engg. & Computer Network)

PRINCIPLES AND PRACTICES FOR IT MANAGEMENT

(2008 Course) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) What is strategy and strategic management? Explain different types of strategies that affect the development of a business. How does strategic management offer competitive advantage to the business. **[8]**

b) Explain risk management process and types of risks applicable to your project if you are an IT project manager. How will you minimize the risks? **[8]**

Q2) a) Explain the research steps to be performed which give rise to the project plan. Why is it necessary to have a contingency plan? **[8]**

b) You are the project manager for upgradation of software laboratory in a college. The requirements are as below : **[8]**

i) Batch of students using the laboratory is to be increased from 15 to 50.

ii) Database server is required to cater to all the clients.

Assuming clients are standalone machines currently, prepare a project proposal for the above with emphasis on estimation, feasibility and implementation plan. Assume any other relevant data if necessary.

Q3) a) Explain the various elements of project plan. Why additional subsidiary plans are needed? **[8]**

b) You are the project manager of an application development project. Your project has a BAC of $ 550,000 and is expected to last one year. As of now your project is 25% complete but it should actually be 40% complete. Due to some incidents early on, you've already spent $ 225,000 for your project budget. For this scenario, calculate earned value, schedule variance, cost performance index, variance at completion and to complete performance index. **[5]**

P.T.O.

c) Write a note on formal process for tracking progress. **[3]**

Q4) a) How WBS helps the project manager? **[5]**

b) As a project manager, you are required to interview potential team members. What selection criteria would you consider? What kind of questions would you ask and why? **[5]**

c) Explain with example, how will you build a PND and analyse it to calculate different types of slack. What help it will provide you as project manager. **[8]**

SECTION - II

Q5) a) Write the difference between six sigma and CMMI. And explain when and how to use these standards in project. **[8]**

b) Write down concept of employee welfare related to IT industries by taking any well known multinational company in India as a case study. **[8]**

Q6) a) Explain the decision making process in the team decisions. **[4]**

b) What skills are essential to become good project manager. **[4]**

c) What methods do you use to resolve disagreements among team members? **[4]**

d) Comment on energy audit. **[4]**

Q7) a) Difference between trademark and copyright. Write two examples of both in IT. **[6]**

b) Write software patent filling process in India. **[6]**

c) Comment on the facebook cyber laws in India. **[4]**

Q8) Write short notes on (any three) : **[18]**

a) Development of MIS Data for ministary of agriculture for your state.

b) Data processing project for weather forecasting.

c) MIS for five-star hotel management.

d) Application of IT in courier services.

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Total No. of Questions : 8]

SEAT No. :

P1614

[Total No. of Pages : 4

[4265]-805

M.E. (Chemical)

APPLIED STATISTICS FOR CHEMICAL ENGINEERS

(2008 Course) (Semester - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer three questions from Section I and three questions from Section II.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) The following table gives experimental data for certain observation. **[18]**

Variable	Frequency
0 - 10	12
10 - 20	16
20 - 30	26
30 - 40	38
40 - 50	22
50 - 60	15
60 - 70	7
70 - 80	4

a) Calculate the measures of central tendency - mean, mode, median.

b) Calculate the measures of dispersion - MD, SD, CoV; Variance.

c) Calculate Quartiles and Quartile deviation.

d) Calculate Bowley's Coefficient of Skewness - Comment on Skewness of the distribution.

Q2) a) From the following data of the wages of 50 workers of a factory compute the first four moments about mean (μ_1, μ_2, μ_3, μ_4) and also the values of β_1 and β_2. Comment on Kurtosis of the distribution. **[8]**

P.T.O.

Weekly wages	Number of workers
100 - 120	1
120 - 140	3
140 - 160	7
160 - 180	20
180 - 200	12
200 - 220	4
220 - 240	3

b) The following table gives wages earned by 100 workers of a factory. **[8]**

Weekly wages	Number of workers
100 - 200	12
200 - 300	16
300 - 400	25
400 - 500	14
500 - 600	13
600 - 700	12
700 - 800	10
800 - 900	6
900 - 1000	3
1000 - 1100	2
1100 - 1200	1

i) Calculate the quartiles Q_1, Q_2, Q_3 and interprete their values.

ii) Find absolute dispersion and QD.

iii) Find absolute measure of Skewness and comment on nature of Skewness.

Q3) a) Calculate Karl Pearson's Coefficient of Correlation between age (X) and playing habits (regular player - Y) from the data given below. Also calculate probable error and comment on the value. **[8]**

Age (X)	Number of students	Regular players (Y)
20	500	400
21	400	300
22	300	180
23	240	96
24	200	60
25	160	24

b) Ten competitors in a beauty contest are ranked by three judges in the following order. **[8]**

Judge - 1	Judge - 2	Judge - 3
1	3	6
6	5	4
5	8	9
10	4	8
3	7	1
2	10	2
4	2	3
9	1	10
7	6	5
8	9	7

i) Calculate the Spearman's rank correlation coefficients between Judge-1 and Judge-2, Judge-2 and Judge-3, Judge-1 and Judge-3.

ii) Compare these coefficients and determine which pair of judges has the nearest approach to common tastes in beauty.

Q4) a) From the following X-Y data calculate regression equations by taking deviations of X-series from 5 and Y series from 7. **[8]**

X	6	2	10	4	8
Y	9	11	5	8	7

b) For above X-Y data calculate the correlation coefficient. **[8]**

SECTION - II

Q5) a) What is statistical estimation? Explain the point and interval estimates used in practice. **[8]**

b) State the properties of a good estimator. **[8]**

Q6) a) A cubical die is thrown 9000 times and a throw of 3 or 4 is observed 3240 times. Show that the die can't be regarded as an unbiased one. Also find the extreme limits between which the probability of throw of 3 or 4 lies. (Take $Z_\alpha = 1.96$ at 5% LOS). **[4]**

b) In a simple random sample of 600 men taken from a big city 400 are found to be smokers. In another random sample of 900 men taken from another city 450 are smokers. Do the data indicate that there is a significant difference in the habit of smoking in the two cities.
(Take $Z_\alpha = 2.58$ at 1% LOS) **[4]**

c) An auto company decided to introduce a six cylinder car whose mean petrol consumption is claimed to be lower than that of the existing auto engine. It was found that the mean petrol consumption for the 50 cars was 10 km/lit with a SD of 3.5 km/lit. Test whether the claim that the new car petrol consumption is 9.5 km/lit on the average is acceptable.
(Take $Z_\alpha = 1.96$ at 5% LOS) **[4]**

d) A man buys 50 electric bulbs of company 'A' and 'B' each. He finds that the average life and SD of bulbs of company 'A' and 'B' are given in the following table :

Company	Average life	SD life
A	1500	60
B	1512	80

Test whether there is significant difference between in the mean life of the two makers of bulbs.
(Take $Z_\alpha = 2.58$ at 1% LOS). **[4]**

Q7) a) State and explain the tests used for testing significance of small samples. **[6]**

b) Two independent samples of sizes 8 & 7 contained the following values:

Sample 1 :	19	17	15	21	16	18	16	14
Sample 2 :	15	14	15	19	15	18	16	

Test whether difference between the means of samples 1 and 2 is significant (Take $Z_\alpha = 1.96$ at 5% LOS) (Use t - distribution). **[6]**

c) A sample of size 13 gave an estimated population variance 3, while another sample of size 15 gave an estimate of 2.5. Could both samples be from populations with same variance.
(Use F - test with $Z_\alpha = 1.96$). **[6]**

Q8) Write short notes on the following :

a) Latin square design of experiments. **[6]**

b) Transportation problem. **[5]**

c) Assignment problem. **[5]**

Total No. of Questions : 8]

SEAT No. :

P1617

[Total No. of Pages : 2

[4265]-828

M.E. (Chemical) (Environmental Engg.)

APPLIED STATISTICS FOR ENVIRONMENTAL ENGINEERS

(2008 Course) (Semester - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Discuss Spearman's Rank Correlation Coefficient. **[8]**

b) The mean weight loss of n = 16 grinding balls after a certain length of time in mill slurry is 3.42 grams with a standard deviation of 0.68 grams. Construct a 99% confidence interval for the true mean weight loss of such grinding balls under the stated condition. **[8]**

Q2) a) In view of measures of dispersion explain **[8]**

i) range
ii) mean deviation
iii) standard deviation

b) Explain how would you work out following statistical measures often used by researchers **[8]**

i) Coefficient of Variation.
ii) Coefficient of $r_{yx_2.x_1}$
iii) Regression equation of X and Y.

Q3) Explain in detail Correlation and Autocorrelation with examples and its plots. **[16]**

P.T.O.

Q4) Five hundred ball bearings have a mean weight of 5.02 OZ and a standard deviation of 0.30 OZ. Find the probability that a random sample of 100 ball bearings chosen from this group will have a combined weight (a) between 496 and 500 OZ (b) more than 510 OZ.

The sampling distribution of means,

$\mu_x = \mu = 5.02$ OZ **[18]**

SECTION - II

Q5) Explain Purposive Sampling, Random Sampling, Stratified Sampling and Systematic Sampling. **[16]**

Q6) An experiment was designed to study the performance of four different detergents. The following whiteness readings were obtained with specially designed equipment for 12 loads of washing distributed over three different models of washing machines:

	Machine 1	Machine 2	Machine 3	Totals
Detergent A	45	43	51	139
Detergent B	47	46	52	145
Detergent C	48	50	55	153
Detergent D	42	37	49	128
Totals	182	176	207	565

Looking on the detergents as a treatments and the machines as a blocks, obtain the appropriate analysis of variance table and test at the 0.01 level of significance whether there are differences in the detergents or in the washing machines. **[16]**

Q7) Write short notes on : **[18]**

a) Degeneracy in transportation problem.
b) The stepping - Stone method.
c) Optimality Test.

Q8) a) What are unbound solutions in Simplex method. **[8]**

b) The assignment cost of assigning any one operator to any one machine is given in the following table. **[8]**

		Operator			
		I	II	III	IV
Machine	A	10	5	13	15
	B	3	9	18	3
	C	10	7	3	2
	D	5	11	9	7

Find the optimal assignment.

Total No. of Questions : 8]

SEAT No. :

P1618

[Total No. of Pages : 2

[4265] - 843

M.E. (Chemical) (Environmental Engg.)

WATER QUALITY MODELING

(Elective - III (b)) (2008 Course) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain various steps involved in model building. **[6]**

b) State and explain curve number hydrology in water quality modeling. **[6]**

c) Write the sources of water pollution. **[6]**

Q2) Explain low frequency analysis in detail. **[16]**

Q3) a) Explain point and non point source with suitable example. **[8]**

b) What are the limitations of mathematical model, explain with example. **[8]**

Q4) Develop a model for Dissolved oxygen Sag analysis. **[16]**

P.T.O.

SECTION - II

Q5) A municipal wastewater having a BOD of 250 g/m^3 is to be treated by a two stage trickling filter. The desired effluent quality is 25 g/m^3 of BOD. If both of the filter depths are to be 1.83 m and the recirculation ratio is 2:1 Find the required filter diameter.

Data : Flowrate = 7570 m^3/d

Wastewater temperature = 20ºC

BOD removal in primary sedimentation = 35% $E_1 = E_2$. **[16]**

Q6) A river sample is put in a settling column. At two points in time, samples are taken at the sampling port, producing following results : **[16]**

at 0 day m_s = 20 mg/l

at 2 days, m_s = 15 mg/l

Determine the settling coefficient K_s.

Q7) Elaborate modeling treatment for complete mix reactor with reaction. State the modeling treatment process kinetics. **[18]**

Q8) a) Considering only mass balances, formulate a model for River water quality model (RWQM). **[10]**

b) State the objectives of RWQM. **[6]**

Total No. of Questions : 10]

SEAT No. :

P1619

[Total No. of Pages : 3

[4265]-847

M.E. (Petroleum)

NUMERICAL METHODS AND SIMULATION IN PETROLEUM ENGINEERING

(2008 Course) (Semester - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer 3 questions from Section I and 3 questions from Section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables, slide rule, electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Using Gauss Elimination Method solve following set of simultaneous equations : **[10]**

$x_1 - x_2 + 2x_3 = -8$

$2x_1 - 2x_2 + 3x_3 = -20$

$x_1 + x_2 + x_3 = -2$

b) Discuss the stepwise procedure for Gauss - Siedel method, provide a flow chart for the same. **[8]**

Q2) a) Obtain the characteristic polynomial and the eigenvalues of the following unsymmetric, real matrix : **[12]**

$$A = \begin{bmatrix} 0 & 2 & 3 \\ -10 & -1 & 2 \\ -2 & 4 & 7 \end{bmatrix}$$

Also obtain the eigen vectors, using Gauss elimination to solve the equations.

b) Can the following set of equations be solved, comment on it : **[4]**

$2.1x_1 + 3.7x_2 = 19.5$

$8.4x_1 + 14.8x_2 = 78$

P.T.O.

Q3) a) Solve using Newton-Raphson technique. **[8]**

$$F(x) = x - \frac{1}{3}e^{x}$$

b) With help of neat diagram explain Regula-falsi method of solving single variable nonlinear algebraic equation. **[4]**

c) Write the expression for multivariable Newton-Raphson technique. In this context highlight Jacobian matrix. **[4]**

Q4) a) Using Euler method solve the following ordinary differential equation: **[8]**

$$\frac{df}{dt} = t^2 + f \quad \text{Given: at } t = 0, f = 1$$

b) Name various methods used for solving partial differential equations. Discuss any of the method with help of mathematical expressions. **[8]**

Q5) a) Use Runge-Kutta method to solve following system at $t = 1.5$. **[10]**

$$\begin{bmatrix} y_1' \\ y_2' \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -5 & -2 \end{bmatrix} \begin{bmatrix} y_1 \\ y_2 \end{bmatrix}$$

Given that at t = 0, $y_1(0) = 2$ and $y_2(0) = -4$.

b) Show that velocity distribution inside a circular pipe can be represented by : **[6]**

$$\frac{u}{U} = 2\left(\frac{y}{\delta}\right) - \left(\frac{y}{\delta}\right)^2$$

Where symbols have their usual significances.
The ratio of $\delta/\delta^* = 3$.

SECTION - II

Q6) a) Name the various parameters/data which are very much essential for reservoir simulation - elaborate on their availability. **[6]**

b) What are black oil models? How do they differ from compositional models? **[6]**

c) Explain the IMPES mechanism to solve reservoir problems. **[6]**

Q7) a) Name four commercial reservoir simulators and discuss their advantages. **[6]**

b) Solve the following reservoir equation : **[10]**

$$\frac{\partial^2 u}{\partial t^2} = 4\frac{\partial^2 u}{\partial x^2}$$

Subject to the conditions

$u(0, t) = 0$

$u(4, t) = 0$

$u(x, 0) = x(4 - x)$

$$\frac{\partial u}{\partial t} = 0 \text{ at } t = 0$$

Taking $h = \Delta x = 1$ and $k = \Delta t = 0.5$,

Find the values of u upto $t = 1.5$

Q8) a) What are the key features of sophisticated numerical simulators? Discuss and elaborate how various challenges on computation front can be handled and bridged well with field data for actal petroleum field applications by modern day simulators. **[8]**

b) Develop Mass Balance and Momentum Balance equations for one dimensional flow through porous media. **[8]**

Q9) a) With help of neat diagram explain how advanced simulation techniques can be applied for Geothermal Reservoirs. **[8]**

b) Write a detailed note on History Matching Technique. In this context also highlight Regression Analysis. **[8]**

Q10) a) Formulate the mathematical expression along with the relevant boundary conditions for a cylindrical piece of oil saturated homogeneous porous matrix of length L whose three sides are bound by impermeable surfaces and the open end is exposed to an adjacent water formation. Draw neat diagram. **[8]**

b) Explain what do you mean by Integrated - Full – Field – Simulation. Discuss the pragmatic approach need to be adopted for actual field applications. Briefly explain the returns obtained. **[8]**

Total No. of Questions : 8]

SEAT No. :

P1620

[Total No. of Pages : 4

[4265] - 848
M.E. (Petroleum)
PETROLEUM RESERVOIR MANAGEMENT
(2008 Course) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) *Attempt any two questions from Section - I and from Section - II.*
2) *Answers to the two sections should be written in separate books.*
3) *Assume additional data if required.*
4) *Use of graph paper is allowed.*

SECTION - I

Q1) a) Create an overall workflow for the development of a static reservoir model. What is object based modeling? How is it useful in the mapping of Interwell region? **[15]**

b) Figure 1 shows a poroperm (K Vs Φ) cross plot for a carbonate reservoir (N = 87), all samples represent identical volumes. Treating them as the sample space, calculate the probabilities of each outcome of the following from figure along with appropriate explanation. **[10]**

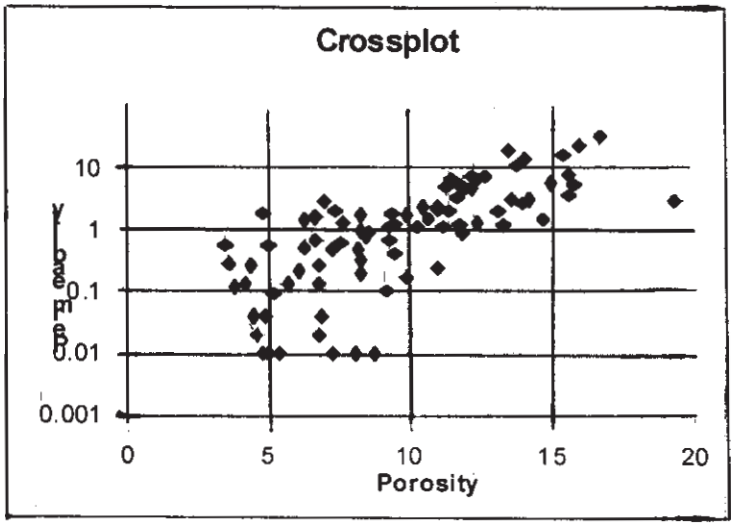


Figure 1 for Q.1.b.

(Assume net pay criterion of K≥1 and that a porosity cutoff is 10%)

P.T.O.

i) Probability of $K > 0.1$.

ii) Probability of $\Phi > 10\%$.

iii) Probability of $(K > 0.1) \cap (\Phi > 10\%)$.

iv) Probability of $(K > 0.1 / \Phi < 10\%)$.

v) Probability of $(0.1 < K < 1) \cap (5 < \Phi < 10)$.

OR

Q2) a) How is reservoir heterogeneity interpreted on different scales? Discuss with neat sketches. **[15]**

b) Name and describe the rock properties and reservoir characteristics that would be necessary to estimate original hydrocarbons in place. Define the 'recovery factor' of oil and gas. **[10]**

Q3) a) The table given below shows porosity values as per increasing depth in a vertical well. **[15]**

Sr. No.	Depth, m	Porosity, ϕ, (%)
1	1256	12.3
2	1257	13.2
3	1258	11.3
4	1259	8.2
5	1260	9.8
6	1261	9.5
7	1262	6.2

Generate semi-variogram for porosity as a function of lag distance. Interpret the graph using behavior of different parameters like sill, range, nugget value etc.

b) Explain Exponential Decline and Hyperbolic Decline models with suitable diagrams. **[10]**

OR

Q4) Answer **any five** of the following: **[25]**

a) Five important components of a petroleum system.

b) Effective permeability and relative permeability.

c) Hydraulic units or Flow units.

d) Net thickness and gross thickness of a formation.

e) Static and dynamic properties.

f) Porosity permeability relationship.

g) Stochastic modeling.

h) Reservoir drive mechanism.

i) Up scaling of reservoir properties.

SECTION - II

Q5) a) What is a mature field? What are the field challenges for the reservoir management of these fields? **[15]**

b) Describe commonly used flood patterns with their characteristics. What are the factors that influence the injector/producer pattern? **[10]**

OR

Q6) a) Explain the role of reservoir simulation in designing a water flood project, name at least five parameters related to water flooding that can be optimized by reservoir simulation. Why is a history match of primary production performance necessary in the study? **[15]**

b) Write a detailed note on History matching. **[10]**

Q7) a) Describe the factors to be considered in the selection process of potentially applicable enhanced oil recovery process for a given field. What are preferred oil viscosity ranges and depth limitations for applying different EOR methods? **[15]**

b) Write a detailed note on Role of horizontal wells in increasing reservoir recovery. **[10]**

OR

Q8) a) A detailed account of production history along with cost incurred during the project span is given in the following table. Oil price is assumed to be $ 75/bbl throughout the tenure of the project. **[20]**

All values for costs are in million dollars, and Oil production in millions of barrels annually.

Using given data, prepare a detailed spreadsheet showing gross revenue, royalty, net revenue, yearly total expenditure and net profit per year.

Royalty is 10% per year on annual production, which has to be paid with the beginning of commercial production.

Income tax is 30% of net profit.

Table : Economic evaluation data for the project

Year	Oil production MMbbl/Y	Capital cost ($ MM)	Operation cost ($ MM)	Production cost ($ MM)
1	0	15.125	----	----
2	0	60.750	----	----
3	5.6	120.50	4.345	12.225
4	11.2	3.975	10.900	22.260
5	5.6	----	19.500	12.982
6	2.1		12.500	5.200
7	1.05	----	11.500	2.765
8	1.2	----	12.500	2.450
9	2.7	-----	9.500	5.910
10	1.9	----	9.500	4.505
11	0.9	----	9.500	2.500
12	0.6	----	9.500	1.750
13	0.2	12.300	8.250	0.590

b) What is a Petroleum Fiscal System? **[5]**

Total No. of Questions : 8]

SEAT No. :

P1621

[Total No. of Pages : 3

[4265] - 849
M.E. (Petroleum)
HORIZONTAL MULTILATERAL AND INTELLIGENT WELLS
(2008 Course) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of graph paper is allowed.***
5) ***Figures to the right indicate full marks.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Discuss in brief primary and secondary method of well control in brief. **[8]**

b) It was desired to complete a well at 12,800 ft., using a 6.625 inch production casing. The pore-pressure and fracture gradient data are given in table below. Design a complete casing program for all casing shoe depths. Assume suitable safety margin and use graphical method. **[10]**

Depth (ft.)	Formation Pressure gradient (lbm/gal)	Fracture gradient (lbm/gal)
1,000	8.6	12.1
2,000	8.6	12.3
3,000	8.7	12.7
4,000	8.8	13.5
5,000	8.9	14.4
6,500	9.1	15.3
7,000	9.0	15.7
8,500	9.2	15.9
9,000	12.1	16.8
10,000	13.9	17.3
11,500	15.0	17.6
12,800	16.0	18.1

P.T.O.

Q2) It is desired to drill using a build, hold and drop trajectory. Horizontal departure to the target is 2,900 ft. at a TVD of 9830 ft. The recommended rate of build is 2.0°/100 ft. The kick off depth is 1780 ft. Determine, **[16]**

a) The radius of curvature, R_1.

b) The maximum inclination angle, θ.

c) The measured depth to the end of the build.

d) The total measured depth.

Q3) a) A drill string consist of 600 ft of 8.25" × 2-13/16' drill collar and rest is 5" drill pipe, 19.5 ppf grade X95 drill pipe. If required MOP is 100,000lb and mud weight is 10 ppg. Steel density = 489.5 ppf Buoyancy factor = 0.847. **[10]**

Calculate maximum depth of hole that can be drilled when,

i) Using new drill pipe P_t = 501, 090 lb.

ii) Using class 2 drill pipe having yield strength P_t = 394,000 lb.

b) Draw the sketches of various types of horizontal wells along with specifications. **[6]**

Q4) Write short notes on : **[16]**

a) Any two rheological properties of Drilling fluids.

b) Wellbore stability in Multilateral drilling.

c) Bit design.

d) Deflection tools.

SECTION - II

Q5) a) Explain GTO and its content for a typical horizontal well planning in brief. **[6]**

b) Given : Hole depth 2350 m, pump pressure 2220 psi, flow rate 600 gpm, ECD = 11 ppg, bit nozzle pressure drop 1032 psi, annular pressure loss = 44.3 psi is given for a wellbore. Find,

i) Original mud weight.

ii) Nozzle size. **[6]**

c) A slurry weighing 15.6 ppg., calculate percentage of water if slurry contains 10% salt. Absolute volume of salt is 0.0394 gal. One sack of class G cement weight = 94 lbs., absolute volume is 3.60 gallons., water weight = 8.33 ppg. **[6]**

Q6) a) Determine pump pressure for following hydraulic system. Also prove that, flow inside drill collar is turbulent and outside is laminar. Use the general critical velocity equation. Data given : **[12]**

i) Length of 5" D/P = 9813 ft,. ID = 4.276 inch.
ii) Length of 6.5" D/C = 273 ft ID = 2.815 inch.
iii) Well depth = 3100 m contains 9 5/8" casing up to 2300 m.
iv) PV = 6 CP, Yield point = 25 lB/100 ft^2.
v) Mud Density = 11 ppg. Flow rate = 430 gpm.
vi) Open hole size = 8.5 inch.
vii) Nozzle size = 13/32. Number of nozzles = 3.
viii) Surface equipment pressure loss = 30 psi.
ix) Pressure loss inside drill pipe and drill collar in psi = $(8.91 \times 10^{-5} \times \rho^{0.8} \times Q^{1.8} \times PV^{0.2} \times L) / D^{4.8}$
x) Annular pressure loss against drill pipe in cased hole is 280 psi and open hole is 80 psi.
xi) Annular pressure loss against drill collar = 21 psi.

b) Draw schematic sketch of any one type of bit. **[4]**

Q7) a) Plot burst load line, and collapse line check selected casing pipe with respect to collapse, Burst and tension for following data. **[12]**

Casing size = 9.625 inch, drift diameter = 8.55 inch, depth of casing is 9900 ft, maximum surface pressure = 6400 psi, fracture gradient at 9900 ft = 16.9 ppg, maximum anticipated mud weight = 13.2 ppg mud weight set = 10.8 ppg., cement top = 7100 ft from surface, cement slurry weight = 16.5 ppg., casing pipe selected as weight = 43.5 ppf, P110., burst pressure = 8750 psi,

Collapse pressure = 4450 psi. Take Buoyancy factor = 0.874.

b) Write important objectives of casing design. **[4]**

Q8) a) What is MWD? Explain MWD system along with various components of it and schematic sketch in brief. **[8]**

b) Write short note any two : **[8]**

i) Method to drill directional trajectory.
ii) Drilling cost calculations.
iii) Intelligent wells.

Total No. of Questions : 6]

SEAT No. :

P1622

[Total No. of Pages : 1

[4265] - 852

M.E. (Petroleum Engineering)

OIL AND GAS FIELD DEVELOPMENT

(2008 Course) (Sem. - I) (Elective - I (c))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer two questions from each section.***
2) ***Answers to the two sections must be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams should be drawn wherever necessary.***
5) ***Use of a non-programmable calculator is allowed.***
6) ***Assume suitable data if necessary and clearly state it.***

SECTION - I

Q1) Explain development of marginal oil field with case study. **[25]**

Q2) Explain IPR with mathematical equations. **[25]**

Q3) Explain drive mechanisms with suitable graphs and diagrams. **[25]**

SECTION - II

Q4) Explain GGS, CTF, CPF and associated SCADA. **[25]**

Q5) Explain life of a reservoir including EOR and IOR. **[25]**

Q6) Explain : **[25]**

a) Drainage area.
b) PVT properties.
c) Rock properties,
d) Completion techniques.
e) Formation damage.

Total No. of Questions : 8]

SEAT No. :

P1624

[Total No. of Pages : 2

[4265] - 855
M.E. (Petroleum)
WELL DESIGN & ENGINEERING
(2008 Course) (Elective - II (b)) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Q.No.1 and Q.No.5 are compulsory. Out of the remaining attempt two questions from Section - I and two questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of Mollier charts, non-programmable electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) What are the different types of casing pipes? Explain in detail typical Casing design program. **[18]**

Q2) a) What is well planning? Describe well planning objectives and procedure in brief. **[10]**

b) Discuss in brief Drill Stem Testing. **[6]**

Q3) a) Draw a typical layout for an offshore drilling. Indicate and explain various features of it. **[10]**

b) Write typical well completion procedure. **[6]**

Q4) Write a short note on: **[16]**

a) Bit design.

b) Types of wells.

c) Rig building.

d) API types of Cement.

P.T.O.

SECTION - II

Q5) a) Describe various factors to be considered in drilling cost estimation. **[10]**

b) Draw the generic nature of following graphs. **[8]**

i) Depth Vs ROP.

ii) Depth Vs Cumulative drilling time.

iii) Depth Vs trip time.

Q6) a) Draw the schematic sketch and explain the principle of each BHA. **[10]**

b) Discuss various reservoir parameters to be considered in the selection of well geometry. **[6]**

Q7) Write short note on: **[16]**

a) Types of horizontal wells.

b) Side tracking.

c) Mud hydraulics.

d) Planning for Well control.

Q8) Discuss in detail any one case study pertaining to well planning of directional well. Explain various factors to be considered, in the design and planning of this well. Write various equations and show graphs to justify the design. **[16]**

Total No. of Questions : 8]

SEAT No. :

P1625

[Total No. of Pages : 2

[4265] - 857
M.E. (Petroleum)
WELL CONTROL
(2008 Course) (Elective - II (d)) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of cm scale graph paper is allowed.***
5) ***Figures to the right indicate full marks.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain in detail reasons of well kick and blowout separately. **[12]**

b) What will be the difference in the height of water influx, oil influx and gas influx in well kick related calculations? Why? **[6]**

Q2) a) Explain primary well control, in brief. **[4]**

b) How the change in rheological properties of drilling fluid may affect it's functioning? **[4]**

c) Calculate : **[4]**

i) No. of sacks.

ii) Volume of water in bbl & in litrs., if 550ft. of 13 3/8" surface casing is to be set in 16" hole. The slurry yield is 1.15 cubic ft/sack & 65% excess is needed. The cement slurry weight is 14 ppg & requires 5.2 gal/sack of water. Cement is circulated to the surface. Capacity of the annulus to be cemented is 0.423 cubic ft/ft. Capacity 13 3/8" Casing is 0.144 bbl/ft.

d) Calculate reduction in bottom hole pressure if, while pulling out, driller forgot to fill the hole and 30 stands of drill pipes were pulled out dry. Well depth = 8600 ft. (TVD), Casing shoe depth = 5000 ft. (TVD). Mud weight = 17 ppg., Open hole capacity = 0.1482 bbl/ft. Casing capacity = 0.1611 bbl/ft., Drill pipe metal displacement = 0.0076 bbl/ft., Length of one stand = 93 ft. **[4]**

P.T.O.

Q3) a) Explain the design considerations for relief well. **[8]**

b) Draw and explain in brief, the generic nature of graph to indicate pressure variation across drill pipe and across the annulus due oil kick during well killing operation. **[8]**

Q4) Write short notes on: **[16]**

a) GTO and well control.

b) Well completion in high pressure zone.

c) Well kick through drill pipe.

d) Factors affecting ROP.

SECTION - II

Q5) On the basis of following points, describe in detail one case study of well control during application of multilateral or horizontal drilling technology for an onshore or offshore field development program. **[18]**

a) Reservoir complications.

b) Drilling tools and technique.

c) Drilling fluids used.

d) Mud selection, cement system.

e) Challenges involved.

f) Well completion strategy.

Q6) a) How to determine the type of influx during well kick? Explain. **[6]**

b) Write a note on: **[10]**

i) Fracture gradient calculation.

ii) Offshore safety.

Q7) a) Draw sketches and explain procedure of any one well control Method. **[10]**

b) A well is being drilled with 14 ppg mud. How much barite is required to increase the mud density to 15 ppg? **[6]**
Hole volume = 699 bbl. Surface volume = 200 bbl.
Barite density is 35.4 ppg.

Q8) Write short notes on: **[16]**

a) Sub-sea well control.

b) Types of BOP.

Total No. of Questions : 8]

SEAT No. :

P1629

[Total No. of Pages : 2

[4265] - 866
M.E. (Petroleum)
ADVANCED OFFSHORE TECHNOLOGY
(2008 Course) (Elective - IV (c)) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Q.No.1 and Q.No.7 are compulsory. Out of the remaining attempt two questions from Section - I and two questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of Mollier charts, non-programmable electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) List and explain the well design considerations for offshore drilling program. **[6]**

b) Discuss the step by step operational procedure for, 'drilling of hole to lower production casing'. **[12]**

Q2) a) How to decide casing setting depth? Explain. **[8]**

b) Write and explain mathematical equations to calculate wind, wave and current forces acting on offshore structures. Also discuss assumptions and parameters used in these equations. **[8]**

Q3) What is well Control? Describe working of lower marine riser pack in detail. Draw schematic sketch of typical subsea BOP stack with LMRP. **[16]**

Q4) a) Write short notes on: **[10]**

i) Heave compensator.

ii) Riser design.

b) Draw neat schematic sketch of a, typical offshore well completion system. **[6]**

P.T.O.

SECTION - II

Q5) What is station keeping? What are the methods and objectives of it? Explain Dynamic Positioning System in detail. **[16]**

Q6) a) What is well cementation? Explain primary well cementation programme for offshore well. **[8]**

b) Discuss types of wells drilled in offshore field development program. **[8]**

Q7) Write short notes on: **[18]**

a) Drilling fluids.

b) Fixed platforms.

c) Forces and motions acting on drillship.

Q8) a) Describe in detail well completion procedure in brief. **[8]**

b) Discuss design considerations for pipeline transportation of oil. **[8]**

Total No. of Questions : 8]

SEAT No. :

P1630

[Total No. of Pages : 2

[4265] - 870
M.E. (Information Technology)
ADVANCED OPERATING SYSTEMS
(2008 Course) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***

SECTION - I

Q1) a) Describe four distributed computing system models with the help of neat diagrams. **[8]**

b) Why are distributed computing systems gaining popularity? **[8]**

Q2) a) Discuss the relative advantages and disadvantages of using the NRNMB, NRMB, RMB and RNMB strategies in the design of a DSM system. **[10]**

b) Explain any two address space transfer mechanisms which are suitable for a process migration facility. **[8]**

Q3) a) State briefly the design and implementation issues of a DSM system. **[8]**

b) Explain the Bully and Ring election algorithms. Discuss the time complexity for both algorithms. **[8]**

Q4) a) Explain with the help of neat diagrams the different communication protocols for RPC. **[8]**

b) How does the Gifford Quorum based protocol handle the network partition problem and increase the availability of write operations at the expense of read operations? **[8]**

SECTION - II

Q5) a) Explain the desirable features of a good message passing system. **[8]**

b) Describe the system architecture of Amoeba. State in brief the design goals of Amoeba. **[8]**

P.T.O.

Q6) a) Explain the different issues involved in client server binding. **[8]**

b) Describe Ricart-Agrawala's algorithm for implementing mutual exclusion in a distributed environment. Discuss how this algorithm satisfies the critical section requirements. State the drawbacks of this algorithm. **[8]**

Q7) a) What are the differences between replication and caching? What are the advantages of replication of data in a distributed file system? **[8]**

b) State the desirable features of a good global scheduling algorithm. **[8]**

Q8) Write short notes (any three) : **[18]**

a) Logical clocks.

b) Fault tolerance.

c) Task assignment approach.

d) Thread synchronization in Mach.

Total No. of Questions : 10]

SEAT No. :

P1632

[Total No. of Pages : 2

[4265] - 874

M.E. (Information Technology)

INFORMATION ASSURANCE AND SECURITY

(Semester - I) (2008 Course) (Elective - II (a))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) List and explain various primitive operations are used in Blowfish? **[8]**

b) What is double DES and triple DES? What kind of attack on double DES makes it useless? **[10]**

Q2) a) What metrics are useful for Profile Based Intrusion Detection? **[8]**

b) What is differential and linear cryptanalysis? Explain the differential cryptanalysis attack. Also compare differential and linear cryptanalysis. **[8]**

Q3) a) Why security policies are important? How security can be achieved with the help of setting of the data integrity policy? **[8]**

b) Differentiate between the following terms: **[8]**

i) Confidentiality and authentication.
ii) Active and Passive attack.
iii) Known plain text attack and chosen plain text attack.
iv) Cryptography and steganography.

Q4) a) Consider information stored on your personal computer. For each of term listed, find an example and explain threat, threat agent, vulnerability, exposure, risk, attack and exploit. **[8]**

P.T.O.

b) Cryptographic hash functions are commonly used for storing passwords. Examples include etc/passwd (using crypt or MD5) and LDAP (using SHA 1) Why are encryption algorithms such as DES and AES not used for storing password. Explain. **[8]**

Q5) a) Explain the Diffie-Hellman Key Exchange. **[8]**

b) Discuss why encryption is the most resorted security tool. Explain the conventional encryption principles. **[8]**

SECTION - II

Q6) a) IPSec and IPv6 include equivalent security features such as key exchange, encapsulation, tunneling and encryption. Discuss the trade off between IPSec and IPv6. **[8]**

b) Write a short note on DOS attacks in Wireless Network. **[8]**

Q7) a) Distinguish between two modes of IPSec. Explain AH (Authentication Header) and ESP (Encapsulating Security Payload). **[8]**

b) What is difference between warm and virus? Explain micro virus. List three names of system threat and program threat. **[8]**

Q8) a) What are the different properties of Digital Signature? What requirement should a digital signature scheme satisfy? **[8]**

b) Name the symmetrical and asymmetrical cryptographic algorithms? Cryptographic hash functions are commonly used for storing passwords. Examples include /etc/passwd (using crypt or MD5) and LDAP (using SHA1). Why encryption algorithms such as DES or AES not used for storing passwords? **[10]**

Q9) a) Explain various web security threats in brief. **[8]**

b) Explain in brief following hacker's tools: **[8]**

i) Root-kits.
ii) Vulnerability Scanners.
iii) Port Scanners.
iv) Sniffers.

Q10) a) What is PGP? Explain with example the reasons for using PGP. **[8]**

b) What is need of VPN? How it can be implemented? **[8]**

Total No. of Questions : 10]

SEAT No. :

P1633

[Total No. of Pages : 3

[4265]-879

M.E. (Information Technology)

MANAGEMENT TRENDS IN INFORMATION TECHNOLOGY

(2008 Course) (Semester - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Solve any THREE questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the role played by IT infrastructure in Operational Control and Decision Support System in an organization. Give suitable examples. **[8]**

b) How the regulations, laws and standards that are common in the industry might impact IT projects? **[8]**

Q2) a) Write in detail Information Systems required in any manufacturing industry. How the information is shared by the various departments in order to process and generate the various reports for effective decision making? **[8]**

b) Development of a new deluxe version of a particular software product is being considered. The activities necessary for the completion of this project are listed in the table below along with their costs and completion times in weeks. **[8]**

Activity	Normal Time	Crash Time	Normal Cost	Crash Cost	Immediate Predecessor
A	4	3	2,000	2,600	-
B	2	1	2,200	2,800	A
C	3	3	500	500	A
D	8	4	2,300	2,600	A
E	6	3	900	1,200	B, D
F	3	2	3,000	4,200	C,E
G	4	2	1,400	2,000	F

P.T.O.

i) What is the project expected completion date?
ii) What is the total cost required for completing this project on normal time?
iii) If you wish to reduce the time required to complete this project by 1 week, which activity should be crashed, and how much will this increase the total cost?

Q3) a) What are different Software Project Cost Estimation methods used by Software industry? Explain any two methods in detail. **[9]**

b) In recent year, university has computerized its examination system by using various software applications. You as a software expert need to find out Risk involved in implementation and administration. Explain these risks involved giving suitable examples. **[9]**

Q4) a) Consider the development of an online portal for X class board examination. Explain the different ways of estimating the budget for the system. Prepare an excel sheet of the project budget. Explain the various techniques of keeping track of budgetary expenses. **[8]**

b) What is the need of change management? Explain in details change management procedure. **[8]**

Q5) a) "ABC company" own 100 cars for rent purpose. All cars are fitted with Satellite Tracking System (GPS). You as an expert, create a IS system for ABC car company's control room to keep track of whereabouts the rented cars. What IT infrastructure is needed for such GIS based system? Solve the problem with the help of necessary assumptions. **[8]**

b) Explain various factors considered while forming teams. What are the challenges in forming a team that includes people from different departments in your organization? **[8]**

SECTION - II

Q6) a) What are different SQA activities? Explain various attribute of quality. **[8]**

b) Explain different levels of testing. What are different types of system level testing? **[8]**

Q7) a) What are various strategies for Resolving Destructive Conflict? **[8]**

b) Compare traditional and modern view of conflict. Explain in detail the reasons that cause workplace conflicts and different ways to deal with conflict. **[8]**

Q8) a) Explain use of electronic records and digital signatures in Government and its agencies. **[8]**

b) Explain four forces that shape ethical conduct in an organization. **[8]**

Q9) a) What is the need of IS audit? Govt. of India planning to implement online voting system for any election of our country. As been an IT Auditor - Identify the possible threats and input control for such system. **[8]**

b) Explain use of IT Act 2000 in E-Commerce. **[8]**

Q10) Write short note on following (any three) : **[18]**

a) The Consumer Protection Act.

b) Six Sigma.

c) Conflict process.

d) Relevance of The Companies Act.

Total No. of Questions : 10]

SEAT No. :

P1634

[Total No. of Pages : 2

[4265] - 882

M.E. (Information Technology)

MOBILE COMPUTING AND M - COMMERCE

(2008 Course) (Elective - III (c)) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are the HLR and VLR? Describe HLR and VLR in Call Routing Roaming? **[8]**

b) Define functions performed within the following procedure **[8]**

i) Identification.

ii) Encryption and ciphering.

iii) Call Clearing.

iv) IMSI attach and detach.

v) Location Update.

Q2) a) Explain the term interference in the space, time, frequency and code domain. What are the countermeasures in SDMA, TDMA, FDMA and CDMA systems? **[8]**

b) Describe the GPRS architecture and protocols? How many of them already exist in GSM. **[8]**

Q3) a) What are various strengths of SMS? Explain all of them. Also state what are the applications areas where these strengths can be used? **[8]**

b) Discuss the tunneling and encapsulation in Mobile IP. **[8]**

P.T.O.

Q4) a) Describe 3G networks, how is a 3G network different from 2G networks? **[8]**

b) What is the major difference between the main functionality of mobile - originated messaging and GSM call-origination procedures? **[8]**

Q5) Write a short note on: **[18]**

a) EDGE.

b) Cell Splitting.

c) CDMA2000.

SECTION - II

Q6) a) What is Wi-Max? How it is different than Wi-Fi? **[8]**

b) What is Direct Sequence Spread Spectrum Technology? Explain how it works in the CDMA technology? **[10]**

Q7) a) Explain relation between GPRS / EDGE / 3G - GSM / 3G - CDMA and WAP. **[8]**

b) Differentiate between the functions of labels, tags and cards. How do smart cards, smart labels, smart tokens and RFID tags work, if they have no internal battery? **[8]**

Q8) a) Why does a mobile device take quality of service issues into account while computing? List the object models for application adaptation for the quality of service constraints. **[8]**

b) Show master-slave architecture in piconet of Bluetooth devices. What are the states in which a Bluetooth device can be found? **[8]**

Q9) a) Explain at least 4 emerging applications of m-commerce. **[8]**

b) Differentiate between the functions of labels, tags and cards. How do smart cards, smart labels, smart tokens and RFID tags work, if they have no internal battery? **[8]**

Q10) a) Explain UMTS system architecture. **[8]**

b) Explain the DECT system architecture and reference model, with the help of a suitable diagram. **[8]**

Total No. of Questions : 8]

SEAT No. :

P1635

[Total No. of Pages : 2

[4265]-909

M.E. (Instrumentation & Control) (Process Instru. & Biomedical Instru.)

TRANSDUCER DESIGN

(2008 Course) (Semester - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Write equation for deflection and strain of the diaphragm of a pressure transducer. The transducer should be clamped diaphragm type, employing stainless steel material. Following specifications are available. **[18]**

Pressure: 12 MPa

Young's Modulus: 210 GPa

Specific Gravity: $7.83 \times 10^{-3} kg/cm^3$

Poisson's Ratio: 0.285.

Calculate the radius of the diaphragm to obtain 1200 micro strain at above mentioned maximum pressure.

a) Determine deflection of diaphragm when pressure values are varied in steps of 3 MPa from 0 to 12 MPa.

b) The diaphragm type strain gauges are installed to obtain electrical output. The bridge excitation is 12 Volts DC. Find the electrical output of the bridge for pressures in steps of 3 MPa upto 12 MPa.

c) Calculate the natural resonant frequency of this transducer at 12 MPa with above specifications.

Q2) a) Explain the use of LDV for measuring velocity profile in wind tunnel. **[8]**

b) Describe LVDT displacement transducer with DC output. Discuss an IC AD 598 for this purpose. **[8]**

P.T.O.

Q3) For solar reflectors - plain and concentrating type- periodically the reflectivity is to be measured. Propose a suitable measuring system with emphasis on the sensor design. **[16]**

Q4) In building automation various sensors are installed to ensure safety. One of the parameters to be detected is "Smoke" for preventing fire hazard. Propose a suitable smoke detector, enclosure and its placement. Describe the working of the system proposed. **[16]**

SECTION - II

Q5) a) Discuss use of optical fiber transducers to measure. **[12]**

- Displacement.
- Vibration.
- Temperature.

b) Explain the sensors used for water pollution monitoring to measure turbidity and pH. **[6]**

Q6) a) Compare piezoelectric and MEMS accelerometer. **[8]**

b) Describe the working of force balance transducer. Discuss any two applications of the same transducer. **[8]**

Q7) In a bottling plant, gas filled containers are pushed over the conveyor. A seal is to be placed on the normally closed capped outlet of such a container. A temperature shrinkable sleeve is used to seal the capped outlet. Hot air is used for shrinking the sleeve sealing the outlet. Gas filled in containers is highly inflammable. Propose a sensor and monitoring system for hot air flow. **[16]**

Q8) Sound level measurement (around 100 decibel) is to be carried out during festivals and at a production unit, manufacturing "horns" for automobile industry. Describe a measuring transducer for the above application. Draw a schematic diagram of such a system and explain it highlighting the sensor.**[16]**

Total No. of Questions : 8]

SEAT No. :

P1636

[Total No. of Pages : 2

[4265]-912

M.E. (Instru. & Control) (Process Instru. Biomedical Instru.)

ANALYTICAL INSTRUMENTATION

(2008 Course) (Semester - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer three questions from Section I and three questions from Section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) With appropriate examples, discuss Classical and Instrumental chemical analysis. Also discuss advantages and disadvantages of both types of analysis. **[18]**

Q2) Explain with a block diagram working of a double beam UV – VIS Spectrophotometer. Also discuss what are the advantages and disadvantages of double beam instrument. **[16]**

Q3) Explain Atomic Emission Spectrometry with various types of excitations. And explain flame emission spectrometry. **[16]**

Q4) a) What is Auger Electron? Explain a Chemical Analytical method which is based on Auger electron detection. **[8]**

b) Explain with neat diagram working of GM Counter. **[8]**

SECTION - II

Q5) Explain with neat diagram working of Atomic Absorption Spectrometer. Also explain Sputtering in hollow cathode lamp. **[17]**

Q6) a) Explain working principle of HPLC with neat diagram. Also explain Sample introduction in HPLC. **[8]**

b) Write a note on "GC detectors". **[9]**

P.T.O.

Q7) Explain with neat diagram working of IR spectrophotometer. Why mirrors are preferred over lenses in IR spectrometry. **[16]**

Q8) What is Nuclear Magnetic Resonance? How it is helpful in chemical analysis? Also explain chemical shift and spin-spin coupling. **[16]**

Total No. of Questions : 6]

SEAT No. :

P1637

[Total No. of Pages : 3

[4265]-918

M.E. (Instru. & Control) (Process Instru. & Biomedical Instru.)

CONTROL SYSTEM DESIGN

(2008 Course) (Semester - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer any 2 questions from Section I and 2 questions from Section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Consider the system having the feedforward transfer function **[20]**

$$G(s) = \frac{4}{s(s+2)}$$

It is desired to modify the closed-loop poles so that an undamped natural frequency $\omega_n = 4$ rad/sec is obtained, without changing the value of the damping ratio, $\varsigma = 0.5$. Design a suitable compensator using Root Locus approach.

b) With an example explain the effect of addition of zero on the root locus. **[5]**

Q2) a) Design a controller for the following first order system :

$$G_p(s) = \frac{2e^{-2s}}{(6s+1)}$$

Using the direct synthesis approach, and given that the desired closed-loop behavior is :

$$G_{CL} = \frac{2e^{-2.5s}}{(5s+1)}$$

[Use first order pade approximation for approximation of delay time].**[10]**

P.T.O.

b)
$$\begin{bmatrix} y_1 \\ y_2 \\ y_3 \end{bmatrix} = \begin{bmatrix} \frac{2e^{-3.2s}}{7.5s+1} & \frac{-0.51e^{-2.3s}}{12s+1} & \frac{-0.009e^{-s}}{9.8s+1} \\ \frac{1.17e^{-7.5s}}{4.5s+1} & \frac{-3.5e^{-2.5s}}{6s+1} & \frac{-0.018e^{-1.2s}}{8.9s+1} \\ \frac{34.28e^{-9.6s}}{9.5s+1} & \frac{49.7e^{-8.5s}}{11.6s+1} & \frac{0.87e^{-1.5s}}{8.8s+1} \end{bmatrix} \begin{bmatrix} u_1 \\ u_2 \\ u_3 \end{bmatrix}$$

Find the RGA for the given system. **[15]**

Q3) Consider a unity feedback system has forward path transfer function. **[25]**

$$G(s) = \frac{K}{s(s+7)}$$

Design a digital control scheme for the system to meet the following specifications :

a) $K_v \geq 11$

b) Peak overshoot $\leq 25\%$

c) Settling time $\leq$ 2.5 Sec

SECTION - II

Q4) a) State and explain concept of controllability. Determine the state controllability of the system. **[10]**

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 3 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 0 & 1 \\ 1 & 0 \\ 0 & 1 \end{bmatrix} u$$

b) Consider a system with state space model. **[15]**

$$\begin{bmatrix} x_1(k+1) \\ x_2(k+1) \\ x_3(k+1) \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -0.7 & -0.15 & -0.8 \end{bmatrix} \begin{bmatrix} x_1(k) \\ x_2(k) \\ x_3(k) \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u(k)$$

Design a state feedback controller using Ackerman's formula such that closed closed-loop poles are at $z_1 = -0.9$, $z_2 = -0.5$, $z_3 = -0.8$.

Q5) a) A control system represented by the following state and output equations

$$\dot{x}_1 = -5x_1 + x_2$$
$$\dot{x}_2 = -3x_2 + u$$

and
$$y = x_1$$

Design observer gain vector such that observer poles are located at $s_1 = -8$ and $s_2 = -11$. **[16]**

b) Explain the design procedure of minimum order state observer. **[9]**

Q6) a) A control system represented by the following state equations

$$\dot{X} = Ax + Bu$$

where

$$A = \begin{bmatrix} 1 & 2 \\ 0 & -5 \end{bmatrix},\ B = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$$

The performance index J is given by

$$J = \int_0^{\infty} (x^T Q x + u^T R u) dt$$

where

$$Q = \begin{bmatrix} 2 & 0 \\ 0 & 2 \end{bmatrix},\ R = [1]$$

Determine the optimal feedback gain matrix K. **[20]**

b) Write a short note on IMC. **[5]**

Total No. of Questions : 8]

SEAT No. :

P1638

[Total No. of Pages : 2

[4265] - 920

M.E. (Instrumentation & Control) (Process & Biomedical Instru.)

ADVANCED SIGNAL PROCESSING

(2008 Course) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) ***Solve any three questions from each Section.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) Explain the need of time frequency analysis? Compare DFT and STFT? **[8]**

b) Explain in brief Multirate filtering applications. **[8]**

Q2) a) Explain Winger distribution. **[8]**

b) Write a short note on Time-Frequency Distribution? **[8]**

Q3) a) Discuss spectral factorization in random process. **[8]**

b) Write short note on models of stochastic processes? Explain any one in detail. **[10]**

Q4) a) Discuss need and applications for power spectrum estimation. **[8]**

b) Explain periodogramm-based non parametric method for spectral estimation. **[8]**

SECTION - II

Q5) a) Explain RMS algorithm for adaptive filters. **[8]**

b) Explain in detail any one application of homomorphic system for convolution. **[8]**

Q6) a) Explain the term Cepstrum? Explain the properties of the Cepstrum. **[8]**

b) Explain QMF filter banks. **[8]**

Q7) a) What is Multiresolution Signal Analysis? Compare STFT and Wavelet transform? Explain in brief signal analysis and synthesis using wavelet transform. **[10]**

b) Explain in brief any one video compression standard? **[6]**

P.T.O.

Q8) a) Explain the theory of sub band decomposition. **[9]**

b) Explain in brief digital broad casting and multimedia systems? **[9]**

Total No. of Questions : 6]

SEAT No. :

P1654

[Total No. of Pages : 3

[4265] - 37
M.E. (Civil) (Structures)
STRUCTURAL DYNAMICS
(2002 Course)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections must be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

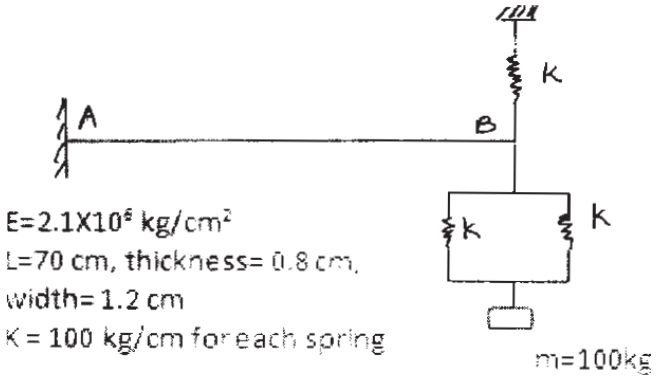
Q1) a) What is meant by Dynamic loading? Explain with examples different types of dynamic loads? **[5]**

b) Describe the concept of mathematical modeling with their components used for a vibrating system? **[5]**

c) What are different methods of vibration analysis? Obtain expression for the amplitude and phase angle of a mass 'm' suspended with a spring of stiffness 'k'. **[5]**

d) A single storey RC building has roof mass 100 t supported on four columns of c/s 400 × 200 mm made of M40 grade concrete. Determine the natural frequency and time period if one of the column is hinged at both ends while others are fixed. Assume floor height 4 m. **[10]**

Q2) a) Determine the spring constant and frequency in cps of the system shown in figure 2.1. **[7]**



P.T.O.

b) What is logarithmic decrement for un-damped free vibratory system? Prove that $\delta = 1/n \ln (x_n/x_{n+1})$ **[8]**

c) In a single degree damped vibrating system, a suspended mass of 8 kg makes 30 oscillations in 18 seconds. The amplitude decreases to 0.25 of the initial value after 5 seconds. Determine : **[10]**

i) Stiffness of the spring.

ii) Logarithmic decrement.

iii) Damping factor.

iv) Damping coefficient.

Q3) a) Obtain general solution for harmonic vibrations of un-damped forced SDOF system? What is magnification factor and its significance? **[8]**

b) What is transmissibility? A machine having mass 100 kg and supported on springs of total stiffness 8×10^5 N/m experiences a disturbing force of 400 N at a speed of 300 rpm. Assuming damping ratio 0.25, determine-

i) Amplitude of motion due to un-balance.

ii) Transmissibility.

iii) Transmitted force. **[10]**

c) Explain Linear Acceleration method for non-linear analysis by step by step method? **[7]**

SECTION - II

Q4) a) Prove that mode shapes are orthogonal in terms of mass and stiffness? **[7]**

b) Determine natural frequency and mode shapes of two storey shear frame having mass and stiffness of first storey 1.5 times that of 2^{nd} storey and equal storey heights. **[8]**

c) Using Duhamal's Integral, determine response of an un-damped system to a rectangular pulse force of magnitude 'Fo' and time 'T'. **[10]**

Q5) a) In a continuous system, derive the equation of free vibrations of uniform shear beam. **[10]**

b) Explain three DOF systems as MDOF and write in matrix form the equation of motion. Hence determine the natural frequencies and mode shapes assuming mass and stiffness of ground storey equal to twice that of first and second storey. **[15]**

Q6) Write notes on (any five) : **[25]**

a) Stodola Method of Analysis.

b) Wilson Theta Method.

c) Finite Element Techniques in Vibration Problems.

d) Rayleigh Method for Frequency in Fundamental Mode.

e) Coupled and Un-coupled MDOF system.

f) Tuned Mass Dampers.

g) Mode Super position technique.

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Total No. of Questions : 8]

SEAT No. :

P1656

[Total No. of Pages : 2

[4265]-47
M.E. (Mechanical) (Heat Power)
ADVANCED FLUID MECHANICS
(2002 Course)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***

SECTION - I

Q1) a) Define particle derivative; derive expression for $\frac{D\vec{v}}{Dt}$, also write components of acceleration vector in cartesian co-ordinates. **[10]**

b) State RTT and explain its significance. **[6]**

Q2) a) State concept of infinitesimal control volume. By using this concept derive continuity equation for compressible fluid. **[10]**

b) State divergence theorem and using same derive conservation of mass equation. **[6]**

Q3) Consider fully developed coutte flow between two infinite parallel plates separated by distance *h*, upward plate moves with velocity *v* and bottom plate is stationary. Pressure gradient act in X-direction and gravity in Z-direction. For this case.

a) Write assumptions made to derive following. **[6]**
b) Derive expression for pressure and velocity field. **[8]**
c) Draw velocity profile for this case. **[2]**

Q4) a) Define shear strain rate and derive expression for same in cartesian co-ordinate system. **[8]**

b) Define vorticity vector and derive in detail the relation between vorticity and angular velocity. **[10]**

P.T.O.

SECTION - II

Q5) a) Derive expression for speed at which infinitesmly small pressure wave travel through medium. **[8]**

b) Obtain an equation to express variation of fluid velocity with change in cross section area in differential form for isentropic compressible steady flow. **[8]**

Q6) a) Derive an expression for stagnation pressure with static pressure in terms of Mach number. **[8]**

b) In a steady isentropic flow of gas with specific heat ratio of 1.289 through varying cross section area duct. Take stagnation temperature as 200ºC and stagnation pressure as 1400 KPa. Find : **[8]**

i) Critical temperature;
ii) Critical pressure.

Q7) a) Consider the velocity distribution in boundary layer $\frac{u}{v} = 2\left(\frac{y}{\delta}\right) - \left(\frac{y}{\delta}\right)^2$ for this deduce following : **[10]**

i) Displacement thickness.
ii) Momentum thickness.
iii) Energy thickness.

b) Enlist and explain the assumptions made in boundary layer theory. **[6]**

Q8) a) Consider air flowing over flat plate 600 mm wide and 500 mm long with velocity 4m/s. Take velocity profile over plate as $\frac{u}{v} = \sin\left(\frac{\pi}{2}.\frac{y}{\delta}\right)$. Take density of air as 1.24 kg/m^3 and Kinematic viscosity of air as 0.15 $\times 10^{-14}$ m^2/s. Determine **[12]**

i) Thickness of boundary layer at the end of the plate.
ii) Shear stress at 0.2 m from leading edge.
iii) Drag force on one side of the plate.

b) State Stoke's law and explain its significance in relation with creeping flow over spherical object. **[6]**

Total No. of Questions : 8]

SEAT No. :

P1658

[Total No. of Pages : 2

[4265] - 52
M.E. (Mechanical) (Heat Power)
ADVANCED HEAT TRANSFER
(2002 Course)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***

SECTION - I

Q1) Derive generalized differential equation of heat conduction in three dimensional cartesian co-ordinate system and state cylinderical and spherical co-ordinate system. **[16]**

Q2) Define following terms in brief : **[16]**

a) Thermal diffusivity.

b) Critical thickness of Insulation.

c) Contact resistance.

d) Factor affecting thermal conductivity.

Q3) a) Write short notes on fin efficiency and fin effectiveness. **[8]**

b) A thermometric pocket is a hollow brass tube (k = 75 W/m deg.) having outer and inner diameter of 15mm of 10mm respectively. The pocket extends to 5cm depth from the wall of a 15cm diameter pipe which carries hot air, the heat transfer coefficient between the pocket and air is given by,

Nusselt Number (Nua) = $0.175\ (Re)^{0.62}$

Determine the error in temperature measurement. Take air temperature 160°C and pipe wall temperature 40°C; Re = 25000 and thermal conductivity 0.036 W/m-deg. **[8]**

Q4) Write short notes on the following : **[3 × 6]**

a) Heister and Grober charts.

b) Time constant of thermocouples.

c) Bi and Fo.

P.T.O.

SECTION - II

Q5) a) In a frustrum shape boiler furnace top diameter is 6m, bottom diameter 5m and height of 3m; top surface at 500ºC; bottom at 1000ºC with emissivity (for top and bottom) is 0.9. The inclined surface is refractory surface. Determine : **[10]**

i) Radiation heat transfer from bottom to top surface.
ii) Refractory surface temperature.

b) Prove that product of peak monochromatic wavelength and absolute temperature corresponding to it is equal to 2900 μmK. **[6]**

Q6) a) Consider a flat plate on which oil flows at a velocity of 0.1 m/s and at 25ºC. Plate is maintained at 95ºC and 4.5m long. Assume properties of oil as : $\rho = 956.8$ kg/m^3; $k = 0.213$ W/mºC $\alpha = 7.2 \times 10^{-8}$ m^2/s; $\gamma = 0.65 \times 10^{-4}$ m^2/s.

Determine :

i) Thermal and hydrodynamic boundary layer thickness on one side of plate.
ii) Total drag force per unit width on one side of plate.
iii) Local heat transfer coefficient at leading edge.
iv) Rate of heat transfer. **[8]**

b) Write significance of following : **[8]**

i) Stanton Number.
ii) Graetz Number.

Q7) a) A steam condenser water flows through the cylinder tubes at 65ºC while steam condensed at 75ºC. Tube diameter is 25mm and length 120cm. 16 tubes arranged in square array. Properties of water $\rho = 998$ kg/m^3; Cp = 4187 J/kg; $k = 0.668$ w/mK; $\gamma = 0.415 \times 10^{-6}$ m^2/s; $\beta = 5.7 \times 10^{-3}$/K; Latent heat of steam = 2300 kJ/kg : Determine :

Rate of condensation for vertical and horizontal tubes. **[8]**

b) Write short notes on : **[10]**

i) Factors affecting Nucleate Boiling.
ii) Regions in forced boiling.

Q8) a) Explain in brief : **[8]**

i) Reynolds analogy.
ii) Colburn analogy.

b) Draw flow pattern in Natural Convection : **[8]**

i) Heated horizontal and vertical cylinder.
ii) Cold vertical plate.
iii) Hot horizontal plate.

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Total No. of Questions : 10]

SEAT No. :

P1661

[Total No. of Pages : 3

[4265] - 193
M.E. (Production)
ADVANCED MACHINE TOOL DESIGN
(2002 Course)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section respectively.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Use of non-programmable electronic pocket calculator and statistical tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Discuss in brief how design considerations of ***feed gear box*** differ from ***speed gear box***. **[6]**

b) What is meant by a compound or compromise gear box? It has been decided to design a fourteen speed gearbox having speeds from 90 rpm to 3200 rpm, in two distinct ranges having 8 speeds at lower regime of working. Draw the compromise ray diagram and discuss any specific provision to be made on the intermediate shafts for obtaining a compact gear box. Give short sketches for additional provisions, if required to be made. **[10]**

Q2) a) Explain the method of increasing the range of regulation in modern machine tools. **[8]**

b) Deduce the mathematical equation for a cone-type friction variator in-order to obtain self-locking. **[8]**

Q3) a) Show any typical method of preloading a lead screw and the major considerations thereof. **[6]**

P.T.O.

b) Find out the specific pressure on a lead screw assuming a mild steel material being cut by HSS tool on a lathe machine using a depth of cut equal to 2 mm and a feed 0.2 mm/rev. Permissible intensity of pressure on the lead screw is 30 kg/cm^2. Weight of the carriage is 50 kg. And the coefficient of friction between the carriage and the guide is 0.20. Find out further, the errors in pitch of the lead screw arising out of the loading condition if the thread profile is trapezoidal type. Also determine the efficiency under

i) No lubrication and

ii) Lubrication having coefficient of kinetic viscosity = 0.0067 kg-sec/m^2 at a speed of 300 rpm.

The screw dimensions are :

Outside diameter = 70 mm Pitch (p) = 10

$D_{average}$ = 65 mm Depth of thread (t_2) = 5 mm

δ = average gap (average clearance) between the non-working surfaces of the thread profile of the screw and the nut = 0.182 mm.

$P_x : P_y : P_z$: : 0.25 : 0.40 : 1

Length of nut = 1.5 D_{av} = 97.5 mm. **[10]**

Q4) a) Give the comparative evaluation of machine tool structures on the basis of: **[8]**

i) Materials for machine tool structures.

ii) Static and dynamic stiffness.

iii) Profiles of machine tool structure.

b) Show that the rigidity of hydro-dynamically lubricated slides is always less than that of hydro-static slideways. **[8]**

Q5) Write short notes (**any three**): **[18]**

a) Composite guideways.

b) Dependence of process capability of machine tool on its rigidity

c) Dynamic analysis of stick-slip vibration in machine tools.

d) PIV drive.

SECTION - II

Q6) a) Discuss in detail the design procedure of a machine tool spindle. **[8]**

b) Explain the concept of static and dynamic rigidity of machine tool and state the procedure for estimating them. **[8]**

Q7) a) Discuss the factors affecting the stiffness of machine tool structure and methods of improvement. **[8]**

b) Analyze the forces acting on a knee - type milling machine during milling operation and explain the procedure of design of the milling machine column. **[8]**

Q8) a) Explain with neat sketches the methods of backlash (pitch error) adjustment in sliding friction power screws. How do these errors affect the performance of the machine tool? **[8]**

b) What do you understand by open and close type hydraulic circuits? Explain the factors used for selecting fluids for hydraulic system. **[8]**

Q9) a) What is meant by Retrofitting? Explain the essential characteristic features of a retrofitted machine tool. **[8]**

b) Explain with neat sketches the working principles of a shaft encoder using gray code and single disc radial transducer. **[8]**

Q10) Write short notes (**any three**): **[18]**

a) Dynamic acceptance tests of machine tools, as advocated by Tobias.

b) Electrical automatic control systems.

c) Adaptive gripper with pneumatic control.

d) Adaptive control system.

Total No. of Questions : 8]

P1662

SEAT No. :

[Total No. of Pages : 2

[4265] - 198
M.E. (Production)
PRECISION ENGINEERING
(2002 Course) (Elective - II (a))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section respectively.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Use of non-programmable electronic pocket calculator and statistical tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the general concept of accuracy of machine tool with neat sketches. **[8]**

b) Elaborate the significance of spindle rotation error for machine tools. **[8]**

Q2) a) Explain the concept of selective assembly principle in ball bearing manufacturing. **[8]**

b) Explain with neat sketch, procedure of calculating the clearance in journal bearings. **[8]**

Q3) a) Detail the chief roles of the microscope in applied metrology. State the significance of interchange and displacement measurement. **[8]**

b) Describe with suitable sketches the influence of machining parameters on surface roughness. **[8]**

P.T.O.

Q4) Write short notes on (any three) : **[18]**

a) Significance of traceability.

b) Precision angle measurement.

c) Clamping and setting errors.

d) Role of amplification in measurement.

SECTION - II

Q5) a) State the principles which govern the design of limit gauges giving examples of such gauges to check : **[8]**

i) Length

ii) Diameter

iii) Depth

iv) Distance between an internal and an external face

b) State the role of co-ordinate measuring machine (CMM) in the current industrial scenario. **[8]**

Q6) a) Explain the procedure of calculation of dependent tolerances on distance between centers of holes. **[8]**

b) Enumerate your thoughts on the merits and limitations of analog vs. digital measuring equipment. Give specific examples. **[8]**

Q7) a) Discuss the various sampling procedures. What role it plays in statistical analysis? **[8]**

b) Explain the need of micro-finishing processes in machining of metals and the inspection procedure adopted. **[8]**

Q8) a) Explain with a suitable example the inaccuracies due to thermal effects in precision machining. **[10]**

b) Write a short note on principle of constant location surfaces. **[8]**

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Total No. of Questions : 8]

SEAT No. :

P1664

[Total No. of Pages : 2

[4265]-412

M.E. (Civil) (Construction & Management)

CONSTRUCTION CONTRACTS ADMINISTRATION AND MANAGEMENT

(2008 Course) (Semester - II)

Time :4 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Attempt any three questions from Section - I and three questions from Section - II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, wherever necessary.***

SECTION - I

Q1) Explain various types of B.O.T contracts, their applications, advantages and limitations. **[18]**

Q2) With respect to the Indian Contract Act (1872) explain :-

a) Sequential actions necessary to form a valid contract. **[6]**

b) Valid excuses for non-performance. **[4]**

c) Provisions for compensation w.r.t additions, alterations, breach. **[6]**

Q3) a) A multistoreyed commercial complex is to be constructed on reclaimed soils after giving suitable foundation treatment. Estimated cost of work is 250 crores to be completed in 2 years. Draft suitable prequalifications to be put in the tender, in order to enable selection of a highly competant contractor. Make necessary, relevant assumptions as regards the above type of work. **[10]**

b) Explain how unbalanced bid and ring tender can be detected. **[6]**

P.T.O.

Q4) Explain the following :

a) Evaluated bid price and Assessed bid capacity. **[4]**

b) Price escalation - provisions in tender. **[4]**

c) Contract correspondence. **[4]**

d) Particular conditions of contract. **[4]**

SECTION - II

Q5) a) Explain with proper examples, why arbitration is considered as a semi-judicial process. **[4]**

b) Explain formation procedure as per Indian Arbitration and Conciliation Act (1996), for the arbitral tribunal. **[4]**

c) Discuss the ethics to be followed by the arbitrators. **[4]**

d) Explain following types of awards, their advantage/limitation. **[3 + 3]**

i) non-speaking award.

ii) speaking award.

Q6) a) Explain the various types of FIDIC documents and state when each one of them is used. **[6]**

b) Discuss the role of Engineer as expected from the FIDIC document. **[4]**

c) Discuss "force majeure" provisions made under FIDIC New Red Book. **[6]**

Q7) a) With examples, differentiate between **[6]**

i) Mediation and conciliation.

ii) DRB and arbitration.

b) Discuss advantages of DRB. **[4]**

c) Explain detail procedure for conduct of hearings as regards disputable issues under DRB. **[6]**

Q8) Explain the following :

a) Contract closure. **[4]**

b) Causes of construction claims. **[4]**

c) Priority of Contract documents. **[4]**

d) EPC type of contract. **[4]**

Total No. of Questions : 8]

SEAT No. :

P1672

[Total No. of Pages : 2

[4265]-476

M.E. (Civil) (Environmental Engineering)

AIR AND WATER QUALITY MODELING

(Semester - I) (2010 Course) (Elective - I (a))

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer any three questions from Section - I and Section - II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator and steam table is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the different steps in the development of a model. **[8]**

b) Explain advection, diffusion and dispersion with respect to transport of pollutant. **[10]**

Q2) a) Explain Streeter–Phelps equation of determining the pollutant concentration at down stream side. **[8]**

b) Write a note: Ground water quality modeling. **[8]**

Q3) a) Explain how waste load allocation is determined. **[8]**

b) What is the importance of stability of atmosphere in air quality modeling? **[8]**

Q4) a) Write a note–Plume behavior. **[8]**

b) Explain the importance of meteorological conditions in the dispersion of pollutants. **[8]**

SECTION - II

Q5) a) What are the assumptions in the Gaussian dispersion model? Explain. **[8]**

b) How do you assess the performance of the air quality model? Explain any four performance evaluation statistics. **[10]**

P.T.O.

Q6) a) Discuss the salient features of multiple cell models. **[8]**

b) What are different types of Air quality indices? How are they evaluated? What is the significance of extreme values? **[8]**

Q7) a) Explain the importance of water and air quality index in the modeling studies. **[8]**

b) Explain–Industrial and municipal effluent index. **[8]**

Q8) a) Explain the procedure for determination of air quality index. **[8]**

b) Explain National AQI. **[8]**

Total No. of Questions : 6]

SEAT No. :

P1673

[Total No. of Pages : 3

[4265] - 473

M.E. (Civil) (Environmental Engg.)

NUMERICAL METHODS AND APPLIED STATISTICS

(2010 Course) (Semester - I)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Solve the system of equations $x^2 + y^2 = 5$ and $x^2 - y^2 = 1$, using Newton. Raphson method (Assume $x_0 = 1$, $y_0 = 1$). **[8]**

b) Solve the following system of equations using Gauss Elimination method. **[10]**

$x_1 + x_2 + x_3 - x_4 = 2,$
$4x_1 + 4x_2 + x_3 + x_4 = 11,$
$x_1 - x_2 - x_3 + 2x_4 = 0,$
$2x_1 + x_2 + 2x_3 - 2x_4 = 2.$

c) The following table gives values of 'y' corresponding to certain values of x. Find value of x, when y = 167.59789. By applying Lagrange's inverse interpolation formula. **[7]**

x	1	2	5	7
$y = f(x)$	1	12	117	317

Q2) a) Using Graphical method,
Minimize $z = 80x_1 + 120x_2$,
Subject to $x_1 \geq 2$, $x_2 \geq 3$, $20x_1 + 50x_2 \leq 300$, $x_1, x_2 \geq 0$ **[8]**

b) Using Simplex method. **[12]**
Maximize $z = 3x_1 + x_2 + 3x_2$,
Subject to $2x_1 + x_2 + x_3 \leq 2, x_1 + 2x_2 + 3x_3 \leq 5, 2x_1 + 2x_2 + x_3 \leq 6\ x_1, x_2, x_3 \geq 0.$

P.T.O.

c) Compare merits and demerits of Arithmetic mean, Geometric mean and Harmonic mean. **[5]**

Q3) a) Derive the relation between first four central moment with raw moments. **[8]**

b) Compute coefficient of skewness and kurtosis and comment on nature of frequency distribution **[10]**

x:	1	2	3	4	5	6	7	8	9	10
f:	6	15	23	42	62	60	40	24	13	5

c) A can hit the target 1 out of 4 times. 'B' can hit the target '2' out of 3 times and 'C' can hit the target '3' out of 4 times. Find probability that

i) Target is hit.

ii) Atleast two hit the target. **[7]**

SECTION - II

Q4) a) Show that Poisson distribution can be used as a convenient approximation to binomial distribution for large n' and small p'. **[6]**

b) The joint pdf of a bivariate random variable (x, y) is given by **[6]**

$$f_{xy}(x,y)=\begin{cases} k\,x\,y & 0<x<y<1 \\ 0 & \text{else} \end{cases}$$

i) Find value of K.

ii) Are x and y independent.

c) If mean and variance of a binomial distribution are 3 and 2 respectively. Find probability that variate takes values.

i) Exactly '2'

ii) Almost '2' **[6]**

d) Find mean and variance of random variable 'X' **[7]**

$$f_x(x)=\begin{cases} kx & 0<x<1 \\ 0 & \text{otherwise} \end{cases}$$

Also find $p\left(\frac{1}{4}<x\leq 2\right)$

Q5) a) Write short notes on <u>any three</u> of the following : **[15]**

i) Null Hypothesis and Alternative Hypothesis.

ii) Type I error and Type II error.

iii) Randomized and Nonrandomized Test.

iv) Degrees of Freedom.

b) A study shows that 16 out of 200 tractors produced on one assembly line required extensive adjustment before they could be shipped, while the same was true for 14 out of 400 tractors produced on another assembly line. At 0.01 level of significance, does this support claim that second production line does superior work. **[10]**

Q6) a) State and explain various components of time series. **[8]**

b) Discuss different types of statistical model for experimental designs. **[8]**

c) Obtain regression equations for the following data : **[9]**

x	:	25	28	35	32	31	36	29	38	34	32
y	:	43	46	49	41	36	32	31	30	33	39

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Total No. of Questions : 8]

SEAT No. :

P1674

[Total No. of Pages : 2

[4265]-482

M.E. (Civil) (Environmental Engineering)

INDUSTRIAL WASTE WATER MANAGEMENT

(2010 Course) (Semester -II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer any three questions from Section - I and Section - II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator and steam table is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) What is meant by water quality index? Discuss its application for Industrial waste water management. Also discuss the special problems of Industrial waste water management. **[18]**

Q2) a) Discuss the importance of equalization and Neutralization tanks for industrial waste water treatment. **[8]**

b) Discuss the concept of volume and waste reduction approach for industrial water pollution control. **[8]**

Q3) a) Discuss the addition of Nutrients in Industrial waste water treatment. **[8]**

b) Explain the concept of industrial ecology for industrial waste water management. **[8]**

Q4) a) Define adsorption isotherm. Explain the steps involved in developing an adsorption isotherm. **[6]**

b) Determine i) EBCT, ii) GAC usage rate, iii) mass of GAC required, iv) volume of water treated, v) bed life, and vi) specific throughput using the following data : Volume of GAC in contactor = 12 m^3, volumetric flow rate = 1200 L/min, Initial concentration of TCE = 1.25 mg/L, Final concentration of TCE = 0.0025 mg/L, GAC density = 450 g/L, Freundlich capacity factor = 25 (mg/g) (L. mg)l/n, and Freund intensity parameter = 0.60. **[10]**

P.T.O.

SECTION - II

Q5) Discuss the water requirement for a fertilizer industry. Describe the sources of wastewater generated and its characteristics with suitable treatment schemes. **[18]**

Q6) Describe the reuse and recovery of by product from dairy industry incorporating all concept of Cleaner Technology. **[16]**

Q7) Discuss the sources of waste water generated with its characteristics and treatment options for wastewater generated from oil and petroleum industry. **[16]**

Q8) Discuss the importance of Common Effluent Treatment Plant (CETP) for the management of industrial waste water. Discuss the basic issues and principles involved in the design of CETP for heterogeneous industrial estates. **[16]**

Total No. of Questions : 8]

P1677

SEAT No. :

[Total No. of Pages : 2

[4265] - 517
M.E. (Mechanical) (Heat Power)
NON CONVENTIONAL POWER PLANTS
(2008 Course) (Elective - III (c)) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***

SECTION - I

Q1) a) From Data of wind power plant, it is observed that wind velocity is 8m/s and atmospheric pressure 1.01325 bar with 20°C temperature and overall efficiency 35%. Find : **[8]**

i) Power density available in wind.

ii) Maximum power density.

iii) Power density from overall efficiency.

iv) Power capacity of wind mill if its diameter is 30 m.

b) What do you understand by solidity factor of wind turbine? **[5]**

c) Enlist environmental impact of wind energy. **[3]**

Q2) a) What are various applications of solar photovoltaic systems? Explain in brief. **[10]**

b) Write short note on solar cell materials. **[6]**

Q3) a) Explain the effect of following parameters on concentrating collectors. **[8]**

i) Inlet temperature of fluid

ii) Mass flow rate.

b) Explain factors considered while designing the central tower type power plant. **[8]**

P.T.O.

Q4) Write short notes on (any three) : **[3 × 6]**

a) Effect of temperature and concentration ratio on efficiency of solar power plant.

b) Global energy trends and options for india.

c) CO_2 reduction potential of renewable energy.

d) Impact of Green house effect.

SECTION - II

Q5) a) Distinguish between float and fixed dome type biogas plant. **[8]**

b) A biogas plant is designed to feed the cow dung of 10 cows. Each cow provides 2.5 kg of dry mass/day. Determine **[8]**

i) Biogas digester volume.

ii) Power available from digester.

The other data is given below : Retention time 30 days; Gas burner efficiency 80%; Density of slurry 50 kg/m^3; C.V. of gas 30 MJ/m^3; Gas occupies 10% of digester volume and equal amount of water is mined with dry mass to make slurry.

Q6) a) Explain with neat sketch claude cyde for OTEC system. **[8]**

b) Explain details of tidal power plant components. **[8]**

Q7) a) Write a short note on Micro hydel plant. **[8]**

b) Explain with neat sketch flash type geothermal power plant. **[8]**

Q8) Write short notes on : **[3 × 6]**

a) Factors affecting wave energy.

b) Applications of fuel cells.

c) CDM.

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Total No. of Questions : 8]

SEAT No. :

P1678

[Total No. of Pages : 2

[4265]-526

M.E. (Mechanical) (Design Engineering)

OPTIMIZATION TECHNIQUES

(2008 Course) (Elective - I (c)) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic calculator and steam table is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Maximize following function with simplex method. **[12]**

Subject to : $f = x_1 + 2x_2 + x_3$

$2x_1 + x_2 - x_3 \leq 2$

$-2x_1 + x_2 - 5x_3 \geq -6$

$4x_1 + x_2 + x_3 \leq 6$

$x_1 \geq 0, x_2 \geq 0, x_3 \geq 0$

b) Explain Classification of optimization problems? **[4]**

Q2) a) Minimize following function with simplex method. **[12]**

Subject to : $f = -40x_1 - 100x_2$

$10x_1 + 5x_2 \leq 2500$

$4x_1 + 10x_2 \leq 2000$

$2x_1 + 3x_2 \leq 900$

$x_1 \geq 0, x_2 \geq 0$

b) What is difference between the simplex algorithm and the simplex method? **[4]**

P.T.O.

Q3) a) Find the extreme points of the function. **[12]**

$$f(x_1, x_2) = x_1^3 + x_2^3 + 2x_1^2 + 4x_2^2 + 6$$

b) State necessary and sufficient conditions for the minimum of a function $f(x)$. **[4]**

Q4) Write short notes on (any three) : **[18]**

a) Convex programming problems.

b) Multi variable optimization with no constraints.

c) Pivotal reduction method.

d) Inequality constraint.

SECTION - II

Q5) a) Determine minimum of the following function using the Quadratic Interpolation method $f = \lambda^5 - 5\lambda^3 - 20\lambda + 5$. Compute the initial step size with $t_o = 0.5$ and A = 0. **[10]**

b) Explain Quasi Newton Method. **[6]**

Q6) a) Minimize $f(x_1, x_2) = x_1 - x_2 + 2x_1^2 + 2x_1x_2 + x_2^2$ from the starting point $X_1 = \begin{Bmatrix} 0 \\ 0 \end{Bmatrix}$ using Powell's method. **[10]**

b) Explain Grid search method. **[6]**

Q7) Minimize $f(x_1, x_2, x_3) = (x_1 - x_2)^2 + (x_2 - x_3)^4$ using Generalized Reduced Gradient Method. **[16]**

Subject to : $g_1(X) = x_1(1 + x_2^2) + x_3^4 - 3 = 0$

$-3 \le x_i \le 3, \; i = 1,2,3$

Q8) Write short notes on (any three) : **[18]**

a) Quasi Newton Method for Unconstrained optimization technique.

b) Geometric interpretation of Sequential Linear Programming.

c) Elimination Method.

d) Conjugate gradient method.

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Total No. of Questions : 8]

SEAT No. :

P1682

[Total No. of Pages : 2

[4265] - 585
M.E. (Mech.) (CAD ME)
ADVANCED MANUFACTURING PROCESSES
(2012 Course) (Semester - I) (Elective - I (b))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each sections.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) List the various types of chip produced during metal cutting. Describe the conditions in which these types of chips are produced? **[6]**

b) Draw and explain Merchant's force diagram. State the assumptions made in the development of such diagram. **[6]**

c) Define the term "tool life"? Explain different factors affecting "tool life". **[6]**

Q2) a) Derive the expression for shear angle in orthogonal cutting in terms of rake angle and chip thickness ratio. **[8]**

b) Write a short note on: **[8]**

i) Friction in metal cutting,

ii) Temperature measurement in orthogonal cutting.

Q3) a) In an orthogonal cutting test with a tool of rake angle 10°, the following observations were made: **[10]**

Chip reduction ratio : 0.3,

Horizontal component of the cutting force = 1290 N

Vertical component of the cutting force = 1650 N

From Merchant's theory, calculate the various components of the cutting forces, and the coefficient of friction at the chip tool interface.

b) Enumerate the grinding process parameters and explain their effects on the grinding performance and the wear rates. **[6]**

P.T.O.

Q4) a) Describe in detail the various arrangements of centre - less grinding with neat sketches. Mention the applications in each case. **[6]**

b) Explain injection moulding. What are different types of moulds used in injection moulding? Give their relative applications. **[5]**

c) Explain metal injection moulding process. **[5]**

SECTION - II

Q5) a) Explain the need for the use of unconventional machining processes compared to the conventional one specifically in terms of processes, material removal rate and applications. **[6]**

b) Explain with sketch principle, working and applications of EDM. **[6]**

c) Explain the principle of ECM with a neat sketch and discuss important properties expected for ECM tool material. **[6]**

Q6) a) Explain with neat sketch principle, working, advantages, limitations and applications of ultrasonic machining. **[6]**

b) Discuss need, advantages & limitations of high speed machining processes. **[5]**

c) Write a note in brief on material properties at high strain rates in high speed machining processes. **[5]**

Q7) a) Discuss the use of CAD and generative manufacturing processes (GMP) for rapid prototyping. **[8]**

b) Write down classification of rapid prototyping technologies and explain fused - deposition - modeling (FDM) process. **[8]**

Q8) Write short note on any three: **[18]**

a) Water Jet Machining,

b) Laser Beam Machining,

c) Economics of high speed machining,

d) Stereolithiography process,

e) Over views of generative manufacturing processes.

Total No. of Questions : 10]

SEAT No. :

P1683

[Total No. of Pages : 2

[4265] - 587
M.E. (Mechanical) (CADME)
CAD/CAM PRACTICES IN METAL FORMING
(2012 Course) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) For any CAD Modeling Package. Explain the terms: **[18]**

a) Miter & Edge Flanges.

b) Bend Angles.

c) Flat pattern.

d) Hems.

e) Manual relief cut.

f) Rip feature.

Q2) a) Explain the concept of anisotropy in yielding. **[8]**

b) Define & explain strain hardening coefficient, plastic strain ratio, strain rate sensitivity. **[8]**

Q3) a) Discuss in detail two dimensional plastic flow slip line theory. **[8]**

b) Explain in detail deformation zone geometry. **[8]**

Q4) a) Discuss in detail Mechanics of Metal Working. **[8]**

b) Explain the effect of punch force, blank holder force, lubrication & Draw beads on formability in drawing process. **[8]**

P.T.O.

Q5) a) What are different grades of steels used in metal forming. Explain any three in detail. **[8]**

b) Discuss plastic stress - strain relationship. **[8]**

SECTION - II

Q6) a) Explain basic die cutting operation with neat sketches. **[9]**

b) Discuss in detail various factors in selecting a press in detail. **[9]**

Q7) a) What is CADDS? Explain. **[8]**

b) Explain the components & working of Hydraulic Press. **[8]**

Q8) a) Explain the steps involved in design of press tool. **[8]**

b) Find the minimum inside bend radius minimum flange length & force required in 'V' bending having ultimate tensile strength of 400 N/mm^2 & elongation of 17% if sheet thickness is 2 mm & length of 'V' is 50 mm. width of 'V' die is 20 mm. **[8]**

Q9) a) Compare mechanical press, pneumatic press & hydraulic press with performance parameters. **[8]**

b) Find the force required for drawing a 70 mm diameter cup from a 100 mm diameter blank of 2 mm thickness, if UTS of material is 300 N/mm^2. **[8]**

Q10) a) Explain shortly spring back, wrinking, earing & strip layout. **[8]**

b) Explain the importance of CAD in metal working. **[8]**

Total No. of Questions : 8]

P1685

SEAT No. :

[Total No. of Pages : 2

[4265] - 707

M.E. (Electronics-Digital Systems)

EMBEDDED VIDEO PROCESSING

(2008 Course) (Elective - III (C)) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) State the features of MPEG-2. Draw a neat block diagram of MPEG encoder & explain function of each block. **[8]**

b) Explain the following terms : **[8]**

i) Search region. ii) Cost function.

iii) Motion vector. iv) Local smoothness constraint.

Q2) a) Explain the factors which decide the design of Q-matrix suggested in JPEG standard. **[8]**

b) For HDTV frame with resolution of 1920 × 1152 & frame rate of NTSC system, calculate the computational complexity when full search & logarithmic search algorithms are used. **[8]**

Q3) a) Define Rate-Distortion function. Compare the performance of motion compensation based & intraframe based video coding techniques. **[8]**

b) Explain the basic video coder/decoder with the help of neat block diagram. **[8]**

P.T.O.

Q4) a) Explain the bit-plane matching criterion for block matching. **[6]**

b) Write short notes on (any three) : **[12]**

i) Arithmetic coding. ii) Video formats.

iii) Quantization. iv) DWT.

SECTION - II

Q5) a) With the help of neat block schematic, explain H.263 encoder/decoder. **[8]**

b) Explain the procedure to test the different blocks in case of hardware CODEC. **[8]**

Q6) a) Explain the various issues in video codec interface. **[8]**

b) State the technical specifications of H/W CODEC. **[5]**

c) Explain Parallel decoding Huffman algorithm. **[5]**

Q7) a) Enlist the different requirements for motion estimation & compensation. **[8]**

b) State the important features of : **[8]**

i) DSP processor.

ii) Media processor.

Q8) Compare : **[16]**

a) MPEG with H.263.

b) DCT with DWT.

c) Subjective with objective quality measurement.

d) RBG with YC_bC_r color space.

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Total No. of Questions : 8]

SEAT No. :

P1686

[Total No. of Pages : 2

[4265]-719

M.E. (E&TC) (Communication Networks)

WIRED & WIRELESS NETWORKS

(2010 Course) (Semester - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is the need of LAN and WAN? Describe in brief. **[8]**

b) Explain ALOHA system with its two versions (Pure ALOHA & Slotted ALOHA). **[8]**

Q2) a) Explain ATM with the help of **[8]**

i) ATM virtual circuits.
ii) ATM reference model.

b) Explain VPN in detail. **[8]**

Q3) a) Explain TCP/IP protocol suite. **[9]**

b) Explain IPv4 addressing scheme. **[8]**

Q4) a) What is Network programming? Explain in brief. **[8]**

b) What is the need of multiple protocols in communication? Discuss in brief. **[9]**

SECTION - II

Q5) a) Explain Fixed routing algorithm giving one example. **[8]**

b) Describe the need of sub netting in internet addressing. **[8]**

P.T.O.

Q6) Discuss the following.

a) Internet Trends & Internet Applications. **[8]**

b) Selective Repeat ARQ. **[8]**

Q7) a) Explain design issues for the protocol layers. **[8]**

b) What is VLSM (Variable Length Subnet Mask)? How does VLSM work? **[9]**

Q8) a) Discuss SONET in brief. **[8]**

b) An organization is granted the block 130.34.12.64/26. The organization needs four sub networks, each with an equal number of hosts. Design the sub networks and find the information about each network. **[9]**

Total No. of Questions : 8]

SEAT No. :

P1687

[Total No. of Pages : 2

[4265] - 733

M.E. (Production) (Manufacturing Engg. & Automation)

SUPPLY CHAIN MANAGEMENT

(2008 Course) (Elective - I (c)) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) ***Solve any three questions from each Section.***
2) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) What are the operational objectives that must be achieved by any organisation for proper logistical design? **[8]**

b) Consider a supply chain involved when a customer purchases a book at a book store. Identify the cycles in this supply chain and the location of the push pull boundary. **[8]**

Q2) a) What are the major drivers of supply chain performance? Explain in details. **[8]**

b) Explain the fundamental trade-off between customer service cost and benefits. How are the trade-off justified? **[8]**

Q3) a) Explain the role of aggregate planning in supply chain management. **[8]**

b) What types of networks are best suited for commodity items? Explain in details. **[8]**

Q4) Write short notes on (any three) : **[18]**

a) Vendor Management.

b) Future potential of SCM.

c) Efficient versus responsive supply chains.

d) Capacitated plant location model.

SECTION - II

Q5) a) Provide an example how diversion and reconsignment can be used to increase logistical efficiency and effectiveness. **[8]**

b) Discuss and illustrate the economic justification for establishing a ware house. **[8]**

P.T.O.

Q6) a) What procedures and strategies can be used to reduce safety stock requirements for a fixed distribution system design? **[8]**

b) The manager at the supermarket would like to decrease the lot size without increasing the cost he incurs. What action can he take to achieve this objective? **[8]**

Q7) a) Explain the scope of emerging distributed cooperative tele-manufacturing over internet. **[8]**

b) "In order to achieve a customer satisfaction reverse logistics can add value to existing supply chains". Explain this statement with examples. **[8]**

Q8) Write short notes on (any three) : **[18]**

a) Role of enterprise resource planning in the SCM.

b) Probabilistic models in inventory management.

c) Warehouse Layout designing principles.

d) Milk Round System (MRS).

Total No. of Questions : 12]

SEAT No. :

P1688

[Total No. of Pages : 3

[4265]-734

M.E. (Production)

ADVANCED MACHINE TOOL DESIGN

(2008 Course) (Elective - I (d)) (Semester - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Attempt one question from each unit of Section I and Section II respectively.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Use of non-programmable electronic pocket calculator and statistical tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

UNIT - I

Q1) a) Discuss briefly the salient features to be considered for selecting and designing a suitable drive system in a machine tool. **[8]**

b) Develop a generalized empirical relationship for the thrust and torque in drilling and compare the same with turning to validate Optiz's hypothesis that the principles of cutting mechanism fall into the same category.**[10]**

OR

Q2) a) Find out the method of differentiating a special purpose machine from a general purpose machine based on the kinematic structure. **[6]**

b) Draw the speed ray diagram (compromise gear box) having 6 speeds in the upper range and 8 speeds in the lower range. The spindle speed ranges from 2600 to 180 rpm. What are the advantages and limitations of such compromise gear box? **[12]**

UNIT - II

Q3) a) Explain the method of evaluating the stiffness and natural frequency of vibration of a machine tool bed having two-tier cross-section with stiffeners, using Krylov's function. State the final expression for frequency of vibration. **[8]**

P.T.O.

b) Discuss the method of designing a horizontal circular table of a vertical boring machine, where the cylindrical workpiece is clamped. Average diameter of the guide is *d* and the width of the guide is *b*. **[8]**

OR

Q4) a) Discuss the importance of following elements in spindle design : **[8]**

i) Diameter of front journal bearing.
ii) Additional spindle support.
iii) Location of bearing and drive element.
iv) Balancing.

b) Analyze the load taken by the balls in a ball bearing used as a spindle support and show that due to contact deformation not more than 80% of the balls take the entire thrust. **[8]**

UNIT - III

Q5) a) What is meant by regenerative chatter? Explain it with reference to turning center. **[8]**

b) Draw the hydraulic circuit for obtaining forward as well as quick return motion of a shaping machine. Indicate all the parts and elements and describe briefly their characteristic functions. **[8]**

OR

Q6) a) Discuss with neat sketch the feed gearbox, operated by Tumbler gears. Show three positions; forward, neutral and reverse. **[8]**

b) With neat sketches of circuit diagrams show the functioning of a thermal relay and an electrical braking system. **[8]**

SECTION - II

UNIT - IV

Q7) a) Explain with a neat sketch the built-in auto inspection system used in cylindrical grinding machine for measuring the outside diameter. **[8]**

b) What procedure is used by the operator to determine the tool length and zero offsets? **[8]**

OR

Q8) a) What are the various types of transducers commonly used in a CNC machine? Explain the functioning of linear transducer and angular transducer. **[8]**

b) Explain with neat sketches the five basic types of tool changers. **[8]**

UNIT - V

Q9) a) 'It is necessary to have high damping coefficient and large stiffness of the tool to reduce vibration'–Discuss the statement giving specific example of a turning operation. **[8]**

b) Explain with suitable example dynamic characteristic of the cutting process. **[10]**

OR

Q10) a) Enumerate the various methods, used in practice to reduce the positional displacement error due to 'Stick Slip'. **[8]**

b) With suitable sketches explain the procedure followed in performing acceptance tests on vertical machining center. **[10]**

UNIT - VI

Q11) a) What is the role of aesthetics in the design of modern machine tools? **[8]**

b) Explain the concept of matrices in the design of layout of machine tools with a suitable example. **[8]**

OR

Q12) a) Discuss the advantages of retrofitting in building machine tools. **[8]**

b) Justify the techniques that can be applied in the design of machine tool structures for micro machining applications. **[8]**

Total No. of Questions : 10]

SEAT No. :

P1689

[Total No. of Pages : 2

[4265]-761

M.E. (Production) (CAD/CAM)

COMPUTER INTEGRATED MANUFACTURING

(2010 Course) (Semester - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Discuss the stages in product development cycle and the importance of each stage. **[8]**

b) Discuss how CIM can act as enabling technology for concurrent engineering. **[8]**

Q2) a) Discuss various CIM hardware and software. **[8]**

b) What are different techniques used for design analysis when launching a new product? Discuss value stream mapping (VSM) technique. **[8]**

Q3) a) Discuss the database requirement in CIM environment. **[8]**

b) What are the desirable features of database management system? Discuss. **[8]**

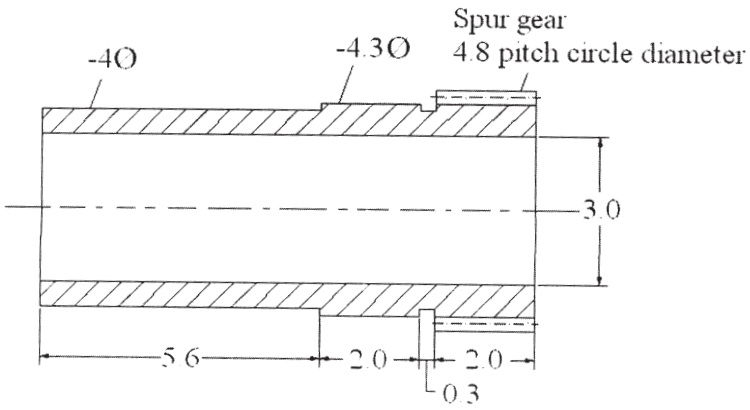
Q4) a) What are the four classes of data in manufacturing? What are the features of PDM which help speedy product development? **[8]**

b) What is cellular manufacturing? Discuss various cell formation approaches known to you. **[8]**

Q5) a) What do you understand by the term, "group technology"? Discuss the uses of GT in various functional departments of an organization. **[9]**

P.T.O.

b) Develop a form code using Opitz system for the part shown in figure. **[9]**



SECTION - II

Q6) a) What is FMC? How does FMC ensures flexibility in manufacturing? **[8]**

b) Describe the features of flexible inspection system. **[8]**

Q7) a) Discuss how to optimize the overall efficiency and effectiveness of FMS. **[8]**

b) What are the major elements of FMS? Describe AGV. **[8]**

Q8) a) Classify ASRS. What are the basic components of ASRS? **[8]**

b) Describe how world wide web can help to shorten the product development cycle time. **[8]**

Q9) a) How do you integrate CAD data with robot operation? **[8]**

b) Discuss product design for automatic manufacture by robot? **[8]**

Q10) a) What are the requirements of an enterprise wide network? **[9]**

b) Describe the three basic network topologies. **[9]**

Total No. of Questions : 8]

SEAT No. :

P1691

[Total No. of Pages : 3

[4265] - 763

M.E. (Production) (CAD/CAM)

ADVANCED MATHEMATICS

(2010 Course) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer 3 questions from Section - I & 3 questions from Section - II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Reduce the quadratic form **[8]**
$3x^2 + 5y^2 + 3z^2 - 2yz + 2zx - 2xy$ to the canonical form. And specify the matrix transformation.

b) If $A=\begin{bmatrix} 0 & 1+2i \\ -1+2i & 0 \end{bmatrix}$ show that (I-A) $(I+A)^{-1}$ is a unitary matrix. **[8]**

Q2) a) Solve the variational problem. **[8]**

$$\delta\int_1^2 \left[x^2(y')^2 + 2y(x+y)\right]dx$$

Given $y(1) = y(2) = 0$.

b) Two masses m_1 and m_2 are connected by an inextensible string Which passes over a fix pulley? Using Lagrange's equations, show that the acceleration of either mass is numerically equal to $(m_1 - m_2)g/(m_1 + m_2)$. **[8]**

Q3) a) Find the Fourier transform of $e^{\frac{-x^2}{2}}$. **[8]**

b) Solve by the method of Laplace transform the equation, **[6]**
$y'' - 2y' - 8y = 0$ with $y(0) = 3, y'(0) = 6$.

P.T.O.

c) Apply convolution theorem to evaluate. **[4]**

$$L^{-1}\left\{\frac{s^2}{(s^2+a^2)^2}\right\}.$$

Q4) a) Solve the integral equation. **[5]**

$$\int_0^{\infty} f(x)\cos\lambda x\,dx = e^{-\lambda}.$$

b) Show that the transformations: **[5]**

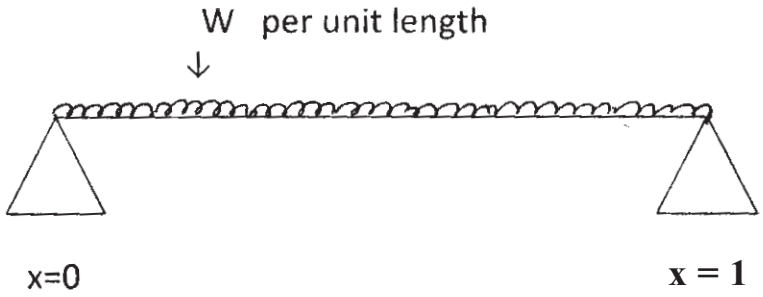
$y_1 = x_1 - x_2 + x_3$

$y_2 = 3x_1 - x_2 + 2x_3$

$y_3 = 2x_1 - 2x_2 + 3x_3$

is regular. Write down the inverse transformation.

c) Find the approximate deflection of simply supported beam under the uniformly distributed load w in figure using Galerkin's method. **[6]**



SECTION - II

Q5) a) A tightly stretched string with fixed end point $x = 0$ and $x = 1$ initially in a position given by $y = y_0 \sin^3\left(\frac{\pi x}{l}\right)$. If it is released from rest from this position. Find the displacement $y(x, t)$. **[9]**

b) Solve $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$, for $0 < x < \pi, 0 < y < \pi$ given that **[9]**

$u(0, y) = u(\pi, y) = u(x, \pi) = 0, u(x, 0) = \sin^2 x.$

Q6) a) Discuss the static variable model and advantages over differential equation model. **[8]**

b) Describe in brief types of simulation approaches. **[8]**

Q7) a) For a chi-square distribution with n.d.f. establish the following recurrence relation between the moments. **[8]**

$\mu_{r+1} = 2r(\mu_r + n\mu_{r-1}), r \geq 1$. Hence find β_1 and β_2.

b) A random variable x has a uniform distribution over (-3,3). Find k for which $p(x>k) = \frac{1}{3}$. Also evaluate $p(x<2)$ and $p[|x-2|<2]$. **[8]**

Q8) a) The height of 6 randomly chosen sailors are (in inch): **[8]**
63,65,68,69,71,72. Those of 10 randomly chosen soldiers are:
61,62,65,66,69,69,70,71,72,73. Discuss the light that these data thrown the suggestion that sailors are on the average faller than soldiers.

b) An insulated rod of length / has its end A and B maintained at 0ºC and 100ºC respectively. Until steady state condition prevail. If B is suddenly reduced to 0ºC and maintained at 0ºC. Find the temperature at a distance x from A at time t. **[8]**

Total No. of Questions : 8]

SEAT No. :

P1696

[Total No. of Pages : 2

[4265]-783
M.E. (Computer Engineering)
DISTRIBUTED SYSTEMS
(2008 Course) (Semester - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer any THREE questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What factors affect the responsiveness of an application that accesses shared data managed by a server? Describe remedies that are available and discuss their usefulness. **[8]**

b) Enlist and explain techniques for dealing with failures in distributed system. **[6]**

c) Explain what is Location Transparency and Replication transparency with suitable examples? **[4]**

Q2) a) Discuss the concept of request/reply message handling using HTTP protocol and TCP protocol. Compare the working limitations and advantages of both protocols. **[8]**

b) Enlist and explain different modules involved in achieving a remote method. invocation. **[8]**

Q3) a) List out the pitfalls of Cristian's algorithm and explain how Berkley's algorithm tries to resolve the issue. **[8]**

b) Discuss caching and replication in Sun Network File System. **[8]**

P.T.O.

Q4) Write Short Notes on (Any Three) : **[16]**

a) NTP

b) Group Communication

c) Peer-to-peer Systems

d) Inter process communication in UNIX.

SECTION - II

Q5) a) What advantage can a DSM implementation obtain from knowing the association between data items and synchronization objects? What is the disadvantage of making the association explicit? **[10]**

b) What is release consistency and sequential consistency? Compare these with other consistency models? **[8]**

Q6) a) Enlist different types of authentication required in a distributed system. Explain need of centralized authentication server in one way authentication protocol based on symmetric cryptosystem. **[8]**

b) What is confinement problem in computer security? Explain why this problem is in general unsolvable? **[8]**

Q7) a) Explain the role of servlet container in the deploying of a web service and execution of a client request. **[8]**

b) Compare SOAP based web services and CORBA. **[8]**

Q8) Write Short Notes on (Any Three) : **[16]**

a) Service descriptions and IDL for web services.

b) Digital signature.

c) GRID.

d) Directory Service.

Total No. of Questions : 8]

P1697

SEAT No. :

[Total No. of Pages : 2

[4265] - 793

M.E. (Computer Engineering) (Computer Networking)

INFORMATION SECURITY AUDIT & MANAGEMENT

(2008 Course) (Sem. - I) (Elective - II (b))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is leadership and management? Explain similarities and differences between leadership and management. **[8]**

b) List and describe the various approaches to task sequencing. **[8]**

Q2) a) How does the sec SDLC differ from the more general SDLC? **[8]**

b) What are three common layers of planning? How do they differ? **[8]**

Q3) a) What is a disaster recovery plan, and why is it important to the organization? **[9]**

b) Explain the components of contingency planning with reference to: **[9]**

i) Business impact analysis.
ii) Incident Response plan.
iii) Timing and sequence of CP elements.

Q4) a) Describe a sample seven-step methodology for implementing training. **[8]**

b) Describe the Bull's eye model. What does it says about policy in the information security program? **[8]**

P.T.O.

SECTION - II

Q5) a) Explain the emerging trends in certification and accreditation. **[8]**

b) Explain the performance measures in information security management. **[8]**

Q6) a) Explain Risk assessment strategies. **[8]**

b) What factors are critical to the success of an information security performance program? **[8]**

Q7) a) What is the most effective biometric authorization technology? Justify your answer. **[8]**

b) Explain various types of laws and ethics in Information security. **[8]**

Q8) Write short notes on (any three) : **[18]**

a) Security Management Models.

b) Intellectual property.

c) Information security professional credentials.

d) General categories and prevention of unethical activity.

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Total No. of Questions : 8]

SEAT No. :

P1702

[Total No. of Pages : 2

[4265] - 921

M.E. (Instru. & Control) (Process Instru. & Biomedical Instru.)

ORGANISATIONAL BEHAVIOUR & MANAGEMENT

(2008 Course) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer three questions from Section - I and Three questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) State and explain various functions of management. Critically analyse the roles and required skills of a manager in an ever changing business environment. **[16]**

Q2) Define Organisational Behaviour. What are its key elements? Explain various OB models with their relevance in present business context. **[16]**

Q3) a) "Personality is a complex and multi-dimentional construct". Explain with reference to determinants of personality. **[9]**

b) What is perception? What are the factors influencing perceptual process? Why perception is a key factor in managerial effectiveness? Justify. **[9]**

Q4) Explain the following theories of Motivation. **[16]**

a) Victor Vroom's Expectancy Theory.

b) Mc Gregor's Theory X and Theory Y.

SECTION - II

Q5) Explain in detail the stages of group development, group structure and group processes. As a manager, how would you manage various groups to under stand group dynamics and measure its effectiveness. **[18]**

P.T.O.

Q6) a) What is Managerial Grid? Explain its various components and importance to industry. **[8]**

b) List out various leadership skills required to excell in a competitive business scenario. **[8]**

Q7) Describe organisational system with its various components. Critically analyse design, technology and human factors for the successful functioning of the organisation. **[16]**

Q8) Define Conflict Management. What are the various causes of conflicts? Explain the mechanism of conflict resolution in industry. **[16]**

Total No. of Questions : 10]

P1703

SEAT No. :

[Total No. of Pages : 4

[4265] - 933
M.E. (Polymer)
MATHEMATICAL AND STATISTICAL METHODS
(2008 Course) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Solve the following system of equations by Gauss-Seidel method. Obtain the solution, at the end of the 5^{th} iteration. **[8]**

$$83x_1 + 11x_2 - 4x_3 = 95$$
$$7x_1 + 52x_2 + 13x_3 = 104$$
$$3x_1 + 8x_2 + 29x_3 = 71$$

b) Solve the following system of equations, using Cholesky's method. **[8]**

$$2x_1 - x_2 = 3$$
$$-x_1 + 2x_2 - x_3 = -3$$
$$-x_2 + x_3 = 2$$

Q2) a) Find the largest eigen value and corresponding eigen vector of the following matrix, using power method, choosing the initial vector as $\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$. **[8]**

$$A = \begin{bmatrix} 3 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 3 \end{bmatrix}$$

P.T.O.

b) Use Newton Raphson method to solve the simultaneous equations
$x^2 - 2x - y + 0.5 = 0$,
$x^2 + 4y^2 - 4 = 0$, with initial
values $x_0 = 2.0$, $y_0 = 0.25$ **[8]**

Q3) a) Reduce the following matrix to tridiagonal form, using Householder's method. **[8]**

$$A = \begin{bmatrix} 1 & 3 & 4 \\ 3 & 2 & -1 \\ 4 & -1 & 1 \end{bmatrix}$$

b) Apply LU decomposition method to solve the system of equations: **[8]**
$2x_1 - x_2 + x_3 = -1$
$2x_2 - x_3 + x_4 = 1$
$x_1 + x_2 + 2x_4 = 3$
$x_1 + 2x_3 - x_4 = -1$

Q4) a) Find the Z-transform of the following (any two) : **[8]**

i) $f(k) = 2^k \cos(3k + 2)$, $k \geq 0$

ii) $f(k) = \begin{cases} 5^k, k < 0 \\ 3^k, k \geq 0 \end{cases}$

iii) $f(k) = (k + 1)a^k$, $k \geq 0$

b) If $f(k) = U(k)$, $g(k) = 2^k U(k)$,
find the Z-transform of the convolution $f(k) * g(k)$. **[4]**

c) Solve the difference equation : **[6]**
$f(k) - 4f(k - 2) = U(k)$,
where $U(k)$ is the unit step discrete function.

Q5) a) Find the inverse Z-transform of the following (any two) : **[8]**

i) $\dfrac{z^2}{\left(z - \frac{1}{2}\right)\left(z - \frac{1}{3}\right)}$, $|z| > \dfrac{1}{2}$

ii) $\dfrac{3z^2 + 2z}{z^2 - 5z + 6}$, $2 < |z| < 3$

iii) $\dfrac{z^2}{z^2 + 1}$, using inversion integral method.

b) Apply sylvester's theorem to find A^{200}, where $A = \begin{bmatrix} 5 & 4 \\ 1 & 2 \end{bmatrix}$ **[8]**

SECTION - II

Q6) a) Use Runge-Kutta method to solve the following system at $x = 0.2$

$$\begin{bmatrix} y' \\ z' \end{bmatrix} = \begin{bmatrix} -3 & 2 \\ 3 & -4 \end{bmatrix} \begin{bmatrix} y \\ z \end{bmatrix}$$

Given that at $x = 0$, $\begin{bmatrix} y \\ z \end{bmatrix} = \begin{bmatrix} 0 \\ 0.5 \end{bmatrix}$ taking the step size $h = 0.2$. **[8]**

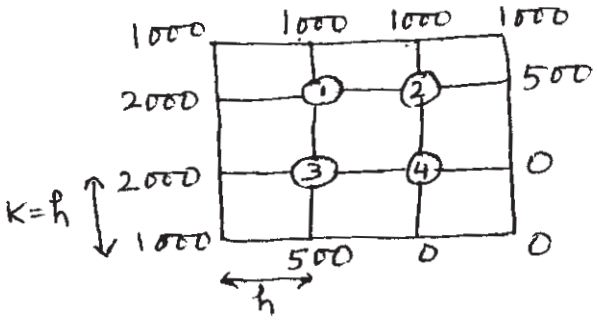
b) Using Adam's Bashforth method, determine the solution of **[8]**

$$\frac{dy}{dx} = x^2(1+y)$$

at $x = 1.4$, given $y(1) = 1$, $y(1.1) = 1.2$,
$y(1.2) = 1.4662$, $y(1.3) = 1.8213$

Q7) a) Solve $\frac{dy}{dx} = x - y^2$ to calculate $y(0.4)$ taking $h = 0.2$ and $y(0) = 1$ using modified Euler's method. **[7]**

b) Evaluate the function $u(x, y)$ at the points 1, 2, 3 and 4 on the grid where $u(x, y)$ satisfies the equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$. Grid is given by **[9]**



Q8) a) Find the extremal of the functional **[8]**

$$\int_0^{\pi} (y'^2 - y^2 + 4y\cos x)dy; \; y(0) = 0, \; y(\pi) = 0.$$

b) Solve the boundary value problem **[8]**
$y'' + y = x$, $(0 \le x \le 1)$, $y(0) = y(1) = 0$,
by Rayleigh-Ritz method. Assume that the trial function is
$\bar{y}(x) = c_0 + c_1 x + c_2 x^2$.

Q9) a) Apply Galerkin's method to solve the boundary value problem $y'' = -x$, with $y(0) = y(1) = 0$, taking the approximate solution as $\bar{y}(x) = c_1 x(1 - x) + c_2 x^2(1 - x)$. **[9]**

b) The following table gives the number of good and bad machine parts, produced by each of three shifts in a factory. **[7]**

Shift	Good	Bad
Day	900	130
Evening	700	170
Night	400	200

Is there any association between the shift and the quality of the parts produced? Given : $\chi^2_{2;\,0.05} = 5.991$

Q10)a) A machine produced 16 defective articles in a batch of 500. After over hauling it produced 3 defectives in a batch of 100. Has the machine improved? **[5]**

Given : $Z_\alpha = 1.645$, where $\alpha = 5\%$ (level of significance).

b) The heights of college students in a city are normally distributed with standard deviation 6 cms. A sample of 1000 students has mean height 158 cms. Test the hypothesis that the mean height of the students is 160 cms.

Given : $|z| = 1.96$ at 5% level of significance. **[5]**

c) The following table gives the number of refrigerators sold by 4 salesmen in three months May, June and July: **[8]**

Month	Salesmen			
	A	B	C	D
May	50	40	48	39
June	46	48	50	45
July	39	44	40	39

Is there a significant difference in the sales made by the 4 salesmen? Is there a significant difference in the sales made during different months?

Given : $F_{0.05} = 5.14$ for (3, 6) degrees of freedom.

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Total No. of Questions : 12]

SEAT No. :

P1705

[Total No. of Pages : 4

[4265]-942

M.E. (Polymer)

POLYMER PHYSICS AND CHARACTERIZATION

(2008 Course) (Semester - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answers to Section - I and Section - II should be written on separate answer book.***
2) ***Solve 3 questions from Section - I and 3 questions from Section - II.***
3) ***Neat diagrams should be drawn whenever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***
6) ***Use of electronic pocket calculator is allowed.***

SECTION - I

Q1) a) What do you understand by *theta* solvent? Comment on its importance. **[5]**

b) What is Cohesive energy density (CED)? What is its significance in understanding solubility of given polymer system? **[6]**

c) Compare between low molecular weight substances and polymer solution properties. **[5]**

OR

Q2) a) With suitable example explain the concept of solubility parameter. Explain the method to measure it. **[8]**

b) Write a short note on Statistical Thermodynamics of Polymer Solutions. **[8]**

Q3) a) What is surface tension? Explain its significance. **[4]**

b) Explain any one method used to understand viscoelastic relaxations in polymers. **[7]**

c) Briefly explain "Dynamic Mechanical Analysis" technique used for polymers. **[5]**

OR

P.T.O.

Q4) a) Explain Pyrolysis Gas Chromatography technique and its applicability in understanding polymer degradation. **[8]**

b) Write a short note on Contact angle measurement technique to find out surface tension. **[8]**

Q5) a) Explain the detail procedure to calculate % crystallinity of given polymer sample using DSC scan. DSC data of polyethylene samples is given below. Find out % crystallinity of all the three samples and comment on their suitability for an impact resistant application. (Heat of fusion melting for 100% crystalline polyethylene sample = 290 J/g). **[12]**

Sample	Melt onset temp. (°C)	Melt Peak temp. (°C)	Enthalpy (J/g)
1	121.9	132.9	195.9
2	121.3	132.6	194.5
3	122.3	131.6	180.1

b) Write a short note on "Molecular motions responsible for various relaxations". **[6]**

OR

Q6) a) Which characterization techniques can be used find out polymer blend composition? Briefly explain in any one. **[7]**

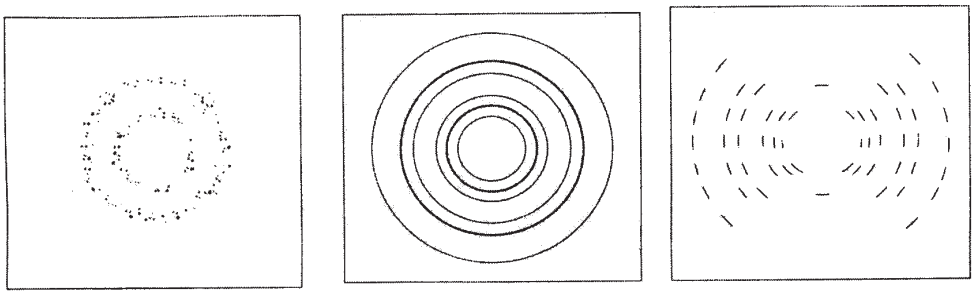
b) Is it possible to understand polymer degradation by TGA technique? Justify your answer with suitable example. **[4]**

c) Refer to Figure 1. Interpret TGA thermogram of PTFE filled with carbon and silica qualitatively and quantitatively. **[7]**

SECTION - II

Q7) a) Enlist various techniques used for finding out molecular weight distribution. Explain any one in detail. **[10]**

b) Following are the XRD patterns of polymers having different morphologies. Identify the morphological states and give at least one example of polymer or polymer product having these types of morphologies. **[5]**



(a) (b) (c)

c) Explain the following terms – Surface resistivity, Volume resistivity, Dielectric constant. **[3]**

OR

Q8) a) Explain the terms – Diffraction, Scattering. With neat sketch explain working of XRD. **[8]**

b) Comment on various detectors used in Gel Permeation Chromatography (GPC). **[5]**

c) Explain the working principle of GPC. **[5]**

Q9) a) What is IR spectroscopy? What information can be obtained from it? **[6]**

b) Write a short note "UV Spectroscopy Technique" used for polymer characterization. **[6]**

c) Briefly explain the principle of Scanning Electron Microscopy (SEM). **[4]**

OR

Q10) a) Explain various methods of sample preparation used in IR technique. **[8]**

b) With schematic diagram explain what information about molecular structure is obtained from a given NMR spectrum. **[8]**

Q11) a) Explain the concept of Linear Viscoelasticity. **[8]**

b) With suitable examples and schematic diagrams explain classification of shear flows. **[8]**

OR

Q12) a) Explain the following terms – Shear flow, Elongational flow, Storage modulus, Loss modulus, Dynamic Viscosity. **[8]**

b) Derive expression for dynamic stress relaxation using Maxwell model. **[8]**

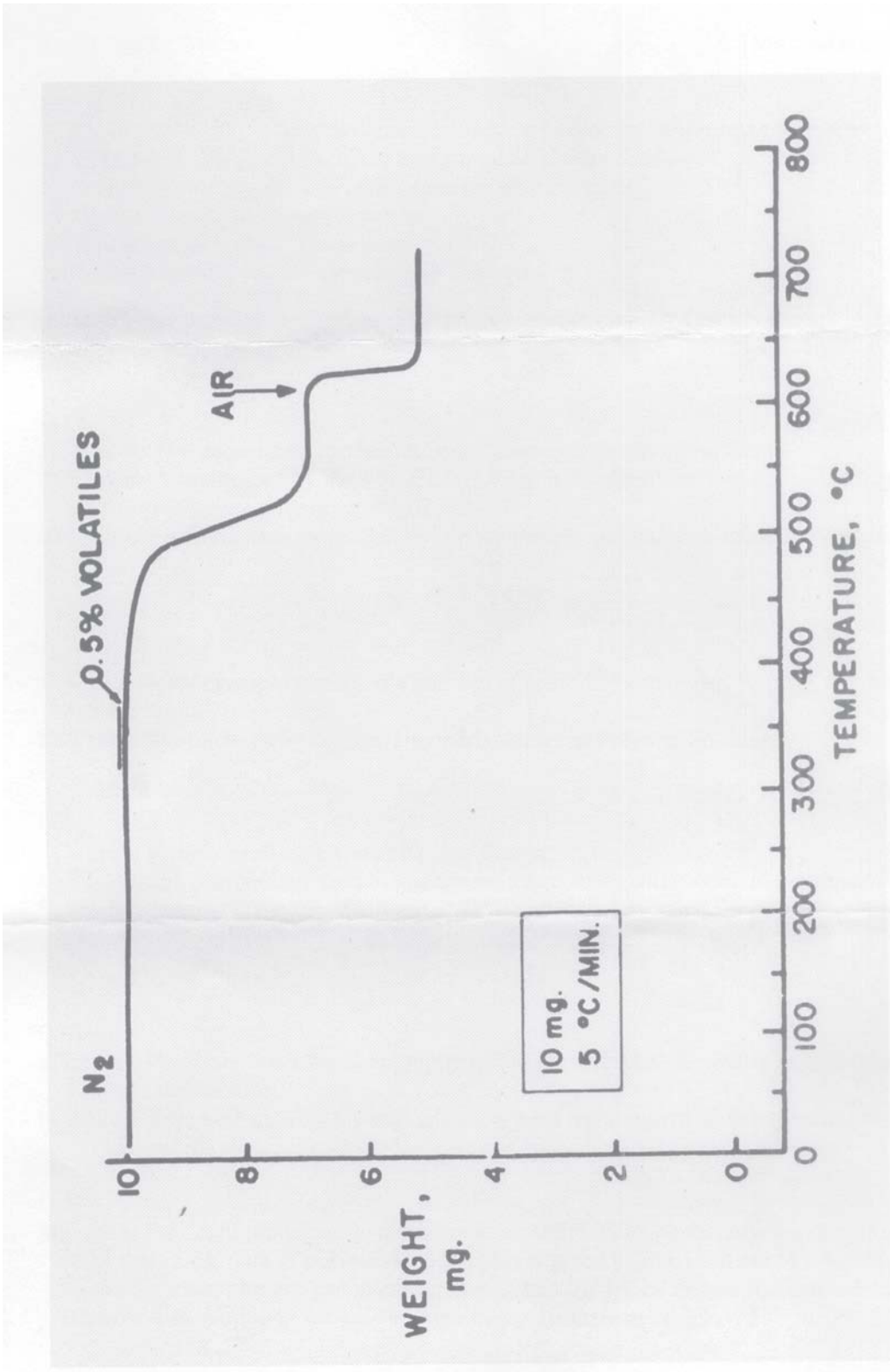


Figure 1. Thermogram of PTFE filled with carbon and silica [for Q.6 (c)]

* * *

Total No. of Questions : 10]

SEAT No. :

P1706

[Total No. of Pages : 2

[4265] - 577

M.E. (Mechanical) (Energy Engg.)

NUCLEAR MATERIALS AND REACTOR FUNDAMENTALS

(Semester - I) (2012 Course) (Elective - I (a))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicates full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the mechanism of 'radiation damage' in nuclear materials. **[9]**

b) What are the properties and selection criteria for materials used in Nuclear steam supply. **[9]**

Q2) a) Describe Fatigue failure phenomenon in Nuclear Reactor Materials. **[8]**

b) How the neutrons affect mechanical properties of metals? **[8]**

Q3) a) Explain the nuclear steam supply system for Pressurized Water Reactor with neat sketch. **[8]**

b) A sample of material contains 40 micro grams of californium - 252. Californium - 252 has half life of 2.638 years. The atomic mass of californium - 252 is 252.08 grams. **[8]**

i) Calculate the number of Californium - 252 atoms initially present.

ii) Calculate the activity of Californium - 252 in curies.

iii) Calculate the number of Californium - 252 atoms that will remain in 10 Years.

iv) Calculate the time it will take for activity to reach 0.001 curies.

Q4) a) Plot the radioactive decay curve for nitrogen - 16 over a period of 120 seconds. The initial activity is 142 curies and half life of nitrogen - 16 is 7.13 seconds. Plot the curve on both linear rectangular coordinates and on semi log scale. **[8]**

P.T.O.

b) What are various types of neutron interactions? Explain them in brief. **[8]**

Q5) a) Describe the fission process using liquid drop model. **[8]**

b) Describe the interactions of following with matter: **[8]**

i) Alpha particle.

ii) Beta Particle.

iii) Positron.

iv) Neutron.

SECTION - II

Q6) a) Classify and explain in brief the various types of nuclear reactors. **[9]**

b) Explain the process of neutron diffusion in non multiplying media using diffusion equation. **[9]**

Q7) a) Differentiate between Pressurized water reactor (PWR) and Boiling water reactor (BWR) with neat sketch. **[8]**

b) Describe the following terms in brief (any two): **[8]**

i) Reactor Period.

ii) Doubling time.

iii) Reactor start-up Rate.

Q8) a) What is 'Nuclear Fuel Enrichment'? Explain its various methods in brief. **[8]**

b) Explain various Uranium mining techniques in brief. **[8]**

Q9) a) Enlist different methods of Nuclear waste disposal? Explain any one in detail. **[8]**

b) Discuss problems encountered and remedies in 'incore fuel management'. **[8]**

Q10) a) How methods of Nuclear Waste Disposal affect the cost of Nuclear Fuel Cycle, Explain in detail. **[8]**

b) What are the costs involved in front end stages of Nuclear fuel cycle, discuss. **[8]**

Total No. of Questions : 8]

P1707

SEAT No. :

[Total No. of Pages : 3

[4265] - 402

M.E. (Civil) (Construction & Management)

MANAGEMENT & PROJECT PLANNING IN CONSTRUCTION

(2008 Course) (Semester - I)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) *Question Nos. 1 and 5 are compulsory. Out of the remaining attempt 2 questions from Section - I and 2 questions from Section - II.*
2) *Answers to the two sections should be written in separate books.*
3) *Neat diagrams must be drawn wherever necessary.*
4) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) List down the direct costs and indirect costs included on a construction project. **[4]**

b) Following table gives the cost duration data for a small construction project.

Activity	Followed by	Duration in day		Cost in Rs.	
		Normal	Crash	Normal	Crash
A	C,D	5	4	5000	6500
B	E,F	4	2	4000	5000
C	H	6	4	3000	5000
D	G	3	2	3000	3500
E	G	4	3	5500	6500
F	H	8	6	4500	6000
G	H	9	6	6000	8000
H	---	10	8	7000	10000

The indirect cost is Rs. 2000/- per day

P.T.O.

i) Draw the network and find critical path. Find the normal duration and the corresponding direct, indirect costs and total project cost. **[4]**

ii) Carry out stage by stage compression and find the optimum duration and the corresponding costs. **[6]**

iii) Find all crash solution. **[2]**

iv) Plot a graph of costs Vs Time. **[2]**

Q2) a) Define "Project". Discuss the characteristics of Project in detail. **[8]**

b) An expressway is to be planned between two major cities in a State. Discuss the contents of pre feasibility study for the project. **[8]**

Q3) a) What is line of Balance Technique? What are the advantages and disadvantages of it? Draw a LOB diagram for building construction with 7 storeys. Show at least 7 activities. (Consider only superstructure activities). **[8]**

b) What is a Mass Haul Diagram? Explain with neat figure. State the applications of the same. **[8]**

Q4) a) What are the activities involved in site mobilization and demobilization for a Road project? **[8]**

b) What are the softwares available for construction project planning? Give the applications as well as merits and demerits of the same. **[8]**

SECTION - II

Q5) a) What is Productivity? How productivity can be improved by "Work Study". Explain with the help of suitable example related with construction. **[6]**

b) Define "Method Study" and "Work Measurement". What are the techniques involved for "Method Study"? Explain any one in detail. **[8]**

c) Find the difference in production rate (8 hrs per day) for tiling work when the standard time is 1 minute 50 seconds and policy allowance are 8% and 10% at site 1 and site 2. **[4]**

Q6) a) What is Piece Rate Method as introduced by Taylor? What are the drawbacks of the method? **[8]**

b) Give the 14 principles of management given by Henry Fayol. What is meant by Fair Wages as defined by Fayol? **[8]**

Q7) a) What is the necessity of job evaluation and merit rating systems? **[8]**

b) What is meant by "Management By Objectives"? How it can be used for performance appraisal of a Construction Manager? Explain with suitable example. **[8]**

Q8) Write short notes on any three of following : **[16]**

a) Herzberg's two factor theory.

b) Time and motion study.

c) Matrix structure of organization.

d) Project life cycle.

e) String Diagram.

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Total No. of Questions : 10]

SEAT No. :

P1709

[Total No. of Pages : 3

[4265]-62

M.E. (Mechanical - Design Engineering)

DESIGN ENGINEERING

(2002 Course)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Derive an expression for 3-4-5 polynomial cam for displacement, velocity, acceleration and jerk. Sketch the curve. What are the limitations of above cam. **[10]**

b) What are the advantages of flexibility in cam? List the major steps in designing polydyne cam. **[6]**

Q2) a) Derive an expression for maximum space efficiency of helical springs. **[8]**

b) Show the effect of height to thickness relation on characteristics of belleville springs. **[8]**

Q3) a) Explain the following terms in context with creep. **[8]**

i) True stress and true strain.

ii) Creep in bending.

b) A particular type of steel at 850ºC has the following creep rates.

S_1 = 24 MPa; creep rate 0.128% per 1000 hrs.

S_2 = 30 MPa; creep rate 0.64% per 1000 hrs.

Determine the constants of the hyperbolic sin law & the creep rate for a stress of 10.5 MPa. **[8]**

P.T.O.

Q4) a) What is difference between design for finite & infinite life problems? Explain modified Goodman diagram. **[8]**

b) The work cycle of mechanical component subjected to completely reversed bending stress consists of following three elements. **[8]**

i) $\pm$ 350 N/mm^2 for 85% of time.
ii) $\pm$ 400 N/mm^2 for 12% of time.
iii) $\pm$ 500 N/mm^2 for 3% of time.

The material for component is 50 C4 (Sut = 660 N/mm^2) and the corrected endurance limit of the component is 280 N/mm^2. Determine life of the component.

Q5) Write short note on the following : **[18]**

a) Factors affecting fatigue behaviour.

b) Rubber springs & mountings.

c) Polydyne cam.

SECTION - II

Q6) a) How to identify the given problem requires optimization or not? What are the methods to classify the problems of optimization? **[6]**

b) What is difference between linear programming and geometric programming. **[6]**

c) How do you solve a maximization problem as a minimization problem? **[4]**

Q7) a) Explain the term peaking & topping as applied to gear. **[6]**

b) Two 10 teeth gears are to mesh without undercutting. The gears are generated using standard hob with 20° pressure angle. Module is 4 mm, the clearance is 0.2 mm. Using extended centre distance method find out, **[10]**

i) Hob shift.
ii) Blank diameter & depth of cutter setting.
iii) Actual pressure angle.

Take usual notations,

$$\theta = inv\phi$$

$$\phi = \upsilon - \frac{2}{15}\upsilon^3 + \frac{3}{175}\upsilon^5$$

where, $\upsilon = 3\sqrt{3\theta}$

θ & ϕ are in radians.

Q8) a) Explain Weibull frequency distribution with the help of plot? **[5]**

b) What do you understand by total quality control? **[5]**

c) What is relation between the probability of survival and factor of safety. **[6]**

Q9) a) Explain the use of composite material in engineering applications. State reasons for a preference in favour of such materials. **[8]**

b) The following data refers for composite material whose elastic constants along and perpendicular to the fibres are as follows. **[8]**

E_{xx} = 100 GPa; E_{yy} = 9.3 GPa; G_{xy} = 7.17 GPa;

υ_{yx} = 0.28; υ_{xy} = 0.01594

Obtain the compliance coefficients appropriate to x′y′ axis which are at +40° (counter-clockwise) to xy axis.

Q10) Write short note on the following: **[18]**

a) Hygrothermal stresses in composite material.

b) Penalty function method.

c) Novikov's gears.

Total No. of Questions : 8]

P1711

SEAT No. :

[Total No. of Pages : 2

[4265] - 145

M.E. (Electronics) (Digital Systems & Computer)

DSP & APPLICATIONS

(2002 Course)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Using Kaiser window, design a high pass filter with following specifications, **[10]**

Stopband cutoff frequency = $\omega_s = 0.20\ \pi$

Passband cutoff frequency = $\omega_p = 0.30\ \pi$

Stopband ripple $\delta_s = 0.002$

b) Explain different window functions and their characteristics. **[6]**

Q2) a) State and prove, the following properties of Z-transform. **[8]**

i) Convolution of two sequences.

ii) Multiplication by exponential.

b) Find the Inverse Z-transform of **[8]**

i) $X(z) = \dfrac{z^2(z+1)}{(z-2)(z-3)}$, ROC $|z| > 3$

ii) $X(z) = \dfrac{z}{4(z-1)(z-½)}$, ROC $|z| < ½$

P.T.O.

Q3) a) Explain how Wiener filter can be used for filtering and prediction. **[8]**

b) Explain the least square inverse filter design method. **[8]**

Q4) Write short notes on : **[18]**

a) Sub-band coding.

b) Image compression using Wavelet Transform.

c) Power Spectrum Estimation using periodogram.

SECTION - II

Q5) a) Implement a Two-stage Decimator for the following specifications

Sampling rate of the input signal = 30,000 Hz

M = 150

Passband = 0 to 60 Hz

Transition band = 60 to 75 Hz

Passband ripple = 0.01

Stopband ripple = 0.002 **[10]**

b) Explain Barlett method for power spectrum estimation? What is its advantage? **[6]**

Q6) a) Draw the block diagram of ADSP 2100 DSP processor? Explain Barrel Shifter in detail. **[8]**

b) How the digital filter is used for FJR digital filtering? Explain. **[8]**

Q7) a) What is Quadrature Mirror filter? Draw the explain the basic structure of two-channel Quadrature mirror filter? **[8]**

b) Explain how ARMA mode is used for power spectrum estimation? **[8]**

Q8) Write short notes on : **[18]**

a) Levinson Durbin algorithm.

b) Signal analysis using DTMF.

c) Speech production model.

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Total No. of Questions : 6]

P1712

SEAT No. :

[Total No. of Pages : 2

[4265] - 168
M.E. (Electrical) (Control Systems)
NONLINEAR CONTROL SYSTEM
(2002 Course)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic table slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain peculiar characteristics of nonlinear control systems. **[10]**

b) What is mean by non linear control system? Discuss classification of nonlinear control system with suitable examples. **[15]**

Q2) a) Explain different types of singular points. **[8]**

b) Explain isocline method of constructing a phase plane trajectory for a given system. **[10]**

c) Compare isocline and delta method of constructing a phase plane trajectory. **[7]**

Q3) a) Derive describing function of saturation nonlinearity. **[8]**

b) How can stability be derived using describing function. Discuss it with suitable example. Explain limit cycle and it's frequency and amplitude. **[17]**

P.T.O.

SECTION - II

Q4) a) Derive describing function of an ideal relay with output equal to + / – 1 unit is connected in cascade with forward path transfer function $G(s)=\frac{1}{s(s+1)}$ in unity feed back control system. Find frequency and amplitude of limit cycle if it exists. Comment on stability of this system. **[17]**

b) Explain describing function of ON-OFF relay with dead zone. **[8]**

Q5) a) An autonomous system is given by $\dot{x}=\begin{bmatrix}0 & 1\\ -1 & -2\end{bmatrix}x$ Examine stability using Liapunov. **[8]**

b) Explain the terms in the sense of Liapunov **[8]**

i) Stability ii) Asymptotic stability

iii) Global Asymptotic stability iv) Instability

c) For linear time-invariant system $\dot{x}=Ax$ derive the expression $A^TP + PA = -Q$ where P & Q are square, Symmetric, Positive definite mitrices. **[9]**

Q6) a) Explain phase plane trajectory method : **[16]**

i) Isocline method

ii) Delta method

b) Compare describing function and phase plane method used to analize nonlinear control system. **[9]**

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Total No. of Questions : 8]

SEAT No. :

P1714

[Total No. of Pages : 2

[4265] - 450
M.E. (Civil) (Hydraulics)
COASTAL ENGINEERING
(2008 Course) (Elective - III (b)) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) ***Answer any three questions each from section-I and section-II.***
2) ***Answers to the both sections should be written in separate books.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of the Electronic pocket calculator and standard Tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Distinguish between (any four) : **[8]**

i) Off shore and near shore region.
ii) Deep water and shallow water.
iii) Regular and random wave.
iv) Sea and swell waves.
v) Storm and Tsunami.

b) State the function of the breakwater. What are different types of breakwater? Draw sketch of any one type. **[8]**

Q2) a) What do you understand by the term "Small Amplitude Wave". State various assumptions used in the derivation of Airy's theory. Also explain the advantages in the application. **[6]**

b) Define wave diffraction. Explain with a neat sketch the wave diffraction in the vicinity of a break water. **[6]**

c) Discuss the assumptions in the hypothesis developed by Penny and Price. **[6]**

Q3) a) What is wave refraction? Write the manual procedure for tracing wave path or wave ray. **[6]**

b) What is the use of Rayleigh distribution? Where Rayleigh distribution is suited? Write down the expression for density function and explain the meaning of terms used in the expression. **[6]**

c) Define wave energy and components of wave energy. **[4]**

P.T.O.

Q4) a) Write a short note on hindcasting and its applications. **[8]**

b) State true or false with reasons if any. **[8]**

i) Littoral sand transport is related to suspended load in deep water.
ii) Artificial Friction is added to the bed of tidal model to reduce the friction.
iii) Hudson formula provides optimum slope of breakwater.
iv) Regular wave generator is based on field wave spectrum.

SECTION - II

Q5) a) What is storm surge? Explain with a neat sketch the factors affecting storm surge. **[6]**

b) Enlist the steps in estimating storm surge. **[6]**

c) Which are the parameters used for description of a wave. Draw a neat definition sketch. **[6]**

Q6) a) Using a definition sketch explain the terminologies associated with a coastal area including beach. **[8]**

b) Which are wave induced coastal currents? Explain any one of them. **[8]**

Q7) a) Explain the process of longshore sediment transport. Explain the effect of sea level change on sediment supplied by rivers to coastal regions. **[8]**

b) Explain the use of remote sensing in sediment budget study. **[8]**

Q8) a) What are different methods of coastal protection? Explain with neat sketches. **[8]**

b) Write short notes on (any two) : **[8]**

i) Natural causes of coastal erosion.
ii) Design of sea wall.
iii) Sand trap design criteria.
iv) Formation of offshore bar.

Total No. of Questions : 10]

SEAT No. :

P1719

[Total No. of Pages : 3

[4265]-536

M.E. (Mechanical Engineering) (Design Engineering)

VEHICLE DYNAMICS

(2008 Course) (Elective - IV (a)) (Semester - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables, slide rule, and non-programmable electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) A passenger car weigh 11 kN has wheelbase of 2.2 m and radius of gyration 0.9 m. The combined stiffness of the suspension springs is 85 kN/m and ratio of stiffness of front to rear wheel is 1.2:1 CG is 1 m behind the front axle. Estimate the natural frequencies of the bounce and pitch motion. Derive the formula used and sketch the corresponding mode shapes. **[16]**

OR

Q2) A tractor with a bounce natural frequency of 2.5 Hz and a damping ratio of 0.12 travels at a speed of 6 km/h over a plowed field described by $S_g(\Omega) = 6.5 \times 10^{-4}\Omega^{-1.6}$ m^2/cycles/m. Determine the root-mean-square value of vertical acceleration of the tractor at a frequency of 1 Hz. Evaluate whether the vibration of the vehicle is acceptable from a fatigue or decreased proficiency viewpoint for an 8 h duration based on the International Standard ISO 2631 (refer figure 1 on last page). **[16]**

Q3) A sports car weighs 11 kN and has a wheelbase of 2.4 m. The center of gravity is 1.1 m behind the front axle. The cornering stiffness of each front tire is 55 kN/rad and that of each rear tire is 60 kN/rad. The steering gear ratio is 20:1. Determine the steady-state yaw velocity gain and lateral acceleration gain of the vehicle in the forward speed range upto 160 km/h with step of 40. **[16]**

OR

P.T.O.

Q4) a) Derive an expression for the steer angle δ_f required to negotiate a given turn with usual notations. **[8]**

b) Explain steady state response to steering input. **[8]**

Q5) Write short notes : **[18]**

a) Cornering Stiffness.

b) SDOF Response to half-sine base input.

c) Frequency weighted rms acceleration.

SECTION - II

Q6) a) Explain transient response characteristic of vehicle in yaw to the steering input. **[8]**

b) Explain braking characteristic of two – axle vehicle. **[8]**

OR

Q7) A passenger car weighs 14 kN and has a wheelbase of 2.44 m. The center of gravity is 1.35 m behind the front axle and 0.5 m above ground level. The braking effort distribution on the front axle is 60%. The coefficient of rolling resistance is 0.015. Determine which set of the tires will lock first on two road surfaces: one with a coefficient of road adhesion $\mu = 0.8$, and the other with $\mu = 0.2$. **[16]**

Q8) A vehicle weighs 1 kN and has a wheelbase of 2.3 m. The center of gravity is 1.5 m behind the front axle and 50 cm above ground level. The frontal area of the vehicle is 2.4 m^2 and the aerodynamic drag coefficient is 0.28. The coefficient of rolling resistance is given by $f_r = 0.0136 + 0.4 \times 10^{-7} V^{2,}$ where V is the speed of the vehicle in kilometers per hour. The rolling radius of the tires is 33 cm. The coefficient of road adhesion is 0.78. Estimate the possible maximum speed of the vehicle on level ground as determined by the maximum tractive effort that the tire-road contact can support if the vehicle is (a) rear-wheel drive, and (b) front-wheel-drive. Plot the resultant resistance versus vehicle speed, and show the maximum thrust of the vehicle with the two types of drive. **[16]**

OR

Q9) A tracked vehicle is equipped with a controlled differential steering system having a gear ratio of 3:1. The vehicle weighs 143 kN, and has a tread of 1.9 m and a contact length of 3.1 m. The contact pressure of the track is assumed to be uniform. On a particular terrain, the value of the coefficient of motion resistance is 0.165, and that of the coefficient of lateral resistance is 0.5. Determine the minimum turning radius of the vehicle. Also calculate the power required to maintain a steady-state turn at the minimum turning radius when the speed of the center of gravity of the vehicle is 10 km/h. **[16]**

Q10) Write short notes: **[18]**

a) Directional stability of vehicle during braking.

b) Spectral Density.

c) Tractive effort.

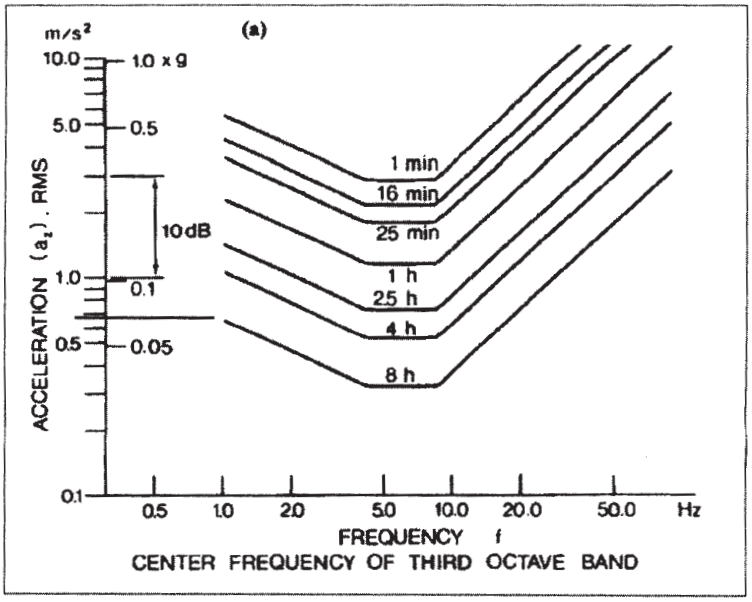


Figure 1. Limits of whole body vibration for fatigue or decreased proficiency as per ISO

Total No. of Questions : 8]

SEAT No. :

P1720

[Total No. of Pages : 3

[4265] - 544

M.E. (Mechanical) (Mechatronics)

CONTROL SYSTEMS

(2008 Course) (Elective - II (a)) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

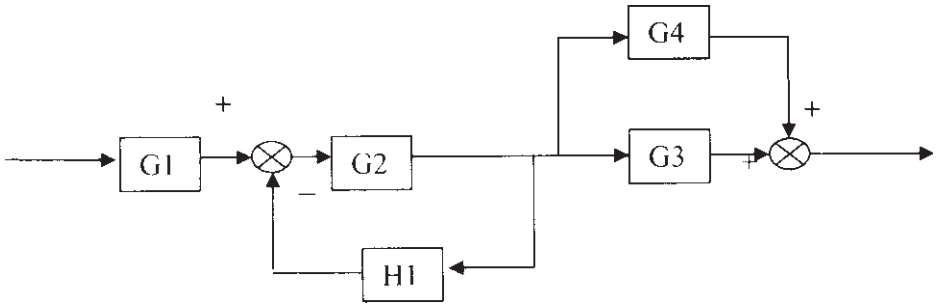
1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, whenever necessary.***

SECTION - I

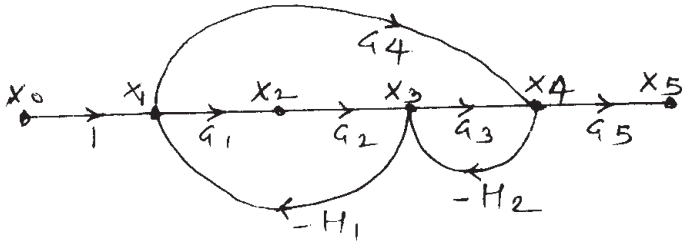
Q1) a) Distinguish between the following : **[8]**

i) Linear and nonlinear control systems.
ii) Open loop and closed loop system.

b) Reduce the following block diagram of the system shown in following figure into a single equivalent block by block diagram reduction technique. **[10]**



Q2) a) Obtain the closed loop transfer function using Mason's gain formula. **[10]**



b) Explain the advantage of Transfer function approach of control system. **[6]**

P.T.O.

Q3) a) Examine the stability by Routh's criterion for the characteristics equation. $S^5 + S^4 + 3S^3 + 2S^2 + 3S + 4 = 0$. **[10]**

b) Describe different test signals used in control systems. **[6]**

Q4) a) The closed loop transfer function of a unity feedback control system is

$$G(S)H(S)=\frac{K}{S(S+2)(S+5)}$$

Sketch the root locus of the system. Determine the value K for marginal stability from the root locus. **[10]**

b) Explain the following terms : **[6]**

i) State.
ii) State variable.
iii) State vector.

SECTION - II

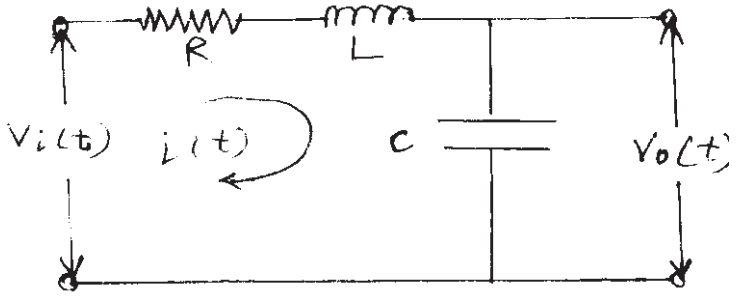
Q5) a) Discuss meaning of under damped and over damped system with respect to transient response of a system. If system has open loop transfer function as **[12]**

$$G(S)H(S)=\frac{25}{S^2+6S+25}$$

Find the delay time, peak time, and settling time.

b) Discuss the characteristics of on off controller and proportional controller. **[6]**

Q6) a) Obtain the state model of the given electrical network in standard form. **[8]**



b) Explain the characteristics of integral controller and derivative controller. **[8]**

Q7) a) A unity feedback control system has

$$G(S)H(S)=\frac{80}{S(S+2)(S+20)}.$$

Sketch Bode plot. Determine from it. **[10]**

i) Gain crossover frequency.
ii) Phase crossover frequency.
iii) Gain margin.
iv) Phase margin.
v) Stability of system.

b) What are adaptive control systems? With block diagram explain its operation. **[6]**

Q8) a) What is neural control system? Explain its features with applications. **[8]**

b) Explain the fuzzy system with the help of fuzzy logic based control system. **[8]**

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Total No. of Questions : 10]

P1722

SEAT No. :

[Total No. of Pages : 3

[4265] - 567

M.E. (Mechanical / Automotive Engineering)

FUNDAMENTALS OF VEHICLE DYNAMICS

(2008 Course) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Square bracketed figures to the right indicate full marks.***
4) ***Use of logarithmic tables, slide rule and non-programmable electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain most commonly used frequency weightings for whole-body vibration. **[4]**

b) The sprung parts of a passenger car weigh 9.5 kN and the unsprung parts weigh 850 N. The combined stiffness of the suspension springs is 41.5 kN/m and that of the tires is 551.3 kN/m. Determine the two natural frequencies of bounce motion of the sprung and unsprung mass. Derive the formula used. **[12]**

OR

Q2) A vehicle is treated as two degree freedom system in bounce and pitch mode. The mass of the vehicle is 1350 kg and its radius of gyration is 1.3 m. The stiffness of the front suspension is 135 kN/m and that of rear suspension is 155 kN/m. Center of gravity of the vehicle is 1.4 m from front, 1.2 m from rear wheel and 0.6 m above ground. Find the natural frequencies and mode shapes. Derive the formula used. **[16]**

P.T.O.

Q3) a) Derive an expression for the steer angle δ_f required to negotiate a given turn with usual notations. **[8]**

b) A rear engine rear wheel drive passenger car has a mass of 1150 kg. The weight distribution on the front axle is 35 % and that on rear axle is 65 % under static condition. If cornering stiffness each of the front tires is 31 kN/rad and that of rear tires is 34 kN/rad determine the steady state handling behavior of the vehicle. If the vehicle has wheel base of 2.23 m find critical/characteristics speed of vehicle. **[8]**

OR

Q4) What are test carried out for determining handling characteristics of -vehicle? Explain each test in detail. **[16]**

Q5) Write short notes : **[18]**

a) ISO Standard for Human Response to Vibrations.

b) Characteristic and Critical speeds.

c) Natural frequency and damping in yaw.

SECTION - II

Q6) A passenger car weighs 18 kN and has a wheelbase of 2.6 m. The CG is 1.1 m behind the front axle and 0.5 m above ground level. The braking effort distribution on the front axle is 68%. The coefficient of rolling resistance is 0.018. Determine which set of the tires will lock first on two road surfaces: one with a coefficient of road adhesion $\mu = 0.78$, and the other with $\mu = 0.22$. **[16]**

OR

Q7) A vehicle weighs 14 kN and has a wheelbase of 2.6 m. The center of gravity is 1.1 m behind the front axle and 50 cm above ground level. The frontal area of the vehicle is 2.2 m^2 and the aerodynamic drag coefficient is 0.28. The coefficient of rolling resistance is given by $f_r = 0.0136 + 0.4 \times 10^{-7} V^2$, where V is the speed of the vehicle in kilometers per hour. The rolling radius of the tires is 32 cm. The coefficient of road adhesion is 0.78. Estimate the possible maximum speed of the vehicle on level ground as determined by the maximum tractive effort that the tire-road contact can support if the vehicle is (a) rear-wheel drive, and (b) front-wheel-drive. Plot the resultant resistance versus vehicle speed, and show the maximum thrust of the vehicle with the two types of drive. **[16]**

Q8) A tracked vehicle weighs 95 kN and has a contact length of 3.2 m and a tread of 2.5 m. The vehicle has a uniform contact pressure and is equipped with a clutch/brake steering system. On a sandy terrain, the value of the coefficient of motion resistance is 0.17, and that of the coefficient of lateral resistance is 0.45. The angle of internal shearing resistance of the terrain φ is 33°. (a) determine the thrusts of the outside and inside tracks required to execute a steady state turn. (b) If, during the turn, the sprocket of the outside track, with a radius of 0.3 m, is rotating at 15 rad/s, and the inside track is disconnected from the driveline by declutching and the brake is applied, determine the turning radius and yaw velocity of the vehicle during the turn. The slip of the running gear during the turn may be neglected in the calculations. **[16]**

OR

Q9) In a rear engine rear wheel drive passenger car each front wheel is loaded by 183 kg and each rear wheel is loaded by 385 kg. Suspension travel at front axle and at rear axle should not exceed 0.045 m and 0.055 m respectively. Find lower bound of the spring rate at both axle. If chassis mass of quarter car model is 375.5 kg, find undamped natural frequency of each axle for the loaded and unloaded condition. **[16]**

Q10) Write short notes on : **[18]**

a) Force-speed response of damper.

b) Frequency Response of road vehicle in yaw.

c) Air suspension system.

❖ ❖ ❖ ❖

Total No. of Questions : 8]

SEAT No. :

P1723

[Total No. of Pages : 2

[4265]-572

M.E. (Mechanical) (Automotive Engineering)

AUTOMOTIVE CHASSIS DESIGN

(2008 Course) (Elective - IV (b)) (Semester - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer any three questions from Section I and three questions from Section II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rules and electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are the general characteristics of a vehicle suspension system? What conditions must be satisfied in suspension of a modern day car. Explain with the help of neat sketches. **[8]**

b) A compression spring is subjected to a load which varies from 400 N to 1000 N. The other parameters of the spring are ; i) Spring index = 6, ii) Design factor for safety consideration = 1.25, iii) Allowable yield stress in shear = 770 MPa, iv) Allowable endurance stress in shear = 350 MPa, v) Compression at maximum load = 30 mm and vi) Modulus of rigidity for spring material = 80 kN/mm^2. Determine important dimensions of the spring such as size of wire, mean diameter of the spring, number of turns of the spring and free length of the spring. **[8]**

Q2) a) Describe with the help of sketches, working of independent wheel suspension system of a modern car dealing with high acceleration, peak speed and high cornering speed. **[10]**

b) With the help of neat sketches describe working of rack and pinion type and also re-circulating ball steering mechanisms. **[6]**

P.T.O.

Q3) a) With the help of neat sketches working of a hydraulic power steering system. List the major component of mechanism and draw a hydraulic circuit showing high pressure and return line. **[8]**

b) Write short note on ABS giving its advantages over normal braking system. **[8]**

Q4) Write short note on the following (Any three) : **[18]**

a) Steering characteristics.

b) Air spring.

c) Wheel alignment.

d) Disc Brakes.

SECTION - II

Q5) a) Why brake shoe adjustment is required? Explain Lockheed heavy duty brake adjusting mechanism. **[8]**

b) What is load conscious valve? Describe working of simple load conscious brake pressure apportioning valve. **[8]**

Q6) a) With the help of neat sketch, explain the detailed construction of Dunlop crosply tyre. **[8]**

b) What are the design requirements of tyres? Explain Run-flat tyres. **[8]**

Q7) a) With the help of neat sketch, explain the working of suspension for rigid six wheelers. **[8]**

b) Describe Scammell articulated trailer. **[8]**

Q8) Write short note on the following (Any three) : **[18]**

a) Transmission of six wheelers.

b) Significance of Aspect ratio and tyre markings.

c) Dual brake.

d) Wheel noise.

Total No. of Questions : 6]

SEAT No. :

P1725

[Total No. of Pages : 2

[4265] - 597

M.E. (Electrical) (Control System)

ADVANCED TOPICS IN CONTROL SYSTEMS

(Semester - I) (2008 Course) (Elective - II (a))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections must be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are the conditions for arbitrary pole-placement? Explain with neat block diagram the method of pole placement design using Linear state variable feedback. **[10]**

b) A linear time-invariant control system is represented in state space form :

$$\dot{x}(t)=\begin{bmatrix}0 & 1 & 0\\ 0 & 0 & 1\\ 3 & 1 & -3\end{bmatrix}x(t)+\begin{bmatrix}0\\ 0\\ 1\end{bmatrix}u(t)$$

Design a linear state variable feedback to place the poles at desired locations : S = – 2, – 3 + j2, and – 3 – j2. **[15]**

Q2) a) Draw a block diagram of an adaptive system and explain the working of each block. **[8]**

b) What is Model Reference Adaptive Control (MRAC)? What are the different methods generally being used in connection with 'MRAC'? **[9]**

c) Explain with block diagrams the various adaptive schemes. **[8]**

Q3) a) Explain with suitable example the terms : **[8]**

i) Sliding surface.
ii) Dynamic sliding surface.

b) Enumerate and explain the uncertainties in system matrix and input matrix. **[8]**

c) Explain briefly the concept of variable structure control. State some of its applications. **[9]**

P.T.O.

SECTION - II

Q4) a) Draw multiple input neuron model and derive its activation function. **[10]**

b) Define and explain generalisation of Neural Network. **[5]**

c) Draw a typical recurrent network and explain the following : **[10]**

i) Supervised learning,
ii) unsupervised learning,
iii) Rain forced learning and
iv) Hebbian learning.

Q5) Explain in detail the following multirate output feedback techniques :

a) Periodic output feedback. **[8]**

b) Fast output sampling feedback. **[8]**

c) Multirate output control. **[9]**

Q6) a) With appropriate diagram, explain the deterministic model of artificial neuron. Also explain with mathematical formula and graphical representation, the activation functions. **[15]**

b) What is Neural Network? Explain how the artificial neural network is inspired from biological neuron. Give atleast four reasons to use neural networks. **[10]**

Total No. of Questions : 12]

SEAT No. :

P1726

[Total No. of Pages : 3

[4265] - 598

M.E. (Electrical) (Control System)

COMPUTER AIDED CONTROL SYSTEM DESIGN

(2008 Course) (Elective - II (b)) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) *Answer three questions from section-I and three questions from section-II.*
2) *Answers to the two sections should be written in separate answer books.*
3) *Neat diagrams must be drawn wherever necessary.*
4) *Figures to the right indicate full marks.*
5) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) Distinguish between cascade compensation and feedback compensation. What factors govern the choice of compensating network? **[6]**

b) A certain feedback control system with unity feedback has open-loop transfer function : **[12]**

$$G(S)=\frac{K}{S(1+0.125s)(1+0.4s)}$$

Design a suitable compensator to satisfy the following design specifications :

i) Velocity error constant $K_v \geq 8$ sec^{-1}.

ii) Phase margin $\phi_m \geq 45°$.

Give reasons for the selection of compensator. Also draw the Bode diagrams for uncompensated and compensated system.

OR

Q2) a) State and explain the conditions for compensation. **[4]**

b) Compare phase-lag network with phase-lead network for compensation in linear control systems. **[6]**

c) Define and explain the terms 'Absolute stability' and 'Relative stability'. Discuss the measures of relative stability using Bode diagrams. **[8]**

Q3) a) Explain the computer method for obtaining the root-locus plot of a linear control system. Give its algorithm and draw its flow chart. **[10]**

b) Explain how to reshape this root-locus plot to obtain the desired performance. **[6]**

P.T.O.

OR

Q4) a) Discuss the computer method for obtaining frequency response by Bode plots from the given open-loop transfer function G(S) H(S). Give its algorithm and draw the flow chart. Compare the computer method with classical approach for obtaining Bode plots. **[12]**

b) Illustrate the important parameters of the typical Bode plots obtained on Computer Screen. **[4]**

Q5) a) Give critical comparison between the phase - plane method and describing function method for the design of nonlinear control system. **[6]**

b) Explain with algorithm the computer method for simulation of nonlinear control system containing 'dead-zone' nonlinearity using describing function method. How to determine the stability of nonlinear control system using describing function method? **[10]**

OR

Q6) a) Define singular point and discuss the various singular points in phase-plane technique. **[6]**

b) Explain with suitable example the phase plane technique for simulating nonlinear control system with 'dead-zone' as non-linear element. Give its algorithm and explain how to determine stability from phase-plane trajectory. **[10]**

SECTION - II

Q7) a) Explain the computer method of determining the controllability and observability of the control system. Give its algorithm or flow chart. **[6]**

b) A certain control system is represented in state space form : **[12]**

$$\dot{x}(t)=\begin{bmatrix} 3 & -2 & 0 \\ 0 & 1 & 0 \\ -5 & 5 & -2 \end{bmatrix} x(t)+\begin{bmatrix} 1 & 0 \\ 0 & 1 \\ -1 & 0 \end{bmatrix} u(t)$$

$$y(t)=\begin{bmatrix} 2 & 1 & 0 \\ 0 & 2 & -1 \end{bmatrix} x(t)$$

Investigate the controllability and observability of the system.

OR

Q8) a) Explain with suitable example the relation between controllability, observability and pole-zero cancellation. **[6]**

b) Give computer method for determining the stability of a control system represented in state-space form. Give its algorithm. **[6]**

c) Determine the solution of the following control system represented in state space form : **[6]**

$\dot{x}(t) = Ax(t) + Bu(t)$

$y(t) = Cx(t)$

with usual notations.

Q9) a) Discuss in detail the pole-placement design using Linear State Variable Feedback (LSVF). Draw the appropriate block diagram. **[6]**

b) A linear time-invariant control system is represented in state space form : **[10]**

$$\dot{x}(t) = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 6 & 3 & -6 \end{bmatrix} x(t) + \begin{bmatrix} 0 \\ 0 \\ 2 \end{bmatrix} u(t)$$

Design the linear state variable feedback to place the poles at desired locations : S = – 2, – 3 + j2 and – 3 – j2.

OR

Q10) Draw neat block diagram showing the structure of full order observer system and explain the procedure for the design of a full order observer. State the principle of separation used in observer design. **[16]**

Q11) a) What are the main considerations for the selection of P, PI or PID controller for process control system? **[6]**

b) Explain with algorithm the design procedure of tunable PID controller using Ziegler-Nichols method. **[10]**

OR

Q12) a) Discuss the advantages of digital control system compared to continuous-time control system. **[6]**

b) Explain with algorithm the procedure for obtaining the computer solution $x(k)$ of the following discrete-time control system represented by

$x(k + 1) = F\,x(k) + G\,u(k)$

where 'k' is the sampling instant; $x(k)$ is the state vector; $u(k)$ is the contol vector. F and G are constant matrices of compatible dimensions. **[10]**

Total No. of Questions : 8]

SEAT No. :

P1730

[Total No. of Pages : 2

[4265]-799

M.E. (Computer Engineering)

INFRASTRUCTURE MANAGEMENT

(2008 Course) (Elective - IV (b)) (Semester - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Attempt any three questions from Section - I and three questions from Section - II.***
2) ***Answer of Section - I and Section - II should be written on separate answer sheets.***
3) ***Figures to the right indicate full marks.***
4) ***Draw neat diagram wherever necessary.***
5) ***Make suitable assumptions wherever necessary.***

SECTION - I

Q1) a) How to estimate total cost of complexity issues in Infrastructure Management? How cost plays important role? Justify. **[8]**

b) What are the benefits and potential problems of using IT Service Management? **[8]**

Q2) a) Write short note on Complexity of current Computing Environment. **[8]**

b) State and explain Infrastructure Management Activities. **[8]**

Q3) a) What are the different factors need to be considered in designing IT Organizations and IT Infrastructure? **[9]**

b) State and explain different tools and their integration for Infrastructure Management. **[9]**

Q4) a) What are steps in identifying Customer Requirements? **[8]**

b) Explain the design process for information system for Infrastructure Management. **[8]**

SECTION - II

Q5) a) Write a short note on Service Level Management. **[9]**

b) What is the role played by Financial Management in hardware and software Infrastructure Management? **[9]**

P.T.O.

Q6) a) What are the different steps by which we can achieve Continuity Management in IT Services? **[8]**

b) Explain the correlation between Capacity Management and IT Services Management. **[8]**

Q7) a) What is Identity and Access Management? Explain components and benefits of Identity and Access Management. **[8]**

b) State and explain the importance of Configuration Management in Service Support Processes. **[8]**

Q8) a) Explain the importance of Authentication and comment on SSO. **[8]**

b) Compare and contrast SAN and NAS. **[8]**

Total No. of Questions : 10]

SEAT No. :

P1731

[Total No. of Pages : 2

[4265]-803

M.E. (Computer) (Computer Networks)

CONVERGENCE TECHNOLOGIES

(2008 Course) (Elective - IV (b)) (Semester - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Compare Circuit switching and Cell switching on the following aspects - Nature of connection, header overhead, resource utilization and congestion control. **[8]**

b) Discuss various pros and cons of G.711, G.726, G.729 speech codecs. **[8]**

Q2) a) What is Technological Convergence? Explain what convergence technologies are used in Mobile communication? **[8]**

b) Discuss the capabilities of T Carrier Systems. **[8]**

Q3) a) Compare various broad band Networks at Data link layer. **[8]**

b) Explain TE1 and TE2 with example. How TE2 can be mapped with ISDN interface. **[8]**

Q4) a) Explain the need for explicit congestion avoidance technique. Explain the significance of FECN and BECN bit in frame relay networks with an example. **[8]**

b) What is the purpose of SS7? Explain SS7 Protocol Architecture. **[8]**

Q5) Write a short notes on (Any three) : **[18]**

a) GFC algorithm in ATM.

b) General Q.931 message format.

c) Rate-based & Windows-based control for BECN.

d) Difference between AAL3/4 & AAL5.

P.T.O.

SECTION - II

Q6) a) List and explain the ATM service categories. **[8]**

b) List traffic management functions to maintain the QoS of ATM connections. Explain any one function in detail. **[8]**

Q7) a) Explain Functional architecture of MEGACO. **[8]**

b) Explain Q.931 call setup process. **[8]**

Q8) List five important Information Elements (IE's) used in ATM signalling? What are the benefits of decoupling the two. **[16]**

Q9) a) What is Circuit Emulation Service (CES)? What are the drawbacks? How are these removed in Dynamic Bandwidth Circuit Emulation Services (DBCES)? **[8]**

b) What are the classifications of CAC algorithms? Explain CAC algorithm for ATM service categories. **[8]**

Q10) Write short note on (ANY THREE) : **[18]**

a) Open Issues in Internet Telephony.

b) Features and benefits of VOIP.

c) Block diagram of H-323 terminal.

d) Net Meeting.

Total No. of Questions : 8]

P1734

SEAT No. :

[Total No. of Pages : 2

[4265] - 142

M.E. (Electronics) (Digital Systems)

(Electronics and Telecommunication) (Instrumentation)

EMBEDDED SYSTEM DESIGN

(2002 Course)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answers to the two sections must be written in separate answer papers.***
2) ***Answer any three questions from each section.***
3) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Explain the architecture of PIC Microcontroller. **[8]**

b) Compare microprocessor and microcontroller. **[8]**

Q2) a) Draw and explain the architecture of 8051 Micro-controller. **[8]**

b) Explain the different addressing modes of 8051. **[8]**

Q3) a) Explain different factors to be considered while selecting processor for an embedded system with examples. **[8]**

b) Compare between RISC and CISC processor. **[8]**

Q4) Write short notes on : **[18]**

a) SPI bus

b) MODBUS

c) PCI bus

P.T.O.

SECTION - II

Q5) a) What is an embedded system? List the characteristics of embedded system. **[8]**

b) Differentiate between embedded operating system and real time operating system. **[8]**

Q6) a) Explain the objects of an operating system kernel. **[8]**

b) Describe the memory selection criteria for an embedded system with three case studies. **[8]**

Q7) a) Explain different modes of operation of ARM Processor, along with its advantage and disadvantages. **[8]**

b) Explain the functions of linker, loader, simulator and emulator. **[8]**

Q8) Write short notes on : **[18]**

a) RTOS.

b) CAN bus protocol.

c) Bluetooth protocol.

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Total No. of Questions : 6]

SEAT No. :

P1736

[Total No. of Pages : 2

[4265] - 609
M.E. (Electrical) (Power Systems)
COMPUTER APPLICATIONS IN POWER SYSTEMS
(2008 Course) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***All questions carry equal marks.***
6) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) State the criteria on which classification of optimization problem is done. Explain any two in details. **[10]**

b) Explain multivariable optimization with equality constraints by Lagrange multiplier method. **[8]**

c) By constrained variation method, find the solution of following optimization problem : **[7]**

Minimize $F(X) = x_1^2 + 6x_2 + 8$

Subject to the constraint $G(X) = 4x_1 + 2x_2 - 7 = 0$

Verify your result by Lagrange multiplier method.

Q2) a) Explain random walk method for unconstrained minimization. Draw flowchart. **[10]**

b) Explain Steepest Descent method. Draw its flowchart. **[6]**

c) Explain Unimodal function. Describe algorithm for unrestricted search elimination method with a limited step size. **[9]**

Q3) a) Explain the Newton Raphson method of load flow analysis (Polar form) along with its flow chart. **[13]**

b) Explain fast decoupled load flow method along with its flowchart. State the assumptions. **[12]**

P.T.O.

SECTION - II

Q4) a) Explain classical method of economic dispatch considering limits. Draw flow chart. **[12]**

b) Derive transmission loss formula in terms of transmission loss coefficients. **[13]**

Q5) a) Explain economic dispatch using Newton Raphson method. Draw flow chart. **[13]**

b) Explain three phase load flow analysis. **[12]**

Q6) Explain the following (any two) : **[25]**

a) A.C. - D.C. load flow problem formulation along with D.C. system model, converter variables and derivation of equations.

b) Formulation of sequence impedance matrix in terms of self and mutual impedances using transformation matrix.

c) Optimal power flow based on Gradient method.

Total No. of Questions : 8]

SEAT No. :

P1739

[Total No. of Pages : 2

[4265] - 565
M.E. (Mechanical) (Automotive Engg.)
AUTOMOTIVE FUELS AND EMISSIONS
(2008 Course) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) Explain the importance of hydrogen as an alternative fuel. Why is it termed as freedom fuel? Elaborate at least two production methods for hydrogen. **[10]**

b) Describe the changes required to be made in petrol engine to run on LPG fuel. **[6]**

Q2) a) Discuss some additives required for diesel. **[4]**

b) Discuss the combustion stages for conventional petrol engine. **[8]**

c) What is knocking? Why is it undesirable? **[4]**

Q3) a) State the first law for reacting systems. **[4]**

b) Explain the concept of enthalpy of combustion. **[4]**

c) Write the combustion reaction for methane with 50% excess air. **[4]**

d) What is significance of adiabatic flame temperature? **[4]**

Q4) Write short notes on : **[18]**

a) Octane and Cetane rating.

b) Fugacity and Activity.

c) Need for alternative fuels.

SECTION - II

Q5) a) What are the main constituents of exhaust emission from diesel engines? Discuss the various factors affecting the exhaust emission? **[8]**

b) What are the bad effects of CO,HC, NOx, Ozone, particulates on human health, animals and crops? **[8]**

P.T.O.

Q6) a) Discuss the emissions from petrol engines and explain briefly how it can be controlled? **[8]**

b) Explain emissions and drivability in case of petrol as well as diesel engines. **[8]**

Q7) a) Discuss in detail greenhouse gas emissions. **[8]**

b) Explain and compare electronic catalytic converter and conventional exhaust catalytic converter. **[8]**

Q8) Write notes on : **[18]**

a) BS III and BS IV norms.

b) Charcoal Canister Control for Evaporative Emission Control.

c) Emission Inventory.

Total No. of Questions : 8]

SEAT No. :

P1740

[Total No. of Pages : 2

[4265] - 667
M.E. (E & TC) (VLSI and Embedded Systems)
REAL TIME OPERATING SYSTEMS
(2008 Course) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written separately.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn whenever necessary.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are the various software architectures used in system design? **[12]**

b) What are the limitations of Foreground/Background software systems? **[6]**

Q2) a) Define the role of IDE. Describe how it is useful in embedded system development? **[10]**

b) Compare traditional desktop OS with RTOS. **[6]**

Q3) a) What are the characteristics of embedded OS? **[6]**

b) Describe context switch operation performed in multitasking OS. Also define the role of TCB. **[10]**

Q4) a) Explain critical section of the code and what cares are required to handle the critical section of the code. **[6]**

b) What are the severe problems need to pay attention in preemptive type OS? **[10]**

SECTION - II

Q5) a) Draw and describe the OS sub system and also describe the operation of non-preemptive kernel. **[8]**

b) Describe the file manipulation functions used in Linux/RTlinux. **[8]**

Q6) a) Describe the rules used to define function as reentrant re-entrant function. **[10]**

b) Describe following µCOS - II functions. **[6]**

i) OSTaskStkChk()
ii) OSTaskChangePrio()
iii) OSTaskSuspend()

P.T.O.

Q7) a) What feature of μCOS - II makes it suitable for real time embedded system design? Also describe the various task states of μCOS - II. **[10]**

b) Describe the requirements and procedure for porting μCOS - II OS. **[6]**

Q8) Write short notes on : **[18]**

a) Memory management in RTOS,

b) Interrupt handling in RTOS,

c) Time delay generation in RTOS.

Total No. of Questions : 10]

SEAT No. :

P1741

[Total No. of Pages : 3

[4265] - 530
M.E. (Mechanical) (Design Engineering)
VIBRATION AND NOISE CONTROL
(2008 Course) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic table and electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Write the differential equations of motion of the vibrating system as shown in Fig.No.1. Find the amplitude ratio and write down frequency equation for the system. Estimate natural frequencies assuming the masses and stiffness to be equal i.e.$m_1 = m_2 = m$ and $k_1 = k_2 = k_3 = k$. **[16]**

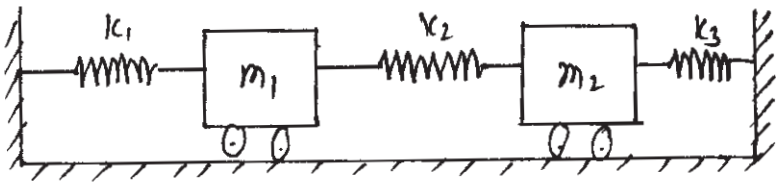

Fig. No. 1

Q2) A uniform string fixed at x = 0 and x = L as shown in Fig.2. Find the eigenvalue and plot the first three eigenfunctions. The tension 'T' in the string is constant. **[16]**

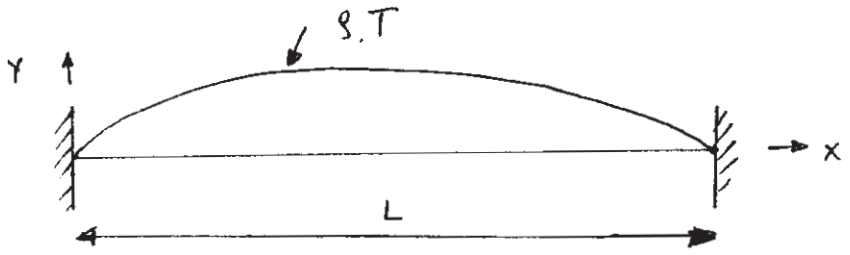

Fig. No. 2

P.T.O.

Q3) Derive expressions for dimensionless displacements in undamped dynamic vibration absorber in terms of the parameters of the system. For the tuned absorber, show **[16]**

a) The relationship between response speed and mass ratio.

b) Frequency response curves for main system and absorber.

Q4) Establish equation for finding frequencies of transverse vibration of beam with varying cross section using Rayleigh-Ritz. **[16]**

Q5) Write the short notes of the following (any two) : **[18]**

a) Duhamel's Integral.

b) Influence coefficients.

c) Balancing of rotating Machine.

SECTION - II

Q6) a) Explain FFT analyzer with a practical application. **[8]**

b) State and explain different machine vibration monitoring techniques. **[8]**

Q7) a) Explain wide band and narrow band random vibrations. **[6]**

b) A random signal has a special density that is constant s (f) = 0.004 cm^2/ cps between 20 cps and 1200 cps and that is zero outside the frequency range. Its mean value is 2.0 cm. Determine its rms value and its standard deviation. **[10]**

Q8) Using Duffing's equation, explain Jump phenomenon for undamped and damped non-linear system. **[16]**

Q9) a) Define sound pressure level, sound power level and sound intensity. What is the sound pressure level of a sound source radiating energy at a rate of 0.2? **[10]**

b) Explain design of enclosure for shielding noise. **[6]**

Q10) Write the short notes of the following (any two) : **[18]**

a) Auto correlation function.

b) Noise absorber.

c) Self excited vibrations.

Laplace Transform Pairs

	$f(t)$	$L[f(t)]$
1.	$f(t)$	$\int_0^\infty f(t)e^{-st}dt = F(s)$
2.	$x(t)+y(t)$	$X(s)+Y(s)$
3.	$K f(t)$	$K F(s)$
4.	$u(t)$ or 1	$\frac{1}{s}$
5.	$\partial(t)$	1
6.	t	$\frac{1}{s^2}$
7.	t^n	$\frac{n!}{s^{n+1}}$
8.	Sin ωt	$\frac{\omega}{s^2+\omega^2}$
9.	Cos t	$\frac{s}{s^2+\omega^2}$
10.	e^{-at}	$\frac{1}{s+a}$
11.	e^{-at} Sin ωt	$\frac{\omega}{(s+a)^2+\omega^2}$
12.	e^{-at} Cos ωt	$\frac{s+a}{(s+a)^2+\omega^2}$
13.	$e^{-at} f(t)$	$F(s+a)$
14.	$u(t-a)$	$\frac{e^{-as}}{s}$
15.	$\partial(t-a)$	e^{-as}
16.	$\begin{bmatrix} 0 \text{ when } t < a \\ f(t-a) \text{ when } t > a \end{bmatrix} = f(t-a)u(t-a)$	$e^{-as}F(s)$
17.	$\frac{df(t)}{dt}$	$sF(s)-f(0)$
18	$\frac{d^2f(t)}{dt}$	$s^2F(s)-sf(0)-\frac{df(0)}{dt}$
19.	$\int_0^t f(t)dt$	$\frac{F(s)}{s}$

Total No. of Questions : 8]

SEAT No. :

P1742

[Total No. of Pages : 2

[4265] - 575

M.E. (Mechanical) (Energy Engineering)

ADVANCED THERMODYNAMICS

(2012 Course) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Obtain following expression for entropy change of an ideal gas. **[8]**

$$\Delta s = c_p \ln\left(\frac{V_2}{V_1}\right) + c_v \ln\left(\frac{p_2}{p_1}\right) \text{ per kg of gas.}$$

b) Explain Generalized compressibility chart. **[8]**

Q2) a) Explain critical point, triple point and phase change process of water with suitable diagrams. **[6]**

b) Steam initially at 1.5 MPa, 300ºC expands reversibly and adiabatically in a steam turbine to 40ºC. Determine the ideal work output of turbine per kg of steam. **[6]**

c) Write note on viral expansions for pv in terms of p and v. **[4]**

Q3) a) Explain availability, reversibility and causes for irreversibility. **[6]**

b) State and prove Clausius Inequality. **[6]**

c) What do you understand by the dead state. **[4]**

Q4) Write note on (any three) : **[18]**

a) Helmholtz and Gibb's function.

b) Tds Equations.

c) Inversion Curve.

d) Entropy generation.

P.T.O.

SECTION - II

Q5) a) Write note on Clausius-Clayperon equation. **[6]**

b) Explain : **[10]**

i) Amagat's Law and Kay's Rule.

ii) Fugacity and activity.

Q6) a) Write note on adiabatic flame temperature. **[6]**

b) Octane (C_8H_{18}) burn with 30% excess air. Estimate actual and theoretical air-fuel ratio. **[6]**

c) Explain criteria for chemical equilibrium. **[4]**

Q7) a) Explain Dalton's law of partial pressure. **[6]**

b) What is significance of Langrange Multipliers. **[6]**

c) Write note on Mass Fraction and mole fraction. **[4]**

Q8) Write note on (any three) : **[18]**

a) Third law of thermodynamics.

b) Enthalpy of formation.

c) Equilibrium constant.

d) Bose-Einstein statistics.

Total No. of Questions : 8]

P1748

SEAT No. :

[Total No. of Pages : 2

[4265] - 132
M.E. (E&TC) (VLSI and Embedded Systems)
SYSTEM DESIGN USING PLDS
(2002 Course)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written separately.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***
5) ***Neat diagrams must be drawn wherever necessary.***

SECTION - I

Q1) a) What are the various features of typical CPLD? **[6]**

b) What are the various programming technologies used for FPGA programming? **[12]**

Q2) a) With the help of architectural block diagram, describe the role of each block of the typical CPLD in detail. **[10]**

b) Why CPLD architecture is less suitable for a digital circuit design with high complexity and high component count? **[6]**

Q3) Design a typical PLD based digital system with the following specifications. 8 bit Analog to Digital converter interface. The digital output value of this signal is to be displayed on 16×2 LCD. Draw the necessary interfacing diagram and write VHDL code separately for each interfacing. **[16]**

Q4) a) Describe with typical block diagram how I/O block section features of the PLD are made programmable? **[10]**

b) Compare PLDs based design with ASIC and list merits and demerits. **[6]**

P.T.O.

SECTION - II

Q5) a) What are the architectural features of the typical FPGA? **[8]**

b) Describe the clock skew and its reasons of occurring and effects on the performance. **[8]**

Q6) a) What type of I/O interfacing logic families and levels are supported by I/O section of the typical FPGA? **[8]**

b) Routing is a critical issue in the FPGA architecture? Explain why? What are the techniques / methods used in a typical FPGA to handle routing issue/s? **[10]**

Q7) a) What is the role of the boundary scan logic and BIST in the system design? **[8]**

b) Describe the various stages of design methodology used for system design? **[8]**

Q8) Design a typical PLD based system with the following specifications. Input the 8 bit digital value through keyboard, and display it on the 16×2-LCD. Generate analog equivalent of it using DAC. Draw the necessary interfacing diagram and write VHDL code separately for each interfacing. **[16]**

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Total No. of Questions : 8]

SEAT No. :

P1749

[Total No. of Pages : 2

[4265] - 135
M.E. (E & TC) (VLSI and Embedded Systems)
REAL TIME OPERATING SYSTEMS
(2002 Course)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written separately.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data if necessary.***
5) ***Neat diagram must be drawn wherever necessary.***

SECTION - I

Q1) a) What are the features of the typical RTOS? **[8]**

b) What are the reasons for priority inversion problem? What is the solution supported by most of the RTOS to solve this problem? **[8]**

Q2) a) Describe sharing data problem? Describe how semaphore provides the solution over this problem? **[10]**

b) Compare RTOS with Desktop OS. **[6]**

Q3) a) Which function is called reentrant function? Specify the rules used to define function as reentrant. **[8]**

b) What are various Inter-Process Communication techniques used in RTOS? **[10]**

Q4) a) Describe memory management techniques used in RTOS. **[8]**

b) Can semaphore be used for signaling device? Justify the answer using suitable example. **[8]**

SECTION - II

Q5) a) What are the salient features of the μCOS-II? **[6]**

b) Draw and describe state diagram of the μCOS-II. **[10]**

Q6) a) What are the salient features of the Vx-Works? **[8]**

b) Describe Task related functions of the μCOS-II **[8]**

P.T.O.

Q7) a) Describe the rate monotonic scheduler algorithm in detail. **[10]**

b) What is the role and advantage of using device drivers? Justify the answer by giving suitable example. **[8]**

Q8) a) What features of the integrated development Environment (IDE) tool are useful in the development of sophisticated embedded system? **[8]**

b) What are the various delay generation mechanisms used in RTOS? **[8]**

Total No. of Questions : 6]

SEAT No. :

P1751

[Total No. of Pages : 2

[4265]-175

M.E. (Electrical) (Power System/Control Systems)

MICROCONTROLLER AND APPLICATION IN POWER SYSTEM

(2002 Course)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer any two questions from each section.***
2) ***Answer two questions from Section I and two questions from Section II.***
3) ***Answers to the two questions should be written in separate books.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the internal RAM structure of 8051. **[5]**

b) Explain the port structure of 8051. **[10]**

c) Explain the special function registers of 8051. **[10]**

Q2) a) Explain the different modes of Timers and draw the internal structure. **[10]**

b) Draw and explain the 8 bit format of Interrupt Enable of 8051. **[5]**

c) Explain the following instructions : **[10]**

i) SUBB A,@Ri
ii) RET & RETI
iii) JMP @ A+DPTR
iv) DJNZ Rn,radd

Q3) a) Explain the various member of MCS-51 family. **[5]**

b) Explain the various modes of Serial communication in 8051 microcontroller. Explain the SFR used for the same. **[10]**

c) Write program to produce a delay of 2 ms using Timer 1 in mode 1. **[10]**

P.T.O.

SECTION - II

Q4) a) Explain how 8051 communicates with PC serially. Draw the block diagram. **[10]**

b) What are functions of assembler and simulator? **[5]**

c) Explain and draw the interface circuit diagram for stepper motor control. Write the program to rotate the motor in clockwise direction. **[10]**

Q5) a) Write the program to generate triangular waveform. **[5]**

b) Describe various tools helpful in various stage of prototype development and draw the flow chart. **[10]**

c) Explain how 8051 can be interfaced to an 8-bit A/D converter. Give the specification of the ADC. **[10]**

Q6) a) Explain the added features of 8096. **[5]**

b) Draw the pin diagram of 8096 and explain it. List out the salient features of 8096. **[10]**

c) Explain the architecture of MCS-96 with neat diagram. **[10]**

Total No. of Questions : 8]

P1752

SEAT No. :

[Total No. of Pages : 3

[4265] - 252
M.E. (CSE) (Information Technology)
MOBILE COMPUTING
(2002 Course)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Attempt any three questions from Section I and three questions from Section II.***
2) ***Answers to the both sections should be written in separate answer sheets.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of non-programmable pocket calculator is allowed.***

SECTION - I

Q1) a) A cellular system uses 12 cell repeating pattern. There are 120 cells in the system and 20,000 subscribers. Each subscriber uses the phone on an average of 30 min per day but on an average 10 of these min are during the peak hours. Assume that the callers are evenly distributed. Calculate **[8]**

i) Average and peak traffic in Earlangs for the whole system.

ii) Average and peak traffic in Earlangs for one cell.

b) What were the problems of conventional mobile telephone system? How these problems are taken care of by Cellular Technology? **[8]**

Q2) a) Assume that base station has a 900 MHz transmitter and vehicle is moving at the speed of 50kmph. Compute the receiver carrier frequency if the vehicle is moving **[8]**

i) Directly towards the BTS.

ii) Directly away from the BTS.

In a direction that is 60° to the direction of arrival of the signal.

b) Calculate the minimum distance to reuse the same frequency in another cell for the following **[8]**

For N = 7 and R = 15 km

For N = 4 and R =25 km

P.T.O.

Q3) a) In CDMA network assume chip code k=6 bits and there are two users (A and B) communicating with base receiver R. Following are the chip sequences **[8]**

Code for A = 010 100

Code for B = 000 110

Consider A and B both transmitted bit I. Show that how receiver will attempt to recover B's transmission.

b) Which factors are affecting the receiving power in cellular networks? **[8]**

Q4) a) Draw the block diagram of GSM System architecture with radio subsystem. What are the standard frequencies of interfaces Um, A_{bis} , radio subsystem and switching subsystem? Mention the one function of each component in the block diagram. **[8]**

b) If the one time slot of TDMA is 0.577 microseconds, calculate the following : **[10]**

i) One Multiframe Time and One Multiframe TDMA Time slots.

ii) One Superframe Time and One Superframe TDMA Time slots.

iii) One Hyperframe Time and One Hyperframe TDMA Time slots.

SECTION - II

Q5) a) How FHSS (Frequency Hopping Spread Spectrum) technology works? How many hop carriers are used in Bluetooth? How many hops are used in Bluetooth per second? **[8]**

b) What is standard mechanism to calculate the cluster size? Why cluster size has standard selected values like N = 3, 4,7,9,12,13? **[8]**

Q6) a) Explain the procedure for call establishment from mobile. What are the functions of RACH, AGCH, SDCCH and FACCH channels? **[8]**

b) How Handoff management makes the use of Measurements, Decision and Execution to carry out the seamless and lossless handoff? Explain how network and mobile device contribute in handoff process. **[8]**

Q7) a) Which handoff algorithm is used in GSM network? How handover is managed in GSM network? **[8]**

b) Give the SMS architecture and explain the role of SM-SC Short Message Service Center, SMS GMSC SMS Gateway MSC and IWMSC Interworking MSC. **[8]**

Q8) Write short notes on (Any Three) : **[18]**

a) WAP.

b) DECT.

c) Hyper LAN.

d) Handoffs in CDMA.

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Total No. of Questions : 8]

SEAT No. :

P1753

[Total No. of Pages : 2

[4265] - 253
M.E. CSE (Information Technology)
NET CENTRIC COMPUTING
(2002 Course)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) ***Attempt any three questions from Section-I and three questions from Section-II.***
2) ***Answers to the two sections should be written in separate answer sheets.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) List and explain the properties of twisted pair cable, coaxial cable and OFC with respect to data rate, frequency range, bandwidth repeater spacing, attenuation, and noise interference. **[8]**

b) What are the functions of layer - 3 switches? How it can be used to create different collision domains? **[8]**

Q2) a) How optimized network can be design using? **[8]**

i) Objective function.
ii) Convex function.

b) Explain a heuristic approach for network design. **[8]**

Q3) a) Which distribution is the best one for calculating average message length in network? **[8]**

b) For store-and-forward packet switching based communication system, the time taken to store and forward a packet through switch along with delays is a governing attribute. If the switching time is 10 microsecond, whether it can be considered as major factor in the response of a client server system where the client is 5000 km away from the server? Assume the propagation speed in copper and fiber to be 2/3 the speed of light in the vacuum. **[8]**

P.T.O.

Q4) Write short notes on (any three) : **[18]**

a) IPX.

b) TCP/IP protocol stack.

c) NetBIOS.

d) CSMA/CD.

SECTION - II

Q5) a) How many different functions are supported by D channel in ISDN architecture? **[8]**

b) Justify or nullify the following statement.
"ATM switch is the key to make the network fast". **[8]**

Q6) a) How different data transfer rates are obtained by combining the different channels in ISDN networks? **[8]**

b) Why Frame Relay is the most popular digital network? How better it is over other existing networks? **[8]**

Q7) a) How lossy compression is implemented in JPEG? **[8]**

b) Explain man-in-middle attack in Kerberos 4. What different parameters to be considered while setting validity period for ticket granting ticket and service granting ticket. **[8]**

Q8) Write short notes on (any three) : **[18]**

a) DWDM.

b) PSTN Gateways.

c) CMST Algorithm.

d) VoIP.

Total No. of Questions : 6]

P1757

SEAT No. :

[Total No. of Pages : 2

[4265] - 464
M.E. (Civil) (Structures)
FINITE ELEMENT METHODS
(2008 Course) (Theory) (Sem. - II)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) *Answer any two questions from each section.*
2) *Answer to the two sections should be written in separate books.*
3) *Figures to the right indicate full marks.*
4) *Neat diagrams must be drawn wherever necessary.*
5) *Use of non programmable calculator is allowed.*
6) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) Explain variational principle in FEM using a suitable example. **[5]**

b) For a rigid frame truss shown in fig. 1 determine **[20]**

i) the nodal displacement components and rotations,

ii) the support reactions and

iii) the forces in each element.

All elements have E = 210 GPa, A = 6.5×10^{-3} m^2 and I= 8.3×10^{-5} m^4

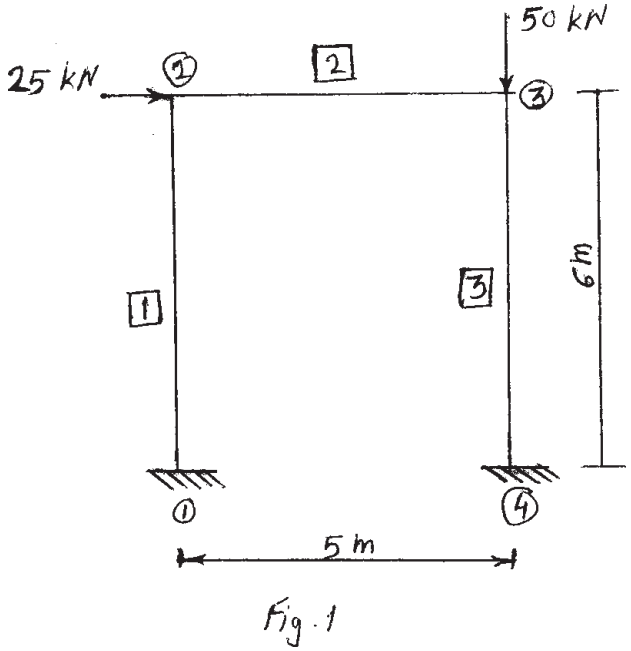

Fig. 1

P.T.O.

Q2) a) Give two dimensional and three dimensional Pascal's triangle. Explain its use in FEM analysis. **[9]**

b) Explain with suitable examples compatible and completeness requirements of displacement functions. **[6]**

c) Determine the shape function for Linear Strain Triangular (LST) element. Use natural coordinate system. **[10]**

Q3) a) Explain isoparametric formulation of rectangular plane stress element. **[8]**

b) Explain Jacobian matrix in case of four noded isoparametric quadrilateral element. Obtain strain displacement matrix. **[12]**

c) What do you mean by higher order elements? Explain its applications with examples. **[5]**

SECTION - II

Q4) a) Explain the method of finding shape function for a hexahedral element using natural coordinates. **[8]**

b) Obtain element stiffness matrix of axisymmetric ring element with a triangular cross section using cylindrical coordinates. **[17]**

Q5) a) Explain semi band width, skyline storage system. **[8]**

b) Write displacement functions for both ACM and BFS elements. Verify conformity of both the elements. **[17]**

Q6) a) What is the difference between plate element and shell element. **[5]**

b) Write a short note on ' Degenerated elements'. **[8]**

c) Explain membrane and bending actions in shell elements. How these two states of stresses are considered in formulating [K] for shell element. **[12]**

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Total No. of Questions : 12]

SEAT No. :

P1759

[Total No. of Pages : 4

[4265] - 503

M.E. (Mechanical Engineering)

(Common to Design, Heat Power, Mechatronics and Automotive Engg.)

TECHNOLOGY AND FINANCIAL MANAGEMENT

(2008 Course) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) ***Answer any one question from each unit.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Unit - I

Q1) a) Define 'Financial Management'. Explain the scope and functions of finance'. **[8]**

b) A company has prepared the following sales budget for the first five months of 2009 : **[8]**

	Sales Budget (Units)
January	10800
February	15600
March	12200
April	10400
May	9800

Inventory of finished goods at the end of every month is to be equal to 25% of sales estimate for the next month. On 1st Jan., 2009, there were 2700 units of product on hand. There is no work-in-progress at the end of any month.

Every unit of product requires two types of materials in the following quantities :

Material A - 4 Kg and Material B - 5 Kg.

Materials equal to one half of the requirement of next month's production are to be in hand at the end of every month. The requirement was met on 1st Jan 2009.

Prepare the following budgets for the quarter ending 31st March 2009 :

i) Quantitative Production Budget

ii) Quantitative Material Purchase Budget.

P.T.O.

OR

Q2) a) Define '*flexible budget*'. What are the advantages of *flexible budgeting*. **[4]**

b) Define 'budget' and 'budgetary control'. Explain the steps involved in budgetary control. **[5]**

c) From the following data, prepare a flexible budget for production of 40000 units and 75000 units, distinctly showing variable cost and fixed cost as well as total cost. Also indicate element wise cost per unit. Budgeted output is 100000 units and budgeted cost per unit is as follows : **[7]**

Direct Material	-	95
Production overhead (variable)	-	40
Direct labor	-	50
Production overhead (fixed)	-	5
Administrative overhead (fixed)	-	5
Selling overhead (10% fixed)	-	10
Distribution overhead (20% fixed)	-	15

Unit - II

Q3) a) Explain the differences between absorption and marginal costing. **[4]**

b) Prepare income statements under absorption costing and marginal costing from the following information : **[14]**

Normal capacity - 20000 units per month
Variable costs (direct materials, direct labor, variable factory overhead) per unit - Rs.6.
Fixed factory overhead - Rs.25000 per month
Variable selling and administrative expenses - Rs.1 per unit sold
Sales price per unit - Rs.10

Actual production, sales and inventories in units are :

	First month	*second Month*	*Third Month*	*Fourth Month*
Units in beginning of inventory	-	-	3000	1000
Units produced	17500	21000	19000	20000
Units sold	17500	18000	21000	16500
Units in closing inventory	-	3000	1000	4500

OR

Q4) a) Explain in brief the stages and flow of costs in Activity Based Costing? **[6]**

b) What are the characteristics of process costing? **[4]**

c) The following data pertaining to a product is available after passing through two processes A and B. The output transferred to process C from process B is 9120 units for Rs.49,263.

Expenses incurred in Process C :

Direct Material	-	Rs.1480
Direct Labor	-	Rs.6500
Direct expenses	-	Rs.1605

The wastage of process C is sold at Rs.1 per unit. The overhead charges were 168% of direct labor. The final product was sold at Rs.10 per unit fetching a profit of 20% on sales. Find the percentage of wastage in process C and prepare Process C account. **[8]**

Unit - III

Q5) a) Define the law of demand and law of supply with an example. **[6]**

b) Define *inflation*. What are the measures, causes and effects of inflation. **[10]**

OR

Q6) a) Define *Balance of Payments*. Explain in brief various components of Balance of Payments. **[8]**

b) Explain the following types of unemployment : **[8]**

i) Cyclical unemployment.

ii) Frictional unemployment.

SECTION - II

Unit - IV

Q7) a) Define Total Quality Management (TQM)? What are the elements and principles of TQM? **[8]**

b) Explain the role of quality standards with reference to ISO 9000 series in manufacturing industries. **[8]**

OR

Q8) a) What is Quality Planning, Quality Control and Quality Improvement. Explain the role of *Juran Trilogy diagram* in quality control. **[10]**

b) What are the seven wastes proposed by Shigeo Shingo. **[6]**

Unit - V

Q9) a) Explain the stages involved in project life cycle with a neat line diagram? **[8]**

b) Define a BOOT project. Distinguish between Principal and Promoter. Explain the types of contracts included in BOOT project strategy. **[10]**

OR

Q10) a) Explain the differences between CPM and PERT. What are the rules for drawing network diagram in project management. **[8]**

b) A project has the following time schedule. **[10]**

Activity	Time in weeks	Activity	Time in weeks
1 - 2	4	5 - 7	8
1 - 3	1	6 - 8	1
2 - 4	1	7 - 8	2
3 - 4	1	8 - 9	1
3 - 5	6	8 - 10	8
4 - 9	5	9 - 10	7
5 - 6	4		

Construct a network diagram and compute.

i) Earliest and latest occurrence of each event.
ii) Float for each activity (in tabular form).
iii) Critical path and its duration.

Unit - VI

Q11) a) Define 'manpower planning'. What are the steps involved in manpower planning. State the advantages of manpower planning. **[10]**

b) Define recruitment. Describe the various sources of recruitment. **[6]**

OR

Q12) a) What is the difference between Training and Development. State the need for training of employees. Explain in detail the various methods of training workers. **[12]**

b) Explain the process of Management By Objectives. **[4]**

Total No. of Questions : 10]

SEAT No. :

P1762

[Total No. of Pages : 3

[4265]-524

M.E. Mechanical (Design Engineering)

INSTRUMENTATION AND AUTOMATIC CONTROL

(2008 Course) (Elective - I (a)) (Semester - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Distinguish between the direct and indirect methods of measurement with suitable example. **[8]**

b) The distribution of the price of the equity share of a company in a stock exchange is shown below: **[8]**

Share price (Rs.)	No. of sessions
50 - 60	50
60 - 70	90
70 - 80	96
80 - 90	80
90 - 100	40

Find the standard deviation and mean of the share price of the company.

Q2) a) What are rank correlation and auto correlation? **[6]**

b) A district industries centre has collected data summarizing the number of industries in the district under each combination of R & D expenditure (in lakhs of Rs.) and annual sales (in crores of Rs.) as shown below :

Annual Sales (Crores of Rs.)	R & D expenditure (in lakhs of Rs.) 10 - 30	30 - 50	50 - 70
10 - 14	3	6	2
14 - 18	6	8	3
18 - 22	4	8	9
22 - 26	2	4	7

Find the correlation coefficient of this grouped data. **[10]**

P.T.O.

Q3) a) The following Sound Pressure Level (SPL) were measured for a machine in a noisy environment.

SPL of machine + background noise = 90 dB
SPL of the background noise = 80 dB

Determine the SPL of the machine alone. **[6]**

b) Explain the working principle of Mcleod gauge and Pirani gauge. **[10]**

Q4) a) The annual sales of readymade garments of a company (in crores of rupees) are summarized below :-

Year	Annual Sales
1	15
2	20
3	28
4	42
5	58
6	75
7	98

Fit a regression model to estimate the annual sales. **[8]**

b) Distinguish between vibrometer and accelerometer with suitable sketches. **[8]**

Q5) Write short notes on any three : **[18]**

a) Heat flux measurement.

b) Humidity measurement.

c) Load cell.

d) Noise measurement.

e) Hot wire Anemometer.

SECTION - II

Q6) a) Explain Prony Brakes for Torque Measurement. **[8]**

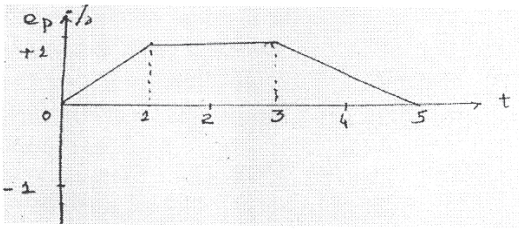
b) Explain with sketch working of Radiation Pyrometers. **[8]**

Q7) a) Explain working of Gas Chromatography with instrumentation. **[8]**

b) Explain Open path UV Spectrometer. **[8]**

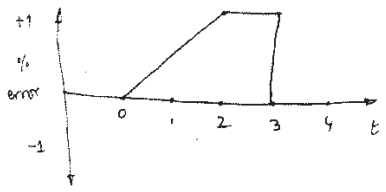
Q8) a) Discuss which controller is best suited for different processes. **[6]**

b) The error shown in fig. below is applied to Proportional Derivative controller with $K_P = 4$, $K_D = 0.6$ s and $P_0 = 25\%$. Draw a graph of resulting controller output. **[10]**



Q9) a) Explain Pneumatic PID controller with sketch. **[8]**

b) Given the error as shown in fig. plot the graph of proportional + integral controller output as a function of time. Consider $K_P = 6$, $K_I = 3$ s and $P_0 = 20\%$. **[8]**



Q10) Write Short Notes on any three: **[18]**

a) Mass Spectrometry.

b) Piezoelectric Accelerometer.

c) Stroboscope.

d) pH measurement.

Total No. of Questions : 8]

SEAT No. :

P1764

[Total No. of Pages : 3

[4265]-541

M.E. Mechanical (Mechatronics)

DESIGN OF MACHINE ELEMENTS

(2008 Course) (Elective - I (a)) (Semester - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are the common materials used in Mechanical Engineering Design? How can the properties of steel can be improved. **[6]**

b) Explain the following heat treatment processes: **[10]**

i) Tempering
ii) Annealing.

Q2) a) What is meant by 'stress concentration'? Illustrate how the stress concentration in a component be reduced. **[6]**

b) A mild steel shaft of 50 mm diameter is subjected to a bending moment of 2000 N-m and a torque T. If the yield point of the steel in tension is 200 MPa, find the maximum value of this torque without causing yielding of the shaft according to

i) the maximum principal stress
ii) the maximum distortion strain energy theory of yielding. **[10]**

Q3) a) A 45 mm diameter shaft is made of steel with a yield strength of 400 MPa. A parallel key of size 14 mm wide and 9 mm thick made of steel with a yield strength of 340 MPa is to be used. Find the required length of key, if the shaft is loaded to transmit the maximum permissible torque. Use maximum shear stress theory and assume a factor of safety of 2. **[8]**

P.T.O.

b) A bar of circular cross section is subjected to alternating tensile forces varying from a minimum of 200 kN to a maximum of 500 kN. It is to be manufactured of a material with an ultimate tensile strength of 900 MPa and an endurance limit of 700 MPa. Determine the diameter of the bar using safety factor of 3.5 related to ultimate tensile strength and 4 related to endurance limit and a stress concentration factor of 1.65 for fatigue load. Use Goodman straight line as basis for design. **[8]**

Q4) a) Write a short note on the following : **[10]**

i) Preferred sizes

ii) Ergonomic consideration in design.

b) A marine type flanged coupling is used to transmit 3.75 MW at 150 rpm. The allowable shear stress in the shaft and bolts may taken as 50 MPa. Determine the shaft diameter and the diameter of bolts. **[8]**

SECTION - II

Q5) a) A truck spring has 12 number of leaves, two of which are full length leaves. The spring supports are 1.05 m apart and the central band is 85 mm wide. The central load is to be 5.4 kN with a permissible stress of 280 MPa. Determine the thickness and width of the steel spring leaves. The ratio of the total depth to the width of the spring is 3. Also determine the deflection of the spring. **[8]**

b) At the bottom of a mine shaft, a group of 10 identical close coiled helical springs are set in parallel to absorb the shock caused by the falling of the cage in case of a failure. The loaded cage weighs 75 kN, while the counter weight has a weight of 15 kN. If the loaded cage falls through a height of 50 m from rest, find the maximum stress induced in each spring if it is made of 50 mm diameter steel rod. The spring index is 6 and the number of active turns in each spring is 20. The modulus of rigidity of the material $G = 80\ kN/mm^2$. **[8]**

Q6) a) What do you understand by full length and graduated leaves of leaf springs. Write the expression for determining the stress and deflection in full length and graduated leaves. **[8]**

b) A full journal bearing of 50 mm diameter and 100 mm long has a bearing pressure of $1.4\ N/mm^2$. The speed of the journal is 900 rpm and the ratio of journal diameter to the diametral clearance is 1000. The bearing is lubricated with oil whose absolute viscosity at the operating temperature

of 75ºC may be taken as 0.011 kg/m-s. The room temperature is 35ºC and the difference between the outlet and inlet temperature of the oil is 10ºC. Assuming specific heat of oil as 1850 J/kg/ºC. Find : **[8]**

i) the amount of artificial cooling required
ii) the mass of lubricating oil required.

Q7) a) Explain the following terms as applied to journal bearings: **[8]**

i) Bearing characteristic number
ii) Bearing modulus

b) A bronze spur pinion rotating at 600 rpm drives a cast iron spur gear at a transmission ratio of 4:1. The allowable static stresses for the bronze pinion and cast iron gear are 84 MPa and 105 MPa respectively. The pinion has 16 standard 20º full depth involute teeth of module 8 mm. The face width of both the gears is 90 mm. Find the power that can be transmitted from the stand point of strength. **[8]**

Q8) a) Discuss the design procedure of spur gears. **[6]**

b) A spur gear made of bronze drives a mild steel pinion with angular velocity ratio of 3.5:1. The pressure angle is 14 1/2º. It transmits 5 kW at 1800 rpm of pinion. Considering only strength, design the smallest diameter gears and find also the necessary face width. The number of teeth should not be less than 15 on either gear. The elastic strength of bronze may be taken as 84 MPa and of steel as 105 MPa. Lewis factor for 14 1/2º pressure angle may be taken as $y = 0.124 - 0.684 / (Number\ of\ teeth)$. **[12]**

Total No. of Questions : 12]

SEAT No. :

P1767

[Total No. of Pages : 3

[4265]-595

M.E. (Electrical) (Control System)

AUTOMATION AND ROBOTICS

(Semester - I) (2008 Course) (Elective - I (a))

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer three questions from Section I and three questions from Section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams should be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Define Robot. Explain with time period the development process in each robot generation. **[10]**

b) Write advantages and disadvantages of NC and CNC machines. **[6]**

OR

Q2) a) Find the worst spatial resolution of a spherical robot with 600 mm arm length. The robot is equipped with three encoders emitting 1200 pulses per revolution. The linear axis is actuated with the aid of 200 mm pitch lead screw having the encoder mounted on it. **[9]**

b) What are the socioeconomic issues in using robots to replace human workers from the workplace? Explain. **[7]**

Q3) a) Give all possible classifications of robots. **[9]**

b) Explore the anatomy of a human wrist joint and analyze it for type of motions provided, number of degrees of freedom, number of joints, type of joints etc. **[8]**

OR

Q4) a) Define the following terms : **[8]**

i) Load carrying capacity.
ii) Work Volume.
iii) Tip speed.
iv) Co-ordinated motion.

P.T.O.

b) For each of the following tasks, state whether a gripper or an end-of-arm tooling is appropriate : **[9]**

i) Welding
ii) Scrapping paint from a glass pain
iii) Assembling two parts
iv) Drilling a hole
v) Tightening a nut of automobile engine

Q5) a) Explain in brief Parts sorting using robot. **[8]**

b) Write Concept of online and offline programming. Also discuss on Specialized manipulation languages. **[9]**

OR

Q6) Write a note on : **[17]**

a) Classification of robot specific languages.

b) Teach pendant.

c) Robot library.

SECTION - II

Q7) a) Write KE and PE equation and explain the role of these equations in Lagrangian analysis. **[9]**

b) Describe the advantages and disadvantages Newton-Euler formulation. **[9]**

OR

Q8) a) Explain how Lagrangian analysis can be applied for a single prismatic joint working against gravity. **[9]**

b) Determine the dynamic model of a 1-DOF, 1-axis planner manipulator with one rotary joint. Assume the link to be a thin cylinder with length L and mass m acting at the centroid of the link. Obtain direct solution and solution using Lagrange-Euler formulation and compare the two. **[9]**

Q9) a) A vector P = 3i-2j+5k is first rotated by 90º about x axis then by 90º about z axis. Finally it is translated by -3i+2j-5k. Determine the new position of vector P. **[8]**

b) Explain in brief rules for establishing link co ordinate frame. **[8]**

OR

Q10) a) A manipulator end effecter point P = [1.2 1.5 1.3] is translated by 4 unit in y-direction and then rotated around z-axis by 45º. Find the final point P'. **[8]**

b) Explain the Geometric approach for obtaining the back solution of a robotic manipulator. **[8]**

Q11) a) Explain in detail Torque and Force control of robotic manipulators. **[8]**

b) Describe open loop and closed loop control of manipulator. **[8]**

OR

Q12) Write a note on : **[16]**

a) Joint position control.

b) Resolved motion position controls.

c) Resolved motion rate control.

Total No. of Questions : 6]

SEAT No. :

P1771

[Total No. of Pages : 2

[4265]-613

M.E. (Electrical) (Power Systems)

ADVANCE POWER ELECTRONICS

(2008 Course) (Elective - I (b)) (Semester - I)

Time :3 Hours] *[Max. Marks :100*

Instruction to the candidates :

Solve any two from each section.

SECTION - I

Q1) a) Compare switching characteristics of SCR and GTO with constructional features. Which is preferred in VSC? Why? **[12]**

b) Compare MOSFET &IGBT based on construction, characteristics and control circuit requirements. **[13]**

Q2) a) Discuss working of 3 phase Current Source Inverter. (CSI). Note the constraints clearly and state valid states for space vector control. **[13]**

b) Comment on VSC & CSC operations, based on device requirements and applications. **[12]**

Q3) a) Explain operation of 12 pulse converter with help of circuit diagram showing converter & transformer arrangement. Draw output voltage waveform. How circulating currents are controlled in transformer secondaries? **[15]**

b) What is SHE? How 3^{rd} order harmonic is eliminated in PWM control? **[10]**

SECTION - II

Q4) a) What are advantages of Multilevel converter over two level converters? How multilevel converters are classified? **[7]**

b) Explain working of 1 ph 3 level half bridge NPC voltage source converter, with device switching states and power transfer modes. Draw waveforms for output voltage & device control voltages. **[18]**

P.T.O.

Q5) a) Explain dc link capacitor voltage balancing in multi-level inverter. **[7]**

b) Write notes on Any Two : **[18]**

i) Shunt Active Filter.
ii) SMES.
iii) Flywheel Energy Storage.

Q6) a) Derive equation of Power with sinusoidal voltage source and non linear loads using $\alpha\beta O$ transformation in 3 ph ac system. **[12]**

b) How Akagi's pq theory is used for reactive and harmonic power compensation? Explain. **[13]**

Total No. of Questions : 8]

SEAT No. :

P1772

[Total No. of Pages : 2

[4265] - 660
M.E. (E & TC) (VLSI and Embedded Systems)
EMBEDDED SYSTEM DESIGN
(2008 Course) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answer to the two sections should be written separately.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data if necessary.***
5) ***Neat diagram must be drawn wherever necessary.***

SECTION - I

Q1) a) What are the various design metrics used for embedded system design? **[10]**

b) What type of buses are employed in embedded systems? Justify the answer with suitable example. **[8]**

Q2) a) What are the architectural features of the ARM Processor? Draw and describe the architecture of typical ARM Processor. **[10]**

b) Describe and compare various programming technologies used in FPGA. **[6]**

Q3) a) What are the issues related with signal integrity and differential signaling? **[8]**

b) Draw and describe layered structure of CAN Node. **[8]**

Q4) a) List and explain various interrupts and exceptions used in ARM Processor. **[8]**

b) What are the memory selection criteria used in embedded system design? **[8]**

SECTION - II

Q5) a) What are seven operating modes of the ARM 7 Processor? **[10]**

b) Describe following ARM instructions. **[8]**

i) BL
ii) LDR
iii) ADC
iv) BIC

P.T.O.

Q6) a) Describe how synchronization between transmitter and receiver is achieved in RS232C protocol? **[10]**

b) Describe and compare various verification techniques used in system design. **[6]**

Q7) a) What are the various RISC architecture design rules? **[8]**

b) Describe the operation of 5-stage pipeline architecture. **[8]**

Q8) Write short notes on : **[16]**

a) MODBUS Protocol,

b) IEEE 802.11 Protocol,

c) Boundary scan technique, and

d) Optimization techniques.

Total No. of Questions : 8]

SEAT No. :

P1776

[Total No. of Pages : 2

[4265] - 741

M.E. (Production) (Manufacturing and Automation)

INDUSTRIAL AUTOMATION

(2008 Course) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) An automated transfer line is divided into two stages with 8 stations in each stage. Each station has cycle time of 1.2 min. and frequency of failure 0.015. Average downtime per stop is 10 min. and a constant downtime distribution is assumed. Determine the required capacity of each storage buffer such that the improvement in the line efficiency compared to zero capacity buffer is 75% of improvement yielded by buffer with infinite capacity. **[10]**

b) Explain largest candidate rule methods for assembly line balancing. **[6]**

Q2) a) A single acting up stroking press having cylinder bore diameter of 380 mm and cycle time of 70 seconds has rapid approach of 210 mm in 12 sec. at 40 bars, pressing operation for 65 mm in 15 sec. at 340 bars and curing in 18 sec. Draw a suitable hydraulic circuit using accumulator and also calculate the size of accumulator and efficiency of circuit. The return is by gravity. **[10]**

b) Explain with neat sketch the working of deceleration valve and draw a typical circuit showing its application. **[6]**

Q3) a) A pneumatic cylinder is needed to press fit a pin into a hole. Design and draw a circuit using a twin pressure valve which is operated by two 3/2 valves. A 4/2 valve is used as the main direction control valve to operate the double acing cylinder. **[10]**

b) Explain the working of FRL unit used in pneumatic system. **[6]**

P.T.O.

Q4) Write short notes on : **[18]**

a) Proportional valves and their applications.

b) Regenerative circuit.

c) Pneumatic sensors.

SECTION - II

Q5) a) Write a program for 8085A μp to find smallest element in a block of 8-bit unsigned binary data, whose number is stored in the memory location A001H, and the data are stored in a memory location beginning from A002H. Store the smallest number in a memory location FF00H. **[6]**

b) Draw the PLC logic diagram to control a process which is desired to start by turning on the motor in 10 seconds after the part touches the limit switch. The process should be terminated automatically when the finish part touches the second limit switch. An emergency switch will stop the process any time when it is pressed. **[10]**

Q6) a) A feeder selector device at one of the stations of an automatic assembly machine has a feed rate of 22 parts/min and provides a throughput of one part in four. The ideal cycle time of the assembly machine is 10 sec. The feeder stops for 18 parts in feed track and will start while 8 parts in feed track. Determine how long will it take for the feeder to turn on once it is turned off and how long it will take to turn off once it is turned on? **[8]**

b) Explain the effect of part population, effect of speed, and effect of number of reciprocating strokes on the feed rate in case of reciprocating fork feeder used in automated assembly systems. **[8]**

Q7) a) State the rules for establishing the link co-ordinate frames of a manipulator. **[8]**

b) Discuss the equations of motion for dynamic modeling of manipulators using Newton-Euler approach. **[8]**

Q8) Write short notes on : **[18]**

a) Position control system in robotics.

b) Forward and inverse kinematics.

c) Rotary transfer machine.

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Total No. of Questions : 8]

SEAT No. :

P1779

[Total No. of Pages : 2

[4265]-791

M.E. (Computer) (Computer Networking)

ADVANCED TCP/IP

(2008 Course) (Elective - I (b)) (Semester - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the system calls for accessing DNS, IP address manipulation, obtaining and setting host names. **[8]**

b) An ISP is granted a block of addresses starting with 190.100.0.0/16. The ISP needs to distribute these addresses to three groups of customers as follows : **[8]**

i) The first group has 64 customers; each needs 256 addresses.

ii) The second group has 128 customers; each needs 128 addresses.

iii) The third group has 128 customers; each needs 64 addresses.

Design the subblocks and find out how many addresses are still available after these allocation.

Q2) a) Explain address acquisition states of DHCP. Explain lease renewal states with message types in DHCP operation. **[8]**

b) Explain two-step bootstrap procedure in BOOTP. **[8]**

Q3) a) DNS client has sent the query message for the IP address of *xxx.yyy*.com. Show the response message of a DNS server. Assume the IP address is 201.34.23.12 **[8]**

b) Compare and contrast DNS structure with the UNIX directory structure. **[8]**

P.T.O.

Q4) Write short note on any three : **[18]**

a) Network Virtual Terminal.

b) RARP Server.

c) Rlogin.

d) Dynamic DNS.

SECTION - II

Q5) a) Explain various TELNET options. How option negotiation takes place? **[8]**

b) Show the sequence of characters exchanged between the TELNET client and the server to switch from the default mode to character mode. **[8]**

Q6) a) Show FTP commands and response for retrieving a list of items in a directory. **[8]**

b) Explain +ftp error control mechanism. What is Sorcerer's apprentice bug? **[8]**

Q7) a) Explain Real time transport control protocol (RTCP). **[8]**

b) Client wants to send data to the server using POST Method. Show the HTTP request and response message formats. **[8]**

Q8) Write short note on any three : **[18]**

a) HTTPS.

b) TFTP.

c) QoS in RTP.

d) Persistent and non persistent connection in HTTP.

Total No. of Questions : 8]

P1780

SEAT No. :

[Total No. of Pages : 2

[4265] - 806

M.E. (Chemical)

MANAGEMENT OF RESEARCH AND DEVELOPMENT IN CHEMICAL INDUSTRIES

(2008 Course) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Solve any three questions from each section.***
2) ***Every answer shall be explained by taking a proper case study from chemical/ancillary chemical industry.***

SECTION - I

Q1) How a R&D project can be planned well? What is a degree / level of success of such a project Vs a planned engineering / construction project? Cite the failure / risk point. Do complete risk analysis. **[16]**

Q2) Energy transfer technologies (for example heat exchangers, fuel burners etc) have improved markedly over last few decades. From highly inefficient technologies they are becoming efficient ones. Explain the component of research in this sector of Chemical Engineering. **[17]**

Q3) What is the status of research & development in Indian Chemical Industry? Mention all major areas of research in Chemical Engineering? Explain any one area in details and discuss about possible / probable scope of developments in the area. **[17]**

Q4) What are PERT & CPM techniques? How can they be utilized to better the outputs in reactive distillation technology? **[16]**

P.T.O.

SECTION - II

Q5) How according to you the chemical engineering research is poised for development in the coming decade, especially in the context of interdisciplinary research areas. Take any case study and discuss. **[17]**

Q6) What are the typical financial needs of a research project on process modification of a known chemical process? How well they can be managed? Explain with a typical example in practice. **[17]**

Q7) Every rupee spent on research has to be recovered from the market. Discuss various methods of this recovery. Prepare a balance sheet on the investments in R& D and the profit / benefit which can be earned out of it. Are investments in R&D cost effective? Explain with example. **[17]**

Q8) Write short notes on (Any three) : **[16]**

a) Pollution free technologies.

b) Mathematical modeling advancement.

c) Innovation in research.

d) Process Intensification Technology Development.

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Total No. of Questions : 8]

P1783

SEAT No. :

[Total No. of Pages : 2

[4265] - 686

M.E. (E&TC) (Signal Processing)

ADVANCED DIGITAL SIGNAL PROCESSING

(2008 Course) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections must be written in separate answer books.***
3) ***Assume suitable data, wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Draw a block schematic for the decimator by a factor D. Draw spectrum of signal at the output of each block. Derive the expression for the output of decimator. **[10]**

b) Explain sampling rate conversion by non-integer factor with the help of block diagram & waveforms. **[8]**

Q2) a) State the applications of multirate DSP & explain any one application in detail. **[8]**

b) For the system shown in fig. find an expression for $y(n)$ in terms of $x(n)$. **[8]**

Q3) a) What is the meaning of polyphase filter? Draw & explain polyphase interpolator filter structure with I = 3. **[6]**

b) A signal with sampling frequency of 3072 kHz is to be decimated by a factor of 64 to get new sampling frequency of 48 kHz. Signal band of interest extends from 0 to 20 kHz. Pass band deviation is 0.00345, stop band attenuation 80 dB. Design a three stage filter. **[10]**

P.T.O.

Q4) a) Describe the use of least square method for system modeling. **[8]**

b) Why is an anti-aliasing filter required. What is the meaning of spectrum stretching in case of downsampling? **[8]**

SECTION - II

Q5) a) Explain the widrow LMS algorithm. **[8]**

b) Describe the application of adaptive filtering to adaptive channel equalization. **[8]**

Q6) a) Discuss how adaptive beam former can be used in radar & sonar applications. **[8]**

b) Explain least squares Lattice algorithm. What is the meaning of gradient adaptive lattice filter. **[8]**

Q7) a) Compare the features of TMS - 320C 54XX and ADSP 21XX. **[8]**

b) Write short note on : **[8]**

i) Barrel shifter. ii) MAC.

iii) Circular addressing. iv) ALU.

Q8) Write short notes on (any three) : **[18]**

a) Modified Harvard architecture for DSP.

b) Properties of Direct-form RLS algorithms.

c) System identification based on an All-Pole (AR) system model.

d) Singular value Decomposition.

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Total No. of Questions : 8]

P1784

SEAT No. :

[Total No. of Pages : 2

[4265] - 651
M.E. (E&TC) (Microwave)
SIGNAL PROCESSING FOR WIRELESS COMMUNICATION
(2008 Course) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam table is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Define stochastic process. **[2]**

b) Explain the different properties of stochastic process. **[4]**

c) Explain the term likelibood and sufficiency. **[4]**

d) What is hypothesis testing? **[3]**

e) What is probability density function? **[3]**

Q2) a) What is correlation receiver? **[2]**

b) Derive suitable expression for the correlation receiver of binary decision problem. **[9]**

c) Draw the structure of the correlation receiver of binary decision problem. **[5]**

Q3) a) What is colored noise? **[2]**

b) Explain whitening approach of obtaining the decision rule for the colored noise. **[4]**

c) Derive suitable expressions for the above and implement the colored noise structure of receiver. **[10]**

P.T.O.

Q4) a) Explain with the help of neat diagram the basic concept of adaptive filters. **[6]**

b) Explain the LMS algorithm from the basics of Wiener filter theory. **[6]**

c) Explain Kalman filter with any one application. **[6]**

SECTION - II

Q5) a) Explain the following non parametric methods of power spectrum estimation. **[8]**

i) Bartlett method ii) Blackman and Tukey method

b) Explain any one parametric power spectrum estimation method. **[4]**

c) Explain the difference between parametric and non parametric method. **[4]**

Q6) a) Explain the baseband digital communication. **[4]**

b) Draw the optimum receiver for polar binary signals and derive the related expression. **[6]**

c) Explain Kalman equalizer for ISI channels. **[6]**

Q7) a) Explain the term target detection. **[4]**

b) What is inter symbol interference? **[2]**

c) What is spread spectrum communication? **[2]**

d) Draw the block diagram of a typical BPSK spread spectrum system and explain the same with wave forms at different blocks. **[8]**

Q8) Write short notes on (any three) : **[18]**

a) RLS algorithm.

b) Application of adaptive filters.

c) Gauss Markov model.

d) Probability Distribution Models.

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Total No. of Questions : 8]

SEAT No. :

P1785

[Total No. of Pages : 2

[4265]-878

M.E. (IT)

ADVANCED TRENDS IN DATABASE SYSTEMS

(2008 Course) (Semester -II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Make suitable assumptions wherever necessary.***

SECTION - I

Q1) a) Explain the difference between Distributed and Centralized Query Processing. Compare the two with reference to processing, cost involved and response time. **[6]**

b) Explain the transparency issue in distributed database. Explain any two types of transparency. **[6]**

c) How is concurrency control handled in distributed database? Describe any method which is used. **[6]**

Q2) a) Define a data Warehouse. Which indexing is best suited for a data warehouse? **[8]**

b) Explain an algorithm that is used to find association rules? **[8]**

Q3) a) Explain the concept of data mining. Explain what is : **[8]**

i) K nearest neighbor.

ii) Decision trees.

b) How can data mining be used for risk assessment and fraud detection? **[8]**

Q4) Write short note on any three : **[16]**

a) Apriori algorithm for data mining.

b) Neural network.

c) Disadvantages of distributed databases.

d) Temporal data mining.

P.T.O.

SECTION - II

Q5) a) How are active database different from normal/passive databases? Explain with example. **[6]**

b) Explain the concept of ECA in active database. Discuss the design and implementation issues in active database. **[10]**

Q6) a) Compare relational database. Object Oriented database, and Object relational database with respect to their strength, applications and limitations. **[8]**

b) With a diagram explain the architecture of TP system. What are the functions of TP monitor? **[8]**

Q7) a) Explain the web crawler architecture in detail with a diagram. **[8]**

b) How does web crawler identify itself to web server? Why is it important to do so? **[8]**

Q8) Write short note on any three : **[18]**

a) Heterogeneous database and data mining.

b) R trees.

c) OR mapping classes and inheritance.

d) XML database.

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Total No. of Questions : 8]

SEAT No. :

P1795

[Total No. of Pages : 2

[4265] - 209
M.E. (Computer)
NETWORK SECURITY
(2002 Course) (Elective - I (a))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer 3 questions from Section - I and 3 questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is security services (X.800)? Explain various Security Services? **[8]**

b) What are the Principles of data Security Architecture? Explain Passive & Active Security attacks in brief. **[8]**

Q2) a) Explain RSA Algorithm. Perform Encryption & decryption for given example. **[8]**

P = 3, q = 11, e = 7, m = 5

b) Explain concept of Kerberos in detail. **[6]**

c) Define threats and attacks. **[2]**

Q3) a) Explain in detail Message Authentication Code [MAC] and Hash function. **[8]**

b) Explain IPV4/IPV6 encapsulation header. **[8]**

P.T.O.

Q4) Write Short Notes on (Any 3): **[18]**

a) DES Algorithm.

b) X. 509.

c) Diffie Helleman Key Exchange Algorithm.

d) Use of Bioinformatics in Security.

SECTION - II

Q5) a) Explain session key management with example. **[8]**

b) Explain different components of DMZ network with suitable diagram. **[8]**

Q6) a) Explain circuit level gateway and application level gateway. **[8]**

b) Explain packet filtering router and stateful inspection firewall. **[8]**

Q7) a) Explain concept of SSL/TLS in detail. **[8]**

b) Explain S/M IME in detail. **[8]**

Q8) Write short notes on (Any three): **[18]**

a) DNS certificates.

b) Privacy Enhanced Mail (PEM).

c) IP-SEC protocol suite.

d) Honey Pot.

Total No. of Questions : 8]

SEAT No. :

P1798

[Total No. of Pages : 3

[4265] - 449
M.E. (Civil) (Hydraulic Engg.)
IRRIGATION AND DRAINAGE
(Elective - III (a)) (2008 Course) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, electronic non programmable pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Discuss modified Penman's method of determining water requirement of crops. **[6]**

b) During a particular stage of growth of a crop, consumptive use of water is 2.8 mm/day. Determine the interval in days between irrigations, and depth of water to be applied when the amount of soil moisture is depleted to

i) 25%

ii) 50%

iii) 75% and

iv) 0% of maximum depth of available water in a root zone which is 100 mm. Assume irrigation efficiency to be 70%. **[6]**

c) Discuss 'Consumptive use' concept. Also differentiate between 'Consumptive use' and 'Conjunctive use' of water. **[6]**

P.T.O.

Q2) a) Discuss various methods of irrigation. Comment on suitability of each method you described. **[6]**

b) A farmer irrigating his farm from well water, analyzed the water and noticed excessive nitrogen and bicarbonates in it. Discuss the problems associated with it and suggest the effective water management practices to curb the effects. **[6]**

c) Explain : **[4]**

i) Field capacity,

ii) Permanent witting point,

iii) Moisture equivalent and

iv) Available moisture.

Q3) a) Discuss the causes of built up of salt in irrigated soil and reclamation procedures of salt affected soils. **[6]**

b) A water sample yielded sodium 410 Mg/lit, calcium 106 Mg/lit, Magnesium 30 Mg/lit and electrical conductivity 2860 micro mhos. How much gypsum would be required to reduce the sodium absorption ratio (SAR) of one ha-m of the water sample to 5? **[6]**

c) Discuss the causes of soil erosion. **[4]**

Q4) a) Discuss the design considerations in the design of elements of a drip irrigation system with the help of a neat sketch. **[12]**

b) Explain the method of determining crop water requirement for a drip irrigation system. **[4]**

SECTION - II

Q5) Discuss the design considerations involved in intake well, jack well, rising main and distribution system in a lift irrigation system. **[16]**

Q6) a) Discuss with a suitable sketch, the different components of a sprinkler system. **[8]**

b) What are the advantages and disadvantages of a sprinkler irrigation system? Also explain the different types of sprinklers. **[8]**

Q7) a) What are outlets? Enumerate different types of outlets which are in common use on Canal Projects. Describe briefly with a neat sketch the functioning, use and design of an 'Adjustable proportionate module' (APM). **[12]**

b) Determine the size of a tile at the outlet of a 6 hectare drainage system, if the drainage coefficient is 1.5 cm, and the tile grade is 0.4%. Assume rugosity coefficient for the tile material as 0.013. **[6]**

Q8) Write short notes on any four of the following: **[16]**

a) On farm structures.

b) Envelope filters.

c) Kennedy's gauge outlet.

d) Cost economics in lift irrigation system.

e) Warabandi.

Total No. of Questions : 8]

SEAT No. :

P1799

[Total No. of Pages : 2

[4265] - 561

M.E. (Mechanical) (Automotive Engg.)

ADVANCED HYDRAULICS & PNEUMATIC SYSTEMS

(Semester - I) (2008 Course) (Elective - I (c))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer 3 questions from Section - I and 3 questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are the qualities required by a fluid to work as hydraulic fluid? Discuss in detail. **[6]**

b) A automobile requires a simple hydraulic system with working pressure of 30 bars. Explain the different components required for the system. **[6]**

c) Explain the role of heat exchanger in hydraulic system. **[6]**

Q2) a) Compare the performance characteristics of positive and non positive displacement pumps. **[8]**

b) Explain how accumulators can be used in automobiles? Draw a circuit diagram to show one such application. **[8]**

Q3) a) List different compressors applicable in pneumatic power systems. Explain how compressed air generation and distribution is done in an automobile industry. **[8]**

b) Explain any two power operated holding devices used in automobiles. **[8]**

P.T.O.

Q4) a) Explain the pressure compensated vane pump. **[8]**

b) What are the different center positions used in direction control valves? Explain the application of these centre positions in hydraulic systems. **[8]**

SECTION - II

Q5) a) What is synchronizing of cylinders? What are the different methods of synchronizing of cylinders? Which method of synchronizing is efficient? **[8]**

b) Draw and explain a pneumatic circuit for sequencing two cylinders, using pilot operated valves only. **[8]**

Q6) a) What are the basic fluidic devices used in fluidic logic control systems? **[8]**

b) Explain how Boolean algebra can be used in fluidic logic control. **[8]**

Q7) a) The feed motion for a hydraulic system has the following working cycle

i) Forward fast approach - 200 mm

ii) Forward slow approach - 100 mm

iii) Return fast approach - 300 mm

Draw a hydraulic circuit by selecting suitable components for the cycle. Explain the working of the circuit giving its applications. **[10]**

b) Explain FRL unit used in pneumatic systems. **[6]**

Q8) a) Explain a set-up to test a pressure relief valve. **[6]**

b) Explain with a circuit, a dual pressure hydraulic system. **[6]**

c) Show a step by step procedure to design a remote control pneumatic system. **[6]**

Total No. of Questions : 10]

SEAT No. :

P1800

[Total No. of Pages : 2

[4265] - 589

M.E. (Mechanical) (CADME)

INTEGRATED PRODUCT DESIGN & DEVELOPMENT

(Elective - II (b)) (2012 Course) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Explain the concept of product life cycle. **[9]**

b) What is product Data Management? Explain. **[9]**

Q2) a) Concurrent engineering approach is more efficient than traditional approach. Justify. **[8]**

b) Elaborate how technology s-curve is efficient tool for technology forecasting? **[8]**

Q3) a) Explain the difference between product design & product development. **[8]**

b) Explain the modern product development process with steps. **[8]**

Q4) a) Explain the concept of house of quality with example. **[8]**

b) Explain FAST method in detail with suitable example. **[8]**

Q5) Explain the concept of customer population & market segmentation. What are different types of customer needs? Explain any two customer need gathering methods. **[16]**

P.T.O.

SECTION - II

Q6) a) Explain the steps in product tear down. **[9]**

b) What is subtract & operate procedure. Discuss. **[9]**

Q7) a) What are objective of Benchmarking? Explain intended assembly cost analysis. **[8]**

b) Discuss product specification setting in product design. **[8]**

Q8) a) What is product portfolio? Explain different product portfolio architectures. **[8]**

b) Explain the importance of Mission Statement & Technical questioning in product development. **[8]**

Q9) a) Explain Taguchi concept of design of experiments. **[8]**

b) Why prototyping is essential in product design? Explain any one technique of rapid prototyping. **[8]**

Q10) a) Explain 6-3-5 method in concept selection. **[8]**

b) What is design for failure modes & effects analysis? **[8]**

Total No. of Questions : 8]

SEAT No. :

P1807

[Total No. of Pages : 3

[4265] - 811
M.E. (Chemical)
COMPUTER AIDED DESIGN
(Elective - I (d)) (2008 Course) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Attempt any three from four questions from each section.***
2) ***Assume suitable data wherever necessary.***

SECTION - I

Q1) a) Explain the importance .FCAD in chemical engineering alongwith its applications. **[8]**

b) What are various components of CAD softwares? Enlist and explain each in detail. **[10]**

Q2) A homogenous gas reaction $A \rightarrow 3R$ has reported rate at 215ºC. **[16]**

$-r_A = 10^{-2}\ C_A^{1/2}$ (mole / lit.sec)

Write a 'C' program to determine space time needed for 80% conversion of 50% A - 50% inert feed to a PFR operating at 215ºC and 5 atm. ($C_{Ao} \rightarrow 0.0625$ moles/lit)

$$\tau = \frac{C_{Ao}^{1/2}}{K} \int_0^{0.8} \left(\frac{1+X_A}{1-X_A} \right)^{1/2} dX_A .$$

Q3) a) Differentiate between: **[8]**

i) RAM and ROM.

ii) DBMS and FMS.

b) What are various types of operating systems? Explain any three in detail. **[8]**

P.T.O.

Q4) a) The homogenous gas decomposition of phosphene **[12]**

$$4\ PH_3\ (g) \rightarrow P_4\ (g) + 6H_2$$

proceeds at 649ºC with first order rate

$$-r_{PH_3} = \left(10/_{hr}\right) C_{PH_3}$$

Write a 'C' program to determine size of PFR operating at 649ºC and 460 kpa which can produce 80% conversion of feed consisting of 40 mole of pure phosphene per hour.

$$V = \frac{F_{Ao}}{K\,C_{Ao}}\left[(1+\in A)ln\frac{1}{1-X_A} - C_A\,X_A\right].$$

b) Enlist various softwares used in chemical engg. for various applications. **[4]**

SECTION - II

Q5) a) What do you mean by stiff differential equations. Explain with suitable example. **[8]**

b) What are various thermodynamic equations used in CAD softwares of chemical engg. Explain any two in detail. **[8]**

Q6) Use both explicit and implicit Euler's methods to solve **[16]**

$$\frac{dy}{dt} = -1000y + 3000 - 2000e^{-t}$$

Where y (0) = 0 solve for y between t = 0 and 0.006. Explain how implicit is better than explicit Euler's method for solving stiff differential equations.

Note : Use any step size required.

Q7) a) Explain method of **[8]**

i) Dew point calculations.

ii) Bubble point calculations in detail.

b) Write flow chart for design of Binary distillation column. **[8]**

Q8) a) What do you mean by steady state and dynamic simulation? What are additional specifications required to transit from steady state to dynamic state simulation. **[8]**

b) i) What are advantages of using excel for doing material and energy balance calculations? **[2]**

ii) Explain why ordinary and partial differential equations are useful in dynamic simulation. Explain with suitable examples. **[8]**

Total No. of Questions : 8]

SEAT No. :

P1809

[Total No. of Pages : 3

[4265] - 938

M.E. (Polymer)

SYNTHESIS AND CHEMISTRY OF POLYMERS

(Semester - I) (2008 Course) (Elective - I (c))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Question - 1 from Section - I and Question - 5 from Section - II are compulsory.***
2) ***Solve any 2 questions from Section - I and any 2 questions from Section - II from remaining.***
3) ***Answers to Section - I and Section - II should be written on separate answer book.***
4) ***Neat diagrams should be drawn whenever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Assume suitable data, if necessary.***
7) ***Use of electronic pocket calculator is allowed.***

SECTION - I

Q1) Answer any 4: **[20]**

a) In case of polymers why average and not absolute molecular weight is considered?

b) Styrene monomer was stored in 2-containers, namely, A and B. Sample in container A became thick, viscous after few months while sample in container B did not. What could be possible reasons for this? Suggest remedy to avoid such problem.

c) Differentiate between chain-and step-growth-polymerization.

d) With suitable examples explain the concept of functionality in polymers.

e) With reference to polyfunctional step - reaction polymerization briefly explain the concept of gelation.

f) Why Novolaks are considered as 2-step while Resols as 1-step resins?

Q2) a) Calculate $\overline{X}_n$ and $\overline{X}_w$ for an equimolar mixture of a diacid and a glycol for following extents of reaction – 0.5, 0.75, 0.9, 0.95, 0.98, 0.99, 0.995. Calculate MWD for each one. **[6]**

b) Compare between Suspension - and Emulsion - Polymerization techniques. **[5]**

c) With suitable examples explain classification of copolymers. **[4]**

P.T.O.

Q3) a) Calculate the average functionality for following reaction mixture – **[5]**

i) 2 moles of terephthalic acid and 1 mole of ethylene glycol.

ii) 3 moles of adipic acid, 2 moles of ethylene glycol and 1 mole of glycerol.

b) What are the different techniques to find out molecular weight? Explain any one in detail. **[7]**

c) Briefly comment of importance of Alfrey-Price equation in copolymerization system. **[3]**

Q4) a) Write a short note on Plasma Polymerization. **[7]**

b) Styrene and methyl methacrylate were used for carrying out bulk copolymerization. **[8]**

Sample I = 26g styrene; 75g MMA

Sample II = 52g styrene; 50g MMA

The initial copolymer compositions found out in the two cases were –

Sample I = 33.18 mole% of styrene

Sample II = 50.85 mole% of MMA.

Find out the monomer reactivity ratios using copolymerization equation

$$F_1 = \frac{r_1 f_1^2 + f_1 f_2}{r_1 f_1^2 + 2 f_1 f_2 + r_2 f_2^2}; \quad F_2 = \frac{r_2 f_2^2 + f_1 f_2}{r_1 f_1^2 + 2 f_1 f_2 + r_2 f_2^2}$$

where, F_1 = molar fraction of M_1 in the copolymer.

F_2 = molar fraction of M_2 in the copolymer.

f_1 = molar fraction of M_1 in the feed.

f_2 = molar fraction of M_2 in the feed

SECTION - II

Q5) Answer any 4: **[20]**

a) Explain the importance of stoichiometry while carrying of polymer synthesis.

b) Differentiate between melt - and solution - polycondensation.

c) With appropriate equations explain number-and weight-average molecular weights in polymers.

d) Define the terms-epoxy equivalent and epoxy value. Comment on their significance in epoxy curing.

e) Write down various ingredients used and thereby, chemical reactions in synthesis of unsaturated polyester resins.

f) Explain the usefulness of Carother's equation.

Q6) a) Calculate the quantity of diethylene triamine (DETA) and Phthalic anhydride required for curing 100 gm epoxy resin having epoxy equivalent 170. **[8]**

b) What are the types of Phenol - formaldehyde resins? Explain their synthesis in detail. **[7]**

Q7) a) Four moles of phenol were reacted with 3 moles of formaldehyde under acidic pH to give Novolak resins. Calculate the quantity of Hexamethylene tetramine (Hexa) required to completely cross-link 100 gm this resin. **[7]**

b) What is solubility parameter? Explain its significance in understanding polymer solubility. **[5]**

c) Briefly comment on the necessity of copolymerization reactions. **[3]**

Q8) a) With suitable examples explain various reactions carried out to modify polymer. **[7]**

b) Explain in detail Polymer Degradation types and mechanism of any one type. **[8]**

Total No. of Questions : 6]

SEAT No. :

P1813

[Total No. of Pages : 2

[4265] - 960
M.E. (Printing)
PRINT MEDIA COMMUNICATIONS
(2008 Course) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*

SECTION - I

Q1) Which are the different methods for surface design? **[16]**

OR

In what aspect surface design needs to be handled technically for printing purpose?

Q2) With respect to surface design of paper, board and ceramics; comment on different aspects needed for printing on them. **[18]**

OR

What salient features one should consider when printing on surfaces like glass & plastics?

Q3) What can be called as disciplined approach to design process? Elaborate. **[16]**

OR

In what aspect surface design needs to be handled technically for printing purpose?

P.T.O.

SECTION - II

Q4) Mention the significance aspects one should take into account while going for design of cover or jacket of a book. **[18]**

OR

Explain in details book typography.

Q5) Which are different front page design methods for news paper printing? **[16]**

OR

What are the possible challenges needed to be faced while accommodating special pages in news paper?

Q6) Comment on digital technology as a tool for solution to printing design problems. **[16]**

OR

Which are the important issues ore needs to take care of while a typographic make-up of a job is concerned?

Total No. of Questions : 8]

SEAT No. :

P1814

[Total No. of Pages : 2

[4265] - 204
M.E. (Computer)
DISTRIBUTED OPERATING SYSTEM
(2002 Course)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from Section - I and three questions from Section - II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Make suitable assumptions wherever necessary.***

SECTION - I

Q1) a) What are the main difference between Network Operating system and Distributed Operating System? **[6]**

b) Which major architectural models are available for Distributed Computing System? Which model is best in current scenario? **[6]**

c) What are the major advantages that have led to emergence and popularity of Distributed Computing System? **[6]**

Q2) a) Describe the Election algorithms and state the complexity of these Election algorithms. **[8]**

b) What are the important issues involved in design and implementation of Distributed Shared Memory system? Explain in brief. **[8]**

Q3) a) Explain what is meant by absolute ordering, consistent ordering and casual ordering of the messages in distributed message passing system. Give a mechanism to implement each one of these. **[10]**

b) What is stub? How are stubs generated? Explain how the use of stubs helps in making the RPC mechanism transparent? **[6]**

P.T.O.

Q4) a) Describe with a neat diagram the distribution of processes in Andrew File system (AFS). What features of AFS design make it more scalable than NFS? **[8]**

b) Write Distributed algorithm for mutual exclusion. Discuss advantages and disadvantages of this algorithm. **[8]**

SECTION - II

Q5) a) Differentiate between caching and replication. **[2]**

b) What are the advantages of replication of data in Distributed System? Explain in brief. **[8]**

c) Explain the Centralized Clock Synchronization algorithm. What are the shortcomings of this type of algorithm? **[8]**

Q6) a) Describe the system architecture of Chorus. State in brief the design goals of the Chorus. **[8]**

b) What do mean by Process Migration? Explain the desirable features of good process migration mechanism. **[8]**

Q7) a) Explain how symmetric and asymmetric cryptosystem work? Discuss relative advantages and disadvantages. **[8]**

b) What are the major motivations for using multithreaded process instead of multiple of single threaded process? Explain in brief. **[8]**

Q8) A server is designed to perform simple integer arithmetic operations such as addition, subtraction, multiplication and division. Clients interact with this server by using RPC mechanism. Describe the contents of the call and reply of this RPC application, explaining the purpose of each of the component. In case of error, the server should inform to the client about the type of error encountered. **[16]**

Total No. of Questions : 10]

SEAT No. :

P1815

[Total No. of Pages : 2

[4265] - 190
M.E. (Production)
HARD AND SOFT AUTOMATION
(2002 Course)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answers will be valued as a whole.***
6) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) Differentiate between mechanisation and automation in brief. **[8]**

b) Explain Geneva Mechanism in brief and also explain cycle time and process time. **[8]**

Q2) a) How basic terminology of transfer line with no internal storage analysed? Explain. **[8]**

b) Explain the functioning of a motor type relay in brief. **[8]**

Q3) a) Explain analysis of feedback control of transfer line. **[8]**

b) Explain Routh Hurwitz Criterion with its advantages and limitations. **[8]**

Q4) a) Explain different methods of line of balancing of an assembly line, with a specific problem. **[8]**

b) Explain briefly machine vision system in robotics. **[8]**

P.T.O.

Q5) Write short notes on (Any Three): **[18]**

a) CORRELAP.

b) CCD Camera.

c) TLMS.

d) LVDT.

e) Butter stock automation.

SECTION - II

Q6) a) What do you understand by Cellular Manufacturing System? Explain in brief with its characteristics. **[8]**

b) Draw and explain ladder diagram. **[8]**

Q7) a) What are different types of AGVS used industries? How analysis of AGV is done? **[8]**

b) Explain CTMC - Continuous Markov Chain model. **[8]**

Q8) a) What are Petri - Nets? Explain uses of Petri - Nets. **[8]**

b) Explain Heuristic algorithm for introducing new machine. **[8]**

Q9) a) Compare Agile Manufacturing System with FMS. **[8]**

b) Explain PFA analysis. How it can be used in Muther's classification? **[8]**

Q10) Write short notes on (Any three): **[18]**

a) 2D/3D inspection using LED or Laser.

b) CRAFT.

c) Protective coatings of equipments.

d) Guidance technology used in AGV.

e) WCM - World Class Manufacturing.

Total No. of Questions : 6]

SEAT No. :

P1816

[Total No. of Pages : 2

[4265] - 281
M.E. (Industrial Engg.)
HUMAN FACTORS ENGINEERING
(2002 Course)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of nonprogrammable electronic pocket calculator is allowed.***
5) ***Assume suitable data, wherever necessary.***

SECTION - I

Q1) Answer **any two** of the following: **[16]**

a) Discuss the effect of thermal conditions on performance of an operator and the method to minimize these.

b) How the illumination requirement changes depending upon certain factors?

c) Explain the basic Human Thermal Balance Equation.

$S = M - E + / - R + / - C + / -K - W$

Q2) Answer **any two** of the following: **[16]**

a) Give the ergonomic aspects to be considered in designing a workplace for office and machine-shop.

b) What are the effects of heat ventilation on efficiency of an operator? Which are the areas where this factor is of importance?

c) Discuss in brief the Psychophysical and Physiological approach of evaluation of capacity to undertake manual material handling.

P.T.O.

Q3) Write short notes on **any three** of the following: **[18]**

a) Physiological effects of thermal conditions.

b) Maximum Aerobic Power.

c) Heat illnesses.

d) Maintenance of Body Core Temperature.

SECTION - II

Q4) Answer **any two** of the following: **[16]**

a) Explain the importance of allowance, its frequency and the concept of aerobic and un-aerobic work.

b) Explain the term Ergonomics. Explain the importance of Aerobic and Un-Aerobic Work.

c) Explain important aspects to be considered while designing Hand Tools.

Q5) Answer **any two** of the following: **[16]**

a) What is the reason that for certain professions like military services a person has got age limit?

b) Discuss the importance of HFE in Industrial Engineering with suitable examples.

c) Explain as to how the time standards get changed according to job design.

Q6) Answer **any three** of the following: **[18]**

a) Which are the anthropometric measurements? Explain applications of any four of these.

b) MOST and Human Efforts.

c) What are the principles of arranging components within physical space?

d) What do you understand by Borg's Scale of Perceived Physical Exertion?

Total No. of Questions : 8]

SEAT No. :

P1819

[Total No. of Pages : 2

[4265] - 515

M.E. (Mechanical) (Heat Power Engineering)

I.C. ENGINES - FUELS & COMBUSTION

(Semester - II) (Elective - III (a)) (2008 Course)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) What are the basic requirements of fuels for diesel and gasoline engines? **[6]**

b) Discuss the consequences of diesel fuel being used in gasoline engines and petrol in diesel engines. **[6]**

c) Explain the following: **[4]**

i) Pre-ignition.

ii) HUCR.

Q2) a) Discuss hydrogen as alternative fuel for engines vis-à-vis mineral fuels giving out its advantages and disadvantages. **[8]**

b) Huge research efforts are being put-in worldwide to use straight vegetable oils (SVOs) in diesel engines. Discuss the problems of using SVOs as fuel in diesel engines. **[8]**

Q3) a) Explain abnormal combustion. Discuss effects of engine variables on detonation in SI engines. **[8]**

b) Which type of combustion chamber is generally used in racing car engines? Explain this combustion chamber design giving out its advantages. **[8]**

P.T.O.

Q4) a) Discuss current design trends in SI engines. **[9]**

b) Compare SI and CI engines wrt the following: **[9]**

i) Initial and maintenance cost.

ii) Compression ratios and operating pressures.

iii) Starting and acceleration.

SECTION - II

Q5) a) Discuss stages of combustion in CI engines. **[6]**

b) Why are IDI combustion chambers being phased - out? Discuss in relation to DI combustion chamber design. **[6]**

c) Explain compression swirl. **[4]**

Q6) a) Discuss the aids generally used in CI engines for cold starting. What methods will you suggest for cold starting, if no aids are fitted in the engine? **[6]**

b) Name various methods of turbo charging and explain constant pressure turbo charging method. **[6]**

c) Explain the limitations of supercharging SI and CI engines. **[4]**

Q7) a) What are the air-fuel mixture requirements for the following operating conditions: **[8]**

i) Cruising.

ii) Maximum power.

iii) Starting.

iv) Deceleration.

b) Explain: **[8]**

i) EGR.

ii) Diesel smoke and control.

Q8) Write short notes on any three: **[18]**

a) Rating of CI and SI fuels.

b) Biodiesel.

c) Fuel additives.

d) Knocking.

Total No. of Questions : 10]

SEAT No. :

P1821

[Total No. of Pages : 2

[4265] - 549
M.E. (Mechanical) (Mechatronics)
DRIVES AND ACTUATORS
(2008 Course) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Solve any three questions from Section - I and any three questions from Section - II.***
2) ***Answers to the two sections should be written on separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data wherever necessary.***

SECTION - I

Q1) a) Describe the following ratings of SCR. **[8]**

i) Surge current ratings.

ii) $I^2 t$ rating.

iii) dv / dt rating.

iv) di / dt rating.

b) Discuss the working of IGBT and explain its transfer and static V-I characteristics. **[8]**

Q2) a) Sketch and explain the constant power and constant drive characteristics for DC series motor. **[8]**

b) Explain the concept of Electrical drives and write down its advantages. **[8]**

Q3) a) Explain Unipolar and Bipolar drive circuits for stepper motor. **[8]**

b) Explain single phase fully controlled rectifier control method for DC separately excited motor. **[8]**

P.T.O.

Q4) a) Explain the static Karmer drive for speed control of induction motor. **[8]**

b) Explain three phase bridge inverter. **[8]**

Q5) Write short note on (any three): **[18]**

a) N channel E-MOSFET.

b) Working of thyristor by Two transistor analogy.

c) Two quadrant operation of chopper controlled DC Drive.

d) Brushless DC motor.

SECTION - II

Q6) a) Compare Hydraulic systems with Pneumatic systems with respect to industrial applications. **[8]**

b) Explain the provision in hydraulic cylinders to avoid the jerk at the piston end. **[8]**

Q7) a) Explain with performance curves the equal percentage valve used in industrial applications. **[9]**

b) Discuss the applications of Hydraulic motors with suitable justifications. **[8]**

Q8) a) Explain counterbalance valve with circuit and application. **[8]**

b) Explain chain boxes in mobile cranes. **[8]**

Q9) a) Explain counter balance circuit w.r.t. hydraulic circuit, working and industrial application. **[9]**

b) Write a short note on encoders. **[8]**

Q10) a) Explain construction, working of steeper motors with one industrial application. **[8]**

b) Explain the use of accumulators used in hydraulics. **[8]**

Total No. of Questions : 10]

SEAT No. :

P1822

[Total No. of Pages : 2

[4265] - 550
M.E. (Mechanical) (Mechatronics)
COMPUTER AIDED DESIGN
(Elective - III (a)) (2008 Course) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any THREE questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***
6) ***Use of pocket non programmable electronic calculator is allowed.***

SECTION - I

Q1) a) Explain briefly the role of quality function deployment function in design. **[8]**

b) Explain with suitable example technological product development cycle. **[8]**

Q2) a) Enlist the limitations of wire frame and surface modeling over solid modeling techniques. **[8]**

b) Compare Explicit and implicit representation of surfaces. **[8]**

Q3) a) Find the degree of the Bezier curve controlled by three points V(0) = (1,1), V(1) = (6,5) V(2) = (0,4). Also find the equation of the Bezier curve in parametric format with parameter 'u'. **[8]**

b) Compare between CSG and B-rep modeling techniques. **[8]**

Q4) a) Derive generalized transformation matrix to rotate the object about an arbitrary line Y = 0.3X + 10. **[8]**

b) A triangle ABC has vertices A(1,1), B(1,2) and C(2,3). It is to be rotated by an angle of 30° CW direction about an arbitrary point P(2,2). Determine: **[8]**

i) The composite transformation matrix.

ii) The co-ordinate of transformed triangle.

P.T.O.

Q5) a) Enlist advantages and limitations of feature based modeling. **[6]**
b) Explain briefly IGES data exchange format. **[6]**
c) Explain the role of design specifications in product design. **[6]**

SECTION - II

Q6) a) Explain shape functions used in FEA. **[8]**
b) Explain briefly the variational approach used to derive integral equations in FEA. **[8]**

Q7) a) Explain general procedure for dynamic analysis of any systems using FEM. **[8]**
b) Derive an elemental stiffness matrix for 1D bar element using Potential Energy approach method. **[8]**

Q8) a) Differentiate between Fused deposition modeling and 3D ink printing techniques. **[8]**
b) Discuss the factors to be considered during designing a product for maintenance operation. **[8]**

Q9) a) Discuss Process integration approach in simulation. **[8]**
b) Discuss compatibility and conversion of Heavy-light issues in simulation. **[8]**

Q10) Write Short Notes on:
a) Convergence requirements in FEA. **[6]**
b) Role of sintered tooling in Rapid prototyping. **[6]**
c) Need for work cell simulation. **[6]**

Total No. of Questions : 8]

SEAT No. :

P1827

[Total No. of Pages : 2

[4265] - 645

M.E. (E & TC) (Microwave)

DIGITAL IMAGE PROCESSING AND ANALYSIS

(2008 Course) (Sem. - I) (Elective - I (b))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are the steps in image digitization? Explain image quantization in detail. **[8]**

b) What is histogram equalization? Perform the equalization of the image I. **[8]**

$$I = \begin{vmatrix} 4 & 4 & 4 & 4 & 4 \\ 3 & 4 & 5 & 4 & 3 \\ 3 & 5 & 5 & 5 & 3 \\ 3 & 4 & 5 & 4 & 3 \\ 4 & 4 & 4 & 4 & 4 \end{vmatrix}$$

Q2) a) Give the 2D-equation for forward and Reverse DWT coefficient of Image I(x,y). Explain how Wavelet Transform helps in edge detection. **[10]**

b) Give the equation for KL transform. Explain any one application of KL transform. **[8]**

P.T.O.

Q3) a) What is the drawback of Laplacian operator? What is the advantage of using LOG filter? **[8]**

b) What are the different color models? Explain any one in detail. **[8]**

Q4) Give short notes on any two: **[16]**

a) Elements of Visual Perception.

b) Fourier Transform.

c) Homomorphic Filtering.

SECTION - II

Q5) a) Compare Hough transform technique with Canny edge detection. **[10]**

b) What is constrained least square restoration technique? How is it different from Iterative Non-linear restoration method? **[8]**

Q6) a) Given 6 x 6 image I, perform dilation using structuring element J given as follows: **[8]**

$$I=\begin{vmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 1 & 1 & 0 & 0 \\ 0 & 1 & 1 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 & 1 & 0 \\ 0 & 0 & 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{vmatrix}, J=\begin{matrix} 0 & 1 & 0 \\ 1 & 1 & 1 \\ 0 & 1 & 0 \end{matrix}$$

b) Give one algorithm for region segmentation. **[8]**

Q7) a) Explain boundary descriptors used to detect a boundary. **[8]**

b) Differentiate between local, global and adaptive thresholding. **[8]**

Q8) a) Discuss the basic principles of Syntactic Pattern Recognition. **[8]**

b) With the help of block diagram explain fuzzy reasoning. **[8]**

Total No. of Questions : 8]

SEAT No. :

P1832

[Total No. of Pages : 2

[4265] - 778
M.E. (Computer Engg.)
MOBILE COMPUTING
(2008 Course) (Elective - I (d)) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are the technical requirements of GSM? **[8]**

b) State reasons behind the design of GSM system. **[4]**

c) What are the primary objectives of FPLMTS? **[4]**

Q2) Discuss in detail, the typical GSM architecture. **[16]**

Q3) a) Explain the SCH message format. **[4]**

b) In a speech frame there are 24 frames in one multiframe lasting 120 ms carrying data. The number of data bits per frame is 114. What is the data rate for full and half rate channels? **[4]**

c) Explain the structure of a TDMA slot with a frame for following bursts **[8]**

i) Frequency Correction burst.

ii) Access burst.

Q4) Write Notes on ANY THREE: **[18]**

a) Application of Mobile communication.

b) Dedicated control channels.

c) Functions of MSC and VLR.

d) MS authentication process.

P.T.O.

SECTION - II

Q5) a) Explain the concept of "Off-Air call setup". What are the advantages of this scheme compared to call establishment without OACSU? Discuss the process of call establishment with OACSU. **[10]**

b) Discuss the three handover cases with the help of a diagram. **[6]**

Q6) a) Explain in detail the temporary mobile subscriber identification assignment process as a result of location update. **[10]**

b) Briefly describe two different types of SIM implementation in GSM. List important items stored in SIM. **[6]**

Q7) The European Digital Cellular System has an individual user data rate of 33.85 kbps in which the speech with error protection has the rate of 22.8 kbps. The data rate of the SACCH is 0.95 kbps. Find the overhead data rate and the TDMA efficiency, assuming that the system contains 125 channels of 200-kHz bandwidth each and with total system bandwidth of 25 MHz. (The frame duration is 4.62 ms divided equally between eight slots). **[16]**

Q8) Write Notes on ANY THREE: **[18]**

a) MTP and SCCP protocol.

b) TCAP.

c) MSSMAP protocol.

d) U_m interface.

Total No. of Questions : 8]

SEAT No. :

P1833

[Total No. of Pages : 2

[4265] - 786
M.E. (Computer Engg.)
SOFTWARE DESIGN AND ARCHITECTURE
(2008 Course) (Elective - III (a)) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer 3 questions from Section - I and 3 questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the following: **[12]**

i) Major phases of design process.

ii) Incremental development processes.

iii) JSD representation.

b) Explain the mapping of quality concepts to countable attributes of design (measurement) for real time control system. **[6]**

Q2) What are the design view points of software? Give the Data Flow diagram (up to level 1) and State Transition Diagram for Bank auto teller machine with their design viewpoints. **[16]**

Q3) Write short notes on: **[16]**

a) Assessing the design process.

b) Design pattern template with an example.

c) Incremental design.

d) Component based design.

P.T.O.

Q4) a) Explain the object oriented design methods with unified process. **[8]**

b) Explain any two architectural styles with their application. **[8]**

SECTION - II

Q5) a) Give the different styles of module view type and explain the documentation of any one style with elements, notation, relation to other styles and example. **[12]**

b) Explain the design tasks of conceptual view and give the conceptual view design of one component of IS2000. **[6]**

Q6) Write short notes on: **[16]**

a) Component and connector view type.

b) Archetype pattern.

c) Documenting Behaviour.

d) Layered architecture.

Q7) a) Explain the global analysis with steps of analyzing factors. **[8]**

b) How do you model the customer in CRM archetype pattern? **[8]**

Q8) Explain the following: **[16]**

a) Literate modeling and its advantages.

b) Allocation view type.

Total No. of Questions : 8]

SEAT No. :

P1849

[Total No. of Pages : 2

[4265]-510

M.E. (Mech. - Heat Power)

CONVENTIONAL POWER PLANTS

(2008 Course) (Elective - II (C)) (Semester - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain with a neat sketch : **[12]**

i) STAG-Cycle.

ii) Regeneration in steam turbine.

b) Write a note on fluidised bed combustion. **[6]**

Q2) a) In a 15 MW steam power plant operating on ideal reheat cycle, steam enters the H.P. turbine at 150 bar and 600ºC. The condenser is maintained at a pressure of 10 kPa. If the moisture content at the exit of L.P. turbine is 10%, determine : **[10]**

i) Reheat pressure.

ii) Specific steam consumption.

iii) Thermal efficiency.

b) Write a note on governing of steam turbines. **[6]**

Q3) a) Explain the working of BWR with a neat sketch. **[8]**

b) Draw a modern steam power plant & explain the fuel circuit. **[8]**

P.T.O.

Q4) Write short notes on (any three) : **[16]**

a) CANDU-type nuclear reactor.

b) Nuclear waste disposal.

c) Cooling towers.

d) Losses in steam turbines.

SECTION - II

Q5) a) Discuss the types of water & air pollution caused by thermal power plants. **[8]**

b) Explain fuel-cells with their limitations. **[8]**

Q6) a) Discuss mini and micro hydal plants along with its potential in India. **[8]**

b) Explain economic scheduling principle in detail. **[8]**

Q7) a) Calculate the cost of generation per kWh for a power station having the following data : **[10]**

i) Installed capacity of the plant = 200 MW.
ii) Capital cost = Rs. 400 crores.
iii) Rate of interest and depreciation = 12%.
iv) Annual cost of fuel, salaries and taxation = Rs. 5 crores.
v) Load factor = 50%.

Also estimate the saving in cost per kWh if the annual load factor is raised to 60%.

b) Explain the following terms : **[6]**

i) Load factor and diversity factor.
ii) Present-worth.

Q8) Write short notes on (any three) : **[18]**

a) Depreciation methods.

b) IR & HR curves.

c) Instrumentation & controls in thermal power plants.

d) Compressed air-storage system.

Total No. of Questions : 8]

SEAT No. :

P1850

[Total No. of Pages : 2

[4265]-527

M.E. (Mechanical) (Design Engg.)

MATERIAL HANDLING EQUIPMENT DESIGN

(2008 Course) (Elective - II (a)) (Semester - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answers will be valued as a whole.***

SECTION - I

Q1) a) State various functions in material handling (Activities in material handling). **[6]**

b) Explain any four principles of material handling with appropriate practical situations. **[12]**

Q2) a) State limitations or negative aspects of material handling system. **[6]**

b) What is material handling equation? Explain its use in analysing a material handling problem. **[10]**

Q3) a) Outline the general analysis procedure for material handling problem & explain in detail any two steps in it. **[8]**

b) List the techniques for determining manpower costs and state situations in which they can be applied. **[8]**

Q4) a) State what are the drives used in hoisting and explain their specific features & uses. **[8]**

b) Explain what are the stability issues related to different types of cranes. **[8]**

P.T.O.

SECTION - II

Q5) a) Draw following types of hooks & comment on each **[8]**

i) Forged standard hook.
ii) Ramshorn hook.

b) Discuss various grabing attachments for loose materials. **[8]**

Q6) a) Explain the construction & features of roller chains. **[8]**

b) Discuss the characteristics & limitations of following conveyers. **[8]**

i) Vibratory conveyers.
ii) Screw conveyers.

Q7) a) Explain how gravity is used in bulk material handling. **[8]**

b) State objectives of storage or warehousing function. **[8]**

Q8) Write short notes on any three of the following : **[18]**

a) Types of ropes used in material handling equipments.

b) Warehouse automation.

c) Different types of conveyers used in Bulk material handling.

d) Safety in material handling.

Total No. of Questions : 10]

SEAT No. :

P1856

[Total No. of Pages : 2

[4265]-701

M.E. (Electronics) (Digital System)

MEMORY TECHNOLOGIES

(2008 Course) (Elective - II (C)) (Semester - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) It is said that DRAM is better than SRAM. Justify the statement? **[6]**

b) Why MOS technology is preferred over bipolar technology in SRAM now a days? **[6]**

c) What is Bi-CMOS? What are its advantages? **[4]**

Q2) a) What is the purpose of designing application specific SRAM and DRAM? **[6]**

b) For the following situation suggest at least one application specific SRAM. **[10]**

i) Two processes want to access the contents of same cell.
ii) Telecommunication Applications.
iii) Data managements or Disk catching or Pattern & Image recognition.
iv) Ultra-high-speed devices.
v) System where frequently power fails.

Q3) a) What are the benefits of trench and stack capacitor over planer capacitor in case of DRAM cell development. **[8]**

b) What are the causes of soft errors in case of DRAM? Explain different ways to reduce these soft errors. **[8]**

P.T.O.

Q4) a) What are the ideal characteristics of nonvolatile memories? **[6]**

b) Point out technological difference between EPROM, EEPROM and FLASH? **[6]**

c) Explain "Fowler Nordheim Tunneling" phenomenon. **[6]**

Q5) a) Why testing of semiconductor memory is required? **[4]**

b) Write Algorithm Test Sequence (ATS). **[4]**

c) Explain Data retention faults w.r.t. **[8]**

i) SRAM

ii) DRAM

SECTION - II

Q6) a) What is "Latchup" problem in semiconductor memories? How this problem can be reduced in semiconductor memories? **[6]**

b) What is "Electromigration"? What are its prominent effects on semiconductor memory? **[6]**

c) Discuss reliability issues related to EEPROM. **[6]**

Q7) a) What are the sources of radiation which affects semiconductor devices? **[4]**

b) What is radiation hardening? **[4]**

c) Why radiation hardening is required for semiconductor memory? What are the physical techniques followed to reduce the radiation effects in memories. **[8]**

Q8) a) Write important features of FRAM. **[4]**

b) Explain the read and write operation of FRAM with suitable diagrams. **[12]**

Q9) a) How analog memory is different than the normal memory? Explain the principle of working of this memory. **[6]**

b) Write short note on "Quantum-Mechanical Switch memory". **[6]**

c) Justify MRAM is more suitable for space applications. **[4]**

Q10) a) Why semiconductor memory packaging is so important? Why semiconductor memory Hybrids (2D and 3D) are required? **[8]**

b) Write technical specifications of Tablet PC available in the current market. **[8]**

Total No. of Questions : 8]

SEAT No. :

P1858

[Total No. of Pages : 2

[4265]-717

M.E. (E & T/C) (Communication Networks)

NETWORK ARCHITECTURE & DESIGN

(2008 Course) (Elective - II (b)) (Semester - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Answer any THREE questions from each section.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) Explain the concept of Architecture and design defensibility with suitable example. **[8]**

b) What do you mean by supportability? Which two main task it focuses? **[8]**

Q2) a) Compare and contrast Hierarchy and interconnectivity. **[8]**

b) What do you mean by system in contest to Network analysis, architecture, and design? What are different systems attributes? **[8]**

Q3) a) Describes several types of delay (real-time, interactive-burst, interactive-bulk, and asynchronous). Give examples of applications or traffic types that have each type of delay. **[8]**

b) Consider a network design in which there is an existing base of PCs and workstations with Ethernet interfaces. Current capacity requirements are beyond 10 Mb/s, and the customer wants to keep his or her investment in Ethernet NICs. The company is migrating from a shared network and is looking at IP routers, Ethernet 10 and 100 Mb/s switches, and LAN as possible options. Compare and contrast these options, disregarding capacity for the moment. **[8]**

i) What distinguishing characteristics of the network design indicate each of these options?

ii) What requirements of the network design would be needed to be better able to make a choice?

P.T.O.

Q4) a) Explain two guidelines for evaluating technologies based on capacity and service plans. **[6]**

b) Describe two ways to make an uptime requirement of 99.999% more precise. **[6]**

c) Given an MTBCF requirement of 10000 hours and an MTTR requirement of 6 hours, calculate an availability requirement. **[6]**

SECTION - II

Q5) a) Explain in detail FCAPS model. **[8]**

b) Explain with example performance envelope from requirements analysis. **[8]**

Q6) a) Explain role of security component architecture in contest to network architecture design? **[8]**

b) Explain in detail Flowspec algorithm and which rules it applies. **[8]**

Q7) a) How much management data would be generated in a centralized management approach within a week, assuming data collection of nine SNMP counters on all routers and Internet Control Message Protocol ping polling of all devices (network and user), with a polling interval of 5 minutes? Each SNMPcounter and ping generates 128 bytes of data. **[8]**

b) Differentiate in-band management Vs out-band management. **[8]**

Q8) a) Define the terms : **[10]**

i) Hard boundary.
ii) Soft boundary.
iii) Rout filler.
iv) Route aggregation.
v) Routing flows.

b) For each of the following queuing mechanisms, give an example of how each would be used within a network. What problem(s) is, each mechanism solving? **[8]**

i) RED.
ii) WRED.

Total No. of Questions : 8]

SEAT No. :

P1864

[Total No. of Pages : 4

[4265]-856

M.E. (Petroleum Engineering)

WELL TESTING AND ANALYSIS

(2008 Course) (Elective - II (C)) (Semester - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answers to the two sections must be written in separate answer books.***
2) ***Questions No. 2 (two) and 8 (eight) are compulsory.***
3) ***Figures to the right indicate full marks.***
4) ***Answer 3 questions from Section I and 3 questions from Section II.***
5) ***Neat diagrams should be drawn wherever necessary.***
6) ***Use of non-programmable calculator, log-log, and semi-log paper is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Derive the continuity equation for a single phase fluid flowing though a one dimensional porous media. **[6]**

b) Explain the various flow regimes that are witnessed in a vertical well test, along with neat diagrams. **[10]**

Q2) Following data is given : **[18]**

q = 30 stb/d
h = 140 ft
B = 1.47 RB/STB
k = 0.2 md
$c_t = 1.4 \times 10^{-5}$ psi^{-1}
μ = 0.72 cp
r_w = 0.5 ft
P_i = 3100 psi
porosity = 20%
r_e = 2800 ft

Calculate the reservoir pressure at the radius of 1 ft, 5 ft, 10 ft and 50 ft after 3 hours of oil production.

P.T.O.

Q3) a) Explain the concept of Superposition in time, with appropriate figures. **[4]**

b) What are the various objectives of well testing? Write your answer in detail. **[4]**

c) A new oil well produced 400 stb/day for 2± days; then it was shut-in for a pressure buildup test, during which the data in Table below were recorded. The other data were : B_o = 1.25 rb/stb, h = 20 ft, phi = 0.20, r_w = 0.29 ft, ct = 19.5 × 10^-6, and viscosity = 1.1 cP. From these data, estimate the formation permeability, k, pi, and skin factor s. Use the Semi-Log graph. **[8]**

Shut-in time, Del-t (hr)	(tp + Del-t)/Del-t	P_{ws}(psia)
0	-	1165
2	37.0	1801
4	19.0	1838
8	10.0	1865
16	5.5	1891
24	4.0	1905
48	2.5	1925

Q4) a) What do you mean by DST? How is it different from a PBU and DD test? **[6]**

b) Explain the phenomenon of afterflow and unloading, along with appropriate diagrams. **[10]**

SECTION - II

Q5) a) What is pseudo pressure?

b) Explain Isochronal and Modified Isochronal Well test. **[16]**

Q6) What are the different types of decline curves? Explain with sketches. **[16]**

Q7) Write down the assumptions used for the derivation of diffusivity equation, and also mention the types of possible solutions of the diffusivity equation. **[16]**

Q8) Define and explain the pressure derivative plot. Draw and explain the diagnostic plot giving five examples. **[18]**

Formulas for the exam

For E (i) function values, refer to the table given with the examination paper

$$p = p_i + 70.6\frac{qB\mu}{kh}\text{Ei}\left(-\frac{948\phi\mu c_t r^2}{kt}\right)$$

$$t_D = \frac{0.000264kt}{\phi\mu_o c_t r_w^2}$$

$$p_{ws} = p_i - \frac{162.6\, q_o\, \mu_o\, \beta_o}{kh}\log\left[\frac{t_p + \Delta t}{\Delta t}\right]$$

$$p_D = -\frac{1}{2}Ei\left(-\frac{r_D^2}{4t_D}\right)$$

$$s = 1.151\left[\frac{p_{1\,hr} - p_{ws(\Delta t=0)}}{m} - \log\left(\frac{k}{\phi\mu_o c_t r_w^2}\right) + 3.23\right]$$

$$p_{wf} = p_i - \frac{162.6 q_o \mu_o \beta_o}{kh}\left[\log t + \log\left(\frac{k}{\phi\mu_o c_t r_w^2}\right) - 3.23 + 0.869s\right]$$

$$p = p_i + 70.6\frac{qB\mu}{kh}\left[\ln\left(\frac{1,688\phi\mu c_t r^2}{kt}\right)\right]$$

$$\frac{(3.975 \times 10^5)\phi\mu c_t r_w^2}{k} < t < \frac{948\phi\mu c_t r_e^2}{k}$$

$$p_{1h} = p_i + m\left[\log\left(\frac{k}{\phi\mu_o\beta_o c_t r_w^2}\right) - 3.23 + 0.869s\right]$$

$$p(r,t) = LS(r,t) = p_i - \frac{70.6\, Q\, \mu}{k\, h}\left[-E_i\left(-\frac{948.1\,\Phi\,\mu\, c_t\, r^2}{k\, t}\right)\right]$$

$$k = \frac{162.6\, q_o\, \mu_o\, \beta_o}{mh}$$

TABLE 1.1—VALUES OF THE EXPONENTIAL INTEGRAL, $-Ei(-x)$

$-Ei(-x)$, $0.000 < x < 0.209$, interval = 0.001

x	0	1	2	3	4	5	6	7	8	9
0.00	+ ∞	6.332	5.639	5.235	4.948	4.726	4.545	4.392	4.259	4.142
0.01	4.038	3.944	3.858	3.779	3.705	3.637	3.574	3.514	3.458	3.405
0.02	3.355	3.307	3.261	3.218	3.176	3.137	3.098	3.062	3.026	2.992
0.03	2.959	2.927	2.897	2.867	2.838	2.810	2.783	2.756	2.731	2.706
0.04	2.681	2.658	2.634	2.612	2.590	2.568	2.547	2.527	2.507	2.487
0.05	2.468	2.449	2.431	2.413	2.395	2.377	2.360	2.344	2.327	2.311
0.06	2.295	2.279	2.264	2.249	2.235	2.220	2.206	2.192	2.178	2.164
0.07	2.151	2.138	2.125	2.112	2.099	2.087	2.074	2.062	2.050	2.039
0.08	2.027	2.015	2.004	1.993	1.982	1.971	1.960	1.950	1.939	1.929
0.09	1.919	1.909	1.899	1.889	1.879	1.869	1.860	1.850	1.841	1.832
0.10	1.823	1.814	1.805	1.796	1.788	1.779	1.770	1.762	1.754	1.745
0.11	1.737	1.729	1.721	1.713	1.705	1.697	1.689	1.682	1.674	1.667
0.12	1.660	1.652	1.645	1.638	1.631	1.623	1.616	1.609	1.603	1.596
0.13	1.589	1.582	1.576	1.569	1.562	1.556	1.549	1.543	1.537	1.530
0.14	1.524	1.518	1.512	1.506	1.500	1.494	1.488	1.482	1.476	1.470
0.15	1.464	1.459	1.453	1.447	1.442	1.436	1.431	1.425	1.420	1.415
0.16	1.409	1.404	1.399	1.393	1.388	1.383	1.378	1.373	1.368	1.363
0.17	1.358	1.353	1.348	1.343	1.338	1.333	1.329	1.324	1.319	1.314
0.18	1.310	1.305	1.301	1.296	1.291	1.287	1.282	1.278	1.274	1.269
0.19	1.265	1.261	1.256	1.252	1.248	1.243	1.239	1.235	1.231	1.227
0.20	1.223	1.219	1.215	1.210	1.206	1.202	1.198	1.195	1.191	1.187

$-Ei(-x)$, $0.00 < x < 2.09$, interval = 0.01

x	0	1	2	3	4	5	6	7	8	9
0.0	+ ∞	4.038	3.335	2.959	2.681	2.468	2.295	2.151	2.027	1.919
0.1	1.823	1.737	1.660	1.589	1.524	1.464	1.409	1.358	1.309	1.265
0.2	1.223	1.183	1.145	1.110	1.076	1.044	1.014	0.985	0.957	0.931
0.3	0.906	0.882	0.858	0.836	0.815	0.794	0.774	0.755	0.737	0.719
0.4	0.702	0.686	0.670	0.655	0.640	0.625	0.611	0.598	0.585	0.572
0.5	0.560	0.548	0.536	0.525	0.514	0.503	0.493	0.483	0.473	0.464
0.6	0.454	0.445	0.437	0.428	0.420	0.412	0.404	0.396	0.388	0.381
0.7	0.374	0.367	0.360	0.353	0.347	0.340	0.334	0.328	0.322	0.316
0.8	0.311	0.305	0.300	0.295	0.289	0.284	0.279	0.274	0.269	0.265
0.9	0.260	0.256	0.251	0.247	0.243	0.239	0.235	0.231	0.227	0.223
1.0	0.219	0.216	0.212	0.209	0.205	0.202	0.198	0.195	0.192	0.189
1.1	0.186	0.183	0.180	0.177	0.174	0.172	0.169	0.166	0.164	0.161
1.2	0.158	0.156	0.153	0.151	0.149	0.146	0.144	0.142	0.140	0.138
1.3	0.135	0.133	0.131	0.129	0.127	0.125	0.124	0.122	0.120	0.118
1.4	0.116	0.114	0.113	0.111	0.109	0.108	0.106	0.105	0.103	0.102
1.5	0.100	0.0985	0.0971	0.0957	0.0943	0.0929	0.0915	0.0902	0.0889	0.0876
1.6	0.0863	0.0851	0.0838	0.0826	0.0814	0.0802	0.0791	0.0780	0.0768	0.0757
1.7	0.0747	0.0736	0.0725	0.0715	0.0705	0.0695	0.0685	0.0675	0.0666	0.0656
1.8	0.0647	0.0638	0.0629	0.0620	0.0612	0.0603	0.0595	0.0586	0.0578	0.0570
1.9	0.0562	0.0554	0.0546	0.0539	0.0531	0.0524	0.0517	0.0510	0.0503	0.0496
2.0	0.0489	0.0482	0.0476	0.0469	0.0463	0.0456	0.0450	0.0444	0.0438	0.0432

$-Ei(-x)$, $2.0 < x < 10.9$, interval = 0.1

x	0	1	2	3	4	5	6	7	8	9
2	4.89×10^{-2}	4.26×10^{-2}	3.72×10^{-2}	3.25×10^{-2}	2.84×10^{-2}	2.49×10^{-2}	2.19×10^{-2}	1.92×10^{-2}	1.69×10^{-2}	1.48×10^{-2}
3	1.30×10^{-2}	1.15×10^{-2}	1.01×10^{-2}	8.94×10^{-3}	7.89×10^{-3}	6.97×10^{-3}	6.16×10^{-3}	5.45×10^{-3}	4.82×10^{-3}	4.27×10^{-3}
4	3.78×10^{-3}	3.35×10^{-3}	2.97×10^{-3}	2.64×10^{-3}	2.34×10^{-3}	2.07×10^{-3}	1.84×10^{-3}	1.64×10^{-3}	1.45×10^{-3}	1.29×10^{-3}
5	1.15×10^{-3}	1.02×10^{-3}	9.08×10^{-4}	8.09×10^{-4}	7.19×10^{-4}	6.41×10^{-4}	5.71×10^{-4}	5.09×10^{-4}	4.53×10^{-4}	4.04×10^{-4}
6	3.60×10^{-4}	3.21×10^{-4}	2.86×10^{-4}	2.55×10^{-4}	2.28×10^{-4}	2.03×10^{-4}	1.82×10^{-4}	1.62×10^{-4}	1.45×10^{-4}	1.29×10^{-4}
7	1.15×10^{-4}	1.03×10^{-4}	9.22×10^{-5}	8.24×10^{-5}	7.36×10^{-5}	6.58×10^{-5}	5.89×10^{-5}	5.26×10^{-5}	4.71×10^{-5}	4.21×10^{-5}
8	3.77×10^{-5}	3.37×10^{-5}	3.02×10^{-5}	2.70×10^{-5}	2.42×10^{-5}	2.16×10^{-5}	1.94×10^{-5}	1.73×10^{-5}	1.55×10^{-5}	1.39×10^{-5}
9	1.24×10^{-5}	1.11×10^{-5}	9.99×10^{-6}	8.95×10^{-6}	8.02×10^{-6}	7.18×10^{-6}	6.44×10^{-6}	5.77×10^{-6}	5.17×10^{-6}	4.64×10^{-6}
10	4.15×10^{-6}	3.73×10^{-6}	3.34×10^{-6}	3.00×10^{-6}	2.68×10^{-6}	2.41×10^{-6}	2.16×10^{-6}	1.94×10^{-6}	1.74×10^{-6}	1.56×10^{-6}

Total No. of Questions : 8]

SEAT No. :

P1866

[Total No. of Pages : 7

[4265]-511

M.E. (Mechanical) (Heat Power Engg.)

ADVANCED GAS DYNAMICS

(2008 Course) (Elective - II (d)) (Semester - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rules, Mollier charts, electronic pocket calculator, steam tables and shock tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Write a short note on transformation of a material derivative to a control volume approach. **[6]**

b) Derive isentropic relations using first and second law of thermodynamics. **[4]**

c) Air flow is discharged to sea level atmosphere through a sonic nozzle. If the air storage pressure at the reservoir is 40×10^5 N/m^2, determine the pressure, temperature density at the exit of the nozzle. Assume that the reservoir air is at ambient temperature. **[6]**

Q2) a) Oxygen flows in a constant-area, horizontal, insulated duct. Conditions at section 1 are p_1 = 344.738 kPa absolute, T_1 = 333.333 K and V_1 = 871.728 m/sec. At a downstream section the temperature is T_2 = 582.222 K. **[6]**

i) Determine M_1 and T_{t1}.
ii) Find V_2 and P_2.
iii) What is the entropy change between the two sections?

P.T.O.

b) Derive following relations from using continuity, momentum, energy equations for normal shocks in terms of upstream Mach number M_1. **[10]**

i) For M_2
ii) ρ_2/ρ_1
iii) P_2/P_1
iv) T_2/T_1

Where subscript 1 denotes conditions of upstream and 2 for downstream. Also discuss the limiting case of $M_1 \to \infty$ as well as $M_1 = 0$.

Q3) a) Derive the following relationships and Explain Area- Velocity for different Mach number. **[12]**

i) $$dp = \frac{\rho V^2}{g_c}\left(\frac{1}{1-M^2}\right)\frac{dA}{A}$$

ii) $$\frac{d\rho}{\rho} = \left(\frac{M^2}{1-M^2}\right)\frac{dA}{A}$$

iii) $$\frac{dV}{V} = -\left(\frac{1}{1-M^2}\right)\frac{dA}{A}$$

b) A blunt-nosed missile is flying at Mach 2.5 at standard sea level. Calculate the temperature and pressure at the nose of the missile. **[4]**

Q4) Write short note on any three : **[18]**

a) Prove $''\nabla.V = 0''$ is continuity equation for incompressible flow.

b) Under and Over expanded nozzle.

c) Shock Polar hodograph for Oblique shock.

d) Explain the propagation of sound wave in subsonic and supersonic flow.

e) Prove the relation between characteristic (M*) and local (M) Mach number for isentropic flow.

SECTION - II

Q5) a) Derive the Prandtle-Meyer expansion function for a supersonic flow over a convex corner. **[8]**

b) A uniform supersonic flow at $M_1 = 2.0$, $P_1 = 0.8 \times 105$ N/m^2 and temperature 270 K expands through two convex corners of 10° each as shown in Fig.1. Determine the downstream Mach number M_3, P_2, T_2 and the angle of the second fan. **[8]**

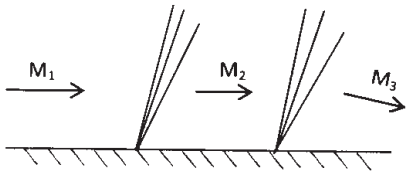


Fig. 1

Q6) a) Derive the Rankine-Hugonoit equation for oblique shock wave and state its merits and demerits. **[8]**

b) For the flow over the half-diamond wedge shown in Fig. 2, find the inclinations of shocks and expansion waves and the pressure distributions. **[8]**

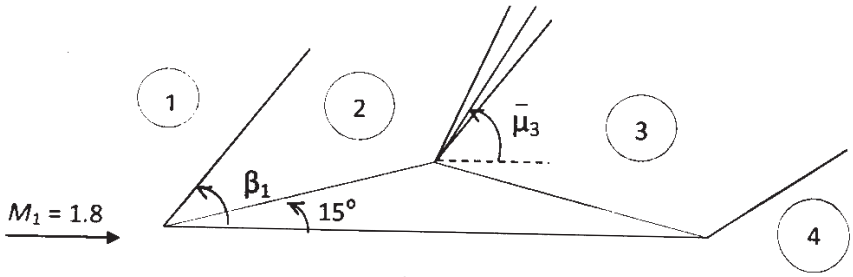


Fig. 2

Q7) a) Derive following relations from using continuity, momentum, energy equations for normal shocks in terms of upstream Mach number M_1. **[8]**

i) P_2/P_1

ii) T_2/T_1

b) A gaseous mixture of air and fuel enters a ramjet combustion chamber with a velocity of 60 m/s and temperature 50°C and at a pressure of 0.35 bar. The heat of reaction of the mixture for the particular fuel to air ratio employed is 1160 KJ/Kg. Find the conditions of stream of exit of

combustion chamber if the friction is neglected and cross-sectional area is constant. Also assume that the properties of both reactants and products of combustion are the same as air. **[8]**

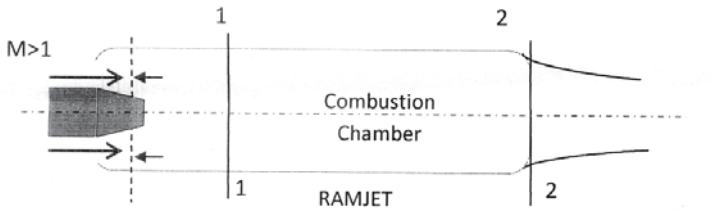


Fig. 3

Q8) Attempt any three questions from the following : **[18]**

a) Bring out the essential differences between Rayleigh flow and Fanno flow. Give at least two examples for each type of flow.

b) Explain a relation connecting flow turning angle (θ), shock angle (β) and free stream Mach number (M) for oblique shock waves. And illustrate the weak shock and strong shock.

c) Explain Chocking condition of C-D Nozzle flow and write the expression of Maximum flow rate.

d) Explain the Shock Reflection and Shock-Shock interaction.

e) Explain Total or Stagnation properties of the flow and write their relation with static properties in terms of Mach number.

TABLE A1: Isentropic Flow of Perfect Gas ($\gamma = 1.4$)

M	p/p_o	T/T_o	ρ/ρ_o	A/A^*	a/a_o	M^*	μ	ν
0.15	0.9844	0.9955	0.9888	3.910	0.9978	0.1639		
0.16	0.9823	0.9949	0.9873	3.673	0.9974	0.1748		
0.17	0.9800	0.9943	0.9857	3.464	0.9971	0.1857		
1.23	0.3964	0.7677	0.5164	1.040	0.8762	1.1806	54.391	4.312
1.24	0.3912	0.7648	0.5115	1.043	0.874	1.1879	53.751	4.569
1.25	0.3861	0.7619	0.5067	1.047	0.8729	1.1952	53.130	4.830
1.8	0.1740	0.6068	0.2868	1.439	0.7790	1.5360	33.749	20.725
2.0	0.1278	0.5556	0.2300	1.688	0.7454	1.6330	30.000	26.380
2.38	0.0706	0.4688	0.1505	2.359	0.6847	1.7852	24.845	36.261
2.83	0.0352	0.3844	0.0916	3.601	0.6200	1.9219	20.693	46.368

TABLE A2: Oblique Shock in Perfect Gas ($\gamma = 1.4$)

M_1	θ	β	p_2/p_1	M_2	β	p_2/p_1	M_2
1.80	14	49.66	2.029	1.290	78.02	3.450	0.696
1.80	15	51.34	2.138	1.245	76.76	3.415	0.712
1.80	16	53.20	2.257	1.196	75.33	3.371	0.733

TABLE A3: Normal Shock in Perfect Gas ($\gamma = 1.4$)

M_1	M_2	p_2/p_1	T_2/T_1	$\Delta V/a_1$	p_{t2}/p_{t1}	p_{t2}/p_1
1.40	0.73971	2.12000	1.25469	0.57143	0.95819	3.04924
1.41	0.73554	2.15278	1.26116	0.58398	0.95566	3.08438
1.42	0.73144	2.18580	1.26764	0.59648	0.95306	3.11980
1.43	0.72741	2.21905	1.27414	0.60892	0.95039	3.15551
1.44	0.72345	2.25253	1.28066	0.62130	0.94765	3.19149
1.45	0.71956	2.28625	1.28720	0.63362	0.94484	3.22776
1.46	0.71574	2.32020	1.29377	0.64589	0.94196	3.26431
1.47	0.71198	2.35438	1.30035	0.65811	0.93901	3.30113
1.48	0.70829	2.38880	1.30695	0.67027	0.93600	3.33823
1.49	0.70466	2.42345	1.31357	0.68238	0.93293	3.37562
1.50	0.70109	2.45833	1.32022	0.69444	0.92979	3.41327
1.51	0.69758	2.49345	1.32688	0.70646	0.92659	3.45121
1.52	0.69413	2.52880	1.33357	0.71842	0.92332	3.48942
1.53	0.69073	2.56438	1.34029	0.73034	0.92000	3.52791
1.54	0.68739	2.60020	1.34703	0.74221	0.91662	3.56667
1.55	0.68410	2.63625	1.35379	0.75403	0.91319	3.60570
1.56	0.68087	2.67253	1.36057	0.76581	0.90970	3.64501
1.57	0.67768	2.70905	1.36738	0.77755	0.90615	3.68459
1.58	0.67455	2.74580	1.37422	0.78924	0.90255	3.72445
1.59	0.67147	2.78278	1.38108	0.80089	0.89890	3.76457

TABLE A4: One-Dimensional Frictional Flow with Change in Stagnation Temperature Rayleigh Flow Parameters ($\gamma = 1.4$)

M	T_t/T_t^*	T/T^*	p/p^*	p_t/p_t^*	V/V^*	S_{max}/R
1.60	0.88419	0.70174	0.52356	1.17561	1.34031	0.59259
1.61	0.88170	0.69680	0.51848	1.18159	1.34394	0.60752
1.62	0.87922	0.69190	0.51346	1.18768	1.34753	0.62250
1.63	0.87675	0.68703	0.50851	1.19387	1.35106	0.63755
1.64	0.87429	0.68219	0.50363	1.20017	1.35455	0.65265
1.65	0.87184	0.67738	0.49880	1.20657	1.35800	0.66781
1.66	0.86939	0.67259	0.49405	1.21309	1.36140	0.68303
1.67	0.86696	0.66784	0.48935	1.21971	1.36475	0.69829
1.68	0.86453	0.66312	0.48472	1.22644	1.36806	0.71360
1.69	0.86212	0.65843	0.48014	1.23328	1.37133	0.72896
1.70	0.85971	0.65377	0.47562	1.24024	1.37455	0.74436
1.71	0.85731	0.64914	0.47117	1.24730	1.37774	0.75981
1.72	0.85493	0.64455	0.46677	1.25447	1.38088	0.77529
1.73	0.85256	0.63999	0.46242	1.26175	1.38398	0.79081
1.74	0.85019	0.63545	0.45813	1.26915	1.38705	0.80636
1.80	0.83628	0.60894	0.43353	1.31592	1.40462	0.90031
1.81	0.83400	0.60464	0.42960	1.32413	1.40743	0.91606
1.82	0.83174	0.60036	0.42573	1.33244	1.41019	0.93183
1.83	0.82949	0.59612	0.42191	1.34088	1.41292	0.94761
1.84	0.82726	0.59191	0.41813	1.34943	1.41562	0.96342
1.85	0.82504	0.58774	0.41440	1.35811	1.41829	0.97924
1.86	0.82283	0.58359	0.41072	1.36690	1.42092	0.99507
1.87	0.82064	0.57948	0.40708	1.37582	1.42351	1.01092
1.88	0.81845	0.57540	0.40349	1.38486	1.42608	1.02678
1.89	0.81629	0.57136	0.39994	1.39402	1.42862	1.04265
1.90	0.81414	0.56734	0.39643	1.40330	1.43112	1.05853
1.91	0.81200	0.56336	0.39297	1.41271	1.43359	1.07441
1.92	0.80987	0.55941	0.38955	1.42224	1.43604	1.09031
1.93	0.80776	0.55549	0.38617	1.43190	1.43845	1.10621
1.94	0.80567	0.55160	0.38283	1.44168	1.44083	1.12211

Total No. of Questions : 10]

SEAT No. :

P1867

[Total No. of Pages : 3

[4265] - 65
M.E. (Mech.) (Design Engineering)
MACHINE STRESS ANALYSIS
(2002 Course)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Use of non programmable calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) A 40 mm x 5 mm angle section as shown in the fig.1 is used as simply supported beam over a span of 2.4 m. It carries a load of 200N along line through the centroid of the section. Determine the resulting bending stresses on point L, M & N (shown in fig. 1). **[16]**

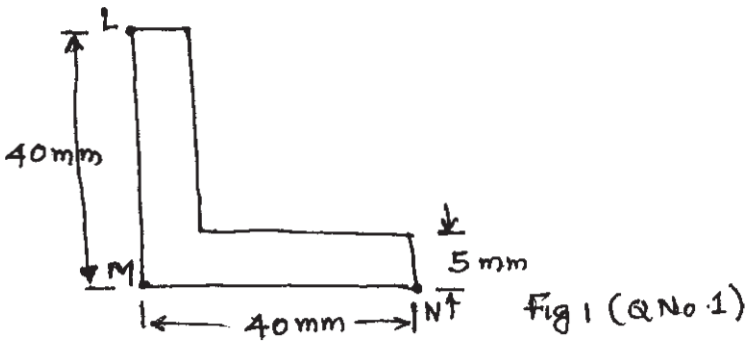


Fig 1 (Q No 1)

Q2) a) Explain in detail Rayleigh - Ritz method. **[8]**

b) Discuss the use of energy method to find plastic deformation. **[8]**

Q3) a) Prove that warping function $\varphi = A(y^3 - 3x^2 y)$ is valid for an equilateral triangular bar subjected to pure torsion. Find relation between stress & torque. The boundaries of the equilateral triangle are defined as $x = a; x + 2a = \sqrt{3}y$ and $x + 2a + \sqrt{3}y = 0$. **[8]**

P.T.O.

b) Find shear centre for a channel of uniform thickness 't' height 'h' and flange width 'b'. **[8]**

Q4) A circular disk is loaded by two equal and diametrically opposite forces acting on the circumference of the disk is 'd'. Derive an expression for finding out compressive stress induced at any point on the diameter which is perpendicular to the direction of load. Determine the maximum compressive stress at the centre. **[16]**

Q5) Write short notes:

a) Equations of equilibrium in polar coordinate. **[6]**

b) Bending of curved bar. **[6]**

c) Uniform strength pressure vessel the **[6]**

SECTION - II

Q6) a) Explain the difference between plane and circular polarized light. **[4]**

b) What will be the relative angular retardation in a quarter - wave plate designed for operations at $\lambda = 546.1\text{nm}$ if it is employed with sodium light where $\lambda = 589.3\text{nm}$? **[4]**

c) Explain following terms used in photo elastic analysis: **[8]**

i) Dark field polariscope

ii) Biefriengent material

Q7) Derive the expression for bursting pressure of a tube in terms of inner and outer radius. State the assumption made. **[16]**

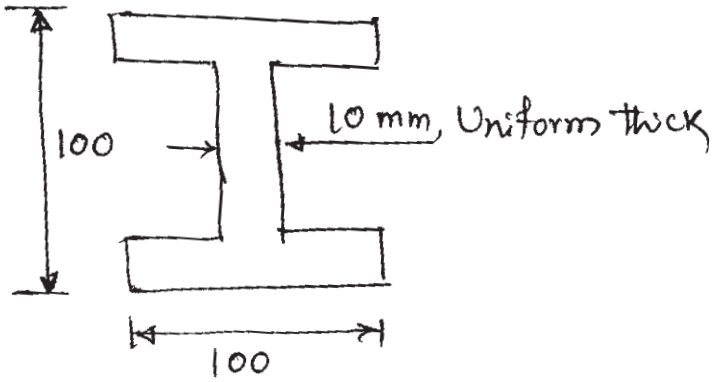
Q8) Airy's stress function in a 2D component is as follows: **[16]**

$$\phi = \frac{\sigma_\theta \alpha^2}{2}\left[\left(\frac{\alpha^2}{2r^2} - 1\right)\cos 2\theta - \ln r\right]$$

In polar coordinates r and θ. σ_0 and σ are constants. Express the stress distribution in terms of σ_r, σ_θ and $\sigma_{r\theta}$.

Q9) a) Define and explain shape factor. **[6]**

b) Find out shape factor for I section as shown in figure 2. All dimensions are in mm. **[10]**



Q10) Write short notes on:

a) Strain guage rossette. **[6]**

b) Two dimensional photo elastic stress. **[6]**

c) Brittle coating methods. **[6]**

Total No. of Questions : 6]

SEAT No. :

P1868

[Total No. of Pages : 1

[4265] - 860

M.E. (Petroleum Engineering)

ADVANCED NATURAL GAS ENGINEERING

(2008 Course) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer two questions from each section.***
2) ***Answers to the two sections must be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams should be drawn wherever necessary.***
5) ***Use of a non-programmable calculator is allowed.***
6) ***Assume suitable data, if necessary and clearly state it.***

SECTION - I

Q1) Describe pv, pt and pressure density diagrams for a gas reservoir. **[25]**

Q2) Derive the pipe line flow equation hence derive an equation for series pipelines. **[25]**

Q3) Explain the parts of a reciprocating compressor with a neat diagram. **[25]**

SECTION - II

Q4) Derive the material balance equation for a gas reservoir. **[25]**

OR

For water drive reservoirs (with no water production at the wells), derive the following equation

$P/Z = (Pi / Zi) [(1- (Gp/Gi)] / [(1- (WeBw/GiBgi))]$

Q5) Draw a process flow diagram to show two methods how H2S is removed from a natural gas stream. **[25]**

Q6) Explain isochronal and modified isochronal testing. **[25]**

Total No. of Questions : 6]

SEAT No. :

P1870

[Total No. of Pages : 2

[4265] - 696

M.E. (Electronics) (Digital System)

FAULT TOLERANT SYSTEM DESIGN

(2008 Course) (Elective - I (a)) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Describe and explain Zoom table and Primitive table with some examples. **[10]**

b) Write a brief short notes on RTL models. **[8]**

Q2) a) Classify and explain different fault simulation algorithm in brief. **[8]**

b) Explain with neat example the multiple stuck fault model. **[8]**

Q3) a) Explain with example the definition of fault equivalence for a sequential circuit. **[8]**

b) With neat diagram, explain path sensitization for 3 input and 1 output system? **[8]**

SECTION - II

Q4) a) With the help of neat diagram the working of compression technique. **[10]**

b) Explain self checking system with neat diagram for error detection & correction. **[8]**

P.T.O.

Q5) a) Explain the terms in detail: **[8]**

i) Fault sampling.

ii) Critical path tracing.

iii) Driven simulation.

b) With neat diagram the detection of static hazard and 6-valued system? **[8]**

Q6) Write short note on: **[16]**

a) Design for test.

b) Testing of PLAs.

Total No. of Questions : 8]

SEAT No. :

P1872

[Total No. of Pages : 3

[4265] - 871

M.E. (Information Technology)

SOFTWARE ARCHITECTURE

(2008 Course) (Elective - I (a)) (Theory) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections must be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Comment on "A software architect is responsible for quality of a software product". **[4]**

b) Explain the different engineering concerns addressed by four architecture views. **[6]**

c) What is the purpose of global analysis? Describe the global analysis activities each with three steps. **[8]**

Q2) a) Explain **ANY TWO** of the following module styles in context of Elements, Relations, Constraints and Purpose (what it's for): **[8]**

- Decomposition style.
- Generalization style.
- Uses style.
- Layered style.

b) Why document software architecture? Discuss the three uses of architecture documentation. **[4]**

c) Differentiate between architecture style and architecture pattern. **[4]**

P.T.O.

Q3) a) What are archetypes? What are business archetypes? List the essential characteristics of archetypes and archetype pattern. **[8]**

b) With reference to Model Driven Architecture (MDA) explain **ANY TWO** of the following: **[8]**

- Platform.
- Model Transformation.
- MDA value proposition.
- Archetype patterns & MDA.

Q4) a) Write short notes on **ANY TWO** of the following design patterns: **[10]**

- Factory Method.
- Facade.
- Iterator.
- Observer.

b) Explain where proxy pattern can be applied. Give solution using UML diagram. **[6]**

SECTION - II

Q5) a) What is design pattern? Explain the benefits and liabilities provided by master-slave design pattern. **[8]**

b) How pattern meets the objective of software architecture? **[4]**

c) What do you understand by behavioral pattern? **[4]**

Q6) a) Discuss design and programming challenges associated with building concurrent and network systems. **[6]**

b) Write in brief on **ANY TWO**: **[10]**

- LOOKUP as resource management pattern.
- Patterns for Distributed Computing.
- Fault tolerance and Exception Handling.

Q7) Explain **ANY THREE** of the following concept: **[16]**

- Levels of EAI (Hint: UI Level, Method, API, Data)
- Model View Controller (MVC).
- Message Oriented Middleware.
- Database Oriented Middleware - JDBC.

Q8) Write short notes on **ANY THREE**: **[18]**

- Three primary patterns in Domain Logic.
- Trends driving EAI problem.
- XML: Optimistic and pessimistic concurrency control.
- Web Services.

Total No. of Questions : 8]

SEAT No. :

P1874

[Total No. of Pages : 2

[4265]-516

M.E. (Mechanical) (Heat Power)

CRYOGENIC ENGINEERING

(2008 Course) (Elective - III (b)) (Semester - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, Mollier charts, electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the working and thermodynamic analysis of Linde Hampson system with the help of neat diagram and develop the expression for liquid yield. **[10]**

b) Explain, briefly the variation of thermal properties of gases in cryogenic range of temperature. **[6]**

Q2) a) Determine the ideal work requirement for the liquefaction of nitrogen beginning at 101.3 kPa and 300 K. From the T-s chart of nitrogen, following property values are given : **[10]**

h_l = 46.2 J/g at 101.3 kPa and 300 K
h_f = 29 J/g at 101.3 kPa and Sat. Liquid,
s_l = 4.42 J/g K at 101.3 kPa and 300 K
s_f = 0.42 J/g K at 101.3 kPa and Sat. Liquid
Derive the expression you use

b) Represent Stirling Cycle on P-V and T-s diagram. Develop an expression for C.O.P. of the Stirling Cycle. When used as a liquefier, what is its efficiency? **[8]**

P.T.O.

Q3) a) Explain the working of Gifford McMahon Cryorefrigerator with neat diagram. **[8]**

b) Explain the difference between high performance vessels and low performance vessels, with a neat sketch. Explain the features of atypical cryogenic storage vessel. outline the design procedure of outer and inner vessel and support systems. **[10]**

Q4) Write short notes on : **[16]**

a) Meissner Effect.

b) Collins Heat Exchanger.

c) Gifford McMahon Cryorefrigerator.

d) Kapitza System.

SECTION - II

Q5) a) Name and explain the instruments used for measuring strain in cryogenic temperature range. Also discuss the effect of low temperature on strain measurements. **[8]**

b) Discuss : **[8]**

i) Cryogenic fluid Storage vessel piping arrangements.

ii) Methods of draining the vessels.

Q6) a) Discuss the statements : **[10]**

i) One of the most critical components in any liquefaction system is the heat exchanger-why?

ii) Heat exchanger effectiveness should be always more than 0.869 why? Explain.

b) Explain in detail, what is meant by J-T effect and Inversion Curve. **[6]**

Q7) a) Explain with neat sketches the working of different compressors and expanders used in cryogenic practice. **[12]**

b) Discuss the effect of compressor and expander efficiency on system performance. **[6]**

Q8) Write short note on : **[16]**

a) ^{3}He-^{4}He Dilution refrigerator.

b) Cryogenic insulations.

c) Space Simulation chamber.

d) Cryogenic Valves.

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Total No. of Questions : 6]

SEAT No. :

P1877

[Total No. of Pages : 2

[4265]-440

M.E. (Civil) (Hydraulics)

REMOTE SENSING AND GIS APPLICATIONS TO WATER RESOURCES ENGINEERING

(2008 Course) (Elective - I (a)) (Semester - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are the elements of Interpretation of Aerial Photographs & Satellite Imageries? Explain their significance and factors influencing them. **[15]**

b) Describe briefly with necessary sketches the concept of Electromagnetic Spectrum? **[10]**

Q2) a) Explain Scattering. Absorption and Refraction with reference to interaction of EMR with the Earth's surface. **[15]**

b) What are the different types of Filters? Explain any one in detail. **[10]**

Q3) a) What is the need of Image Classification? Explain in detail Supervised and Unsupervised method of Image Classification. **[15]**

b) Describe briefly the following types of Resolution with necessary sketches: **[10]**

i) Spatial Resolution.
ii) Spectral Resolution.
iii) Radiometric Resolution.

P.T.O.

SECTION - II

Q4) a) What is GIS? What are the objectives of GIS and explain in detail the components of GIS. **[15]**

b) State the Differences between : **[10]**

i) Spatial and Non-Spatial Data.

ii) Vector and Raster Model.

Q5) Explain application of GeoInformatics with working Flow Charts in following areas: **[25]**

a) Irrigation and drainage surface runoff estimation.

b) Crop yield and land use management.

Q6) Explain application of GeoInformatics with working Flow Charts in following areas : **[25]**

a) Wet land management.

b) Watershed management.

Total No. of Questions : 8]

SEAT No. :

P1880

[Total No. of Pages : 2

[4265]-72

M.E. (Mechanical) (Design Engineering)

COMPUTER AIDED DESIGN

(2002 Course) (Elective - II (b))

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain how symmetry is used in FEA with applications. **[8]**

b) A triangle ABC with vertices A (2, 4), B (4, 6) and C (2, 6) is to be reflected about the line defined by BC. Determine : **[8]**

i) The concatenated transformation matrix; and

ii) The coordinates of the vertices for a reflected triangle.

Q2) a) Derive a concatenated transformation matrix for rotation about arbitrary point. **[6]**

b) Discuss the Problem Modeling and Boundary Conditions for the following cases : **[6]**

i) Press fit of a ring on a rigid shaft.

ii) Press fit of elastic sleeve on a elastic shaft.

c) Explain, with suitable examples, the plane stress and plane strain condition. **[4]**

Q3) a) What are the different pitfalls in the simulation? How they can be avoided? **[6]**

b) Given a point P (1, 3, 5) find : **[6]**

i) Transformed point P* if P is translated by $d = 2i + 3j - 4k$ and then rotated by 30^o about the Z axis.

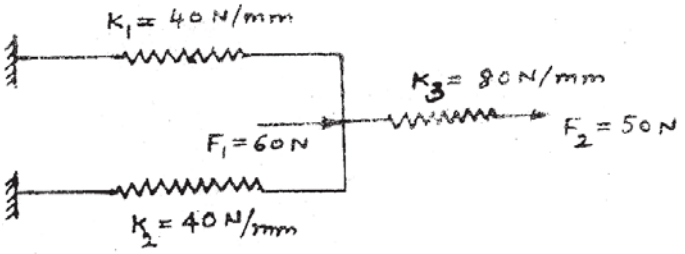
ii) Same as in (i) but point P is rotated first, and then translated. Is the final point P* the same in both (i) and (ii)? Explain your answer.

c) Briefly describe various curve manipulations. **[6]**

P.T.O.

Q4) a) What do you understand by parametric representation of curve? Discuss the advantages of parametric representation. **[8]**

b) A system of spring is shown in the fig. Determine the overall stiffness matrix and deflection of each spring. **[10]**



SECTION - II

Q5) a) Derive stiffness matrix for truss element. **[8]**

b) Explain following data exchange formats. **[8]**

i) Shape based format.

ii) Product data based formats.

Q6) a) What is Local and Natural Coordinate system? For 1-D spar element derive the relationship between local and global coordinate system. **[6]**

b) What is an isoparametric element? Explain with suitable example. **[6]**

c) Discuss as when the simulation is appropriate tool. **[4]**

Q7) a) Explain semiautomatic and fully automatic method of mesh generation. **[6]**

b) Compare CORE and GKS graphics standards. State the various graphics standards available. **[6]**

c) Explain how symmetry is used in FEA with applications. **[4]**

Q8) Write a short note on any three : **[18]**

a) Engineering Animation.

b) Inverse Transformation.

c) Network Topologies.

d) CSG tree with suitable example.

e) Simulation languages.

Total No. of Questions : 8]

SEAT No. :

P1881

[Total No. of Pages : 2

[4265] - 488

M.E. (Civil - Environmental Engineering)

GROUND WATER CONTAMINATION AND POLLUTION TRANSPORT

(2010 Course) (Elective - IV (a)) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Figures to the right indicate full marks.***
3) ***Assume suitable data if necessary clearly mentioning the same.***
4) ***Use of non-programmable scientific calculator is allowed.***

SECTION - I

Q1) a) Explain importance of Ground Water. What are its advantages disadvantages? Explain in detail. **[8]**

b) Explain GW as geotechnical problem, with special reference to : **[8]**

i) Geo-hydrological Investigations.
ii) Geo-physical Investigations.

Q2) a) Explain in detail various factors that govern contamination of ground water. **[8]**

b) Explain following Terms : **[8]**

i) Specific Storage Coefficient.
ii) Storativity.
iii) Aquitard.
iv) Aquiclude.

Q3) a) Explain the procedure for calculating GW potential in an area. **[8]**

b) What are flow nets? Explain the with suitable example method of constructing flow nets. **[8]**

Q4) a) Assume that three piezometers are installed very close to each other but penetrate up to different depths as given below : **[10]**

Piezometer	a	b	c
Elevation at surface (m)	425	425	425
Depth of piezometer (m)	150	100	50
Depth of Water (m)	27	47	36

P.T.O.

Let A, B and C refer to the points of measurement of piezometers a, b and c respectively. Calculate :

i) GW head at a, b and c in meters.
ii) Pressure head at a, b and c in m.
iii) Fluid pressure at B in N/m^2.

b) Explain the method of determining hydraulic conductivity of the strata. **[8]**

SECTION - II

Q5) a) Explain with suitable example, how the concept of well interference is helpful in GW management in an area. **[8]**

b) The geology of the strata has direct impact of GW potential of an area. Explain this statement in detail. **[8]**

Q6) a) What is sea water intrusion? Explain Ghyben-Herzberg relation wrt confined and unconfined aquifers. **[10]**

b) Explain how to prevent and control the sea water intrusion. **[6]**

Q7) a) Explain importance of tracer studies and pollution dispersion models in GW contamination studies. **[5]**

b) Explain remedial measures to recover GW pollution in an area. **[6]**

c) Give 2 examples each of physical models and mathematical models used in GW studies. Explain any one model in detail. **[5]**

Q8) a) Explain in detail various methods of artificial recharge. **[10]**

b) Enlist any 4 methods of GW recharge. Explain any one in detail. **[8]**

Total No. of Questions : 8]

P1882

SEAT No. :

[Total No. of Pages : 3

[4265] - 529

M.E. (Mech.) (Design Engg.)

ROBOTICS

(2008 Course) (Elective - II(c)) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Question No. 1 & 5 are compulsory.***
2) ***Solve three questions each from Section - I & Section - II.***

SECTION - I

Q1) a) With a neat sketch explain **[10]**

i) Spherical co-ordinate robot.

ii) Cartesian gantry type robot.

b) Explain the terms : **[8]**

i) Precision. ii) Control resolution.

iii) Special resolution. iv) Repeatability.

Q2) a) For the following Link parameter table given,

Link	α_{i-1}	a_{i-1}	d_i	θ_i
1	0	0	5	0
2	90°	0	1	0
3	0	0	3	θ_1

Obtain the transform matrices as given below

i) $[^0_1T]$, $[^1_2T]$, $[^2_3T]$ and $[^0_3T]$

ii) Determine the corresponding joint variables using the Forward Kinematics Approach, when the coordinates of the center of the tool mounting plate for the performance of certain task are (4, 3, –10) and $\theta_1 = 90°$. **[10]**

b) Discuss the term Inverse Kinematics for Manipulators in detail and explain the possibilities of arrival of alternative solutions for such type of problems. **[6]**

P.T.O.

Q3) a) Derive the required equation with the help of self explanatory sketches and explain Lagrangian Mechanics for a two link Robot. **[10]**

b) What do you understand by the term "Mapping between the frames"? Explain this with the suitable sketch. Discuss its use for understanding the robot motions. **[6]**

Q4) a) For an Industrial robot, the first joint of robot is to rotate from 20° to 50°. The initial and final angular velocities are +05 deg/sec, and –50 deg/sec. The motion is to be completed in 10 sec. Obtain the coefficients of a cubic polynomial connecting the two end positions. Obtain the cubic polynomial equation and draw the plots of position, velocity and acceleration for the given curve as a function of time. **[10]**

b) Define the term "Trajectory Planning". Explain in brief the essential steps in Trajectory Planning. Elaborate a procedure to obtain a cubic polynomial trajectory for each joint variable, q(t), of the n-dof manipulator. **[6]**

SECTION - II

Q5) a) Discuss-controller is an error driven system. **[6]**

b) Explain the working of incremental & absolute encoder. **[6]**

c) Compare electric acuators vs. hydraulic acuators. **[6]**

Q6) a) What are internal & external sensors? Explain with reference to various functions performed by them. **[8]**

b) Explain two types each of **[8]**

i) force sensors.

ii) velocity sensors.

Q7) a) Explain Walk through programming Method, used for robotic systems. Also discuss the limitations of this type of programming method in comparison with the other existing methods. **[8]**

b) What are the various types of robot programming languages? Explain salient features of each type with elaborations and examples. **[8]**

Q8) Write short notes (any four) : **[16]**

a) MEMs

b) Pneumatic drive systems

c) Continuous path control system.

d) Remote centre complience.

e) Work volume.

f) Illumination techniques used in machine vision.

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Total No. of Questions : 8]

SEAT No. :

P1883

[Total No. of Pages : 2

[4265] - 673

M.E. (E & TC) (Common to VLSI Embedded & Digital Systems)

EMBEDDED AUTOMOTIVE SYSTEMS

(2008 Course) (Elective - IV (a)) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) *Answer any three questions from each section.*
2) *Answers to the two sections should be written in separate answer books.*
3) *Neat diagrams must be drawn whenever necessary.*
4) *Figures to the right indicate full marks.*
5) *Assume suitable data, whenever necessary.*

SECTION - I

Q1) a) Explain the current trends in automotive systems. What is Hybrid vehicle? **[8]**

b) Explain the role of embedded systems in Automotive systems. **[8]**

Q2) a) How onboard diagnostic system is achieved? **[8]**

b) What are the different types of interferences? How they can be overcome? **[8]**

Q3) a) Write short note on following : **[8]**

i) GPS system in automobile system.
ii) Vehicle security system.

b) Which are the components for Electronic engine management systems? Explain briefly. **[8]**

Q4) a) Describe following sensors with their interfacing technique. **[10]**

i) Crank angle position sensors.
ii) Flow sensors.
iii) Vehicle speed sensors.

b) What are ECUs? Explain their significance in modern vehicles. **[8]**

SECTION - II

Q5) a) Describe briefly solid state ignition system techniques. **[8]**

b) How fuel metering is done? Which are the different techniques? **[8]**

P.T.O.

Q6) a) Which are the rating, and efficiency of battery? What are the various tests on batteries and how charging is done? **[8]**

b) How artificial intelligence plays role in modern automobiles? **[8]**

Q7) a) Briefly explain the technique of integrated engine control. **[8]**

b) Draw a schematic arrangement for a typical CAN network containing a master and number of slaves. How multiprocessor communication is possible? **[8]**

Q8) a) Explain the following systems in modern vehicles in modern vehicles. **[8]**

i) Lane departure warning.
ii) Curve over speed counter measures.
iii) Blind spot monitoring.
iv) Parallel parking assistance.

b) Discuss with block diagram, the recent trends in cruise control of car. **[10]**

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Total No. of Questions : 8]

SEAT No. :

P1885

[Total No. of Pages : 2

[4265]-735

M.E. (Production Engineering)

ADVANCE ROBOTICS

(2008 Course) (Elective - II (a) (Semester - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Describe the various characteristics used to specify robotic manipulators. **[10]**

b) Explain the structure of industrial robot with its elements. **[8]**

Q2) a) Explain Direct kinematics and Inverse kinematics. **[8]**

b) Explain Denavit Hartenberg parameters for link transformation with suitable example. **[8]**

Q3) a) Assuming that a contour path of an end-effector of a robot can be defined by a cubic fit in the form: $\theta(t) = a_0 + a_1t + a_2t^2 + a_3t^3$, Plot the joint angle $\theta(t)$, with initial angle = 20°, final angle = 80° and the time to attain final angular position of the joint is 4 seconds. **[8]**

b) Classify various types of grippers used in robots. Describe vacuum gripper in detail. **[8]**

Q4) a) Explain with neat sketches PID controller and control stability. **[8]**

b) Explain force analysis in gripper system. **[8]**

P.T.O.

SECTION - II

Q5) a) Explain in brief the programming methods used in robotics. **[10]**

b) Explain range sensors and proximity sensors. **[8]**

Q6) a) Describe force and torque sensors used in robots. **[8]**

b) Describe various image processing steps in Robotic Vision System. **[8]**

Q7) a) Explain the role of Jacobian matrix in the path control strategy. **[8]**

b) Explain the grasp planning considerations with example. **[8]**

Q8) a) With neat block diagram describe position control system of robotics. **[8]**

b) Compare Newton-Euler and Lagrange-Euler formulations and situations when you will prefer NE formulations/LE formulations. **[8]**

Total No. of Questions : 8]

P1887

SEAT No. :

[Total No. of Pages : 2

[4265] - 825
M.E. (Chemical)
FUEL CELLS TECHNOLOGY
(2008 Course) (Elective - IV(c)) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Solve any three questions from each section.***
2) ***Figures to the right indicate full marks.***

SECTION - I

Q1) Derive Cottrell equation used in the design of a fuel cell relating current generated in fuel cell with time. **[17]**

Q2) Describe types of solvents used in the fuel cell. Discuss various design aspects related to their selection in a fuel cell. **[16]**

Q3) A fuel cell is formed by using H_3PO_4 and air with following data. Standard reduction potential ($E°_{(Red)}$) in Volts (V) is as under

$4e^- + 4H^+ + O_{2(g)} \rightarrow 2H_2O$ $\quad E°_{(Red)} = +1.23$ V

$2e^- + 2H^+ \rightarrow H_{2(g)}$ $\quad E°_{(Red)} = 0$ V

Form a fuel cell for H_3PO_4 concentration of 2M at one of the electrodes and air pressure of 4 atm at the other. **[17]**

Q4) Write short notes on any three : **[17]**

a) Nernst equations.

b) Faraday's Law.

c) Current Voltage Plot.

d) Fick's Law.

P.T.O.

SECTION - II

Q5) Describe improvements in the fuel cell performance of present day hydrogen & oxygen based fuel cell over coal derived fuel gas based fuel cell at premature stages of development of fuel cells. **[16]**

Q6) Derive Tafel equation relating overpotential in a fuel cell to the current generated in the external circuit, from first principles. **[17]**

Q7) A current of 0.965 Amp is passed through 500 ml of 0.5M NaCl. What will be the average concentration of OH^- ions in the final solution? Also discuss the use of these data in the design of a new fuel cell. **[17]**

Q8) Write short notes on (any three) : **[16]**

a) Rotating Disc Electrode.

b) Noisy current.

c) Ohmic Polarization.

d) Nernst Equation.

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