

Total No. of Questions : 6]

[Total No. of Pages : 3

P1702

[3665]-162

M.E. (Electrical) (Control Systems)
OPTIMIZATION TECHNIQUES AND OPTIMAL
CONTROL

(Revised Course 2002)

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 and electronic pocket calculator is allowed.
- 6) Assume suitable data, if necessary.

SECTION - I

Q1) a) Compare the ratios of intervals of uncertainty (Ln/Lo) obtainable in the following methods, for $n = 6$, where 'n' is the number of experiments:

- i) Fibonacci method.
- ii) Golden section method. [8]

b) Find the value of x in the interval (0, 1) which minimizes the function

$$f(x) = 1.6x - x^2$$

within an accuracy of ± 0.05 by using Fibonacci search method. [12]

c) Prove that a convex function is unimodal function. [5]

Q2) a) Explain with algorithm the Fletcher-Reeves conjugate gradient method of optimization. Draw its flow chart. [10]

b) Minimize the function

$$f(x_1, x_2) = 2x_1 - 2x_2 + x_1^2 + x_1x_2 + x_2^2$$

starting from the point $\begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$, using conjugate gradient method by

Fletcher - Reeves or by steepest Descent method. [15]

P.T.O.

Q3) a) State the general Linear Programming Problem in the standard form and explain the terms: [6]

- i) Basic solution
- ii) Feasible solution, and
- iii) Optimal solution.

b) Use simplex method to solve the Linear Programming Problem:

Minimize the function

$$f(x_1, x_2) = -2x_1 - 2x_2$$

Subject to constraints:

$$x_1 + x_2 \leq 3$$

$$x_1 \leq 2 \quad ; \quad x_2 \leq 2$$

$$x_1 \geq 0 \text{ and } x_2 \geq 0$$

[12]

c) Explain Bellman's optimality principle. What are the advantages and disadvantages of Dynamic programming? [7]

SECTION - II

Q4) a) From fundamental principles derive the "Euler-Lagrange Equation". [8]

b) A system is characterized by

$$\dot{x}_1(t) = x_2(t)$$

$$\dot{x}_2(t) = u(t)$$

It is to be controlled to minimize the performance index.

$$J = \frac{1}{4} \int_0^3 u^2 dt$$

Taking $x_1(0) = x_2(0) = 1$ and $x_1(3) = x_2(3) = 0$, find the set of necessary conditions for optimal control. [10]

c) State and explain the "Transversality conditions". [7]

Q5) a) Define Hamiltonian. Derive the state, costate and control equations and explain the procedure for solving optimal control problem using Hamiltonian method. [10]

- b) Consider the control system represented by state equation:

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u$$

Assuming the linear optimal control law,

$$u = -Kx = -k_1x_1 - k_2x_2$$

determine the constants k_1 and k_2 so that the following quadratic performance index is minimized

$$J = \frac{1}{2} \int_0^{\infty} (X^T Q X + U^T R U) dt.$$

$$\text{Assume } Q = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}; R = 1. \quad [15]$$

Q6) Attempt any three of the following:

- State the Pontryagin's Minimum Principle and outline the procedure for solving optimal control problem using Pontryagin's minimum principle. [9]
- Explain with block diagram the optimal Bang - bang control system. [8]
- Explain clearly the relationship between the minimum principle and Dynamic programming. [8]
- State and explain the linear state regulator problem. [8]
- Explain any one method for the numerical solution of Reduced order 'Matrix Riccati Equation'. [8]



Total No. of Questions : 6]

[Total No. of Pages : 2

P1433

[3665]-175

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.*

SECTION - I

- Q1)** a) Explain the optimal operation of generators. State the effect of transmission losses on the optimal scheduling of power plants. Derive the exact coordination equation. Express transmission loss as a function of generator powers through B coefficients. Derive the solution for P_{Gi} explaining its iterative procedure. [13]
- b) Explain optimal scheduling of hydro thermal system. [12]
- Q2)** a) What is the importance of unit commitment study in the Power System? Explain Dynamic programming method for solving the problem of unit commitment with a suitable example. [13]
- b) Explain reliability considerations in unit commitment and Patton's security function. [12]
- Q3)** a) Explain genetic algorithm for unit commitment. [13]
- b) Explain economic dispatch by Gradient method and Newton's method. [12]

SECTION - II

- Q4)** a) From the complete block diagram of load frequency control of isolated power system, explain steady state analysis when (i) $\Delta P_c = 0$ (ii) $\Delta P_D = 0$ (iii) $\Delta P_c = \Delta P_D$. Draw steady state frequency characteristic with change in the load. [12]
- b) Explain the two area optimal load frequency control. With block diagram, explain state space model of two area control. [13]

P.T.O.

Q5) a) Why reactive power support is needed in a power system? Explain various methods of reactive power control. [12]

b) Explain Supervisory Control and Data Acquisition (SCADA) system. Draw its block diagram. Explain the components of SCADA and various functions performed by it. [13]

Q6) Explain the following:

a) Automatic voltage regulator. [13]

b) Energy control and types of energy interchanges or exchanges. [12]



Total No. of Questions : 10]

[Total No. of Pages : 3

P1434

[3665]-185

M.E. (Production)
HARD AND SOFT AUTOMATION
(Old & Revised 2002 Course)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates :

- 1) Answer any three questions from each section.*
- 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) Your answers will be valued as a whole.*
- 7) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 8) Assume suitable data, if necessary.*

SECTION - I

Q1) a) In a eight station Geneva mechanism the driver rotates at 3 rpm. [8]
Determine:

- i) The cycle time of indexing mechanism.
- ii) Process time.
- iii) Time spent by each cycle in indexing the table to the next working position.

b) A 15 station transfer line has an ideal time $T_c = 0.9$ min. The probability of station breakdowns per cycle is equal for all stations and $P = 0.004$ breakdowns / sec. The average down time per line is 0.8 min.

For each of the upper bound and lower bound approaches determine.

- i) Frequency of line stop cycle.
- ii) Average actual production rate. [8]

Q2) a) Four machines used to produce a family of parts are to be arranged into a GT cell. The from-to data for the parts processed by the machines are shown in the table below: [10]

From	To			
	1	2	3	4
1	0	10	0	40
2	0	0	0	0
3	50	0	0	20
4	0	50	0	0

P.T.O.

- i) Determine the most logical sequence of machines for this data using Hollier Method 2.
 - ii) Construct the flow diagram for the data, showing where and how many parts enter and exit the system.
 - iii) Compute the percentage of each sequence moves and percentage of back tracking moves.
 - iv) Develop a feasible layout plan for the cell.
- b) Explain the principle of Assembly line Balancing with specific reference to formulation of the problem. [6]

Q3) A single machine system having three transition states, viz setup, processing undergoing repairs, is required to be analysed for determining a steady. State probabilities using continuous Markov chain model [CTMC] under:

- a) Resumption Policy.
- b) Discard policy.

If the setup rate is 22 per hour, processing rate is 6 per hour, failure rate 0.7 and repair rate is 1 per hour.

Find out through put rate or average production rate under policy (a) and (b). [16]

Q4) a) The company is decided to install FMS system. Following data have been collected:

- i) Vehicle speed. - 200 ft / min.
- ii) Average loaded travel distance per delivery - 600 ft.
- iii) Average empty travel distance per delivery - 400 ft.
- iv) Pick up time - 0.60 min.
- v) Drop off time = 0.70 min.
- vi) Traffic factor = 0.85.
- vii) Total delivery required = 63 per hour.

Calculate number of AGVs required. [8]

- b) What are the different types of AGVs? Explain different components of AGVs and AGVs guidance systems in print. [8]

Q5) Write short notes on (Any Three): [18]

- a) Cellular manufacturing.
- b) Difference between Hard and Soft Automation.
- c) World Class Manufacturing.
- d) Relay & limit switches used on transferline.
- e) Difference between productivity & Flexibility.

SECTION - II

Q6) a) Explain Transferline Monitoring system in brief. [8]

- b) What are the advantages of Line Mimic Diagram Machine status Report and Line status Report? [8]

Q7) a) Explain the salient features of an Agile Manufacturing system. Compare Agile manufacturing with lean production. [10]

- b) What is “line tracking”? Explain its advantages and disadvantages. [6]

Q8) a) Explain stability analysis by Routh - Horwitz criterion. [8]

- b) Explain different levels of Automation & control in manufacturing. [8]

Q9) a) What are the different transducers used for automatic inspection of parts? [8]

- b) Explain vision system used in Robots. [8]

Q10) Write short notes on (Any Three): [18]

- a) PFA analysis.
- b) Adaptive Control Systems.
- c) On-line inspection through LED or LASER.
- d) Robot Grippers.
- e) Motor type Relay.



Total No. of Questions : 8]

[Total No. of Pages : 2

P1436

[3665]-192

M.E. (Production)

HUMAN FACTORS IN DESIGN AND MANUFACTURING

(Elective - I) (Revised 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) Explain Analytical Hierarchy process. [8]
b) Explain the product data associativity. [8]
- Q2)*** a) Explain Diagraph theory with suitable illustration. [8]
b) Explain PDM system architecture. [8]
- Q3)*** a) Explain MRP II system for manufacturing organisation. [8]
b) Explain the supply chain for automobile industry. [8]
- Q4)*** a) "Aesthetic aspects are the governing factors in the design of consumer products". Justify with suitable illustration. [8]
b) Explain various stages of product life cycle. [10]

SECTION - II

- Q5)*** a) Explain principles of auditory display. [8]
b) Explain different kinds of fatigue. [8]
- Q6)*** a) Explain the ergonomics criteria to be considered while designing a automobile driver seat. [8]
b) Explain Work and Rest cycle. [8]

P.T.O.

Q7) Explain Manual Material Handling in relation with **[16]**

- a) Health effects.
- b) Lifting task.
- c) Carrying task.
- d) Pushing task.

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

- a) Bio-mechanics.
- b) WBGT and BB.
- c) Effect of heat and cold on human performance.



Total No. of Questions : 10]

[Total No. of Pages : 5

P1437

[3665]-195

M.E. (Production Engg.)

RELIABILITY ENGINEERING

(Old & Revised Course 2002) (511110)

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 calculator is allowed.

SECTION - I

- Q1)** a) i) A system operates for 5000 hrs and data obtained shows a failure rate of 1 in 40,000 hrs, what will be the probability of survival of system? [4]
- ii) If probability of survival is expected 80% at 5000 hrs, what will be the span of MTBF? [4]
- b) Following table shows the results of life tests carried out on 200 components simultaneously for 100 hours. [8]

Operating Time (hours)	0	10	20	30	40	50	60	70	80	90	100
Number of surviving Components	200	175	160	145	130	105	96	80	70	66	40

Evaluate hazard rate, failure density and reliability and plot these functions against time.

- Q2)** a) Two identical motors are operating in a redundant configuration. If either of the motor fails the remaining one can still operate with full load. Failure rates for motor are 0.0004 and statistically independent. If both starts at $t = 0$, Find the Reliability at 500 hrs and Mean time to Failure (MTTF). [8]

P.T.O.

- b) Following data refer to the problem of allocation of Reliability to each component in the system.

Sr. No. i	No. of Components (n_i)	Operating time, Hrs (t_i)	Probability of system failure due to failure of (i^{th}) subsystem (W_i)
1	9	15	0.10
2	10	10	0.05
3	8	25	0.25
4	15	20	0.20
5	14	30	0.30
6	10	35	0.10

Find out the failure rates of the components, so that the system reliability becomes 0.99, using AGREE method. [8]

- Q3)** a) i) 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: [4]

$R_s(t) = 3e^{-\lambda t} - 3e^{-2\lambda t} + e^{-3\lambda t}$, where λ - failure rate and t - mission time.

- ii) 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 0.005 failures/hour. Compute reliability of the aircraft for 10-hour flying mission. [4]

- b) The following data refer to predicted reliability of Eight 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	7	8
Predicted reliability	0.994	0.998	0.990	0.996	0.990	0.980	0.95	0.98

- Q4)** a) Find the reliability of system shown in Fig. 1 using conditional probability method. The values in the blocks show reliabilities of each element. [8]

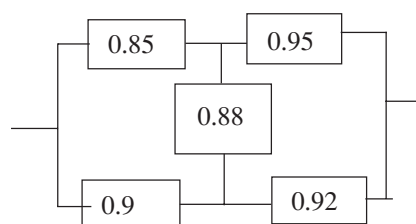


Fig 1

- b) A system consists of three subsystems A, B, C having failure rates 0.002, 0.004 and 0.008 respectively per hour. If the mission time is 25 hours and the system reliability required is 0.95, find the failure rate as well as reliability of each subsystem for the entire mission period, using ARINC method. State any assumptions used. [8]

Q5) Write short notes on following (Any three): [18]

- Reliability Centered Maintenance.
- Reliability effort function.
- Star - delta method for reliability evaluation.
- Matrix method for solving conditional configuration.
- Bath-Tub curve with significance of each phase.

SECTION - II

- Q6)** a) Explain the systematic procedure to be followed for constructing Failure mode and effects analysis (FMEA) Table. [8]
- b) A Logic gate diagram for FTA study has been shown in Fig.2. The failure probabilities for basic modes A, B, C, D and E are 0.01, 0.002, 0.04, 0.005 and 0.004 respectively. Find out the failure probability of T_0 . Assume mission time of 200 hrs. Also calculate the reliability of system. [8]

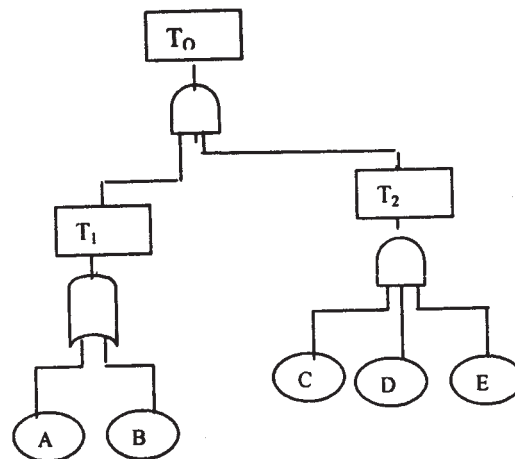


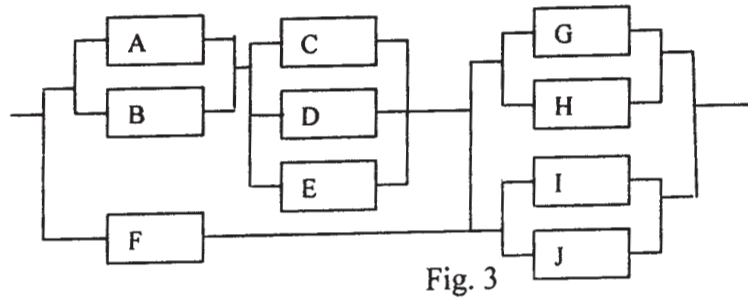
Fig.2

- Q7)** a) The following data refers to a short sample reliability test of an engineering instruments:

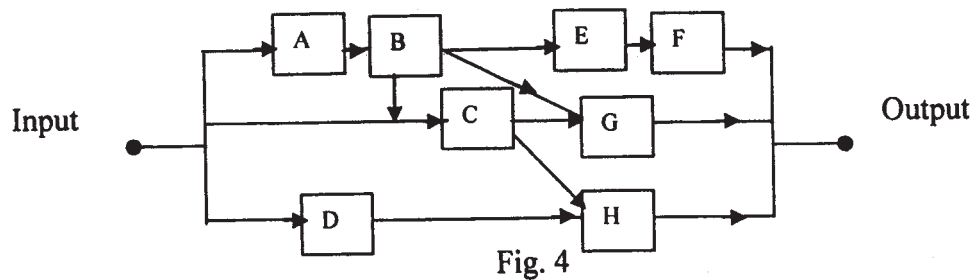
Failure No.	1	2	3	4	5	6	7	8
MTTF (Hrs)	12	22	16	10	15	29	28	32

Calculate the reliability using mean and median ranking method. Also plot the reliability Vs Time. [8]

- b) Construct a fault tree for the system failure shown in Fig. 3 and write the expression for it. The letters in the block indicates basic elements. Also find the reliability of the system if each element has failure probability of 0.1. [8]



- Q8) a) What is meant by accelerated test in evaluating reliability? Explain sudden death testing method for reliability evaluation. [8]
- b) Define Tie-sets and Cut-sets. State various tie-sets and cut-sets from the Fig.4. Give optimal tie sets and optimal cut sets. [8]



- Q9) a) State what is meant by redundancy and classify it. [8]
- b) Define availability and maintainability for the system from the following data collected at a plant: [8]
- Mean time before failure : 55 Hrs.
- Mean time to repair : 10 Hrs.
- Administrative logistic time : 25% of MTTR
- Calculate operational availability and inherent availability of the plant.

- Q10)a) The mean strength and the standard deviation of a bolted joint are 3000 Kg/cm² and 280 Kg/cm² respectively. The joint is loaded such that stress induced has a mean value of 2530 Kg/cm² with a standard deviation of 42 Kg/cm². Assuming that shear strength and the induced stresses are independent and normally distributed, find out the probability of survival of the bolted joint. Extract of data from statistical table is given below:[8]

Z	1.2	1.3	1.4	1.5	1.6	1.7	1.8
$\phi(z)$	0.8849	0.9032	0.9192	0.9331	0.9452	0.9550	0.9640

- b) Calculate the system reliability Using conditional probability approach for the system shown in Fig. 5. If each component has reliability 0.95.[10]

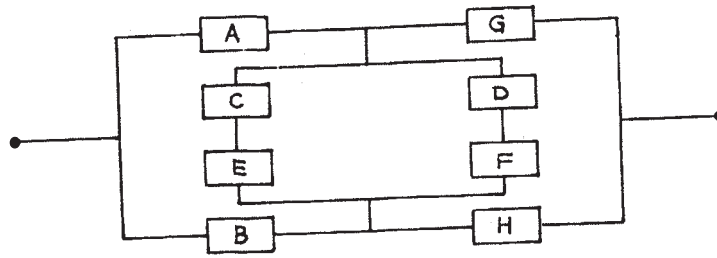


Fig. 5



Total No. of Questions : 8]

[Total No. of Pages : 2

P1438

[3665]-200

M.E. (Computer)

ADVANCED COMPUTER ARCHITECTURE

(2002 Old 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) *Figures to the right indicate full marks.*
- 5) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) With the help of suitable examples, demonstrate concepts of Instruction Predication and Instruction Predication with respect of EPIC Architecture? [8]
- b) Draw and Explain architectural block diagram of Itanium processor. List key differentiating features of the same compare to other Intel family processors? [8]
- Q2)** a) Discuss the different approaches used for executing multiple threads. Explain instruction execution flow with respect to various pipeline stages in IBM power 4 / Power 5 Processor. [8]
- b) What are the features of Scalable Processor Architecture? Explain register windows and its parameter passing between procedures of SPARC architecture. [8]
- Q3)** a) Discuss the cache - coherency problem with CC-NUMA architecture and explain any one coherency protocol. [8]
- b) Differentiate between SMP and Cluster organization. Explain the appropriate application domains for both architectures. [8]
- Q4)** Write short notes on : [18]
- a) Gigabit Ethernet.
 - b) Storage Area Network.
 - c) Internet Servers and Graphics Servers.

P.T.O.

SECTION - II

- Q5)** a) An organization with 100 Nodes wants to distribute a 1 MBPS Internet connection among its nodes while providing the basic security from the outside world. Suggest and justify suitable solution along with the appropriate configuration requirements. [8]
- b) Compare PVM with MPI message passing library. Explain the various collective communication functions implemented with the same. [8]
- Q6)** Compare Cluster computing and Grid computing. Draw and Explain in detail the System Architecture of PARAM 10000 having Myrinet Network. Explain in brief the features of PARAMnet, a Proprietary Network Developed by CDAC. [16]
- Q7)** a) Discuss the use of Cluster Monitoring and Management tools for high performance Computing. [8]
- b) Explain the role of following Application Level Protocol. [8]
- i) NFS.
 - ii) CIFS.
 - iii) HTTP.
- Q8)** Write short notes on : [18]
- a) HPCC Suit.
 - b) Bewoulf Clusters.
 - c) Network Attached Storage (NAS).



Total No. of Questions : 8]

[Total No. of Pages : 2

P1439

[3665]-203

M.E. (Computer Engg.)

NETWORK SECURITY

(Elective - II) (Revised 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) Assume suitable data, if necessary.***

SECTION - I

- Q1)*** a) What do you mean by 'Security Life Cycle'? Explain with suitable diagram. [8]
- b) What is DNS poisoning? How DNS poisoning is carried out? Explain with suitable example. [8]
- Q2)*** a) What are the objectives of HMAC Design? Explain HMAC algorithm with suitable diagram. What are the security issues in HMAC design.[8]
- b) What are the roles of the Oakley key determination protocol and ISAKMP in IPSec? Explain. [8]
- Q3)*** a) Explain X.509 authentication services and elements of Public key certificate. [8]
- b) Compare and contrast Confidential policies Vs Integrated policies. [8]
- Q4)*** Write short notes on (any three): [18]
- a) Information security with Bioinformatics.
 - b) Kerberos Realm.
 - c) Cryptography using elliptic curves.
 - d) Cyber laws.

P.T.O.

SECTION - II

- Q5)** a) What are the security facilities in the TCP/IP protocol stack? Explain the advantages of network level, transport level & application level security approaches. [8]
- b) What are typical phases of operation of viruses or worms? How does a worm propagate? [8]
- Q6)** a) Explain the Routing algorithms Vulnerabilities. [8]
- b) How a stateful firewall works? Explain stateful filtering and stateful inspection in this regards. [8]
- Q7)** a) Describe how the following threats to web security is countered by a particular feature of SSL.
- i) IP Spoofing. ii) IP Hijacking.
- iii) Replay attack. iv) Syn flooding. [8]
- b) Explain the functions of principle components of the Network management architecture with suitable block diagram. [8]
- Q8)** Write short notes on (any three): [18]
- a) Network partitioning : Models & Methods.
- b) Signature based IDS.
- c) PGP & PEM.
- d) Modern symmetric key ciphers.



Total No. of Questions : 8]
P1665

[Total No. of Pages : 2

[3665]-206
M.E. (Computer Engg.)
ADVANCES IN COMPILER TECHNIQUES
(Revised Course 2002)

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) *Figures to the right indicate full marks.*

SECTION - I

- Q1)** a) Explain in detail various issues involved in designing a compiler. [10]
b) Explain following points with respect to symbol table : [6]
Storage classes, Visibility, lifetimes.
- Q2)** a) Discuss issues involved in designing intermediate language. [8]
b) Explain in detail control flow analysis. [8]
- Q3)** a) Explain various data flow properties, with their role in optimization. [10]
b) Explain Just In Time compilation. [6]
- Q4)** a) Explain various tools used for generating a compiler. [10]
b) Write short notes : [8]
i) Cross compiler.
ii) Depth first search traversal of a flow graph.

SECTION - II

- Q5)** a) Explain in detail code generation for pipelined machines. [10]
b) Discuss bi-directional data flow analysis. [6]
- Q6)** a) Explain various issues related to compilation for distributed machines. [10]
b) Compare different forms of intermediate code. [6]

P.T.O.

- Q7)** a) By giving example explain SSA form. [8]
b) What is register allocation and assignment problem? [4]
c) Explain following terms : dominators, reducible flow graph. [4]
- Q8)** Write short notes (Any three) : [18]
a) Symbol table.
b) Inter-procedural Data flow analysis.
c) Auto scheduling compiler.
d) Uses of DAG.



Total No. of Questions : 8]

[Total No. of Pages : 2

P1440

[3665]-208

M.E. (Computer Engineering)

BIOINFORMATICS

(Elective - II) (Sem. - II) (Revised)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates :

- 1) Question Nos. 4 and 8 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.**

SECTION - I

- Q1) a) Draw a neat labeled diagram of a Prokaryotic cell. [2]**
b) Explain the functions of following cell organelles with diagrams (Any 7): [14]

- i) Vacuole
- ii) Endoplasmic Reticulum
- iii) Golgi apparatus
- iv) Nucleus
- v) Lysosomes.
- vi) Mitochondria
- vii) Cytoskeleton
- viii) Ribosomes.

- Q2) a) Distinguish between.**
i) DNA and RNA.
ii) Plant Cell and Animal Cell. [8]
b) What are the different types of cells found in human body? [4]
c) Explain working of Tryptophan repressor switch in bacteria. [4]

- Q3) a) Write a short note on the Amino acids found in living organisms and classify them according to their types. [8]**
b) Explain process of transcription in eukaryotic cell. [4]
c) What are enzymes? How are they classify. [4]

P.T.O.

Q4) Write short notes on (Any 6): **[18]**

- a) Ramchandran plot.
- b) DNA replication.
- c) 2 Bio-molecules.
- d) Promoter and enhancer sequences.
- e) Importance of proteins.
- f) Various types of mutations found in cell.
- g) Regulation of genetic switch.

SECTION - II

Q5) a) What type of information is contained in DNA database. **[4]**
b) What are the emerging areas in the field of Bioinformatics? **[4]**
c) Write a note on Protein Databank (PDB). **[4]**
d) What are the current protein and DNA databases available on internet. **[4]**

Q6) a) What do you mean by sequence alignment, explain the terms local and global alignment? **[6]**
b) Explain in detail primary, secondary and tertiary structures of protein. **[6]**
c) Describe any one algorithm for predicting protein secondary structure. **[4]**

Q7) a) Explain the FASTA algorithm. **[6]**
b) What is 3-D structure comparison for protein and comment on its need. **[4]**
c) Write a program in C to measure the % of 'a', 't' bases in DNA sequences. **[6]**

Q8) Write short notes on (Any 6): **[18]**

- a) EMBL databank.
- b) Neural network prediction method.
- c) Dynamic programming algorithm.
- d) Quaternary structure of proteins.
- e) Dot matrix method.
- f) Pairwise and multiple alignment of sequences.
- g) Hidden Markov model for gene prediction.



Total No. of Questions : 6]

[Total No. of Pages : 2

P1481

[3665]-694

M.E. (Petroleum Engg.)

**ENVIRONMENTAL MANAGEMENT TECHNOLOGY AND SAFETY
MEASURES (2008 Course)**

Time : 3 Hours]

[Max. Marks : 100

Instructions :

- 1) *Answers any two questions each from Section-I and Section-II.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams should be drawn wherever necessary.*
- 4) *Use of semilog paper and graph paper is allowed.*

SECTION - I

Q1) a) What are the sources of land air and water pollution during production of oil and gas? What are the precautionary measures taken to avoid such pollution by the petroleum industry? **[15]**

b) A confined aquifer of 40.0 m thickness has two monitoring wells spaced 1000 m apart along the direction of groundwater flow. The difference in water level in the wells is 10.0 m (the difference in piezometric head). The hydraulic conductivity is 50 m/day. Estimate the rate of flow per meter of distance perpendicular to the flow. Assume aquifer width = 1 m. [Hint : First calculate the hydraulic gradient, then apply Darcy's Law] **[10]**

Q2) Write a detailed essay on "Climate Change and the role of petroleum industry". **[25]**

Q3) Write notes on any three of the following : **[25]**

- a) Safety in H₂S environment.
- b) Toxicity of petroleum products and treatment chemicals.
- c) Chemical methods to control offshore oil spills.
- d) Abandonment of oil wells and structures.

SECTION - II

Q4) a) Write notes on the following : **[10]**

- i) Petroleum site assessment for environment impact.
- ii) Disaster management in offshore installation.

P.T.O.

- b) Discuss the case of recent explosion in the petroleum products storage depots at Jaipur, from safety and environment point view in an urban neighbourhood. [15]

Q5) A petroleum product trunk pipeline needs to be constructed from oil jetty. Logistically it runs along the coast for a length of 50 km followed by 100 km through arid climatic region followed by 200 km through high monsoon rainfall area. Discuss the corrosion problems that this pipeline will encounter. Support your answer by giving various mechanisms of corrosion with respect to the environments. Suggest precautionary measures for the anticipated corrosion related problems. [25]

Q6) Discuss the protocol for field investigation of an onland site spilled with petroleum products. Support your discussion by considering the following : [25]

- a) Levels of protection.
- b) Work zone control, and
- c) Knowledge of safety procedures.



Total No. of Questions : 6]

[Total No. of Pages : 1

P1441

[3665]-222

M.E. (Petroleum)

WELL TESTING AND ANALYSIS

(512109B) (2003 Course)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates :

- 1) Answer any 2 (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) Derive the diffusivity Eqn in cylindrical co-ordinates. **[25]**

Q2) Explain Pressure Derivative Cure with five examples. **[25]**

Q3) Explain ETR, MTR, LTR on a horner plot, log log plot and Derivative Plot. **[25]**

SECTION - II

Q4) Explain the drill stem Test Equipment and analysis. **[25]**

Q5) Explain Gas Well Testing. **[25]**

Q6) Explain Horizontal Well Test Analysis. **[25]**



Total No. of Questions : 10]

[Total No. of Pages : 4

P1442

[3665]-228

M.E. (Instrumentation, Process & Biomedical)

ADVANCED MATHEMATICS

(506101)

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) With usual notation, prove that (any two): [6]

i) $\Delta = \frac{\delta^2}{2} + \delta \cdot \sqrt{1 + \frac{\delta^2}{4}}.$

ii) $(1 + \Delta)(1 - \nabla) = 1$

iii) $\nabla y_{n+1} = h \left[1 + \frac{\nabla}{2} + \frac{5}{12} \nabla^2 + \dots \right] y_n.$

b) The pressure P of wind corresponding to velocity V is given by the following data. Estimate P when V = 25. [10]

V :	10	20	30	40
P :	1.1	2.0	4.4	7.9

Q2) a) The following table gives the results of the measurements of train resistance; V is the velocity in km per hour, R is the resistance in kg per ton: [8]

V :	20	40	60	80	100	120
R :	5.5	9.1	14.9	22.8	33.3	46.0

If R is related to V by the relation $R = a + bV + cV^2$, find a, b and c.

b) Solve $x^4 - 5x^3 + 20x^2 - 40x + 60 = 0$, by Newton - Raphson method given that all the roots of the given equation are complex. [8]

P.T.O.

Q3) a) Solve the initial value problem: [9]

$$\frac{dy}{dx} = x - y^2, \quad y(0) = 1$$

to find $y(0.4)$ by Adam's method. Starting solution required are to be obtained using Runge-Kutta method of order 4 using step value $h = 0.1$.

b) Apply Gauss-Seidal iteration method to solve the equations:

$$20x + y - 2z = 17$$

$$3x + 20y - z = -18$$

$$2x - 3y + 20z = 25 \quad [8]$$

Q4) a) A slider in a machine moves along a fixed straight rod. Its distance x cm. along the rod is given below for various values of the time t seconds. Find the velocity of the slider and its acceleration when $t = 0.3$ second. [9]

$t =$	0	0.1	0.2	0.3	0.4	0.5	0.6
$x =$	30.13	31.62	32.87	33.64	33.95	33.81	33.24

b) Evaluate $\int_0^4 e^x dx$ by Simpson's rule, given that $e = 2.72$, $e^2 = 7.39$, $e^3 = 20.09$, $e^4 = 54.6$ and compare it with the actual value. [8]

Q5) a) The following table gives the values of x and y : [8]

$$x : 1.2 \quad 2.1 \quad 2.8 \quad 4.1 \quad 4.9 \quad 6.2$$

$$y : 4.2 \quad 6.8 \quad 9.8 \quad 13.4 \quad 15.5 \quad 19.6$$

Find the value of x corresponding to $y = 12$, using Lagrange's method.

b) Find the missing values in the following table: [4]

$$x : \quad 45 \quad 50 \quad 55 \quad 60 \quad 65$$

$$y : \quad 3.0 \quad - \quad 2.0 \quad - \quad -2.4$$

c) Express $y = 2x^3 - 3x^2 + 3x - 10$ in factorial notation. [4]

SECTION - II

Q6) a) Velocity distribution for a fluid flow is given by $u = -x$, $v = 2y$ and $w = 3 - z$. Find the equation of stream line passing through the point $(1, 1, 2)$. [6]

- b) Prove that Euler's dynamical equations of motion is given by

$$\int \frac{dp}{\rho} + \Omega + \frac{1}{2}(\bar{q})^2 - \frac{\partial \phi}{\partial t} = \text{constant}$$

Where ρ be the density, P the pressure, Ω the force potential, ϕ the velocity potential and \bar{q} the velocity of the fluid. [10]

- Q7)** a) Show that the velocity potential $\phi = \frac{a}{2}(x^2 + y^2 - 2z^2)$ satisfies the Laplace's equation. Also determine the stream lines. [5]

- b) Determine the condition that $\bar{q} = (ax + by)\bar{i} + (cx + dy)\bar{j}$ may give the velocity of an incompressible fluid. Show that the stream lines of this motion are rectangular hyperbolas when the motion is irrotational. [5]

- c) A liquid mass is rotating with a constant angular velocity ω about a vertical axis under the action of gravity. Find the pressure at any point of the liquid if the motion is steady. [6]

- Q8)** a) Define mean time to failure (MTTF) of the probability distribution function $f(t)$. Show that its variance is given by [5]

$$\sigma^2 = \int_0^{\infty} t^2 f(t) dt - (\text{MTTF})^2.$$

- b) The time - to - failure density function (PDF) for a system is $f(t) = 0.01$, $0 \leq t \leq 100$ days. [5]

Find :

- i) $R(t)$.
 - ii) The Hazard rate function.
 - iii) The MTTF.
 - iv) The standard deviation.
 - v) The median time to failure.
- c) A hydraulic system is comprised of five components having the following constant failure rates (times are in days): [6]
- i) Find the system MTTF and standard deviation.
 - ii) Find the system design life if a 0.99 reliability is desired.

- Q9) a)** Using the familiar Markov model, compare the availability function in the form. [9]

$$A(t) = \frac{\mu}{\lambda + \mu} + \frac{\lambda}{\lambda + \mu} \cdot e^{-(\lambda + \mu)t}$$

Hence find the steady - state or long - term availability of single component.

- b) For a system having a Weibull failure distribution with a shape parameter of 1.4 and a scale parameter of 550 days. [8]
find:
- i) R (100 days)
 - ii) MTTF.
 - iii) S.D.
 - iv) The design life for a reliability of 0.90.

- Q10)a)** A mechanical valve fails to close (fails open) 5% of the time. Compute the system reliability for three valves: [6]

- i) in series.
 - ii) in parallel.
- b) A component can be repaired at the constant rate of 10 per 8 - hour day. What is the probability of a single repair exceeding one hour? [5]
- c) A requirement exists for an engine pump to be repaired (or replaced) within 3 hour 90 percent of the time. If the repair distribution is log normal with $s = 0.45$, what MTTR should be achieved to meet this goal? [Given : 1.28 is the normal deviate (z value) corresponding to a cumulative probability of 0.90]. [6]



Total No. of Questions : 6]

[Total No. of Pages : 1

P1443

[3665]-230

M.E. (Instru.) Process & Bio.
ADVANCED ELECTRONIC INSTRUMENTATION
(506103) (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 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)** What is an arbitrary wave form generator? Explain with the help of block Schematic and an application. [25]
- Q2)** Explain principle and working of dual slope analog to digital converter. What is the criterion for selection of clock frequency? [25]
- Q3)** Write short notes on the following: [25]
- a) Sound level meter.
 - b) Insulation tester.

SECTION - II

- Q4)** Explain the following controls of a dual trace oscilloscope with an application: [25]
- a) AUTO and NORMAL mode.
 - b) Line trigger.
 - c) Variable sweep.
 - d) CHOP and ALTERNATE mode.
 - e) X - Y mode.
- Q5)** What are the different errors occur in universal counter? [25]
- What are the techniques used to minimize these errors.
- Q6)** Write short notes on the following: [25]
- a) Semiconductor pressure sensor.
 - b) Data Acquisition System.



Total No. of Questions : 10]

[Total No. of Pages : 2

P1445

[3665]-246

M.E. (Information Technology)

SOFTWARE ENGINEERING

(2003 Course) (510121)

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 in detail function point metric. List all the values adjustment factor. What are the metrics for specification quality? [8]
- b) Describe the spiral model of software development and discuss its strengths and weaknesses. [8]
- Q2)** a) Explain backward engineering for Client Server Architecture. [8]
- b) What is software architecture? Enlist important characteristics of the model of your choice with a suitable diagram. [8]
- Q3)** a) Explain why the process of project planning is iterative and why a plan must be continually reviewed during a software project. [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) Define dependability of a Computer System. What are the four principle dimensions of dependability? [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) Stages in a software project plan.
c) Reference Architecture.



Total No. of Questions : 8]

[Total No. of Pages : 2

P1486

[3665]-250

M.E. CSE (Information Technology)
ADVANCED INTERNET TECHNOLOGY
(510127) (Revised Course-2002)

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, if necessary.*
- 4) Draw sketches wherever necessary.*
- 5) Figures to the right indicate full marks.*

SECTION - I

- Q1)** a) What is the difference between virus and intrusion attack on computer node? What is the basic difference in the working principle of antivirus and intrusion detection? [8]
- b) What do you mean security mechanisms? Explain with example the meaning of detection, prevention and recovery. [8]
- Q2)** a) What is the difference between physical and logical access control? Give two examples of each and explain the level of security achieved through it. [8]
- b) What is the block size in DES? What is the cipher key size in DES? What is the round key size in DES? Why does the DES function need an expansion permutation? [8]
- Q3)** a) Using RSA algorithm calculate the following: [8]
- i) Given $n = 221$ and $e = 5$, find d .
 - ii) Given $n = 3937$ and $e = 17$, find d .
- b) What do you mean by e-mail bombing? Is it the same like denial of service attacks? Justify your answer. [8]

P.T.O.

Q4) Write short notes on: (Any Three) [18]

- a) Cyber Pornography
- b) SYN Flood Attack
- c) ARP Cache Poisoning
- d) Privacy Regulations

SECTION - II

Q5) a) How PKI takes the care of Secure communication, Data Integrity, Authentication, Authorization and Non-Repudiation? [8]

b) What do you mean by e-mail frauds? Does PEM protocol helps to prevent it? Justify your answer. [8]

Q6) a) What is the difference between packet filtering router and stateful inspection of firewall? [8]

b) What do you mean by network partitioning? Explain how security can be well implemented with network partitioning. [8]

Q7) a) Explain SNMP Proxy with diagram. What is necessity of Proxy in SNMP? [8]

b) List the goals of NTP protocol and state the role of NTP in the present networks. Which major parameters are taken into consideration in NTP version 3? [8]

Q8) Write short notes on : (Any Three) [18]

- a) Secure RSVP
- b) STS protocol
- c) Blind key cryptosystems
- d) Secure RTP



Total No. of Questions : 8]

[Total No. of Pages : 2

P1740

[3665]-276

M.E. (Chemical)

CATALYSIS AND SURFACE PHENOMENON

(2002 Course)

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) *Figures to the right indicate full marks.*

SECTION - I

Q1) Define catalysis and give its classification and discuss the preparation of catalysis using laboratory technique. [16]

Q2) Derive the equation for surface area determination using BET method. [16]

Q3) Discuss the characterization of catalysis using.

- a) XRD method [8]
- b) ESR method. [8]

Q4) Write short notes on. [18]

- a) Chemisorption
- b) Catalyst activation
- c) Zeolites.

SECTION - II

Q5) Discuss the chemistry and thermodynamics of adsorption. [16]

Q6) What are the different types of adsorption? Discuss any 4 types. Write all necessary equations and draw the nature of plots. [16]

Q7) Derive the equation for effectiveness factor in catalysis. [16]

P.T.O.

Q8) Write short notes on.

[18]

- a) Catalyst deactivation
- b) Fluidized bed reactor
- c) Heat and Mass Transfer in catalysis.



Total No. of Questions : 6]

[Total No. of Pages : 2

P1414

[3665]-31

M.E. (Civil-Structures)

**NUMERICAL METHODS AND FINITE ELEMENT
STRUCTURAL ANALYSIS
(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) *Figures to the right indicate full marks.*
- 4) *All questions carry equal 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 initial value problem $u' = -2tu^2$, $u(0) = 1$, $h = 0.2$ in the interval $[0, 0.6]$ using Fourth Order Classical Runge-Kutta Method.[15]

b) Find the dominant eigen value and corresponding eigen vector of the matrix

$$\begin{bmatrix} 1 & 6 & 1 \\ 1 & 2 & 0 \\ 0 & 0 & 3 \end{bmatrix} \text{ using power method.} \quad [10]$$

Q2) a) Compute the solution of partial differential equation $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ at $x = 0.1$ and $t = 0.01$ using [12]

- i) Jacobi's method ii) Gauss Seidel Method

b) Solve $\Delta^2 u = -10(x^2 + y^2 + 10)$ over the square mesh with sides $x = 0$, $y = 0$, $x = 3$, $y = 3$ with $u = 0$ on the boundary mesh of length 'l' unit. [13]

P.T.O.

Q3) a) Solve the boundary value problem $-u'' + xu = 0$, $u(0) = 1$, $u(1) = 1$, using Rayleigh-Ritz Method. [13]

b) Using Galerkin Technique, solve boundary value problem $\frac{d^2 y}{dx^2} - x = 0$, $y(0) = 0$, $y'(1) = -1/2$ [12]

SECTION - II

Q4) a) A rectangular cantilever of unit thickness, length L and depth L/3 is subjected to transverse load P at its free end and three loads of P/2 each at L/4, L/2 and 3L/4. Dcretise the structure numbering the elements and nodes.

State boundary conditions of problem. Write nodal load matrix and state size of stiffness matrix. [12]

b) Derive the 2D shape function in natural co-ordinates for three noded triangular element. [13]

Q5) a) What is CST and LST? Give suitable example and illustrate its use in F.E.M. [5]

b) How does 'aspect ratio' of an element affect accuracy of result in FEM analysis? [6]

c) Write Jacobian matrix for 2D element use conventional symbols. [4]

d) Explain convergence and convergence criteria to be satisfied by ideal displacement function. [10]

Q6) a) With respect to FEM analysis explain use of [8]

i) Jacobian transformation.

ii) Gaussian quadrature.

b) Explain semi band width, skyline storage system. [8]

c) Write note on following stating what criteria govern the choice of each in specific problem [9]

i) subparametric

ii) isoparametric

iii) superparametric elements.



Total No. of Questions : 6]

[Total No. of Pages : 3

P1418

[3665]-38

M.E. (Civil) (Structures)
BRIDGE ENGINEERING (New)
(501509) (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 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 the followings: [9]
- i) Wing wall.
 - ii) Abutment pier.
 - iii) Kerb.
- b) List the data parameters to be collected/investigated from a proposed bridge site stating their importance. [8]
- c) What are the factors affecting the span of bridge, Derive the conditions for 'Economical span' of bridge stating the assumptions made. [8]

- Q2)** Design slab, cross girder and main girder of RCC T-beam and slab girder deck for the crossing of a national highway. The cross section is as shown in figure **Fig1**. Consider interior panel of the deck slab. Place the loads so as to produce critical SF and BM in the deck slab and girder. Draw neat sketches showing details of reinforcement in plan and elevation. [25]

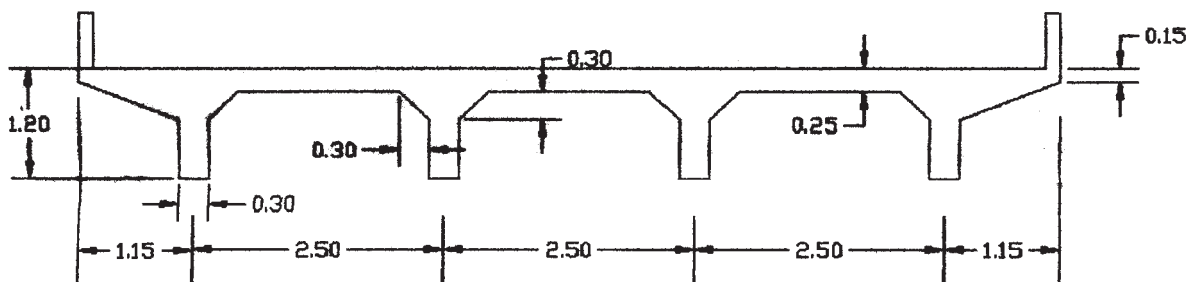


Fig1 (All dimensions are in meters)

P.T.O.

Size of RCC kerb = 150 mm x 600 mm

Effective span of longitudinal girder = 14m

Live load = IRC - Class AA

Thickness of wearing coat = 80 mm.

Spacing of cross - girders = 3.5 m c/c.

Width of carriageway = 7.5 (c/c dist between outer girders).

Number of longitudinal girders = 4, spaced at 2.5 m c/c.

Materials : M30 concrete, Fe500 steel.

Q3) a) Design the culvert with the data:

Clear span of the culvert = 5m.

Clear carriage way width = 7.5 m.

Size of kerb = 200 mm x 600 mm.

Average thickness of wearing coat 80 mm.

Use material M25, Fe 500.

Culvert is on the national high way.

Draw the cross section showing details of reinforcement at mid-span and at junction of the slab are kerb. [15]

b) Compare simply supported RCC girder with PSC girder in following respect:

i) Ease of construction.

ii) Launching.

iii) Losses of prestress.

iv) Economy. [10]

SECTION - II

Q4) a) Draw detailed cross section of typical box section PCS girder naming all the components. [8]

b) List the different forces to be considered for design of bridge substructure design, explain importance of each. [8]

c) Describe different types of bridge foundations mentioning the situations for particular type is used stating merit and demerits of each type. [9]

- Q5) a)** Check the stability of the abutment for the following: **[15]**
- Top width of abutment = 1.2 m.
 Height of abutment = 5 m.
 Front face of abutment is vertical and the back face is battered at 1 : 6.
 Material of abutment stone masonry.
 Unit Weight of soil = 18 kN/m³.
 Angle of repose = 28°.
 Superstructure : A Team - bridge with span 12 m.
 Type of loading : IRC class AA.
- b) List the steps involved in segmental construction of the continuous deck type post tensioned box prestressed concrete bridge. **[10]**
-
- Q6) a)** Explain “shape factor” for elastomeric bearing. **[4]**
- b) Write a short note on metallic bearing, Draw sketches. Explain its merits and demerits. **[6]**
- c) Design a reinforced elastomeric bearing at a pinned end of a plate girder of a bridge with following data.
- Maximum vertical load = 1000 kN
 Dynamic vertical load = 100 kN
 Transverse lateral load = 50 kN
 Longitudinal load = 60 kN
 Longitudinal total translation 12 mm
 Rotation at support 0.003°
 Shear modulus of elastomeric bearing = 1.2 N/mm².
 Allowable comp. stress for concrete = 8 N/mm².
 Allowable comp. stress for elastomer = 10 N/mm². **[15]**



Total No. of Questions : 8]

[Total No. of Pages : 3

P1698

[3665]-413

M.E. (Civil) (Construction & Management)
PROJECT ECONOMICS & FINANCIAL MANAGEMENT
(2002 and 2008 Course)

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 slide rule and electronic pocket calculator is allowed.**
- 6) Assume suitable data, if necessary.**

SECTION - I

Q1) a) Explain the following evaluation techniques of capital budgeting, stating their merits and limitations: **[14]**

- i) B/C ratio
 - ii) NPV
 - iii) IRR.
- b) How do the ARR and Pay-Back Period methods compare with the above techniques given in 1(a)? Explain briefly. **[4]**

Q2) a) ABC company is considering an investment of Rs. 2.5 lakhs capital outlay over a period of 5 years. The annual income before depreciation, but after considering all other charges is as follows:

Year	Income (Rs.).
1	100,000
2	100,000
3	80,000
4	80,000
5	40,000

P.T.O.

After 5 years, the scrap value expected is Rs. 10,000. Depreciation is to be taken at 20% per year on a straight line basis. Consider cost of capital as 15%. Determine

- i) Pay back period.
 - ii) Rate of return on average investment.
 - iii) NPV for the proposal. [12]
 - b) Explain briefly Capital Asset Pricing Model. [4]
- Q3) a) Explain [8]**
- i) Wealth maximization approach and
 - ii) Profit maximization approach,
- and also discuss their advantages and disadvantages or limitations.
- b) What is a portfolio? What is its significance? Explain how risk and return of a portfolio are evaluated, with an example. [8]
- Q4) a) A contractor is executing a project for a client. A standard contract document exists for this work. The project consists of a multi - storeyed building. Making suitable assumptions, prepare format for showing the cash inflows and cash outflows for the contractor. In what way such a statement is useful to the contractor? Explain in brief. [12]**
- b) Explain the concept of life - cycle costing of a construction project with an example. [4]

SECTION - II

- Q5) a) Estimate the working capital required for a certain venture based on the following data: [14]**
- i) Stocks for stores and materials Rs. 20,000/-
 - ii) Stocks for finished products Rs. 8,000/-
 - iii) Average credit on sales for a period of 6 weeks Rs. 400,000/-
 - iv) Average payment of wages and other outgoings over a time lag of 2 months Rs. 450,000/-
 - v) Advance payments Rs. 15,000/-
- Consider 10% amount in reserve, to take care of contingencies.
Make any additional assumptions required and clearly state them.
- b) What is depreciation?
Explain the various methods of calculation of depreciation. [4]

Q6) a) Prepare a balance sheet for a company based on the following data: **[8]**

i) Fixed Assets	Rs. 5,000,000/-
ii) Reserves and Surplus	Rs. 13,000,000/-
iii) Current Assets	Rs. 2,000,000/-
iv) Loans and Advances	Rs. 2,500,000/-
v) Current Liabilities	Rs. 1,000,000/-
vi) Investments	Rs. 6,000,000/-

b) Explain any four accounting concepts with examples. **[8]**

Q7) a) Explain the various modes of raising funds for managing a construction project worth Rs. 30,000 crores to be completed in a period of three years under a Public - Private Partnership. **[11]**

b) Briefly list the measures taken for cost control during design and construction. **[5]**

Q8) Explain in brief the following: **[16]**

- a) Role of finance manager.
- b) Break - even analysis.
- c) Mutual funds.
- d) Acquisition and merger.



Total No. of Questions : 8]

[Total No. of Pages : 3

P1504

[3665]-414

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

OPERATIONS RESEARCH

(2008 Course and 2002 Course) (Old Course)

Time : 4 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) 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) Use either Big M method or Two - phase Method to

[16]

Minimize $Z = 20x_1 + 10x_2 + 30x_3$

S.t

$$12x_1 + x_2 + 5x_3 \geq 60$$

$$2x_1 + 3x_2 + 2x_3 \geq 15$$

$$5x_1 + x_2 + 7x_3 \geq 45$$

$$x_1, x_2, x_3 \geq 0.$$

Q2) Precast units are to be transported from 3 casting yards to 4 sites. The quantity available at the yards, the quantity required on the sites and the unit cost of transportation are given below. Determine the distribution policy which will minimize the total cost of transportation. Initial feasible solution should be obtained by VAM.

[18]

Casting yards	Sites				Quantity Available
	1	2	3	4	
A	12	23	43	3	6
B	63	23	33	53	8
C	33	1	63	13	17
Demand	4	7	6	14	

P.T.O.

- Q3) a)** Firms A, B, C & D each submitted tenders for 4 contracts for which bids were invited. The bids are given in the following table. If each firm is to be allocated only one contract, find an optimal assignment which will minimize the total cost. [10]

Firms	Contracts			
	1	2	3	4
A	18	16	19	14
B	20	14	13	20
C	16	16	19	17
D	18	19	17	18

- b) Explain the procedure of processing n-jobs on 3 machines. [6]

- Q4) a)** Use Fibonacci method to Maximize $Z = 8x - 2x^2$ in an interval from 0 to 10 within an accuracy of 1%. Carry out only the first 4 iterations. [10]
- b) Explain the algorithm of Newton's method and state its advantages over the steepest Gradient method. [6]

SECTION - II

- Q5)** A builder has 4 money units which he wishes to invest in 3 projects A, B & C. The expected returns from the 3 projects for each level of investment are given below. Use Dynamic Programming to obtain the best allocation to maximize the overall returns. [16]

Investment	Returns from projects		
	A	B	C
0	0	0	0
1	7	8	9
2	25	20	15
3	30	36	19
4	38	44	30

- Q6) a)** What are the assumptions in a queueing model? [4]
- b) What is Kendall - Lee Notation? [4]
- c) What are the Civil Engineering Applications of queueing theory? [4]
- d) Explain the concept of Simulation. [4]

Q7) a) State the assumptions in a Two person Zero - sum Game. [4]

b) In a two - person, zero - sum game the gain matrix for player A is as follows:

	B_1	B_2	B_3
A_1	-4	6	8
A_2	-8	-3	6
A_3	2	-3	4

Find the best strategy for each player and the value of the game. Is the Game Fair? [10]

c) What are the circumstances under which the replacement of an equipment becomes necessary? [4]

Q8) a) Explain the various costs associated with a project. [6]

b) Following data pertains to two projects. [10]

Particulars	Project A	Project B
Investment in Rs lakh	35	42
Annual costs in Rs lakh	2	1
Annual benefits in Rs lakh	8	10
Useful life in years	10	12
Interest rate in %	12	12

Discuss the choice of the projects based on NPV and B/C ratio.



Total No. of Questions : 8]

[Total No. of Pages : 2

P1668

[3665]-418

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

THRUST AREAS IN PROJECT MANAGEMENT

(2008 Course) (Open Elective - IV)

Time : 4 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) *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 cost-influence diagram and show importance of project pre-planning. Discuss the role of PDRI in project pre-planning. [18]
- Q2)** With examples, explain the 8 ISO 9001:2000 principles in brief. [16]
- Q3)** Explain with a case study, project partnering and its importance. [16]
- Q4)** Explain in brief : [16]
- a) SWOT analysis.
 - b) Qualities required for an entrepreneur.
 - c) Advantages of SCM.
 - d) Strategic objectives.

SECTION - II

- Q5)** Discuss advantages and limitations of fast track construction with any case study. [18]
- Q6)** Discuss advantages and limitations of MIVAN technology. [16]
- Q7)** Explain concept of pre-engineered structures. Explain any 3 Butter TM building systems in detail. [1+15]

P.T.O.

Q8) Explain in brief :

[16]

- a) Competency mapping.
- b) Proflex roofing system.
- c) John Mullin's evaluation framework.
- d) TQM.



Total No. of Questions : 6]

[Total No. of Pages : 2

P1508

[3665]-456

M.E. (Civil Structures)

DESIGN OF COMPOSITE CONSTRUCTION

(501404) (Revised Course-2008) (Elective - I)

Time : 4 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) Figures to the right indicate full marks.*
- 4) Neat diagrams must be drawn wherever necessary.*
- 5) Use of electronic pocket calculator is allowed.*
- 6) Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Explain concept of composite beam and concept of behaviour of composite beam. **[10]**
- b) Show that for no interaction case, at $x = 0$, slip strain is maximum and slip is zero. Also, prove that at $x = \frac{\ell}{2}$, slip is maximum and slip is zero in composite beam.
- Draw the typical deflections, slip strain and slip for above conditions. **[15]**
- Q2)** a) Explain three structural elements of composite floors. State and explain the terms of the equation for neutral axis above the sheeting. **[10]**
- b) Compare the stress block for concrete strength according to Eurocode and I.S. 456-2000 with help of figure and equations. **[15]**
- Q3)** A composite column of 350 mm × 350 mm × 3000 mm is cast with M30 concrete grade and ISHB 250 steel section. It consists of 4 bars of 14 mm diameter of Fe 415. If the design axial load is 1500 kN and design bending moment @xx and yy axis is 180 kNm and 0 kNm respectively, check adequacy of concrete encased composite section for uniaxial bending.

P.T.O.

For ISHB250, $f_y = 250 \text{ N/mm}^2$ and $E_a = 200 \text{ kN/mm}^2$

M30, $E_m = 31220 \text{ N/mm}^2$

partial safety factors γ_a and $\gamma_s = 1.15$, $\gamma_c = 1.5$

[25]

SECTION - II

Q4) A composite truss has following parameters.

- i) Span = 10 m
- ii) Truss spacing = 3m
- iii) Slab thickness = 150 mm
- iv) Profile depth = 75 mm
- v) Self weight of deck slab = 2.80 kN/m^2
- vi) Max. laterally un-restrained length in top chord = 1.5 m
- vii) Concrete grade = M20
 - a) Evaluate the - Pre composite stage loading.
 - b) Design - the top chord.
 - c) Design the bottom chord for composite stage.
 - d) Determine the capacity of composite section in compression.

[25]

Q5) Explain design steps of multistoreyed 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]



Total No. of Questions : 12]

[Total No. of Pages : 4

P1513

[3665]-465

M.E. (Civil) (Structures)

EARTHQUAKE RESISTANT DESIGN OF STRUCTURES

(2008 Course) (Elective - III)

Time : 4 Hours]

[Max. Marks : 100

Instructions to the candidates :

- 1) *Solve Q.No. 1 or Q. No. 2, Q.No.3 or Q.No. 4, Q.No. 5 or Q.No.6 from section I and Q.No.7 or Q.No.8, Q.No.9 or Q.No. 10, Q.No. 11 or Q.No. 12 from section II.*
- 2) *Use of IS1893 (Part I) 2002 is permitted.*
- 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 electronic pocket calculator is allowed.*
- 7) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) What are the causes of earthquakes? Explain with neat sketches the Elastic Rebound Theory? [6]
- b) Explain philosophy behind earthquake resistant design of the structure? [6]
- c) What is meant by the focus and epicenter of an earthquake? [6]

OR

- Q2)** a) What is an earthquake? Classify earthquakes based on different parameters? [6]
- b) Classify and describe with suitable sketches different types of waves generated by an earthquake and their effects on structure? [6]
- c) Define liquefaction and describe the factors affecting on it? [6]
- Q3)** a) The Architect and Structural Engineer must coordinate at the planning stage of Building structure. Comment. [8]
- b) Write short notes on- [8]
- i) Strength and stiffness.
 - ii) Simplicity and symmetry.
 - iii) Stiff and flexible building.

P.T.O.

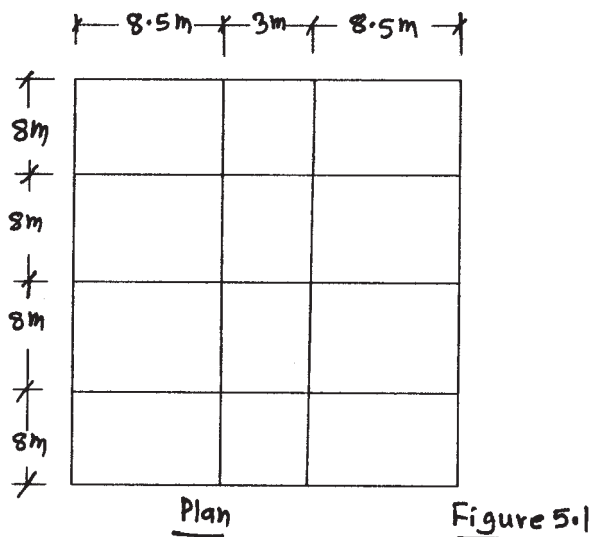
OR

Q4) a) Discuss the various approaches to deal with the problems of non-structures. Which of them would you recommend when the structure is flexible. [8]

b) Discuss how the soil and structure interact during an earthquake. [8]

Q5) Plan of three storey school building is as shown in figure 5.1. Determine the lateral forces at different storey levels.

D.L. = 5 kN/m^2 , L.L. = 4 kN/m^2 on each floor and 1.5 kN/m^2 on roof. Assume soil type hard and seismic zone IV. [16]



OR

Q6) Determine frequency and design seismic coefficient for an ordinary masonry shear wall in primary health centre at Killari, given the following data- Roof Load - 20 kN/m , Height of Wall - 3.5 m , Width of wall - 0.3 m , Unit weight of wall - 20 kN/m^3 , Type of soil - Rocky. [16]

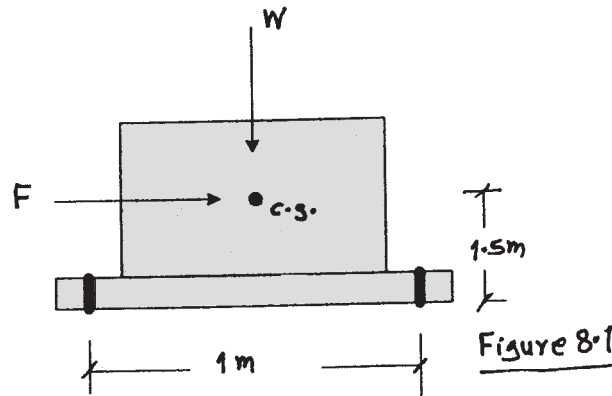
SECTION - II

Q7) a) What are the causes of instability of steel buildings? Discuss in detail the P - Δ Effect. [8]

b) Describe the procedure to carry out dynamic analysis to obtain the designed seismic forces and its distribution along the height of multistory building. [8]

OR

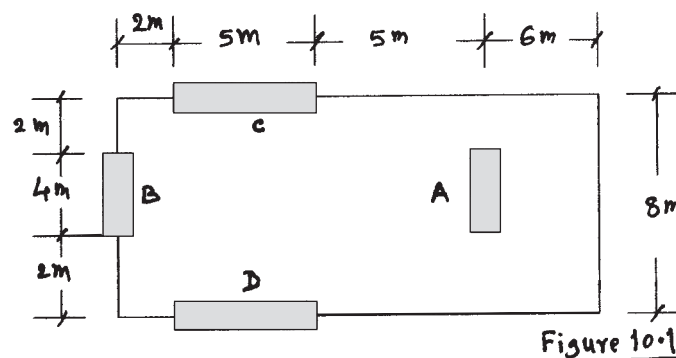
- Q8)** A 120 kN equipment is to be installed on the roof of a five storey building in zone III. It is anchored by four bolts one at each corner, embedded in concrete slab. Floor to floor height of the building is 3.1 m for four storeys and 4 m for ground storey. Refer Figure 8.1. Determine the shear and tension demands on the anchored bolts during earthquake shaking. [16]



- Q9)** a) Discuss the behavior of the following masonry walls in seismic regions.
- i) Un-reinforced masonry walls.
 - ii) Reinforced masonry walls.
 - iii) Infill walls. [9]
- b) Define bands. At what levels in a masonry building it is to be provided? Give justification for each of them. [9]

OR

- Q10)** A simple one storey building having two shear walls are in M-25 grade concrete and 200 mm thick. Design shear force is 100 kN in either direction. Compute design lateral forces in Y - direction using torsion provisions. Refer Figure 10.1. [18]



- Q11)** a) How would you carry the assessment of RC building to ascertain the requirements and level of retrofitting. [8]
b) Describe with suitable sketches the various methods of retrofitting. [8]

OR

Q12) Write notes on any three of the following: [16]

- a) Ductility requirements in RC building.
- b) Seismic design of RC elevated water tank.
- c) Winkler Model.
- d) Base Isolation of structure.



P1723

[3665]-481

M.E. (Mech. H.P.)

ADV. AIR CONDITIONING & HEATING & VENTILATION

(502105 B) (2008 Course) (Elective - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions :

- 1) *Attempt 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 slide rule, Mollier charts, electronic pocket, psychrometric chart, calculator and steam tables is allowed.*
- 6) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) Estimate the direct and diffuse sky radiation intensities on a roof with 30° angle of tilt with horizontal, facing south-east, at 3:00 pm on 21st July at a location 30° N latitude.

Given : Hour angle (h) at 3 pm = 45°

Sun's declination (d) on 21 July at 3 pm = $20^\circ 25'$

Coefficient for sky radiation (C) = 0.136

What is the effect of solar heat gain on room load? **[12]**

b) Briefly discuss equivalent temperature difference method. **[6]**

Q2) Determine duct sizes of section A to G for duct system shown & find the total pressure at fan outlet using

i) Equal friction method

ii) Static regain method.

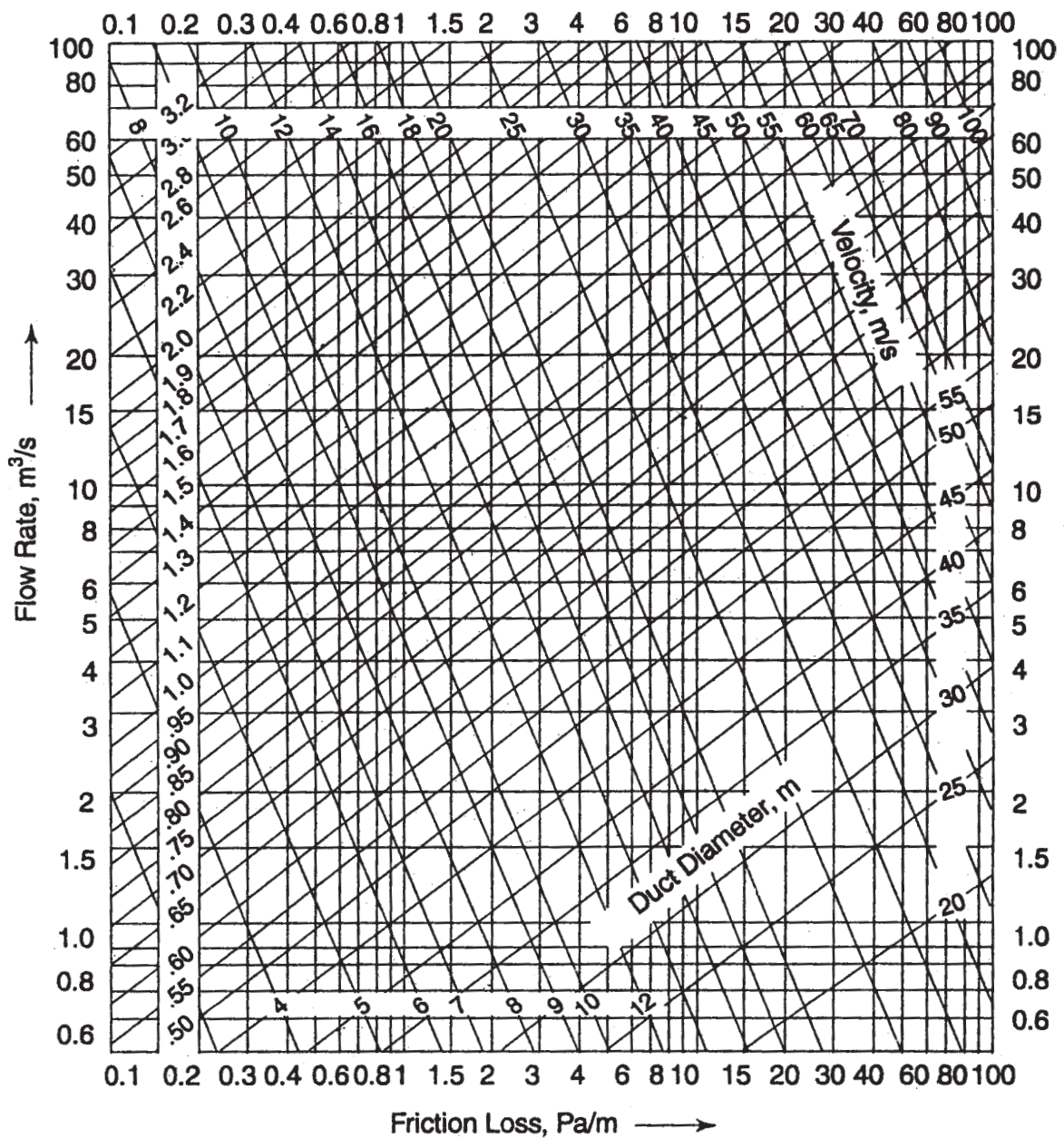
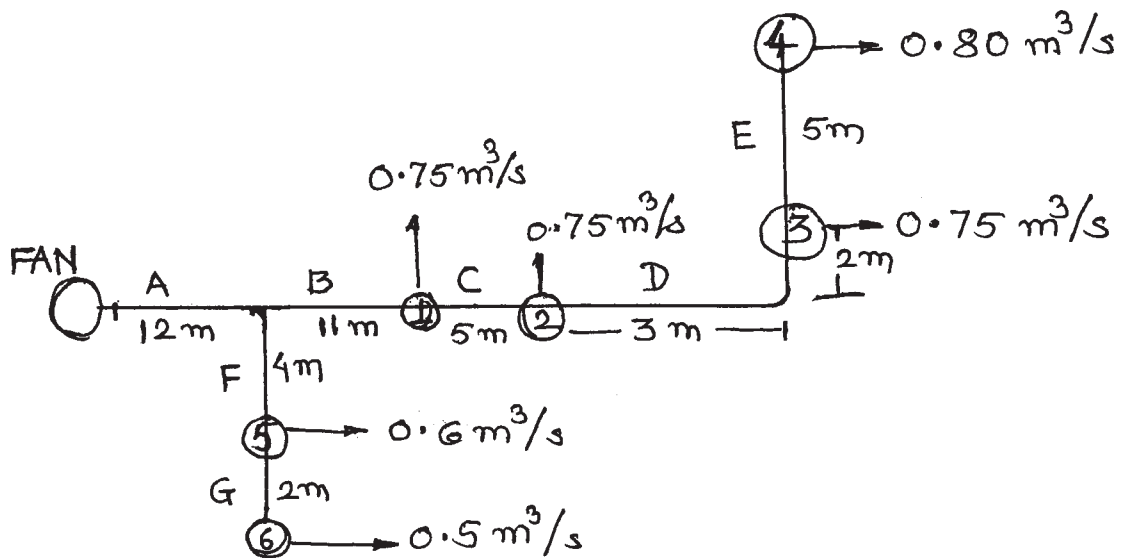
Given : Velocity in A = 420 mpm

Dynamic loss coefficient in elbow = 0.22

Static regain factor in fittings (R) = 0.75

Static pressure at each outlet = 4 mm of H₂O. **[16]**

P.T.O.



- Q3) a)** Explain the limitations of standard psychrometric chart and explain in detail how to construct psychrometric chart for non-standard pressures? Draw suitable sketches. [8]
- b) A central air conditioning plant processes fresh air from 43°C DBT and 24°C WBT to 12°C DBT and 95% RH. The rooms have individual cooling coils with individual thermostats, controlled by supply of chilled water to the room. The induction ratio is 4 : 1 by volume. Room sensible and latent heat gains are 6 kW and 1.1 kW respectively. The primary air delivered to the room is 8 cmm.
- Find i) RH in room,
 ii) Cooling load on room coil,
 iii) Cooling load on central a/c plant,
 iv) Grand total heat.
- Show process on psychrometric chart. [8]
- Q4) a)** Describe the various sources of noise in air conditioning plants. Also state the methods to reduce/prevent the noise. Describe any one method briefly. Show sketch, if necessary. [8]
- b) i) Give typical examples of inside and outside design conditions and state their effects on design procedure. [5]
 ii) Sketch two types of air distribution grills and state (only) their advantages. [3]

SECTION - II

- Q5) a)** What is the difference between Infiltration and Ventilation? How to calculate the ventilation load? Give values of minimum ventilation requirement rates in Cmm/m² floor area for practical applications. [8]
- b) Discuss the performance characteristics of centrifugal fans. Explain the fan operation in series and parallel. Draw the combined characteristics. [8]
- Q6) a)** Discuss the Thermodynamics of evaporating cooling. Explain with sketches the working of any two types of evaporator coolers. [8]
- b) A green house is cooled with an evaporative cooling method. Inside RH is to be maintained at 90%. The outdoor conditions are 40°C DBT and 25°C WBT. The maximum temperature of air leaving the green house is 33°C. The heat load of the green house is 3000 kJ/m²-hr. Take SHF = 0.5 for green house load. Find the air flow and water rates per m² per hour. [8]

Q7) Write notes on (Any four) :

[16]

- a) Humidistats.
- b) Cycling and sequencing controls.
- c) Different types of Air Filters.
- d) Standards and codes for Air conditioning systems.
- e) Cooling Towers.

Q8) a) Give a typical layout and design procedure for a 100 TR Central Air Conditioning plant. **[9]**

b) Discuss the typical Air Conditioning Systems for (any two) of the following : **[9]**

- i) Aeroplane
- ii) Railway coach.
- iii) Automobile.



Total No. of Questions : 10]

[Total No. of Pages : 2

P1619

[3665]-484

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

MEASUREMENT TECHNIQUES & DATA ANALYSIS

(2008 Course)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates :

- 1) *Answer any 3 questions from each section.*
- 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) *Your answers will be valued as a whole.*
- 7) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*

SECTION - I

Q1) a) Explain the classification of measuring instruments. [8]

b) Explain the various standards used in measurement. [8]

Q2) a) Explain different types of correlations? [6]

b) Find out regression co-efficient of Y on X & X on Y from the following data.

$$\sum X = 50, \quad \bar{X} = 5, \quad \sum Y = 60, \quad \bar{Y} = 6$$

$$\sum XY = 350, \quad \text{Variance of X} = 4, \quad \text{Variance of Y} = 9. \quad [12]$$

Q3) a) In a partially destroyed record the following data are available. [10]

Variance of X = 25.

Regression equation X upon Y $5X - Y = 22$

Regression equation Y upon X $64X - 45Y = 24$

Find

- i) Mean value of X & Y
 - ii) Co-efficient of correlation between X & Y.
- b) Explain probable error & standard error. [6]

P.T.O.

- Q4)** a) Explain with neat sketch the working and principle of selective radiation pyrometer. [8]
b) A copper - constantan thermocouple was found to have linear calibration between 0°C and 400°C with emf at maximum temperature equal to 20.68 mV. Find [8]
i) The correction which must be applied to the indicated emf if the cold junction temp. is 25°C .
ii) If the indicated emf is 8.92 mV in the circuit, find the temperature of hot junction.

- Q5)** a) Explain with a neat sketch the working of turbine flow meter. [8]
b) Explain the working of hot - wire anemometer. [8]

SECTION - II

- Q6)** a) What are microphones? Explain any one type of microphone. [8]
b) Explain how do you measure blood pressure of human being. [8]

- Q7)** a) Explain the working of McLeod gauge with a neat sketch. [8]
b) What is an accelerometer? Explain the principle and working of it. [8]

- Q8)** a) Explain Beer - Lambert's law. [6]
b) Explain the working of single beam-spectrophotometer. [8]
c) Enumerate the applications of spectroscopy. [4]

- Q9)** a) Explain the working of Pneumatic P + I controllers. [8]
b) Design a Proportional - Derivative controller with 140 PB and 0.2 min derivative time. The faster signal speed is 1 min. Measurement range is 0.4 to 2V and output is 0 to 10 V. [8]

- Q10)** Write short notes on any four: [16]
a) Measurement of Torque.
b) Measurement of specific heat.
c) Difference between Correlation & Regression analysis.
d) Humidity measurement.
e) Colorimetric methods.



Total No. of Questions : 8]

[Total No. of Pages : 2

P1704

[3665]-49

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

THERMAL AND MECHANICAL DESIGN OF HEAT EXCHANGER

(2002)

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) 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 are different factors considered for the selection of heat exchangers? Explain with examples? [8]
- b)** Write a note on classification of heat exchangers giving application of each type. [8]
- Q2) a)** Discuss the various codes used in heat exchanger design. [8]
- b)** Explain the causes and effects of fouling in heat exchangers. [4]
- c)** What are the different supports used in practice for heat exchangers?[4]
- Q3) a)** How the number of tubes and baffles are decided in shell and tube heat exchanger? [8]
- b)** Explain in brief-
- i)** Temperature approach, meet and cross.
 - ii)** Limitations of plate type heat exchanger. [8]
- Q4) a)** Name the specific heat exchanger and explain their construction (in brief) for the following applications- [8]
- i)** Air preheater.
 - ii)** Condenser in window A.C.
 - iii)** Water cooled condenser.
 - iv)** Cooling towers.

P.T.O.

- b) Water enters in counter flow, double pipe H.E. at 15°C, flowing at the rate of 1300 Kg/hr. It is heated by oil ($C_p = 2 \text{ kJ/KgK}$) flowing at the rate of 550 Kg/hr from inlet temp. of 94°C. For an area of 1 m² and an overall H.T.C. of 1075 W/m²K, determine the total heat transfer. [10]

SECTION - II

Q5) Write short notes on any three— [18]

- a) Bell - Delaware method.
- b) TEMA standards.
- c) Tinkers Method.
- d) Vibrations and its damping in H.E.

Q6) a) Give the details of heat pipe with suitable sketch and explain its applications. [6]

b) What are the various considerations in material selection for H.E. and special properties at elevated temperatures. [8]

c) Explain the difference between NTU method and LMTD method. [2]

Q7) a) Write a note on advanced material used in H.E. [6]

b) What are the different types of heat transfer fluids used in H.E.? Give examples, temperature range and limitations. [10]

Q8) a) Explain briefly spiral plate and spiral tube heat exchanger. [8]

b) Discuss various cleaning techniques used in heat exchanger cleaning. [8]



Total No. of Questions : 10]

[Total No. of Pages : 4

P1520

[3665]-491

M.E. (Mechanical) Design Engineering - I
MATHEMATICAL MODELING & ANALYSIS
(502201) (Revised 2008 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) Use of electronic pocket calculator is allowed.*
- 5) Assume suitable data, if necessary.*

SECTION - I

Q1) Write short notes on (Any Three):

[18]

- a) System, Environment and Variables.
- b) Cause variables and effect variables.
- c) Stochastic variables.
- d) Static and Dynamic systems.
- e) Linear Graph Terminology.

Q2) a) Use the Signal flow graph method to determine the static transition matrix.

[6]

$$\begin{bmatrix} \dot{X}_1 \\ \dot{X}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -25 & -10 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}.$$

b) Construct the signal flow graph for the simultaneous equations,

$$x_1 = a_{11}x_1 + a_{12}x_2 + b_1 u_1$$

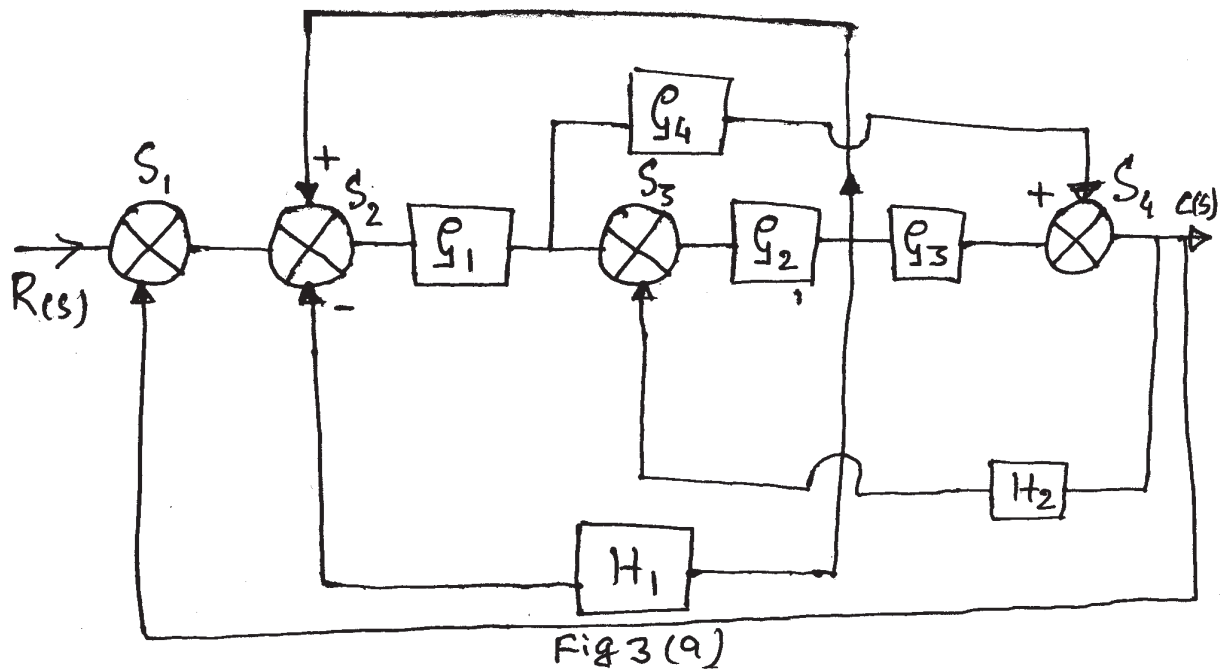
$$x_2 = a_{21}x_1 + a_{22}x_2 + b_2 u_2$$

Find overall gain using Mason's gain formula.

[10]

P.T.O.

Q3) a) Construct Signal Flow Graph for the given block diagram. [8]



b) Find $f(A) = e^{At}$ for [8]

$$A = \begin{bmatrix} 0 & 2 \\ -2 & -4 \end{bmatrix}.$$

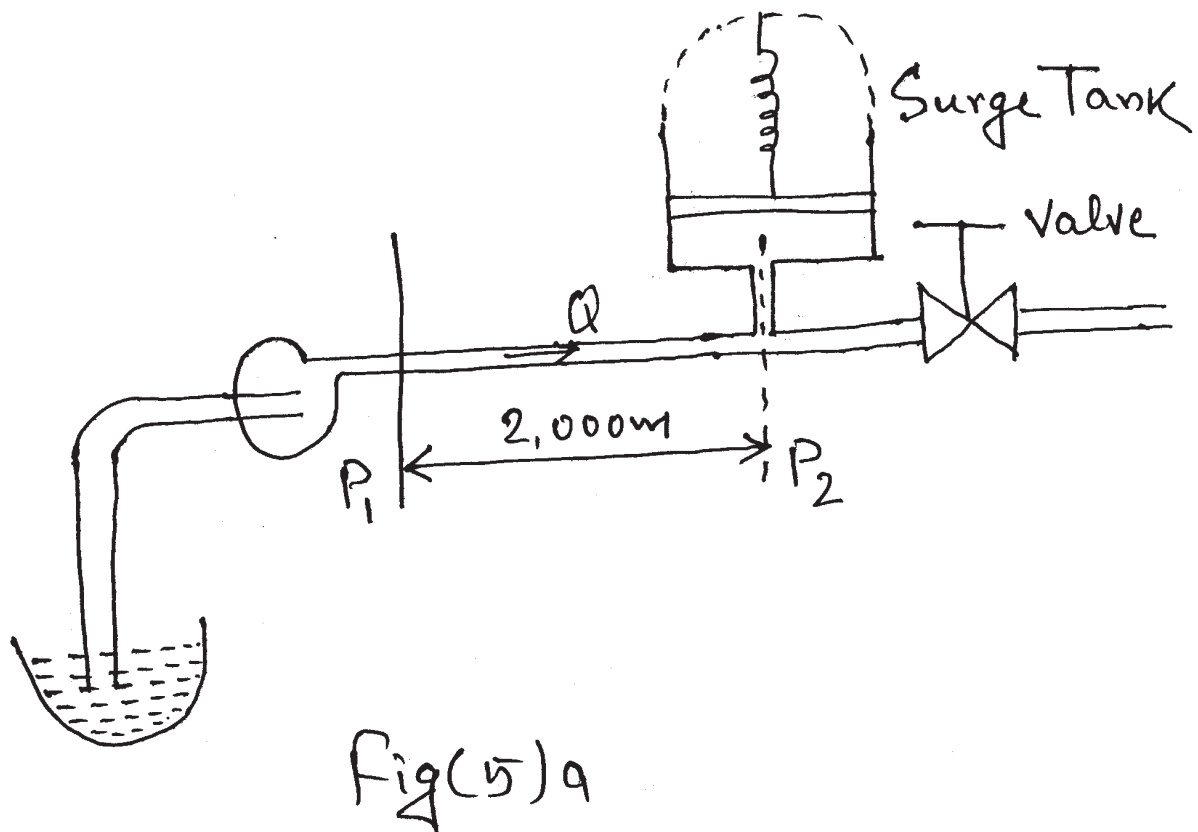
Q4) a) Obtain state space representation for

$$y(t) = \frac{(D+3)}{(D+1)(D+2)} f(t). \quad [8]$$

b) Find the inverse of matrix $[SI - A]$ and write each element in partial fraction expansion form,

$$[SI - A] = \begin{bmatrix} S & -1 \\ 25 & S+10 \end{bmatrix}. \quad [8]$$

- Q5) a) Figure Q.5(a) shows the pumping system. Construct Fluid Circuit and write system equation. [8]



- b) Discuss the linear graph models. [8]

SECTION - II

- Q6) The transverse displacement u of a point at a distance x from one end at any time t of a vibrating string satisfies the equation: [16]

$$\frac{\partial^2 u}{\partial t^2} = 25 \frac{\partial^2 u}{\partial x^2}$$

with the boundary conditions

$$u(0, t) = u(5, t) = 0$$

and initial conditions

$$u(x, 0) = 20x \text{ for } 0 \leq x \leq 1$$

$$u(x, 0) = 5(5 - x) \text{ for } 1 < x \leq 5$$

$$\frac{\partial u}{\partial t} = 0 \text{ at } t = 0, 0 \leq x \leq 5$$

Solve this equation numerically for one half period of vibration taking $\Delta x = 1$. Derive the formula that you use.

Q7) A metal ball at 1200°K is allowed to cool down in air at an ambient temperature of 300°K . Assuming heat is lost only due to radiation, the differential equation for the temperature of the ball is given by

$$\frac{d\theta}{dt} = (-2.5 \times 10^{-12}) \cdot (\theta^4 - 8.5 \times 10^9)$$

using Runge Kutta fourth order method find the temperature of metal ball at $t = 500$ sec. Assume step size $\Delta t = 250$ sec. [16]

Q8) a) Find the Z - transform of the following: [8]

i) $3n - 4 \sin \frac{n\pi}{4} + 5a.$ ii) $\text{Cosh } n\theta.$

b) Find Laplace transform of any two of the following: [8]

i) $e^{2t} \cos^2 t$ ii) $t^3 e^{-3t}$

iii) $\frac{\cos at - \cos bt}{t}$

Q9) a) Draw the graph of the periodic function:

$$f(t) = \begin{cases} t & 0 < t < \pi \\ \pi - t & \pi < t < 2\pi \end{cases}$$

and find its Laplace Transform. [9]

b) Find the Fourier cosine transform of

$$f(x) = \begin{cases} x & \text{for } 0 < x < 1 \\ 2 - x & \text{for } 1 < x < 2 \\ 0 & \text{for } x > 2 \end{cases} \quad [9]$$

Q10) a) Using Z - transform solve the difference equation: [10]

$$y_{n+2} + 6y_{n+1} + 9y_n = 2n$$

$$\text{with } y_0 = y_1 = 0.$$

b) Explain in brief types of simulation approaches. [6]



Total No. of Questions : 10]

[Total No. of Pages : 3

P1522

[3665]-495

M.E. (Mech.) (Design Engg.)

ADVANCED MATERIAL SCIENCE

(Revised 2008 Course) (Elective - I)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Answer any 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.*
- 6) Use of non programmable calculator is allowed.*

SECTION - I

- Q1)** a) Define the terms lattice, unit cell, basis and crystal structure. [8]
- b) The density of thorium, which has FCC structure and one atom per lattice point, is 11.72 g/cm^3 . The atomic weight of thorium is 232 g/mol. Calculate
- i) the lattice parameter and ii) the atomic radius of thorium [8]
- Q2)** a) What is known as packing factor? What is its physical significance in metallic structures? Give the formulas for and values of atomic packing factor of a cubic cell. [8]
- b) What do you understand the lattice directions and lattice plane? What are the Miller indices of slip directions for
- i) on the (111) plane in an FCC unit cell and
- ii) on the (011) plane in BCC unit cell. [8]
- Q3)** a) Explain the eutectic reaction taking place in iron carbon equilibrium system. [6]
- b) Explain the construction of TTT diagram of iron - carbon system of steel. [10]

P.T.O.

- Q4)** a) Explain following heat treatments: [10]
i) Process annealing ii) Austenizing iii) Spheroidizing
iv) Normalizing v) Quenching
- b) What is difference between eutectic steel and eutectoid steel? Explain it with reference to iron carbon diagram. [6]
- Q5)** Write short notes on any three of the following: [18]
- a) HSLA
b) Maraging steel
c) Cu-Zn diagram
d) Heat treatment of tool steel
e) Heat treatment of non-ferrous materials.

SECTION - II

- Q6)** a) What is a nano-material and it is having importance? [6]
b) What are the particular properties of orthodontal materials? [4]
c) What are super conducting materials and how they are differ from the conventional materials? [6]
- Q7)** a) Explain how the volume of fiber, fiber orientation and fiber strength are related with each other. [6]
b) What is shape memory alloy? What are its manufacturing techniques? [6]
c) What are important requirements of the sport materials? [4]
- Q8)** a) What is PVD? Explain the process in detail mentioning its advantages, limitations and applications. [6]
b) What are some important characteristics of sintered ceramics? [6]
c) State the main applications of refractory materials. [4]

- Q9)** a) Distinguish between surface coating and surface hardening with its applications. [5]
- b) Why surface preparation is required before applying any coating? State various techniques of surface preparation and explain them in brief. [5]
- c) Explain CVD and IVD ion implantation method. [6]

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

- a) Biomaterials
- b) Smart materials
- c) Manufacturing of composite materials
- d) Tribological aspects of surface coatings
- e) Prosthetic materials.

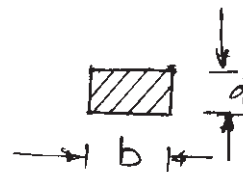
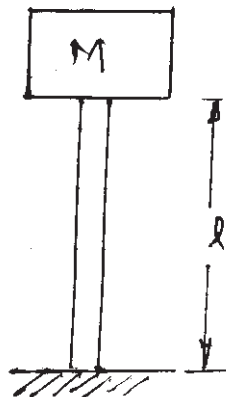


M.E. (Mechanical - Design Engg.)**OPTIMIZATION TECHNIQUES****(502204 - C) (Elective - I) (Revised 2008 Course)****Time : 3 Hours]****[Max. Marks : 100****Instructions to the candidates :**

- 1) Answer any **THREE** questions from each section.
- 2) Answer to each section should be written in separate 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)** How do you solve a maximization problem as a minimization problem? [6]
- b)** A uniform column of rectangular cross section is to be constructed for supporting a water tank of mass M . It is required i) to minimize the mass of the column for economy and ii) to maximize the natural frequency of transverse vibration of the system for avoiding possible resonance due to wind. Formulate the problem of designing the column to avoid failure due to direct compression and buckling. Assume the permissible stress to be σ_{\max} . (Refer fig. 1). [10]



cross-section of column.

Fig. 1 Water tank on a column

- Q2) a)** State the various methods available for solving a multivariable optimization problem with equality constraints. [6]

- b) In a two stage compressor, the working gas leaving the first stage of compression is cooled (by passing it through a heat exchanger) before it enters the second stage of compression to increase the efficiency. The total work input to a compressor (W) for an ideal gas, for isentropic compression is given by,

$$W = C_p T_1 \left[\left(\frac{p_2}{p_1} \right)^{(k-1)/k} + \left(\frac{p_3}{p_2} \right)^{(k-1)/k} - 2 \right]$$

Where C_p is the specific heat of the gas at constant pressure, K is the ratio of specific heat at constant pressure to that at constant volume of the gas, and T_1 is the temperature at which the gas enters the compressor. Find pressure P_2 at which intercooling should be done to minimize the work input to the compressor. Also determine the minimum work done on the compressor. [10]

Q3) a) What is difference between linear programming and geometrical linear programming method. [6]

- b) Minimize the following function with simplex method.

$$f = 2x_1 + 3x_2 + 2x_3 - x_4 + x_5$$

subject to the constraints,

$$3x_1 - 3x_2 + 4x_3 + 2x_4 - x_5 = 0$$

$$x_1 + x_2 + x_3 + 3x_4 + x_5 = 2$$

$$x_i \geq 0 \quad ; \quad i = 1 \text{ to } 5 \quad [10]$$

Q4) a) Why is linear programming important in several types of industries?[6]

- b) Find all the basic solutions corresponding to the system of equations by pivotal reduction system. [10]

$$2x_1 + 3x_2 - 2x_3 - 7x_4 = 1$$

$$x_1 + x_2 + x_3 + 3x_4 = 6$$

$$x_1 - x_2 + x_3 + 5x_4 = 4$$

Q5) Write short note on any THREE: [18]

- Inequality constraint.
- Decomposition principle.
- Postoptimality Analysis.
- Langrange Multiplier Method.

SECTION - II

Q6) a) What are the different methods are adopted for non linear optimization. Explain any one method with suitable example. [8]

b) Minimize $f(x) = (100 - x^2)$ over the interval of $60 \leq x \leq 150$ by half interval method. [8]

Q7) Minimize $f(x_1, x_2, x_3) = (x_1 - x_2)^2 + (x_2 - x_3)^4$.
subject to

$$g_1(\mathbf{X}) = x_1(1 + x_2^2) + x_3^4 - 3 = 0$$

$$-3 \leq x_i \leq 3, i = 1, 2, 3$$

using the GRG method. [16]

Q8) a) What is the difference between Newton method & Quasi - Newton method of unconstrained optimization techniques. [6]

b) Find the minimum of the function

$$f(\lambda) = 0.65 - \frac{0.75}{1 + \lambda^2} - 0.65\lambda \tan^{-1} \frac{1}{\lambda}$$

using Newton - Raphson method with starting point

$$\lambda_1 = 0.1; \quad \text{Use } \epsilon = 0.01. \quad [10]$$

Q9) a) What is the role of one - dimensional minimization methods in solving an unconstrained minimization problem? [6]

b) Minimize $f(x_1, x_2) = x_1 - x_2 + 2x_1^2 + 2x_1x_2 + x_2^2$

starting from point $\mathbf{X}_1 = \begin{Bmatrix} 0 \\ 0 \end{Bmatrix}$ by using conjugate Gradient method. [10]

Q10) Write short note on any THREE: [18]

- a) Penalty function method.
- b) Random search method.
- c) Golden section method.
- d) Half interval method.



Total No. of Questions : 10]

[Total No. of Pages : 2

P1758

[3665]-499

M.E. (Mechanical) (Design)

ROBOTICS

(Elective - II) (2008 Course)

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 calculator is allowed.*

SECTION - I

- Q1)** a) Explain the Classification of Robots on the basis of Configuration. [8]
b) Explain dynamic properties of robots. [8]

- Q2)** a) Explain the following: (Any Two) [8]
i) Drives used in Robot.
ii) Path Control systems in Robot.
iii) Forward and Inverse Kinematics.
b) A planar RR Manipulator has first link of 100 mm length and second link of length 70 mm. State whether the manipulator can reach points P, Q, R separately where P is at (15, 15) Q is at (15, 70) and R is at (15, 170). [8]

- Q3)** a) Explain Denavit Hartenberg parameters for link transformation. [8]
b) Explain Lagrangian Formulation for manipulator dynamics. [8]

- Q4)** a) A robot has the link parameters are as shown in table. Determine the origin of the gripper w.r.t. base frame indicating all the intermediate steps. [8]

i	α_{i-1}	a_{i-1}	d_i	θ
1	0°	0	0	30°
2	90°	5	0	90°
3	90°	10	0	0°

P.T.O.

- b) A robot joint is required to reach 60° from 30° taking a total time of 6 seconds. Obtain the cubic polynomial fit and sketch the trajectory. [8]

Q5) Write short notes on following: (Any three) [18]

- a) Applications of Robots.
- b) Matrix representation of coordinate transformation.
- c) Newton-Euler's dynamic formulation.
- d) Trapezoidal velocity strategy for robots in trajectory planning.

SECTION - II

Q6) a) Classify sensors and give the characteristics for selecting thesis sensors for using them in robot system. [8]

b) Explain with suitable figure Touch and slip sensors. [8]

Q7) a) Explain encoders used in robot system. [8]

b) Explain the classification of robot controllers. [8]

Q8) a) Explain H-bridge drives for DC motor. [8]

b) Explain illumination techniques in machine vision system in robotics. [8]

Q9) a) Explain low level and high level machine vision system. [8]

b) Explain the levels of robot programming and their requirements. [8]

Q10) Explain any three from the following: [18]

- a) Robot programming languages.
- b) Micro-robotics.
- c) MEMS.
- d) Stability issue in legged robots.
- e) Telecheirs.



Total No. of Questions : 10]

[Total No. of Pages : 3

P1524

[3665]-500

M.E. (Mechanical) (Design Engineering)

VIBRATIONS & NOISE CONTROL

(2008 Course)

Time : 3 Hours]

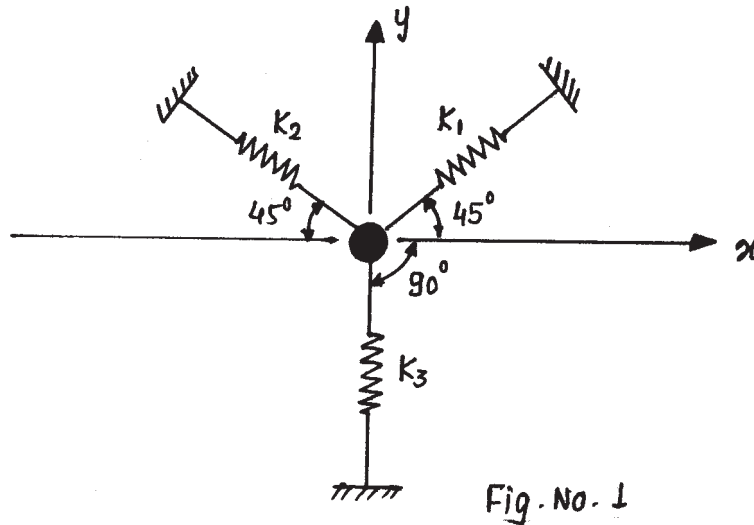
[Max. Marks : 100

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) 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) For the system shown in Fig. No. 1, Construct mass and stiffness matrices through the method of Influence Coefficient. Hence find its Natural frequencies and mode shapes through Matrix iterations. Sketch the first mode. Take $K_1 = 200 \text{ N/m}$, $K_2 = 500 \text{ N/m}$, $K_3 = 2000 \text{ N/m}$. $m = 12 \text{ Kg}$. [16]



Q2) Find first two natural frequencies of transverse vibrations of a cantilever beam having length 'l', constant thickness 't', height at the fixed end 'b' and at the free end zero using Rayleigh - Ritz method. [16]

Q3) A uniform shaft of length 2500 mm and circular cross section of radius 5 mm is fixed at one end. Determine vibration of shaft if sinusoidal torque of $200 \sin 20\pi t$ acts at its free end. Take $G = 0.8 \times 10^{11} \text{ N/m}^2$ and $\rho = 7800 \text{ kg/m}^3$. [16]

P.T.O.

- Q4)** An air compressor of mass 200 kg, with an unbalance of 0.01kg-m, is found to have large amplitude of vibration while running at 1200 rpm. Determine mass and the spring constant of the absorber to be added if the natural frequencies of the system are to be at least 20 percent from the impressed frequency. [16]
- Q5)** A rectangular pulse of height ' F_0 ' and duration ' t_0 ' as shown in Fig. No. 2 is applied to an undamped spring mass system. Find the response of the system and discuss its relation to the natural frequency. [18]

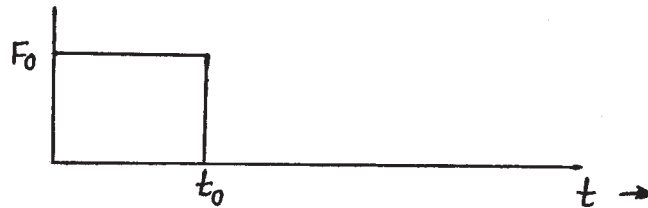


Fig. No-2

SECTION - II

- Q6)** a) What is experimental modal analysis? Explain how you will carry out the experimental modal analysis of a plate of uniform thickness. [8]
 b) Explain the different machine vibration monitoring techniques. [8]
- Q7)** a) Explain wide band and narrow band random vibrations. [6]
 b) What is Autocorrelation function and Spectral Density?
 Calculate the Autocorrelation function corresponding to the ideal white noise and to the unit step function. [10]
- Q8)** Using Duffing's equation explain Jump phenomenon for undamped and damped non-linear system. [16]
- Q9)** a) Derive governing equation of sound propagation. [10]
 b) Explain design of enclosure for shielding noise. [6]
- Q10)** Write the short notes of the following (Any Two): [18]
 a) Limit Cycle.
 b) Cross correlation function.
 c) Noise absorber.

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	$\delta(t)$	1
6	t	$\frac{1}{s^2}$
7	t^n	$\frac{n!}{s^{n+1}}$
8	$\sin \omega t$	$\frac{\omega}{s^2 + \omega^2}$
9	$\cos t$	$\frac{s}{s^2 + \omega^2}$
10	e^{-at}	$\frac{1}{s + a}$
11	$e^{-at} \sin \omega t$	$\frac{\omega}{(s + a)^2 + \omega^2}$
12	$e^{-at} \cos \omega t$	$\frac{s + a}{(s + a)^2 + \omega^2}$
13	$e^{-at} f(t)$	$F(s + a)$
14	$u(t - a)$	$\frac{e^{-as}}{s}$
15	$\delta(t - a)$	e^{-as}
16	$\begin{cases} 0 & \text{when } t < a \\ f(t - a) & \text{when } t > a \end{cases} = f(t - a) u(t - a)$	$e^{-as} F(s)$
17	$\frac{df(t)}{dt}$	$s F(s) - f(0)$
18	$\frac{d^2 f(t)}{dt^2}$	$s^2 F(s) - s f(0) - \frac{df(0)}{dt}$
19	$\int_0^t f(t) dt$	$\frac{F(s)}{s}$



Total No. of Questions : 10]

[Total No. of Pages : 4

P1526

[3665]-503

M.E. (Mechanical) (Design Engineering)

RELIABILITY ENGINEERING

(2008 Course) (Elective - III)

Time : 3 Hours]

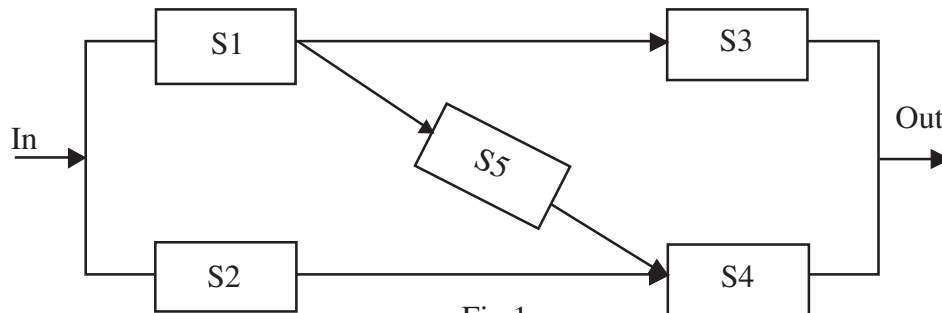
[Max. Marks : 100

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 non-programmable electronic calculator is allowed.
- 6) Assume suitable data, if necessary.

SECTION - I

- Q1) a)** Derive the expression to calculate the reliability for the system shown in Fig. 1. [12]



- b) Define Reliability. Write a note on 'Design for Reliability'. [6]

- Q2) a)** The early failure rate of a component is given by

$$z(t) = ae^{-bt}$$

Determine the probability of survival of the component from age T for a mission time 't' h, given that the component has survived up to age T.[8]

- b) A manufacturer of an electronic actuator buys his requirement of sensors from four different suppliers. On an average, firm F1 supplies 30%, F2 supplies 25%, F3 supplies 22%, F4 supplies 23% of the requirement. A quality test carried out on the sensors supplied by each firm reveals that:

P.T.O.

6% of the supplied from F1 are below standard.

8% of the supplied from F2 are below standard.

10% of the supplied from F3 are below standard.

12% of the supplied from F4 are below standard.

Whenever a substandard sensor is used, the actuator is found to give unsatisfactory performance. Each actuator uses a sensor supplied by F1 or F2 or F3 or F4. If, in a test, an actuator is found to give an unsatisfactory performance, what is the probability that the sensor in the actuator was supplied by E1? [8]

Q3) a) Explain the properties and applications of ‘Failure Function’ and ‘Reliability Function’. [8]

b) Time-to-failure distribution of the gearbox within an armoured vehicle can be modelled using Weibull distribution with scale parameter $\eta = 2400$ miles and shape parameter $\beta = 1.25$. Find the probability that gearbox will not fail during a mission time of 200 miles. Assuming that the age of the gearbox is 1500 miles. [8]

Q4) a) A system consists of four items, each of them is necessary to maintain the required function of the system. The time to failure distribution and their corresponding parameter values are given in Table 1. Find the reliability of the system for 500 and 750 hours of operation. [8]

Item	Time to failure distribution	Parameter values
Item 1	Exponential	$\lambda = 0.001$
Item 2	Weibull	$\eta = 1200$ hours $\beta = 3.2$
Item 3	Normal	$\mu = 800$ hours $\sigma = 350$
Item 4	Weibull	$\eta = 2000$ hours $\beta = 1.75$

Table 1 Time to failure distribution and their parameter of the items.

b) Define and explain following terms with the help of suitable example
i) Availability ii) Maintainability [8]

Q5) Write the short note on following (Any three): [18]

- a) Reliability measures.
- b) Forms of hazard function.
- c) Mean residual life.
- d) Redundancy.
- e) FEMA.

SECTION - II

- Q6) a)** A maintainability demonstration test is carried out on 20 parts and the accomplished repair times are shown in Table 2. If the target MTTR is 20 hours, check whether the system has achieved the target maintainability using 95% confidence level. [8]

24	12	6	8	20
40	17	9	12	4
10	30	26	32	19
18	32	14	10	26

Table 2

- b) What is meant by accelerated test in evaluating reliability? Explain any one method of evaluating reliability using accelerated test. [8]
- Q7) a)** The failure time of automobile brakes are observed to be 43500, 52000, 63500, 72000, 84500, 93500, 10100, 111500, 116000 and 123000 kilometers of operation. Plot the probability density, reliability, and the hazard functions of the failure time to brakes. [8]
- b) What is the purpose of a design and safety review technique? Explain the system safety analysis procedures. [10]
- Q8) a)** For an emergency operation theatre in a hospital, the power is obtained from the main city supply through a transformer connected in series. To ensure an uninterrupted supply, an auxiliary generator is also used with a suitable switch over. The probability of failure of the city supply is 0.01 and the transformer reliability is 0.996. The auxiliary power generator has a reliability of 0.99. Draw the block diagram for the system. Construct the fault tree and based on this calculate the reliability of the system. [8]
- b) Explain the Morkov Model. How it is applied in reliability analysis of a system having constant hazard rate? [8]
- Q9) a)** Using cut set approach, determine the equivalent RBD for minimal cut sets for the bridge network shown in fig.2. [8]

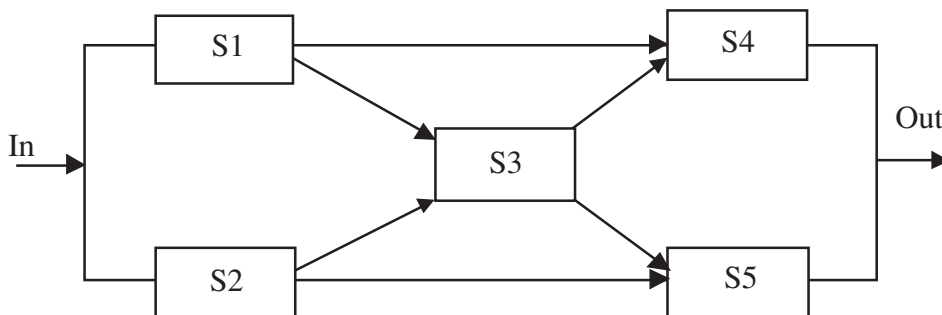


Fig.2

- b) Explain the cold, hot and warm standby redundant system. [8]

Q10) Write the short note on following (Any Three):

[18]

- a) Choice of distribution.
- b) Objectives of reliability testing.
- c) Methods of solving complex systems.
- d) Optimal replacement strategy.
- e) Reliability based optimum design.



Total No. of Questions : 7]

[Total No. of Pages : 4

P1527

[3665]-504

M.E. (Mechanical) (Design Engineering)
ENGINEERING FRACTURE MECHANICS
(2008 Course) (Elective - III)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates :

- 1) Attempt not more than 5 questions of which at least 2 questions must be 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.*
- 7) All questions carry equal marks.*

SECTION - I

- Q1)** a) Write about fatigue crack growth under varying loading. How do you explain endurance limit where the material has almost infinite life? [8]
b) What is sustained load fracture? [5]
c) Discuss crack growth rate for various ranges of stress intensity factor variation. For which region is 'Paris' equation considered valid. [7]
- Q2)** a) Explain Griffith's energy balance approach to identify catastrophic failure of a material. [7]
b) What does one understand by the term crack resistance? [5]
c) Define standard methods for evaluating fracture toughness of materials. What are the recommended proportions for the compact tension specimen? How does one ensure that the initial crack is sharp of proper length and is at desired location? [8]
- Q3)** a) For a large biaxially loaded plate, with a crack of width '2a', oriented along 'x' - axis show that the stress components at the tip of the sharp crack are given by –

$$\sigma_x = \frac{\sigma\sqrt{\pi a}}{\sqrt{2\pi r}} \cos \frac{\theta}{2} \left(1 - \sin \frac{\theta}{2} \cdot \sin \frac{3\theta}{2} \right)$$

P.T.O.

$$\sigma_y = \frac{\sigma \sqrt{\pi a}}{\sqrt{2 \pi r}} \cos \frac{\theta}{2} \left(1 + \sin \frac{\theta}{2} \cdot \sin \frac{3\theta}{2} \right)$$

where, r & θ are polar co-ordinates with origin at the crack tip. ' σ ' is the stress at ∞ along x & y edges.

Hence explain significance of stress intensity factor. [10]

b) Discuss the stress distribution around the tip of a crack in engineering materials. Hence explain the following terms:

i) Notional crack tip.

ii) Crack tip opening displacement.

iii) Fracture toughness.

iv) Crack closure.

v) Crack arresters. [10]

SECTION - II

Q4) a) Compare & contrast the basic philosophy of failure prediction for yielding type failure with failure by rapid crack extension. [6]

b) State the plastic zone analysis assumptions as per Irwin's theory. [4]

c) Prove that the effective crack length (a_{eff}) is given by following equation—

$$a_{\text{eff}} = a + \frac{1}{2\pi} \left(\frac{k_I}{\sigma_y} \right)^2$$

where, a = actual half length of crack.

K_I = stress intensity factor.

σ_y = yield strength. [10]

Q5) A component is subjected to varying loading. The load varies so that the maximum load causes a stress of $\left(\frac{\sigma_y}{2} \right)$ of the material where as at minimum load the stress is zero. The material used has

$$\sigma_y = 830 \text{ MPa and } K_{IC} = 120 \text{ MPa } \sqrt{m}.$$

A crack of 1 mm can be detected.

Find the cycles of life available after detection of the crack. How often need the component be tested so that a reasonable life is still available to plan for replacement of the component?

Use following relations –

$$K_I = 1.12 \sigma \sqrt{\pi a} \text{ and}$$

$$\frac{da}{dn} = 9.7 \times 10^{-13} (\Delta K_I)^{3.8}. \quad [20]$$

Q6) a) Explain the principle of leak before bursting in the design of a pressure vessel. Discuss occurrence of a fast running crack along the pipe length. What provisions could prevent such an occurrence? Will it make any difference to the phenomena, whether the fluid flowing is a gas or liquid? [8]

b) A pipe, 0.3m in diameter, is to carry a fluid at a pressure of 20 MPa. The pipe external surface is likely to contain semi-ellipsoidal defects with a semilongitudinal axis of 4mm and a radial depth of 2mm. The defect might grow keeping the proportions of defect identical.

Following materials are to be considered for the pipe construction.

Material	yield point, MPa	K_{IC}
Steel (1)	1525	58
Steel (2)	750	120

Relevant expressions for stress intensity factors are

$$\text{Radial failure, } K_r = 1.12 \frac{pR}{h} (\pi a)^{1/2}$$

$$\text{Axial failure } K_a = \frac{pR}{h} \left[\pi c \left(1 + 1.61 \frac{c^2}{Rh} \right) \right]^{1/2}$$

Where, p = Pressure, MPa

R = Radius of Pipe, m

h = pipe thickness, m

a = depth - radial of defect, m

$2C$ = axial length of defect, m

Recommend choice of material and pipe thickness. [12]

Q7) Write in short about -

[20]

- a) Fatigue damage evaluation under random loading cycles.
- b) Mechanisms of fracture.
- c) Experimental evaluation of sustained load fracture.
- d) Use of clip gauges in K_{IC} tests.
- e) Plain strain and stress condition in K_{IC} testing.



Total No. of Questions : 10]

[Total No. of Pages : 3

P1625

[3665]-512

M.E. (Mechanical) (Mechatronics)

DIGITAL SIGNAL PROCESSING

(2008 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) 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) For a LTI system input signal $x(n) = n + 1$ for $0 \leq n \leq 2$, and impulse signal $h(n) = a^n u(n)$ for all n . Determine the output response of the system. [8]

b) Consider the analog signal

$$x_a(t) = 3 \cos 100\pi t$$

- i) Determine the minimum sampling rate required to avoid aliasing.
- ii) Suppose that the signal is sampled at the rate $F_s = 200$ Hz. What is the discrete time signal obtained after sampling?
- iii) Suppose that the signal is sampled at the rate $F_s = 75$ Hz. What is the discrete - time signal obtained after sampling? [8]

Q2) a) With suitable examples briefly explain the following systems.

- i) Linear & Non Linear.
- ii) Causal and non causal.
- iii) Static & Dynamic.
- iv) Time variant and time invariant. [8]

b) What is signal. Give the classification of the signals. Explain it in brief.[6]

c) Draw and explain in brief the basic butterfly structure for DIT - FFT.[4]

P.T.O.

Q3) a) Determine the 'Z' transform showing R.O.C. for the following finite duration signals.

i) $x(n) = \delta(n-2)$

ii) $x(n) = \delta(n+2)$

iii) $x(n) = \{ \underset{\uparrow}{1}, 2, 3, 4 \}$

iv) $x(n) = u(n)$. [8]

b) State and prove any three properties of DFT. [8]

Q4) a) Using Long division method, determine inverse 'Z' transform of

$$X(z) = \frac{1 + 2z^{-1}}{1 - 2z^{-1} + z^{-2}}$$

if i) $x(n)$ is causal ii) $x(n)$ is anti causal. [8]

b) Draw a basic block diagram of any DSP system. Explain each block in brief. [4]

c) Explain the properties of Linear Convolution. [4]

Q5) Write short notes on: [16]

a) Application DSP in mechatronics.

b) FFT in modal analysis.

c) Filter realization techniques.

d) Comparison of Harvard and modified Harvard Architecture.

SECTION - II

Q6) a) Compute the 4-point DFT of the following signal

$$x(n) = \cos \frac{\pi n}{2} \quad 0 \leq n \leq 3. \quad [8]$$

b) Explain in details the classification of filters with the help of frequency response. [8]

Q7) a) Perform the circular - convolution of the following sequences.

$$x_1(n) = \{ \underset{\uparrow}{2}, 3, 5, 6 \}$$

$$x_2(n) = \{ \underset{\uparrow}{1}, 2, 4, 3 \} \quad [8]$$

b) Determine the z transform of the signal [8]

$$x(n) = n^2 u(n) \quad \text{for all } n.$$

- Q8)** a) Give the comparison between FIR and IIR filters. [6]
 b) Realize the following difference equation using DF - I and DF - II, after obtaining transfer function.

$$y(n) - \frac{1}{3}y(n-1) = x(n) + \frac{1}{2}x(n-1) + \frac{1}{4}x(n-2) \quad [10]$$

- Q9)** a) Explain with help of block diagram, the architecture of any one DSP chip. [10]
 b) A discrete time signal $x(n]$ is defined as [6]

$$\begin{aligned} x(n) &= 2 + \frac{|n|}{3} && \text{for } -3 \leq n \leq 1 \\ &= 1 && \text{for } 2 \leq n \leq 3 \\ &= 0 && \text{elsewhere} \end{aligned}$$

Determine the values of signal and sketch the following.

- i) $y(n) = x(n)$
 ii) $y(n) = x(n-1)$
 iii) $y(n) = x(n+1).$

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

- a) Windowing Techniques of FIR filter.
 b) Use of DFT for vibration analysis.
 c) Dual Tone Multiple frequency (DTMF).
 d) Spectral analysis.



Total No. of Questions : 8]
P1626

[Total No. of Pages : 3

[3665]-513
M.E. (Mechatronics)
CONTROL SYSTEMS
(502805) (2008 Course)

Time : 3 Hours]

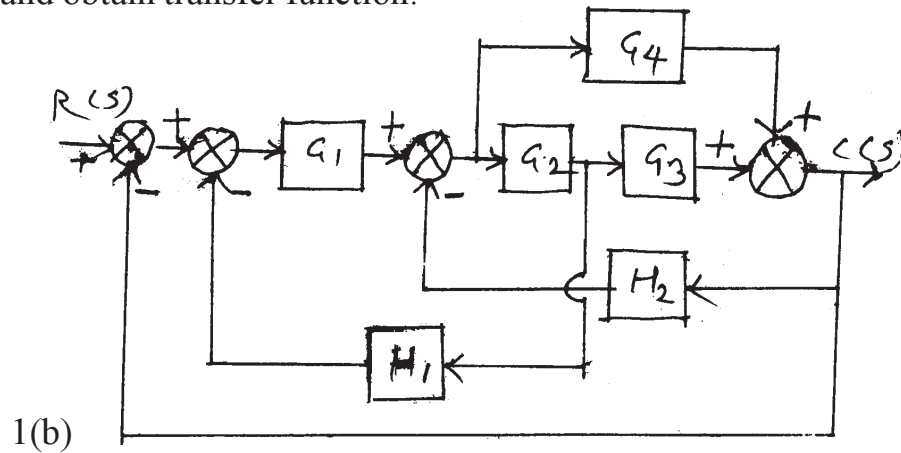
[Max. Marks : 100

Instructions :

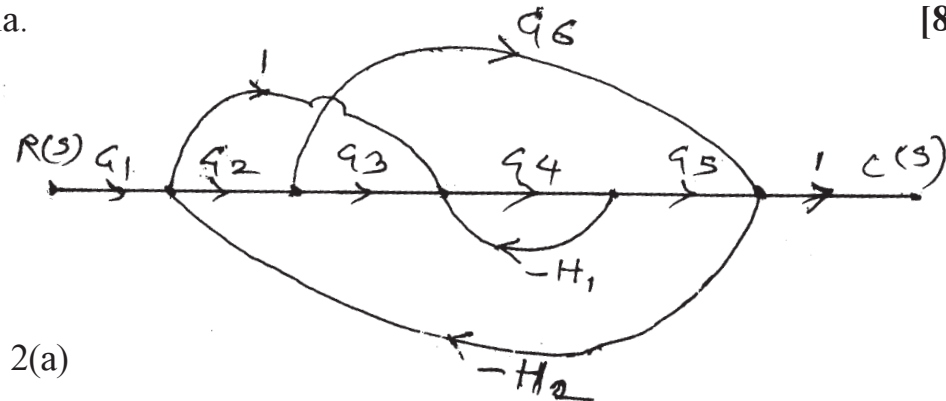
- 1) Answer any three questions from each section.
- 2) Answers to the two sections should be written in separate answer books.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Figures to the right indicate full marks.
- 5) Assume suitable data, whenever necessary.

SECTION - I

- Q1) a)** Distinguish between the following : [8]
- i) Feedback and feed forward control systems.
 - ii) Linear and non linear control systems.
- b)** Reduce the following block diagram of the system shown in following figure and obtain transfer function. [10]



- Q2) a)** Obtain the closed loop transfer function $C(S)/R(S)$ using Mason's gain formula. [8]



P.T.O.

- b) Explain standard test signals and state clearly the difference between steady state and transient response of a system. [8]

Q3) a) A unity feedback system has forward path transfer function. [10]

$$G(s) = \frac{(s+2)}{s(s+1)}.$$

Determine rise time, peak time, settling time (2% Tolerance), and maximum overshoot, Delay time, output response for unit step input.

- b) Using Routh Hurwitz stability criterion, find the stability of the following system whose characteristic equation given is [6]

$$S^6 + S^5 + 3S^4 + 3S^3 + 2S^2 + S + 1 = 0.$$

How many roots of the system lie in the RHS of S plane?

Q4) a) Write short notes on : [8]

- i) Adaptive control
- ii) Inferential control.

- b) What is meant by controllability and observability? Explain. [8]

SECTION - II

Q5) a) The open loop transfer function of a unity feedback control system is

$$G(s)H(s) = \frac{K(s+4)}{(s+2)(s+3)}$$

Sketch the root locus of the system, comment on stability. [12]

- b) How time domain and frequency domain can be correlated? [4]

Q6) a) A unity feedback control system has [10]

$$G(s)H(s) = \frac{40(s+5)}{s(s+10)(s+2)}$$

Sketch Bode plot. Determine from it.

- i) Gain crossover frequency.
 - ii) Phase crossover frequency.
 - iii) Gain margin.
 - iv) Phase margin.
 - v) Stability of system.
- b) Derive the expression for the response of first order system with unit ramp input. Find the steady state error e_{ss} . [8]

Q7) a) For a certain control system [8]

$$G(S)H(S) = \frac{k}{(S+2)(S^2+4)}$$

Sketch the Nyquist plot. And Comment on stability.

b) Explain the following terms. [8]

- i) State
- ii) State variable
- iii) State space
- iv) State vector.

Q8) a) What are the disadvantages of Proportional, Integral, Derivative control modes. How they can be overcome in composite control modes. [8]

b) Sketch and comment on the outputs of P, PI, PD and PID controllers for a unit step input. [8]



Total No. of Questions : 12]

[Total No. of Pages : 2

P1693

[3665]-523

M.E. (Control Electrical)

ADVANCED MATH. TECH. FOR CONTROL SYSTEM

(503108)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates :

- 1) Attempt Q. 1 or 2, 3 or 4, 5 or 6, 7 or 8, 9 or 10 & 11 or 12.
- 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 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 what do you understand by Euclidean space. [6]
b) Write the concept of Local and global extrema. [6]
c) Explain the method of Lagrange multipliers. [5]

OR

- Q2)** a) Show that the sum of two convex functions is a convex function. [8]
b) Explain the concept of constrained extrema. [9]

- Q3)** a) Explain the method of multivariable optimization with inequality constraints. [9]
b) Write the concept of convex programming problem. [8]

OR

- Q4)** a) Write the steepest descent method of optimization of a problem. [9]
b) Explain & write Newton's method of optimization the problem. [8]

- Q5)** a) Write the standard form of linear programming problem? [8]
b) Consider the problem of maximizing $f = 2x_1 - x_2 + 5x_3$ subject to the constraints. $x_1 - 2x_2 + x_3 \leq 8$, $3x_1 - 2x_2 \geq -18$ & $2x_1 + x_2 - 2x_3 \leq 4$. State this linear programming problem in standard form. [8]

OR

P.T.O.

Q6) Minimize $f = 2x_1 + 3x_2 + 2x_3 - x_4 + x_5$

subject to the constraints

$$3x_1 - 3x_2 + 4x_3 + 2x_4 - x_5 = 0$$

$$x_1 + x_2 + x_3 + 3x_4 + x_5 = 2$$

and $x_i \geq 0, i = 1 \text{ to } 5$

[16]

SECTION - II

Q7) a) Explain what do you understand by unimodal function. [6]

b) Explain what do you understand by fibonacci method. Write the method of obtaining optimum point. [12]

OR

Q8) Find the maxima of $f = x(1.5 - x)$ in the interval (0.0 to 1.00) to within 10% of exact value by Dichotomous search method. [18]

Q9) Explain the method of finding unconstrained geometric programming problem from differential calculus point of view. Discuss the degree of difficulty & sufficiency condition. [16]

OR

Q10) Explain the concept of suboptimization and principle of optimality used in multistage decision problems. [16]

Q11)a) Explain the concept of integer linear programming using graphical representation. [8]

b) What do you understand by concept of a cutting plane using Gomory's Cutting Plane method. [8]

OR

Q12)a) Define the probability. [4]

b) Explain what do you understand by stochastic Non-linear programming. [12]



Total No. of Questions : 12]

[Total No. of Pages : 2

P1697

[3665]-532

M.E. (Electrical) (Control System)

IDENTIFICATION TECH. & ADAPTIVE CONTROL

(503109) (2008 Course)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates :

- 1) Attempt Q. 1 or 2, 3 or 4, 5 or 6, 7 or 8, 9 or 10, & 11 or 12.***
- 2) Neat diagrams must be drawn wherever necessary.***
- 3) Figures to the right indicate full marks.***
- 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.***

SECTION - I

Q1) What are different Identification Techniques.

Write the effect of system, model structure, experimental condition on identification experiment. **[16]**

OR

Q2) Consider the model structure given by differential equation.

$$y(t) + a y(t - 1) = b u(t - 1) + \epsilon(t) \quad \text{[16]}$$

Q3) What is parametric method of identification technique. Write the least square method in detail. **[16]**

OR

Q4) Explain the Non Parametric method of identification method.

Write the Transient and Impulsive analysis. **[16]**

Q5) What do you understand by prediction error method. Write in detail.

Write the limitations and modification. **[18]**

OR

Q6) What is Instrumental variable method used for the estimation of system dynamics. **[18]**

P.T.O.

SECTION - II

Q7) Explain what do you understand by adaptive control.

Write in detail the application of adaptive control. [18]

OR

Q8) a) Explain self tuning adaptive scheme. [9]

b) Explain in detail about Robust high gain control. [9]

Q9) What is adaptive control system? What are different ideas used while designing the gain scheduling controller. [16]

OR

Q10) What do you understand by Least Square model and regression models. Discuss how to estimate parameters in dynamical system. [16]

Q11) Construct the algorithm for adjusting parameters in MRAS using Liapunov's stability theory. [16]

OR

Q12) a) State and explain MIT rule. [8]

b) Explain with neat diagram Model Reference Adaptive Scheme (MRAS). [8]



Total No. of Questions : 8]

[Total No. of Pages : 3

P1632

[3665]-575

M.E. (VLSI & Embedded System)

ASIC DESIGN AND MODELLING

(2008 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) Assume suitable data, if necessary.

SECTION - I

- Q1)** a) Draw and explain in detail the flow chart relating to ASIC design Flow? [12]
- b) Draw and explain simplified Fabrication Process of an IC chip layout?[6]
- Q2)** a) What are different types of Simulation? Explain in detail Static Timing Analysis and how it differs from circuit and logic simulation. [12]
- b) How do you optimize Skew / Insertion delays in Clock tree synthesis?[6]
- Q3)** a) Explain Step by Step process to be followed in Design for Test flow in ASIC? [6]
- b) find a minimal Test Set for the circuit to Show the coverage of various Stuck at faults for the circuit shown in Fig. 1. [10]

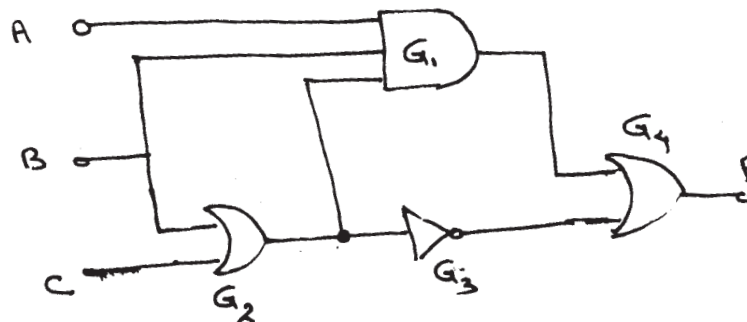


Fig. 1

P.T.O.

Q4) a) List the goals and objectives for each of the ASIC physical design Steps? [8]

b) For the following connectivity matrix shown below: [8]

i) Draw the network graph and find the Cut weight.

ii) Improve the partition using K - L Algorithm.

C =

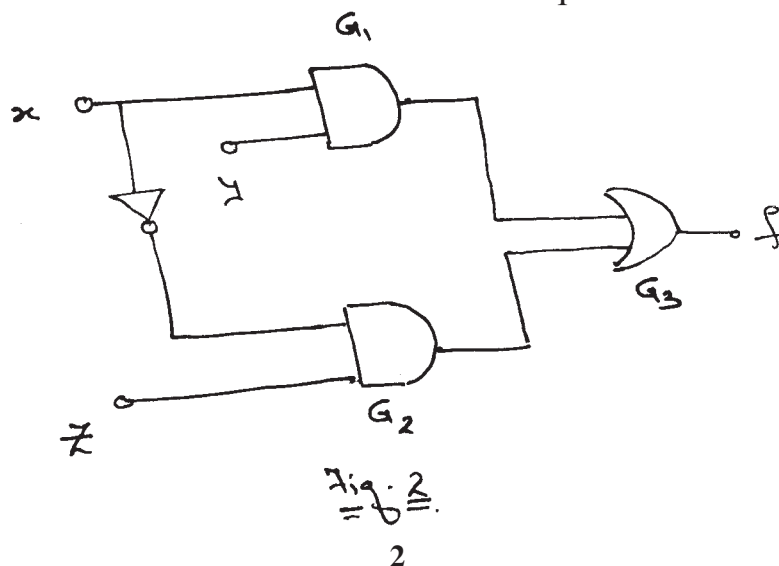
0	0	0	0	0	0	1	0	0	0
0	0	0	0	0	1	0	1	0	0
0	0	0	1	1	0	0	0	0	0
0	0	1	0	0	0	0	1	0	1
0	0	1	0	0	0	0	0	0	0
0	1	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	1	0
0	1	0	1	0	0	0	0	0	1
0	0	0	0	0	0	1	0	0	1
0	0	0	0	0	0	0	1	1	0

SECTION - II

Q5) a) Explain different modeling technique used in VHDL and Write a VHDL Code for Sequence detector to detect sequence 10 from the pattern 00 11 10 01 with Moore state machine model. [12]

b) Compare Full Custom and Semi Custom ASIC with the Schematic. [6]

Q6) a) Define Path Sensitization technique. For the circuit shown in Fig. 2 derive a test based on the Path sensitised technique. [8]



- b) Explain in detail the Built In Self Test architecture in a sequential circuit. [8]

- Q7) a) What is the difference between Constructive and Iterative placement methods? Explain any one Iterative algorithm in detail with example. [8]
- b) Explain the term Back Annotation. Neglect the pull down resistance to calculate Elmore constants at node B and Node C using Elmore delay model for the circuit shown in Fig. 3. [10]

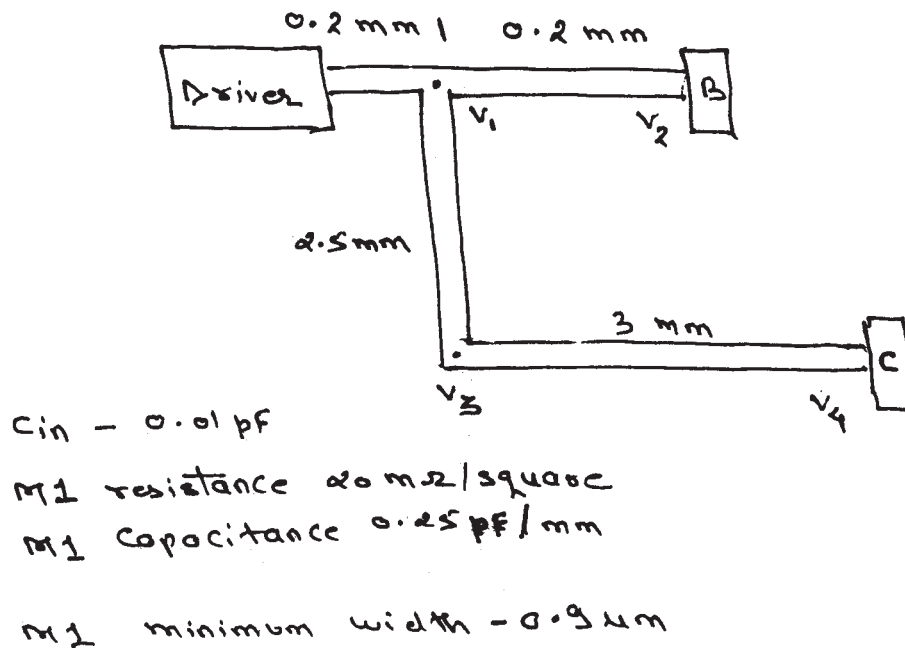


Fig. 3

- Q8) Write Short notes on (Any Two): [16]
- Formal Verification.
 - Functional Verification.
 - Physical Verification.



Total No. of Questions : 8]

[Total No. of Pages : 2

P1659

[3665]-590

M.E. (Electronics) (Digital System)

MICRO ELECTRONICS

(2008 Course)

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 electronic pocket calculator is allowed.*
- 5) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) Design CMOS logic gates for following functions: [8]

i) $F = \overline{((A \cdot B) + (C \cdot D))}$

ii) $F = \overline{((A + B + C) \cdot D)}$

b) Explain CMOS inverter and its transfer characteristics. [8]

Q2) a) Explain application of transmission gate and its application. [8]

b) Write VHDL code for D. Flip Flop with asynchronous set and reset input. [8]

Q3) a) What is the cause of static dissipation in CMOS? Explain in detail. [8]

b) What is Domino logic? Explain its operation. [8]

Q4) Write short notes on: [18]

- a) Dynamic power dissipation.
- b) Synthesizable VHDL constructs.
- c) Ultra fast VLSI circuits and system.

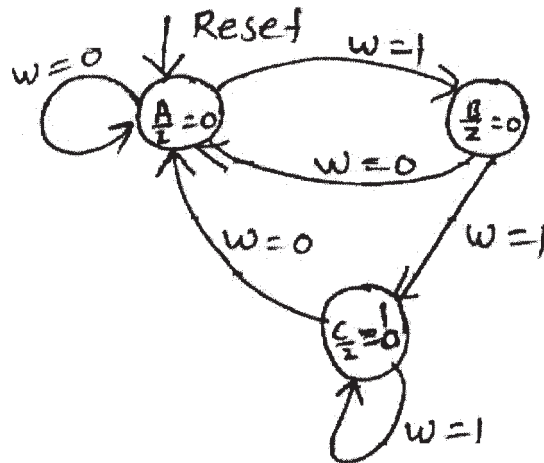
SECTION - II

Q5) a) Explain MOS implementation of a current sink along with its IV characteristics. [6]

P.T.O.

b) Write VHDL code for following FSM.

[10]



Q6) a) Explain various routing technique in detail. [10]

b) What is clock skew? What is the main task of clock distribution? Explain types of physical clocking networks. [6]

Q7) a) Draw transistor schematic of inverter and it's respective stick diagram. Also draw symbols for wires used on various layouts. [10]

b) Which are the various CMOS parasitics? [6]

Q8) Write short notes on: [18]

a) Subsystem Design Principals.

b) VHDL data objects.

c) Process statement.



Total No. of Questions : 10]

[Total No. of Pages : 2

P1633

[3665]-595

M.E. (Electronics) (DS)

WIRELESS & MOBILE TECHNOLOGIES

(504197) (2008 Pattern)

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) Your answers will be valued as a whole.*
- 7) Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) What are the main problems of signal propagation? Why do radio waves not always follow a straight line? Why is reflection both useful and harmful? [8]
- b) What are the means to mitigate narrowband interference? What is the complexity of the different solutions? [8]
- Q2)** a) Name the requirements for a mobile IP and justify them. Does mobile IP fulfill them all? [8]
- b) What are general problems of mobile IP regarding security and support of quality of service? [8]
- Q3)** a) How does dynamic source routing handle routing? What is the motivation behind dynamic source routing compared to other routing algorithms from fixed networks? [9]
- b) Think of ad - hoc networks with fast moving nodes, e.g; cars in a city. What problems arise even for the routing algorithms adapted to ad-hoc networks? What is the situation of highways? [8]
- Q4)** a) Name the main elements of the GSM system architecture and describe their functions. What are the advantages of specifying not only the radio interface but also all internal interfaces of the GSM system? [9]

P.T.O.

- b) Assume all stations can hear all other stations. One station wants to transmit and senses the carrier idle. Why can a Collision still occur after the start of transmission. Explain. [8]

- Q5)** a) With a focus on security, what are the problems of WLANS? What level of security can WLANS provide, what is needed additionally and how far do the standards go? [9]
- b) Why is the PHY Layer in IEEE 802.11 subdivided? What about HiperLAN2 and Bluetooth? [8]

SECTION - II

- Q6)** a) What is the basic purpose of DHCP ? Name the entities of DHCP. [8]
- b) How can DHCP be used for mobility and support of mobile IP? [8]
- Q7)** a) How and why does I - TCP isolate problems on the wireless link? What are the main drawbacks of this solution? [8]
- b) Show the interaction of mobile IP with standard TCP. Draw the packet flow from a fixed host to a mobile host via a foreign agent. [9]
- Q8)** Why does WAP defines its own security level and does not rely on the security provided by the mobile phone network? What problems does the WAP security layer cause? Think of end-to-end security. [17]
- Q9)** Discuss in detail about the request - to - send / clear - to - send (RTS / CTS) mechanism. [16]
- Q10)** What is the difference between band - splitting and underlay - overlay techniques for increasing the capacity of cellular networks? What is the effectiveness of each in improving the capacity? How do they differ from one another? [17]



Total No. of Questions : 8]

[Total No. of Pages : 2

P1742

[3665]-604

M.E. (Electronics - Digital System)

EMBEDDED VIDEO PROCESSING

(2008 Course) (Elective - III)

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) *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) Write an expression of 2-D DCT and explain every term of the expression. What are the DC & AC coefficients? Justify – Whether a same C/MATLAB function can be used to evaluate forward DCT & Inverse DCT. [8]
- b) Discuss the various preprocessing operations in MPEG-1 encoder to accept video scene from NTSC/PAL/SECAM based video camera. [8]
- Q2)** a) Explain the various factors which can decide the design of Q-matrix suggested in JPEG standard. Write any typical Q-matrix and justify whether this step invite losses in overall compression scheme. [10]
- b) Estimate computational complexity of full search method of motion compensation in terms of operations per second for 'MAD' criterion. How does 'PDC' measure save the computations? [8]
- Q3)** a) Define Rate-Distortion function and using the same compare the performance of motion compensation based and intra-frame coding based video coding techniques. [8]
- b) Compare
- i) MPEG with H.261
 - ii) JPEG with JPEG-2000. [8]
- Q4)** a) What is quantization? Explain the different types of Quantizer. [8]

P.T.O.

- b) Explain the importance of following parameters wrt to design for optimum QoS.
- i) Bit rate
 - ii) Error resilience
 - iii) Delay
- [8]

SECTION - II

- Q5)** a) Explain in detail the technical specifications of hardware video CODEC. [8]
b) State and explain briefly the design and non-design goals of H.261. [8]

- Q6)** a) Explain the procedure of testing the different blocks of hardware CODEC. [8]
b) State the objectives of MPEG-4 standard. Using abstract model explain the concept of audio/visual objects and their spatio-temporal relationships to generate encoded bit streams. [10]

- Q7)** a) Explain how the camera noise is filtered by the pre-processing process. [5]
b) Explain the use of De-blocking and De-ringing filters used in post-filtering process. [5]
c) Explain the important factors to be considered while transmitting the coded video signal. [6]

- Q8)** Explain in detail : [16]
- a) Entropy based coding
 - b) Objective quality measurement
 - c) Features of ITU-R BT 500-10
 - d) Features of embedded and media processors.

□□□

Total No. of Questions : 8]

[Total No. of Pages : 2

P1690

[3665]-605

**M.E. (Electronics) Digital System
RECONFIGURABLE COMPUTING
(504205) (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) Use of electronic pocket calculator is allowed.*
- 5) Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) What do you mean by coarse and fine grained architecture? What are the expected characteristics of RD? [8]
- b) What are the typical issues and constraints while development of general purpose reconfigurable device? [8]
- Q2)** a) Compare the architectures of FPGA, General purpose Processor, and ASIC pertaining to functional capacity, functional diversity and data density. [8]
- b) List the typical characteristics and merits of multicontext FPGA. [8]
- Q3)** a) Give the mathematical model to compute area needed for cross bar and memory. Assume wire pitch of 8λ . [8]
- b) What are the limitations of conventional interconnects being used in FPGAs? [8]
- Q4)** Write short notes on any three. [18]
- a) Rent rule based hierarchical interconnect model.
 - b) Network utilization efficiency.
 - c) Weak upper bound and interconnects.
 - d) Overheads in design.

P.T.O.

SECTION - II

- Q5)** a) State the relationship between efficiency and task path length, architectural contexts. Give suitable example. [8]
b) List the research challenges in software development for reconfigurable device. [8]
- Q6)** What are the concepts behind time switched FPGA and dynamically programmable gate array? Explore the architecture of any one of them in detail. [16]
- Q7)** a) “Rich flexible interconnects of FPGA is good resource as well as headache to designer”. Comment on this statement. Give suitable example. [8]
b) What is peak performance density? Explain with the help of determining parameters. [8]
- Q8)** Write short notes on any three. [18]
a) RP space area model.
b) Contexts and their effects.
c) Instruction growth versus interconnect growth.
d) Partial and full reconfiguration with examples.



Total No. of Questions : 8]

[Total No. of Pages : 2

P1464

[3665]-607

M.E. (Electronics) Digital System
DIGITAL SIGNAL COMPRESSION
(Part - II) (Elective - IV) (2008 Revised Course)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Solve any three questions from each section.*
- 2) Draw diagrams wherever required.*
- 3) Use suitable data if required.*
- 4) Figures to the right indicate full marks.*
- 5) Use of scientific calculator is allowed.*

SECTION - I

- Q1)** a) What is entropy? Explain Huffman coding with a simple example. [8]
b) Explain Linear predictive coding for speech. How to select the order of the predictor? [9]
- Q2)** a) What is companding? What is the advantage of logarithmic curve for companding? Explain A-law and μ law quantizers. [9]
b) Explain subband coding for speech signal. How will you select the sampling frequency for a band? [8]
- Q3)** a) Explain rate-distorsion theory. How is it utilized for coding? [8]
b) What are methods for music compression? Explain MIDI. [8]
- Q4)** a) Explain pdf optimized adaptive quantizers. [8]
b) Explain characteristics of audio signals? Why non-uniform quantizers are useful for audio signals. [8]

P.T.O.

SECTION - II

- Q5)** a) Explain the use of wavelets for image coding. Explain properties of a mother wavelet. [8]
b) Compare subband coding with transform coding. How will you select a transform. [9]
- Q6)** a) What is zero tree? Explain image coding using EZW charts. [8]
b) Describe any one Lossy compression technique and any one lossless compression technique? How are the applications? [9]
- Q7)** a) Explain basics of Video compression techniques. [8]
b) What is streaming Video? How is it achieved? [8]
- Q8)** a) Explain any one motion estimation algorithm. [8]
b) Describe the performance measures for any compression technique. Compare any two compression techniques for speech signals. [8]



Total No. of Questions : 8]

[Total No. of Pages : 2

P1472

[3665]-619

M.E. (Production)

MATERIAL TECHNOLOGY

(2008 Pattern)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates :

- 1) Answer any 3 questions from each section.***
- 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.***

SECTION - I

- Q1)*** a) Explain the various parameters influencing recrystallisation temperature. [6]
- b) What are the various factors which cause brittle fracture in otherwise ductile material? Explain them in detail. [6]
- c) What is a perfect crystal? Why are they strong? [4]
- Q2)*** a) State & explain Griffith's theory of brittle fracture & show that the stress required to propagate a crack in a brittle material is a function of size of microcrack. [8]
- b) Why solid solutions are harder than the pure metals constituting the solid solution? On what factors hardening depends? Explain these factors. [6]
- c) Which properties are of great concern while selecting material for high temperature applications? [4]
- Q3)*** a) Explain various stages of fatigue failure. Also explain Paris law. [6]
- b) Explain super plasticity & Homologus temperature. [4]
- c) With suitable example, discuss Age Hardening. [6]

P.T.O.

- Q4)** a) How mechanical failures can be prevented? [6]
b) Recommend suitable material for the following applications. Suggest heat treatment also, if required. Justify choice. (Any 5).
Gears, Crank shaft, Lathe bed, Milling cutter, Cylinder block for Diesel engine, Dental cap, Reinforcement bars used for RCC. [10]

SECTION - II

- Q5)** a) Explain with typical composition. What is Managing Steel. Also mention it's typical properties, strengthening mechanism used & atleast two applications. [6]
b) What are shape memory alloys? Discuss with typical applications. [5]
c) What is Metallic glass? How it is produced? [5]
- Q6)** a) With atleast 2 examples, explain why ceramics can be candidate materials for structural applications. [4]
b) What is cross - Linking of polymers? [4]
c) What is HSLA & Dual phase steel? [8]
- Q7)** a) What is Aspect ratio? Explain the effects of orientation of fibers on Tensile strength of FRP? [6]
b) How carbon fibers are produced? Explain applications of C - C composite. [6]
c) Derive the formula to calculate Modulus of composite which is fiber reinforced.
Boron fibers, $E_f = 380$ GPa, are made into a unidirectional composite with an aluminium matrix, $E_m = 60$ GPa. What is the modulus parallel to the fibers for 10 & 60%? [6]
- Q8)** Write short notes on (Any 4): [16]
a) Alclad.
b) Prevention of Fatigue failure.
c) Dislocations.
d) Cubic Boron Nitride.
e) MMC.
f) Business issues involved in Material selection.



Total No. of Questions : 12]

[Total No. of Pages : 2

P1727

[3665]-627

**M.E. (Production Engg.)
RESEARCH METHODOLOGIES
(2008 Course) (Elective - IV)**

Time : 3 Hours]

[Max. Marks : 100

Instructions :

- 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 non-programmable electronic calculators is allowed.*
- 6) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) What are the various research methods? Explain in brief experimental research. [8]
b) Explain the criteria for good research. [8]

OR

- Q2)** a) Explain research approaches in experimentation. [8]
b) Explain variation application fields of researches. [8]
- Q3)** a) What is need of research design? Explain in brief. [10]
b) What are the basic principles of experimental design? [6]

OR

- Q4)** a) Explain factorial design of experiment. [8]
b) What are the factors of good design? [8]
- Q5)** a) What are the types of data to be collected for research? Explain in brief. [10]
b) What are the methods for data collection? Explain any two. [8]

OR

- Q6)** a) Explain devices used in data collection in research methods. [10]
b) Describe in short Pilot study and pretest of tools. [8]

P.T.O.

SECTION - II

- Q7)** a) Why statistical methods are being used for data analysis? [8]
b) What are the measures of central tendency? Explain in short. [8]

OR

- Q8)** a) What are sampling distributions present in data analysis? [8]
b) Explain in Brief (i) Chi-square test, (ii) Analysis of variance. [8]

- Q9)** a) Explain applications of decision making techniques. [10]
b) Explain TOPSIS method of decision making. [8]

OR

- Q10)** a) Explain simulated annealing method of analysis. [8]
b) Explain in short (i) Genetic algorithm, (ii) Data Envelope Analysis (DEA) [10]

Q11) Explain the techniques of interpretation and precautions in interpretation. [16]

OR

Q12) Explain different steps in report writing. [16]

□□□

Total No. of Questions : 8]

[Total No. of Pages : 2

P1557

[3665]-631

M.E. (Computer)

EMERGING TRENDS IN COMPUTER ARCHITECTURE

(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) With the help of suitable example demonstrate the concept of Instruction Speculation and Branch Predication with respect to EPIC Architecture. [8]
- b) How cache coherence problem is solved by directory based protocol in CC - NUMA Architecture? [8]
- Q2)** a) With the help of neat diagram. Explain concept of Reflective memory. How it can be used for efficient communication? [8]
- b) What is a Cluster? Explain the various Issues in Cluster Design. [8]
- Q3)** a) With suitable diagram explain differences between SUPERSCALAR, SUPERPIPELINED, SUPERSCALAR SUPERPIPELINED Architectures. [8]
- b) Write down details of IA - 64 Instruction format. [6]
- c) Explain in brief Fiber Channel Interconnection Topologies. [4]
- Q4)** Write Short notes on: [16]
- a) Cluster Applications.
 - b) Salient features of IBM Power IV.
 - c) LogP Communication Model.

P.T.O.

SECTION - II

- Q5)** a) Compare SATA with SAS with respect to various parameters. [8]
b) Discuss features of Myrinet Gbps packet switched network. [8]
- Q6)** a) Discuss following with respect to ATM Technology. [8]
i) Cell Format.
ii) Cell switch design.
iii) N/W interfaces.
b) What grid is Computing? What are Benefits of grid computing? Explain various software components associated with Grid Computing. [10]
- Q7)** a) What are the differences between Shared Media Networks and Switched Networks? In each network class, Mention TWO example network topologies, and explain their advantages and disadvantages. [8]
b) Discuss various Thread Synchronization Mechanisms. [8]
- Q8)** Write Short notes on: [16]
a) MPI - A Standard Message passing Interface.
b) Network Attached Storage (NAS).
c) Compare CISC WITH RISC Architectures.



Total No. of Questions : 8]

[Total No. of Pages : 2

P1559

[3665]-633

M.E. (Computer Engg.)

ADVANCED SOFTWARE ENGINEERING

(510104) (2008 Course) (Elective - 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.*

SECTION - I

- Q1)** a) What are the phases of System Engineering Life Cycle? What is Software Process? What is Software Process Model? What are the attributes of good Software? [8]
- b) What is the difference between Waterfall and Evolutionary process models? What is Process Iteration? What are the merits of Spiral Development model? [8]
- Q2)** a) What is the role of Requirement Engineering as a Life Cycle Phase? What is the impact of Feasibility Study on Project? What is the impact of changing requirements? [8]
- b) What is the distinction between sub-system and module? What is Object-oriented decomposition? What is Function-oriented pipelining? [8]
- Q3)** a) How System Structuring is performed? What are the Control Models available at the architectural level? What is Modular Decomposition? [8]
- b) What is component? What are the characteristics of components? What are the basic elements of a Component Model? [8]

P.T.O.

Q4) Write short notes on: (Any Three) [18]

- a) Language-processing systems
- b) Real-time System Design
- c) Object Oriented Design Process
- d) Formal Specification

SECTION - II

Q5) a) Why Verification and Validation planning is important? What is Software Inspection? What Faults Classes can be checked using Inspection Process? [8]

b) What is Automatic Static Analysis? Which fault classes are checked by Static Analysis? [8]

Q6) a) What are the factors affecting Software pricing? What Cost Estimation Techniques are available? How Algorithmic Cost modelling is performed? [8]

b) What are the principal activities in Software Quality Management? What is Quality Assurance? What are the standards that may be establishes as a part of Quality Assurance process? [8]

Q7) a) How Software Processes are classified? How Process Analysis is carried out? [8]

b) What is Cleanroom strategy? How Functional Specification is achieved in Cleanroom Software Engineering? What are the merits of Cleanroom Software Engineering? [8]

Q8) Write short notes on : (Any Three) [18]

- a) Risk Identification
- b) Release Testing
- c) Requirements-based testing
- d) Software Quality Metrics

□□□

Total No. of Questions : 8]

[Total No. of Pages : 2

P1560

[3665]-634

M.E. (Computer)

INTELLIGENT SYSTEMS

(510104B) (2008 Course) (Elective - 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) Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) With neat diagram and example explain Goal based, agent. [8]
b) How a task environment is specified? Specify it with PEAS description for an automated taxi. [8]
- Q2)** a) What is goal and problem formulation of a problem solving agent? Explain agent design by means of pseudo-code. [8]
b) With algorithm explain the recursive implementation of Depth Limited Search. [8]
- Q3)** a) Define and explain CSP (Constraint Satisfaction Problem). With example explain the simple back tracking algorithm for CSP. [12]
b) Compare between IDA* and SMA* memory bounded search strategies. [6]
- Q4)** a) What is planning? What is the necessity of designing planning agent? How planning problems are represented? [10]
b) Compare between problem solving and planning. [6]

P.T.O.

SECTION - II

- Q5)** a) Explain the four components of partial order plan (POP). [8]
b) Discuss a job shop scheduling problem for assembling two cars. Obtain its solution using POP. [8]
- Q6)** a) How one can apply Critical Path Method (CPM) to determine the possible start and end times of each action? Explain with example. [8]
b) Discuss execution monitoring and replanning agents. [8]
- Q7)** a) Compare between conditional planning and replanning. [6]
b) Explain “Coercion” w.r.t. sensorless planning. [6]
c) Discuss disjunctive and conditional effects w.r.t. conditional planning. [6]
- Q8)** a) What is the use of Bayesian Network in probabilistic reasoning? Explain with example a simple Bayesian Network. [8]
b) What is the basic task of any probability inference system? Explain the enumeration algorithm for answering queries. [8]



Total No. of Questions : 08]

[Total No. of Pages : 2

P1669

[3665]-638

M.E. (Computer Engg.)

ADVANCED COMPILERS

(2008 Course)

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) *Figures to the right indicate full marks.*

SECTION - I

- Q1)** a) What is necessity of intermediate form? Compare and contrast different forms of intermediate code in detail. [8]
b) By giving proper example, explain how each phase of compiler interacts with symbol table. [8]
- Q2)** a) Explain : code generator. [6]
b) Explain in detail : code generation for pipelined machines. [10]
- Q3)** a) Explain in detail various data flow properties. For what purpose u-d chain and d-u chain are used? [8]
b) Explain : unified algorithm for data flow analysis. [8]
- Q4)** Write short notes (Any three) : [18]
a) SSA form
b) LEX and YACC
c) Issues in designing a compiler
d) Register assignment and allocation.

SECTION - II

- Q5)** a) Explain : Dynamic compilation. [8]
b) Explain following terms – [8]
Data dependence, direction vectors, loop independent dependences.

P.T.O.

- Q6)** a) Explain following terms with respect to compilation of distributed machines :
Data partitioning, instruction, scheduling, machine optimization. [8]
b) What is Just in Time compilation? Explain in detail. [8]
- Q7)** a) Explain structure of a parallelizing compiler. [8]
b) What is need for code optimization? Explain different techniques for performing optimization. [8]
- Q8)** Write short notes (Any three) : [18]
a) Symbol table
b) Control flow analysis
c) Phases & Passes of compiler
d) Auto Scheduling compilers.



Total No. of Questions : 8]

[Total No. of Pages : 2

P1562

[3665]-641

M.E. (Computer Engineering)

DISTRIBUTED SYSTEMS

(510108) (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) 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) Sun XDR marshals data by converting it into a standard big-endian form before transmission. Discuss the advantages and disadvantages of this method when compared with CORBA's CDR. [8]
- b) What is an open distributed system and what benefits does openness provide? [6]
- c) Consider a simple server that carries out client requests without accessing other servers. Explain why it is generally not possible to set a limit on the time taken by such a server to respond to a client request. What would need to be done to make the server able to execute requests within bounded time? Explain. [4]
- Q2)** a) Explain how NTP distribute time information over the Internet. [8]
- b) Explain Ricart and Agarwala's algorithm for mutual exclusion. [4]
- c) Why is computer clock synchronization necessary? Describe the design requirements for a system to synchronize the clocks in a distributed system. [4]
- Q3)** a) How caching and replication takes place in NFS? [8]
- b) How does AFS ensure that cached copies of files are up to date when files may be updated by several clients? [4]
- c) How does NFS automounter help to improve the performance and scalability of NFS? [4]

P.T.O.

Q4) Write Short Notes on (Any Three): **[16]**

- a) X.500 directory service.
- b) Distributed objects model.
- c) Maekawa's voting algorithm.
- d) Global state of distributed system.

SECTION - II

Q5) a) Explain approaches to implement distributed shared memory. [6]
b) What are implications of DSM for page replacement policies? Explain. **[8]**
c) Explain in which respects DSM is suitable or unsuitable for client - server systems. **[4]**

Q6) a) Describe two methods for solving key distribution problem for a symmetric cryptosystem and discuss their relative advantages and disadvantages. [8]
b) What is a digital signature? What are its uses in the security of a distributed system? Give a method to create a digital signature. Describe how digital signature can be used for ensuring message integrity in a distributed system. **[8]**

Q7) a) A coordination protocol could be carried out in order to coordinate the actions of web services. Outline the architecture for a centralized and distributed coordination protocol. In each case, describe the interactions needed to establish coordination between a pair of web services. [8]
b) Explain the role of a servlet container in the deploying of a web service and execution of a client request. **[4]**
c) Explain the main elements of WSDL description. **[4]**

Q8) Write Short Notes on (Any Three): **[16]**

- | | |
|------------------------|----------------------|
| a) Consistency models. | b) Thrashing in DSM. |
| c) Access matrix. | d) Globus toolkit. |



Total No. of Questions : 8]

[Total No. of Pages : 2

P1714

[3665]-648

M.E. (Computer)

SOFTWARE PROJECT MANAGEMENT

(501112(A)) (2008 Course) (Elective - IV)

Time : 3 Hours]

[Max. Marks : 100

Instructions :

- 1) Answers 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) State what is meant by product and process metrics giving examples.
b) State the purpose of collecting metrics data and state when are software metrics used in a software organization.

[16]

- Q2)** a) State what is meant by issues in a project? Why is it important to track and manage issues? Give example of a typical issues-log used in a project.
b) What is the main mechanism for regularly communicating the state of the project to senior management and customer? What are the typical contents of a status report?

[16]

- Q3)** a) State what is meant by requirements management life cycle.
b) State and explain the key deliverables at the various stages of requirement analysis.

[16]

- Q4)** Write short notes on the following :

[18]

- a) Project Planning best practices.
- b) Proposals and Contracts.
- c) Work breakdown structure.

P.T.O.

SECTION - II

Q5) Assuming suitable data, state what are the deliverables of the design phase of a software project. Answer should include both the high level design as well as the detailed design stages. **[16]**

Q6) a) State what are the typical sections which are included in a project management plan.

b) Using a typical example project, chart out the details of the following sections :

i) Project Summary

ii) Project Process.

[16]

Q7) Write short notes on the following : **[18]**

a) Project risk management.

b) Configuration Management.

c) Client Management Issues.

Q8) a) State what is the defacto industry standard for defining quality.

b) Explain how quality control activities are planned and managed using procedural and quantitative approach. **[16]**



Total No. of Questions : 8]

[Total No. of Pages : 2

P1638

[3665]-654

M.E. (Computer Engineering)
COMPUTER NETWORKING
Advanced TCP/IP
(2008 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) Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Explain with examples how client server interaction is done using TCP and UDP protocol. Justify its suitability to specific applications? [8]
- b) A client and server can both run on the same computer and use a TCP socket to communicate. Explain how it is possible to build a client and server that can communicate on a single machine without learning the host's IP address. [8]
- Q2)** a) The DHCP message format is inconsistent because it has two fields for client IP address and one for the name of the boot image. If the client leaves its IP address field empty, the server returns the client's IP address in the second field. If the client leaves the boot file name field empty, the server replaces it with an explicit name. Why? [8]
- b) Why DHCP is required? Explain Address Acquisition States with message types in DHCP operation? [8]
- Q3)** a) What is BOOTP? What are its advantages? Show the contents of all fields for a BOOTP request packet sent from a client with physical address 00:11:21:15:EA:21. [8]
- b) How would you accommodate abbreviations in a domain naming scheme? As an example, show two sites that are both registered under .edu and a top-level server. Explain how each site would treat each type of abbreviation? [8]

P.T.O.

- Q4)** Write a short notes on any THREE: [18]
- a) IP Spoofing & DNS Security.
 - b) DNS Resolution.
 - c) Working of relay agent in BOOTP.
 - d) IPV6.

SECTION - II

- Q5)** a) Explain various modes of operation of Telnet. Show the sequence of characters exchanged between the TELNET client and the server to switch from the default mode to the character mode? [8]
- b) Explain the Secure Shell (SSH). Can SSH be used to achieve all functionalities provided by *rlogin*? Justify. [8]
- Q6)** a) Show the encapsulation of a TFTP data message, carrying block number 7, in a UDP user datagram. What is the total size of user datagram? [8]
- b) What is FTP? Explain the process of using FTP for retrieving list of items in a directory. [8]
- Q7)** a) In SMTP, if we send a one-line message between two users, how many lines of commands and responses are exchanged? Which are they? [8]
- b) Differentiate between HTTP and HTTPS. Explain under what circumstances can a proxy caches web page, when using HTTPS? [8]
- Q8)** Write a short notes on any THREE: [18]
- a) RTTP
 - b) NVT
 - c) WWW architecture
 - d) Out-of-Bound Signaling in Telnet.



Total No. of Questions : 08]

[Total No. of Pages : 2

P1715

[3665]-655

M.E. (Computer)

WIRELESS TECHNOLOGY

(Computer networking)

(Elective - II) (510305) (2008 Course)

Time : 3 Hours]

[Max. Marks : 100

Instructions :

- 1) *Answer 3 questions from Section-I & 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 CRT terminal is used to enter alphanumeric data into a computer. The CRT is connected to the computer through a voice grade telephone line having a usable bandwidth of 3000 Hz. And an output signal to noise ratio (S/N) of 10 dB. Assume that the terminal has 128 characters and that the data sent from the terminal consists of independent sequences of equi-probable characters.

- a) Find the capacity of the channel.
- b) Find the maximum (theoretical) rate at which data can be transmitted from the terminal to the computer without errors.

[16]

Q2) a) Draw a typical 802.11 MAC frame showing various fields. Expand the frame control field into its subfields. State what is the significance of WP bit?

- b) State and explain the basic rules which apply to all transmitters using the distributed coordination function (DCF).

[16]

Q3) a) State what are the different propagation paths over which energy radiated from a transmitting antenna may reach the receiving antenna?

- b) Distinguish between ionospherically reflected (sky) waves, tropospheric waves and ground waves.
- c) What are radiation patterns for center-fed vertical dipole antennas having short lengths?

[18]

P.T.O.

Q4) With the help of a suitable diagram show various function blocks and their interconnections in a GSM architecture. State what are the major interfaces and protocols used and functions of various elements of the network. [16]

SECTION - II

Q5) State and explain the basic location update procedure in a GSM network. [16]

Q6) a) State what are the different types of spread spectrum techniques used by the radio based physical layer of 802.11.

b) Explain the terms :

i) Multipath interference and

ii) Intersymbol interference with respect RF propagation.

[16]

Q7) With reference to the Bluetooth protocol explain the following : [16]

a) Characteristics of the piconet channel.

b) SCO and ACL links.

c) Packet formation.

d) Connection establishment.

Q8) a) With the help of a suitable diagram explain the basic idea of Mobile IP.

b) Show the important agents and function nodes in the diagram. State what are the motivating factors for using mobile IP.

c) What is meant by tunneling in data transfer to the mobile node? Illustrate it with a diagram. Also explain what is meant by reverse tunneling.

[18]



Total No. of Questions : 8]

[Total No. of Pages : 2

P1570

[3665]-667

M.E. (Chemical)

PROCESS DESIGN & SYNTHESIS

(Elective - I) (2008 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) 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 Hierarchy of process design. [12]
b) Explain the various engineering ethics. [6]
- Q2)** a) Explain the concept of Onion Model. [8]
b) Describe the various parameters related to the life cycle of process. [8]
- Q3)** a) Discuss the use of flow sheet simulators to assist in process design. [6]
b) What is green engineering? Explain with respect to the environmental concerns. [10]
- Q4)** Write short note on: [16]
a) Principles of process synthesis.
b) Product design.

P.T.O.

SECTION - II

Q5) a) Explain threshold problems in heat exchanger network. [6]

b) Explain composite curves for following heat recovery system. [12]

Stream No.	Type	Supply Temperature $T_s(^{\circ}\text{C})$	Target Temperature $T_t(^{\circ}\text{C})$	Heat Capacity, C_p (MW/K)
1	Cold	20	180	0.2
2	Hot	250	40	0.15
3	Cold	100	230	0.45
4	Hot	210	85	0.3

Q6) a) Explain distillation sequencing for minimum boiling azeotrope using pressure variation. [8]

b) Discuss reactive separation process using example. [8]

Q7) a) Discuss choice of reactor for multiple parallel reaction system for $a_1 > a_2$ and $a_2 > a_1$, where a_1 and a_2 are the orders of primary and secondary reactions respectively. [8]

b) Discuss attainable region (AR) approach in detail. [8]

Q8) Explain the following: (Any Two) [16]

a) Residue Curve Maps.

b) Heat and power integration.

c) Pressure Swing Separation.

□□□

Total No. of Questions : 8]

[Total No. of Pages : 2

P1572

[3665]-674

M.E. (Chemical)

PROCESS MODELING AND SIMULATION

(2008 Revised 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) *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 how a process model is formulated? [8]

b) Define modelling. Discuss its applications and compare the various types of models. [8]

Q2) a) Develop a mathematical model for a batch reactor under adiabatic conditions for a reaction



State all the assumptions made. [10]

b) For a given CSTR, a reaction as given below takes place under non - adiabatic conditions. Write a mathematical model for the reactor.



Q3) a) Develop a mathematical model for unsteady state co-current shell and tube heat exchanger with detailed assumptions. [8]

b) Derive a set of mathematical equations for a gas - liquid absorption column operating in co - current mode. [8]

Q4) Write short note on (Any Four): [16]

- | | |
|-------------------------|-------------------------|
| a) Process Analysis. | b) Deterministic Model. |
| c) Lumped Model. | d) Process simulation. |
| e) Dynamic state model. | |

P.T.O.

SECTION - II

- Q5)** a) Explain optimization. Discuss its applications and various methods of optimization in detail. [12]
b) Discuss linear programming used in process optimization. [6]
- Q6)** a) Discuss a mathematical model for two stage feed forward type evaporator system. [10]
b) Explain the terms:-
i) Global max.
ii) Point of inflection.
iii) Concave function. [6]
- Q7)** a) Maximize function $y(x) = x^4 - 6x^3 + 6x^2 - 2x + 4$ in the interval 0 to 10 by means of dichotomous search method with $E = 0.5$. [8]
b) Minimize $f(x) = x^2 - 6x + 3$ in the range $0 \leq x \leq 12$ upto 3% of x . [8]
- Q8)** a) Discuss the optimal design of an NH_3 reactor to get an objective function for reactor volume optimization. [8]
b) Derive the necessary and sufficient conditions for optimization for multivariable problems. [8]



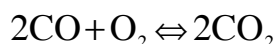
P1741**[3665]-678****M.E. (Chemical Engg.)****ADVANCED REACTION ENGINEERING****(2008 Course) (509111)****Time : 3 Hours]****[Max. Marks : 100****Instructions :**

- 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) 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) Find out the mechanism for oxidation of CO over a catalyst.



All the rates are initial rates.

$-\text{r}_{\text{CO}_2}$ (mol/dm ³ .sec)	0.02	0.035	0.049	0.060	0.196	0.384	0.902	1.653	4.44	5.00	4.44	2.77
C_{CO} (mol/dm ³)	0.01	0.01	0.01	0.01	0.1	0.2	0.5	1.0	5.0	10	20	50
C_{O_2} (mol/dm ³)	1	3	6	9	1	1	1	1	1	1	1	1

[16]

Q3) Give types of catalyst deactivation. Explain mechanism governing each type.

For general gas phase catalytic reaction $\text{A} \xrightarrow{k_1} \text{B}$ which is carried out isothermally in a batch reactor, the catalyst deactivation follows a first order decay law and is independent of the concentrations of both A & B.

Given : $\text{CA}_0 = 1 \text{ mol/dm}^3$, $\text{V}_0 = 1 \text{ dm}^3$, $\text{W} = 1 \text{ kg}$, $k_d = 0.1 \text{ min}^{-1}$ at 300 K (Ed/R = 2,000 K), $k_1 = 0.2 \text{ dm}^3/(\text{kg cat. min})$ at 300 K (Ed/R = 500 K)

Write general equation for catalyst activity as a function of time. **[16]**

P.T.O.

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

- a) Catalyst properties
- b) Dual site mechanism
- c) Effectiveness factor
- d) Thiele Modulus.

SECTION - II

Q5) What is RTD? Define function $F(t)$. Discuss use of $F(t)$ in determining non idealities with proper example. **[16]**

Q6) Write segregation model for determining non idealities in a PFR. The second order reaction $2A \rightarrow B + C$ occurs in the liquid phase. The RTD function for the reactor in which it is to be carried out is given by

- i) $E(t) = 0$ for $0 < t < 10$,
- ii) $E(t) = 0.01 * (t-10)$ for $10 < t < 20$,
- iii) $E(t) = 0.01 * (30-t)$ for $20 < t < 30$,
- iv) $E(t) = 0$ for $t > 30$

The entering concentration is 2 molar and the specific reaction rate is $0.06 \text{ dm}^3/\text{mol}.\text{sec}$.

What is the conversion after 30 sec. in a batch 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 notes : **[18]**

- a) Surface Reaction Rate.
- b) Nonidealities in a tubular reactor.
- c) Weisz Prater factor.
- d) Sintering Kinetics.

□□□

Total No. of Questions : 6]

[Total No. of Pages : 1

P1640

[3665]-687

M.E. (Petroleum Engineering)
OIL AND GAS FIELD DEVELOPMENT
(512104) (Elective - Ic) (New 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 should be drawn wherever necessary.*
- 4) Figures to the right indicate full marks.*
- 5) Use of a non-programmable calculator is allowed.*
- 6) Assume suitable data if necessary and clearly state it.*

SECTION - I

- Q1)** Explain the various stages in the life of the reservoir. What are drive mechanisms? How do these effect the development of the reservoir? **[25]**
- Q2)** What field data is required for an oil field for development assuming one exploratory well is drilled and it is dry? **[25]**
- Q3)** What laboratory data is required for an oil field development assuming one well is drilled where gas has been found? **[25]**

SECTION - II

- Q4)** What is EOR? Explain in brief the different methods. At what stage is planning done for this in Field development? **[25]**
- Q5)** Explain the special development of Offshore Marginal Oil Fields. **[25]**
- Q6)** What is Reservoir Simulation? How can it influence Field Development? **[25]**

Total No. of Questions : 8]

[Total No. of Pages : 3

P1716

[3665]-692

M.E. (Petroleum)

WELL CONTROL

(New Course 2008) (Elective - II (d)) (512105)

Time : 3 Hours]

[Max. Marks : 100

Instructions :

- 1) *Q.1 and Q.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 cm scale graph paper is allowed.*
- 6) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) Define and explain in brief. **[12]**

- i) Well kick
- ii) Blowout
- iii) Kill fluid
- iv) Bullheading
- v) Snubbing
- vi) Abnormal pressure zone.

b) Determine the height in feet of the influx using following data. **[6]**

Pit gain = 20 bbl
Hole size = 8.5 in
Drill collar OD = 6.5 in
Drill collar length = 450 ft.
Drill pipe OD = 5.0 in.

Q2) a) What is well control? Differentiate between primary, secondary and tertiary method of well control, in brief. **[4]**

b) Determine the type of influx using following data. **[4]**

SICP = 1044 psi
SIDPP = 780 psi
Height of influx = 400 ft.
Mud weight = 15.00 ppg.

P.T.O.

- c) A well is being drilled with 12 ppg mud. How much barite is required to increase the mud density to 13 ppg.? [4]

Hole volume = 600 bbl.

Surface volume = 300 bbl.

Barite density is 35.4 ppg.

- d) While pulling out driller forgot to fill the hole and 30 stands of drill pipes were pulled out dry. Use following data and calculate reduction in bottom hole pressure. [4]

Well depth = 9000 ft. (TVD), Casing shoe depth = 5000 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.

- Q3)** a) What is the objective of relief well drilling? Write the design considerations for relief well and highlight the operational aspects to accomplish the objectives. [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) Well control during drill stem testing.
- b) Well completion operations in abnormally pressured zones.
- c) Unusual situations in well control.
- d) Surface BOP control unit.

SECTION - II

- Q5)** Use the following data and fill out a kill sheet. A kick was observed after closing the surface BOP. [18]

Data : Original mud weight = 9.6 ppg,

Measured depth = 10,525 ft.,

Kill rate pressure @ 50 SPM = 1000 psi

Kill rate pressure @ 30 SPM = 600 psi

Drill string – drill pipe 5.0 in. – 19.5 lb/ft. capacity is 0.01776 bbl/ft.

HWDP 5.0 in. 49.3 lb/ft., capacity = 0.00883 bbl/ft., length = 240 ft.,

Drill collars – 8.0 in. O.D. – 3.0 in. ID, capacity is 0.0087 bbl/ft.

length = 360 ft.

Annulus – Hole size = $12\frac{1}{4}$ in. drill collar/open hole capacity = 0.0836 bbl/ft.,
 drill pipe/open hole capacity = 0.1215 bbl/ft.,
 Drill pipe/casing capacity = 0.1303 bbl/ft.
 Mud pump (7 in. \times 12 in. triplex @95% eff.) = 0.136 bbl/stk.
 Leak of test with 9.0 ppg mud = 1130 psi
 Casing setting depth = 4000 ft.
 Shut in drill pipe pressure = 480 psi, Shut in casing pressure = 600 psi,
 Pit volume gain = 35 bbl, True vertical depth = 10.000 ft.

Calculate :

- i) Initial circulating pressure
 - ii) Kill mud weight
 - iii) Final circulating pressure
 - iv) Strokes to bit, and bit to surface strokes.
 - v) Prepare step down plan on graph paper for drillers method.
- Q6)** a) How the change in rheological properties of drilling fluid may affect well control operations? Explain. [6]
- b) Write a note on (Any two) : [10]
- i) Leak off test and fracture gradient.
 - ii) Offshore safety procedures.
 - iii) Subsea completion and well control.
 - iv) Choke manifold and kill line.
- Q7)** a) Write in brief procedure of well control using, [10]
- i) Concurrent method
 - ii) Wait and weight method.
- b) Use Mohr's circle and equations. Calculate normal stress and shear stress on a fracture plane making an angle of 30° . If two principle stresses are 20 psi and 10 psi respectively. [6]
- Q8)** a) Draw the schematic sketch of a single typical blow out preventer stack arrangement. Indicate all the features. Explain the meaning of stack designation 3M - $13\frac{5}{8}$ SRA. [8]
- b) Describe in brief any one case study pertaining to offshore well control operation. Write the known parameters challenges involved and operational procedure in brief. [8]



Total No. of Questions : 12]

[Total No. of Pages : 3

P1577

[3665]-703

M.E. (IT)

SOFTWARE ENGINEERING METHODOLOGIES

(514402) (2008 Course)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates :

- 1) *Answer question 1 or 2, 3 or 4 and 5 or 6 from section - I and question 7 or 8, 9 or 10 and 11 or 12 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) The incremental model delivers a series of releases called increments that provide progressively more functionality for the customers as each increment delivers. Discuss this statement with an example of a hypothetical system. [8]
- b) What are the advantages of providing static and dynamic views of the software process in RUP. [8]

OR

- Q2)** a) Compare spiral model and RUP based on similarities and dissimilarities. [8]
- b) Explain in detail the agile process model. Enumerate its advantages and disadvantages. [8]

- Q3)** a) Using your knowledge of how an ATM is used, develop a set of use - cases that could serve as basis for understanding the requirements of an ATM system. Document these use - cases. [8]
- b) Explain various methods of requirements discovery for a software system. [8]

OR

- Q4)** a) Explain the formal process of requirement change management. [8]
- b) How are MOF, UML, CWM and XMI related to each other? [8]

P.T.O.

- Q5) a)** Explain UML2.0 features with reference to modularity, layering and extensibility. [9]
- b)** What are the techniques of modeling actors in Use Case Diagrams? Draw an use case diagram for an online theatre booking system. [9]

OR

- Q6) a)** A home security system is under design. It consists of the control panel, the system and various sensors. Identify and 3 use case scenarios and express them using sequence diagrams in UML 2.0. [9]
- b)** Explain any 3 of following features of an activity diagram with reference to a hypothetical travel booking system.
Concurrency, adornments for activity edges, input / output pins, activity partitions. [9]

SECTION - II

- Q7) a)** Explain following design concepts
architecture, patterns, information hiding, refinement, refactoring. [8]
- b)** Using UML graphical notation for object classes design the following object classes identifying attributes and operations. Use your own experience to decide on the attributes and operations that should be associated with these objects.
- i) A telephone.
 - ii) A printer for a personal computer.
 - iii) A personal stereo system.
 - iv) A bank account. [8]

OR

- Q8) a)** Giving reasons for your answer suggest and explain an appropriate control model for the following systems (Any two):
- i) A batch processing system that takes information about hours worked and pay rates and prints salary slips and bank credit transfer information.
 - ii) A set of software tools that are produced by different vendors but which must work together.
 - iii) A television controller that responds to signals from a remote control unit. [8]
- b)** Explain the major elements of the design model. [8]

- Q9)** a) What is a component? What are interfaces? What reference to components, interfaces & dependencies explain component level design guidelines.[8]
- b) What is software testing? Explain a typical software testing process. Define system testing and component testing. [8]

OR

- Q10)**a) Give illustrative examples to explain the following:
- i) Requirements based testing.
 - ii) Partition testing.
 - iii) Structural testing.
 - iv) Path testing. [8]
- b) Write a note on the “Art of software debugging”. [8]

- Q11)**a) Explain different methods of control structure testing. [9]
- b) What are the characteristics of testability? Define and explain. [9]

OR

- Q12)**a) Explain various project estimation techniques that estimate size, effort and cost. [9]
- b) Compare the process assessment model CMMI with reference to CMM on the basis of KPAs. [9]



Total No. of Questions : 8]

[Total No. of Pages : 2

P1580

[3665]-711

M.E. CSE (Information Technology)

NET CENTRIC COMPUTING

(514426) (2008 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) Assume suitable data, if necessary.***

SECTION - I

- Q1)*** a) What is the need of Cyclic Redundancy Check? How it is useful in error control? Data link protocols almost always put the CRC in a trailer rather than in a header. Why? [8]
- b) Compare between distributed data networks and centralized data network. [8]
- Q2)*** a) Explain the working of single mode and multimode fiber cable with suitable diagrams. How step index fiber is different from graded index fiber? [8]
- b) Explain the importance of data design parameters from network design point of view. [8]
- Q3)*** a) Suppose we have a single server in a shop and customers arrive in the shop with a Poisson arrival distribution at a mean rate of $\lambda = 0.5$ customers per minute. This implies that the interarrival times have an exponential distribution with an average interarrival time of 2 minutes. The server has an exponential service time distribution with a mean service rate of 4 customers per minute. Considering a M/M/1 queuing system calculate. [8]
- i) Average service time.
 - ii) Arrival rate.

P.T.O.

- iii) Service rate
- iv) Utilization of server.
- v) Probability of 2 customers in the system.
- vi) Average number of customers in the queue.
- vii) Average waiting time.
- viii) Average time in the system.
- b) How network administrator can assure an optimize network capacity, growth, architect network resiliency and survivability? [8]

Q4) Write short notes on (Any Three): [18]

- a) Fault diagnosis and recovery in network.
- b) Stochastic processes.
- c) Working of Bridge.
- d) Bin packing algorithm.

SECTION - II

- Q5)** a) Why ATM technology is used as a backbone for Internet? How ATM technology provides constant bit rate even if different technologies have different frames sizes? [8]
- b) Compare between DAFS and CIFS. [8]

- Q6)** a) What do you mean by signaling protocol? Explain any one signaling protocol used in VOIP. [8]
- b) Describe the various Frame Relay Congestion Control techniques. [8]

- Q7)** a) Draw and explain the architecture of ADSL. [8]
- b) Compare between backup and mirroring. [8]

- Q8)** Write short notes on (Any Three): [18]
- a) Sharma's algorithm.
 - b) PSTN Gateways.
 - c) Security applications in banking and commerce.
 - d) Wavelet Compression.



Total No. of Questions : 10]

[Total No. of Pages : 4

P1497

[3665]-72

M.E. (Mechanical - Design Engineering)

MECHANICAL VIBRATIONS

(502202) (2002 Revised 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 answer books.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Figures to the right indicate full marks.*
- 5) Use of pocket electronic calculator is allowed.*
- 6) Assume suitable data, if necessary.*

SECTION - I

Q1) A mechanical system with non linear restoring force is acted upon by an excitation $F_0 \cos \omega t$ is represented by the equation $\ddot{x} + \alpha x + \beta x^3 = F_0 \cos \omega t$
Determine the approximate steady state vibration. Sketch and explain frequency response for the system with damping and without damping.
[17]

- Q2)** a) Give three examples of random input. How will you proceed to find their spectral density? [5]
- b) Show that auto correlation function is sinusoidal wave is another sinusoidal wave. How does this fact help us in the design of a random inputs. [6]
- c) Show that the response of a spring mass lightly damped system to a white noise input will be a narrow band process. [5]

- Q3)** a) Classify various system in relation to vibration analysis. Give an example for each class. [6]
- b) What do you understand by a “Narrow Band” process? Why is it significant in vibration analysis? Sketch the spectral density graph for a narrow band process. Find its auto correlation function. [8]

P.T.O.

- c) Distinguish between stationary; non stationary and ergodic random process. [3]

Q4) Derive an expression for finding natural frequency of undamped free vibration of a three rotor system using Holzer's method. Explain the procedure for finding frequency and draw flow chart for the computer programming. [16]

Q5) a) Explain how (i) Time averaging and (ii) Mean square values are obtained. [4]

b) A random signal has a spectral density that is constant $s(f) = 0.004 \text{ cm}^2/\text{cps}$; between 60 cps and 1000 cps and that is zero outside the frequency range. Its mean value is 2.5 cm. Determine its rms value and its standard deviation. [12]

OR

Write short notes on any two of the following: [16]

- a) Perturbation Method
- b) Jump Phenomenon
- c) System approach for shock analysis
- d) Limit cycles

SECTION - II

Q6) A rigid light bar of length 1 meter carries a mass of 50 kg at one end, and is hinged at the other end. Two springs of stiffness 5 kN/m support the bar at a distance of 25 cm and 50 cm from the hinged end. A force $500 e^{-t}$ acts on the mass for one second. Find the response of the system. [17]

Q7) From the first principles explain the working of centrifugal pendulum. Hence explain its use on a diesel engine. [16]

Q8) A triple pendulum consists of three identical pendulums each of mass 'M' and length 'L'. Find the mass and stiffness matrices by using Lagrange's equations. Hence find the first two natural frequencies and mode shapes by the method of matrix iteration. **[16]**

Q9) A fixed beam carries an eccentric motor of mass 50 kg running at 1500 rpm at its midspan. The motor has a rotational unbalance of 5 kg cm. The length of the beam is 2 meter and has a square cross section of side 2 cm. Material is steel. Find the steady state response of the beam at the mid and quarter length. **[17]**

Q10) Write short notes on any two: **[16]**

- a) Stiffness and inertial influence coefficients.
- b) Orthogonality of the modal vectors, their normalization and generalized force.
- c) Rayleigh-Ritz method of finding natural frequencies of the continuous system.
- d) Eigenvalues and Eigen Vectors.

Laplace Transform Pairs

$f(t)$		$Lf(t)$
1. $f(t)$	—	$\int_0^{\infty} f(t) e^{-st} dt = F(s)$
2. $x(t) \pm y(t)$	—	$X(s) \pm Y(s)$
3. $Kf(t)$	—	$KF(s)$
4. $u(t)$ or 1	—	$1/s$
5. $\delta(t)$	—	1
6. t	—	$1/s^2$
7. t^n	—	$\frac{n!}{s^{n+1}}$
8. $\sin \omega t$	—	$\frac{\omega}{s^2 + \omega^2}$
9. $\cos \omega t$	—	$\frac{s}{s^2 + \omega^2}$
10. $u(t - a)$	—	$\frac{e^{-as}}{s}$
11. $\delta(t - a)$	—	e^{-as}
12. e^{-at}	—	$\frac{1}{s + a}$
13. $e^{-at} \sin \omega t$	—	$\frac{\omega}{(s + a)^2 + \omega^2}$
14. $e^{-at} \cos \omega t$	—	$\frac{s + a}{(s + a)^2 + \omega^2}$
15. $e^{-at} f(t)$	—	$F(s + a)$
16. $\left. \begin{array}{l} 0 \text{ when } t < a \\ f(t - a) \text{ when } t > a \end{array} \right] = f(t - a)u(t - a)$		$e^{-as} F(s)$
17. $\frac{d f(t)}{dt}$	—	$sF(s) - f(0)$
18. $\frac{d^2 f(t)}{dt^2}$	—	$s^2 F(s) - s f(0) - \frac{d f(0)}{dt}$
19. $\int_0^t f(t) dt$	—	$\frac{F(s)}{s}$

Total No. of Questions : 8]

[Total No. of Pages : 3

P1584

[3665]-744

M.E. (Chemical) (Environmental Engg.)
APPLIED STATISTICS FOR ENVIRONMENTAL ENGINEERS
(2008 Course)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates :

- 1) *Answer any 03 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 residual error in the regression model. **[8]**

b) In a partially destroyed laboratory, record of an analysis of correlation data, the following results only are legible: **[8]**

Variance of X = 9 Regression equations : $8X - 10Y + 66 = 0$,

$40X - 18Y = 214$

Calculate:

- i) the mean values of X & Y.
- ii) the correlation coefficient between X & Y.
- iii) The standard deviation of Y.

Q2) An analysis of monthly wages paid to the workers of two firms A and B belonging to the same industry gives following results:

	Firm A	Firm B
Number of workers	500	600
Average daily wage	Rs. 186	Rs. 175
Variance of distribution of wages	81	100

- a) Which firm has largest wage bill.
- b) In which firm, A or B, is there variability in individual wages.
- c) Calculate the average daily wage, the variance of wages of all workers in firms A & B together. **[16]**

P.T.O.

- Q3)** a) Use Conen's method to estimate the Mean and Variance of a censored sample $n = 30$ that is lognormally distributed. The 30 individual values $(x_1, x_2, \dots, x_{30})$ are not given, but assume that a transformation $y = l_n(x)$ will make the distribution normal with mean n_y and variance σ_y^2 . [9]
- b) Explain the method of moment generating function for the CHI - square distribution. [9]

Q4) Pumpkins were grown under two experimental conditions. Two random samples of 11 and 9 pumpkins show the sample standard deviations of their weights as 0.8 and 0.5 respectively. Assuming that the weight distributions are normal, test the hypothesis that the true variances are equal, against the alternative that they are not at the 10% level.

Assume that $P(F_{10, 8} \geq 3.35) = 0.05$ and $P(F_{8, 10} \geq 3.07) = 0.05$. Establish relation between t and F distribution. [16]

SECTION - II

Q5) Explain purposive sampling, Random sampling, stratified sampling and systamatic sampling. [16]

- Q6)** a) Explain randomized block design model. [8]
- b) Find the optimal assignment of four jobs and four machines when the cost of assignment is given by the following table. [8]

	J_1	J_2	J_3	J_4
M_1	10	9	8	7
M_2	3	4	5	6
M_3	2	1	1	2
M_4	4	3	5	6

- Q7)** Write short notes on: [18]
- a) Latin square design.
- b) Transportation algorithm.
- c) Max - flow - min - cut theorem.

Q8) a) What is the function of the minimum ratio rule in the simplex method.[8]

b) Maximize $Z = 3x_1 + 2x_2$
Subject to $-x_1 + 2x_2 \leq 4$
 $3x_1 + 2x_2 \leq 14$
 $x_1 - x_2 \leq 3$
 $x_1 \geq 0, x_2 \geq 0$

Use graphical method.

[8]



Total No. of Questions : 8]

[Total No. of Pages : 1

P1585

[3665]-745

M.E. (Chemical) (Environmental)
ENVIRONMENTAL GEOSCIENCES
(2008 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) 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) Describe Atmosphere, Lithosphere and Hydrosphere of the Earth. **[16]**

Q2) Explain major ecosystems of the Earth. **[16]**

Q3) Describe earthquakes with respect to following points. **[18]**

- | | |
|---------------------------|--------------------------|
| a) Earthquake waves. | b) Earthquake intensity. |
| c) Effects of earthquake. | d) Causes of earthquake. |

Q4) Write an essay on volcanicity, types and causes of volcanicity. **[18]**

SECTION - II

Q5) Explain effects of mineral exploration on environment. **[16]**

Q6) Describe in detail Acid drainage mine. **[16]**

Q7) Write a detailed note on Applications of Remote sensing & GIS in Environmental Science. **[18]**

Q8) Write notes on the following: **[18]**

- a) Biochemical factors in environmental health.
- b) Geochemical cycle.
- c) Diseases induced by human use of Land.



Total No. of Questions : 8]

[Total No. of Pages : 2

P1533

[3665]-755

M.E. (Chemical) (Environmental)

WASTEWATER TREATMENT AND DESIGN

(509138) (2008)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates :

- 1) *Question one is compulsory and any two from the remaining questions.*
- 2) *Question five is compulsory and solve any two from the remaining questions.*

SECTION - I

- Q1)** a) Explain theoretical aspects of different types of Reactors for the wastewater treatment. [6]
- b) Derive an equation for the effluent tracer concentration as a function of time for an ideal flow in CSTR. [6]
- c) How non ideal behavior of a reactor used for wastewater treatment is evaluated? [6]

- Q2)** a) Explain important qualities of a tracer. [4]
- b) The continuous response to a pulse input into a closed vessel is given below. From this data Calculate the Mean Residence Time (t). [8]

Time (t) (minutes)	0	5	10	15	20	25	30	35
C_{pulse} g/l Tracer output Concentration	0	3	5	5	4	2	1	0

- c) Explain the significance of F curve. [4]
- Q3)** a) Explain two film theory of mass transfer in an absorption system for a gas in a basin open to atmosphere with surface area A and depth h. [6]
- b) Explain mass transfer controlling steps in adsorption system. [4]
- c) Describe experiment for the development of adsorption isotherms. Explain Freundlich and Langmuir adsorption isotherms. [6]

P.T.O.

Q4) Write short notes on:

[16]

- a) Spread of RTD.
- b) Ideal and non ideal reactors.
- c) Absorption and adsorption.
- d) Structure of activated Carbon.

SECTION - II

Q5) a) Explain importance of rapid mixing and verity of mixers used in wastewater treatment. **[6]**

- b) What are the governing principals of micro and macro flocculation?[6]
- c) What are the different types of mixing patterns are produced in mixing zone? Explain factors which determines the power requirement of a mixer. **[6]**

Q6) a) Why Carbon is used for adsorption? Explain the method of reactivation of Carbon. **[4]**

- b) Explain importance of Mass Transfer Zone in the design of adsorption column. **[4]**
- c) How GAC and PAC are utilized for the treatment of wastewater? In the case of GAC contactors define the terms EBCT and CUR. **[8]**

Q7) a) Explain the principal of settling of particles, what is Hindered Settling?[6]

- b) Give mechanism of equipments used for sedimentation in wastewater treatment. **[5]**
- c) Membrane filters. **[5]**

Q8) a) Define Biological processes used for wastewater treatment according metabolic function and treatment. **[6]**

- b) Describe constituents and biological characteristics of wastewater. **[4]**
- c) Explain important parameters for the design of a bioreactor. **[6]**



Total No. of Questions : 8]

[Total No. of Pages : 2

P1536

[3665]-759

M.E. (Environmental Engineering)

WATER QUALITY MODELING

(2008 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) *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) Describe the classification of model in detail. [6]
b) Explain various steps involved in model building. [6]
c) Write the sources of water pollution. [6]

Q2) Explain low flow frequency analysis. [16]

Q3) Formulate a mathematical model for BOD reaction. Specify the assumptions clearly. [16]

Q4) Develop a mathematical model for rate of oxygen uptake in microbial growth. [16]

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. [16]

Data : Flowrate = $7570 \text{ m}^3/\text{d}$

Wastewater temperature = 20°C

BOD removal in primary sedimentation = 35% $E_1 = E_2$.

P.T.O.

- Q6)** Determine the removal efficiency for a sedimentation basin with a critical overflow velocity of $2\text{ m}^3 / \text{m}^2 \cdot \text{h}$ in treating a wastewater containing particles whose settling velocities are distributed as given in the table. Plot the particle histogram for the influent and effluent wastewater. [16]

Settling velocity m/h	No. of particles per liter $\times 10^{-5}$
0.0 - 0.5	30
0.5 - 1.0	50
1.0 - 1.5	90
1.5 - 2.0	110
2.0 - 2.5	100
2.5 - 3.0	70
3.0 - 3.5	30
3.5 - 4.0	20
Total	500

- Q7)** Elaborate modeling treatment for complete mix reactor with reaction. State the modeling treatment process kinetics. [18]

- Q8)** A city discharges 30 Mgal / d of sewage into a stream whose minimum rate of flow is $300 \text{ ft}^3/\text{s}$. The velocity of the stream is about 2 m / hr. The temperature of the wastewater is 20°C , while that of stream is 15°C . The 20°C BOD_5 of the wastewater is 200 mg/L, while that of stream is 1.0 mg/L. The wastewater contains no dissolved oxygen, but the stream is 90 percent saturated upstream of the discharge. At 20°C , K is estimated to be 0.3d^{-1} while K_2 is 0.7d^{-1} . Determine the critical oxygen deficit and its location. Also estimate the 20°C BOD_5 of a sample taken at the critical point. Use temperature coefficients of 1.135 for K and 1.024 for K_2 . Also plot the dissolved oxygen sag curve. [16]



Total No. of Questions : 10]

[Total No. of Pages : 3

P1661

[3665]-77

M.E. (Mechanical) (Design Engineering)
COMPUTERAIDED DESIGN
(2002 Revised Course)

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) *Figures to the right indicate full marks.*
- 4) *Use of electronic calculator is allowed.*
- 5) *Assume suitable data, if necessary.*

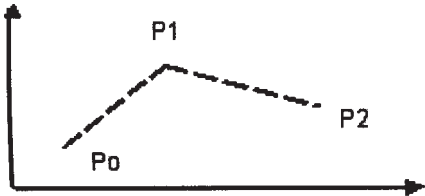
SECTION - I

- Q1)** a) Describe the IGES methodology. [6]
b) A triangle PQR represented as P(14, 15), Q(66, 15) and R(40, 60). It is mirrored about line $y = 30$. [10]
i) The composite transformation matrix; and
ii) The coordinates of the vertices for a reflected triangle.
- Q2)** a) Find the co-ordinates of triangle ABC with vertices A(3, 3), B(9, 3) and C(3, 7) when it is scaled by $S_x = 2$ and $S_y = 2$ about point P(5, 4). [6]
b) The coordinates of four points are given by $P_0 = [2 \ 2 \ 0]^T$, $P_1 = [2 \ 3 \ 0]^T$, $P_2 = [3 \ 3 \ 0]^T$ and $P_3 = [3 \ 2 \ 0]^T$. Find the equation of the Bezier curve. Also find points on the curve for $u = 0, 0.25, 0.5, 0.75$ and 1. Also draw the curve. [10]
- Q3)** a) What is an isoparametric element? Explain with suitable example. [6]
b) Consider a thin tapered plate with 6 inches width at top and 3 inches width at bottom having a length of 24 inches and uniform thickness of 1 inch. The material of the plate is steel having Young's modulus $E = 30 \times 10^6$ psi and weight density 0.28 lb/in³. In addition to its self weight, the plate is subjected to point load $P = 100$ lb at its midpoint. [10]
i) Model the plate with two finite elements.
ii) Using elimination approach, solve for the global displacement vector.
iii) Evaluate stress in each element.
iv) Determine the reaction force at support.

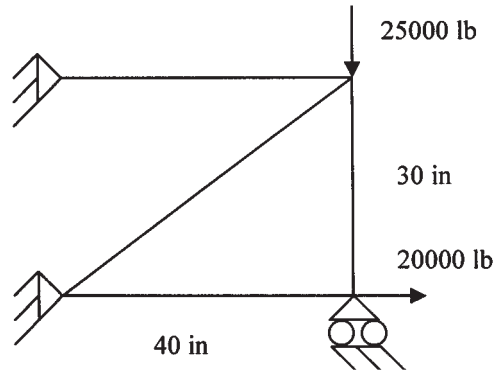
P.T.O.

- Q4)** a) What is Local and Global Coordinate system? For 1-D spar element derive the relationship between local and global coordinate system. [6]
- b) Derive the function Π for the axially loaded tapered bar. The bar has a length L and a variable cross-section area A . It is loaded with a concentrated axial load P at its free end. The axial displacement at any point along the bar is governed by the following differential equation: $AE \frac{d^2 u}{dx^2} = 0$. Where E is the modulus of elasticity of the bar material. [10]
- Q5)** a) Write a short note on accuracy of Finite Element Solution. [6]
- b) Explain how following problems are modeled and solved. [6]
- Cylinder subjected to internal pressure.
 - Infinite cylinder with external pressure.
 - Press fit of a ring on a rigid shaft.
 - Press fit of elastic sleeve on a elastic shaft.
- c) Find the focal distance and the orientation in space of a parabola that passes through three points, one of which is the vertex. [6]

SECTION - II

- Q6)** a) Define parametric equation of a arc with centre at $C(2, 2)$ and radius $R = 1$ also define a line joining C and $P(4, 4)$. Find the intersection point between the line and arc. [8]
- b) Summarized the characteristics of B-spline curve that are useful in design. [8]
- Q7)** a) Find the equation of the Hermite cubic spline that connects P_0 and P_2 and that is tangent to the two line segment as shown in fig. [8]
- 
- b) Derive the transformation needed to convert the control vertices of a periodic cubic B-spline curve into those of cubic Bezier that represents the same curve. [8]
- Q8)** a) Sketch the geometric parameters require to create extruded, revolve, sweep, loft, offset and knit surface operations. [8]
- b) Find the equation of the Bezier surface that covers the R define by $P_{00}(0, 0)$, $P_{10}(4, 0)$, $P_{11}(4, 2)$ and $P_{01}(0, 4)$. Also, find the surface vector and its midpoint. [8]

- Q9)** a) What are the parameters that define a helix? Draw a sketch to illustrate your answer. [6]
- b) Consider the four bar truss shown in the figure. It is given that $E=29.5 \times 10^6$ psi and $A = 1 \text{ in}^2$ for all elements.
- Using elimination approach, solve for the global displacement vector.
 - Evaluate stress in each element.
 - Determine the reaction force at support. [10]



Q10) Short notes on any three :

[18]

- Data exchange translators.
- Network Topologies.
- CSG tree with suitable example.
- Simulation languages.
- Shape functions.

□□□

Total No. of Questions : 10]

[Total No. of Pages : 3

P1542

[3665]-771

M.E. (Polymer Engg.)

SYNTHESIS AND CHEMISTRY OF POLYMERS

(509104) (2008 Course) (Elective - I)

Time : 3 Hours]

[Max. Marks : 100

Instructions :

- 1) *Question Nos. 1 and 6 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) *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) Attempt any **four** :

- a) Three samples of monodisperse Nylon 6,6 are mixed together as follows :
10 g of A having molecular weight 50,000
5 g of B having molecular weight 40,000
3 g of C having molecular weight 1,00,000
Find out the polydispersity index of the polymer mixture. [5]
- b) Enlist the various chain transfer reactions in radical polymerization. [5]
- c) Write importance of oxidative polymerization. Enlist at least three polymers synthesized by this technique. [5]
- d) Explain in brief the mechanisms of "Living" polymerization techniques. [5]
- e) Write a short note on Polyaddition polymerization. [5]
- f) A monomer sample in storage becomes thick after eight months. Discuss the possible reasons. Suggest a remedy for the storage of this monomer in future. [5]

- Q2)** a) What is the significance of Carother's equation in the polymer field? Derive Carother's equation. [8]
- b) Compare in details Emulsion and Solution polymerization techniques. [7]

P.T.O.

OR

- Q3)** a) Enlist various techniques to find out number average molecular weight (M_n). Explain any one in detail. [7]
- b) Discuss the effect of i) initiator concentration, ii) temperature, and iii) monomer concentration on molecular weight or degree of polymerization in case of free radical polymerization. [8]
- Q4)** a) Describe in brief Plasma polymerization technique. What are its salient features? Mention special application of this technique. [8]
- b) In order to manufacture following polymers suggest suitable initiators : [7]
- i) polyisobutylene.
 - ii) isotactic polypropylene.
 - iii) polyvinyl chloride.

OR

- Q5)** a) A polymerization reaction is in progress. How will you know whether it is a condensation or addition polymerization? Explain. [5]
- b) Half-life of a free radical initiator is 8 hours at 70°C. Is it a suitable initiator for polymerization of styrene in benzene? Explain. [5]
- c) Discuss the different types of initiators used in free radical polymerization with examples. [5]

SECTION - II

Q6) Attempt any **four** :-

- a) What is functionality? Calculate average functionality in following reaction mixture :- [5]
- i) 1 mole of Melamine and 1 mole of Formaldehyde.
 - ii) 1 mole of Terephthalic acid and 1 mole of Ethylene Glycol.
- b) "Only certain kinds of rings undergo polymerization". Comment on the statement. [5]
- c) Why is it necessary to vulcanize rubbers? Which properties are enhanced by vulcanization? Explain with the help of suitable diagram. [5]
- d) Calculate the quantity required of Phthalic anhydride to completely cross-link 100 gm of DGEBA (epoxy resin) with epoxy equivalent 170. [5]
- e) What is hydrogenation reaction? What types of catalysts are used for hydrogenation? How this reaction is used in polymer modification? [5]
- f) State and explain various modes of degradation of polymers. [5]

Q7) a) Five moles of phenol were reacted with 4 moles of formaldehyde under acidic conditions to form Novolak resins. Calculate [8]

- i) average molecular weight of this resin.
- ii) how many grams of Hexamethylene tetramine (Hexa) will be required to completely cross-link 100 grams of aforementioned Novolak resin?

b) Describe chlorosulphonation of polymers. Give its significance. [7]

OR

Q8) a) Write down the chemical reaction involved in synthesis of following polymers (Any 2). [8]

- i) Epoxy
- ii) Polyurethanes
- iii) Silicones
- iv) Unsaturated polyesters.

b) Compare properties of polymeric solutions with that of solutions of low molecular substances. [7]

Q9) a) Show by equation the overall chemical reaction involved in the synthesis of polymers from the following chemicals. [10]

i) $\text{CH}_2 = \text{C}(\text{CH}_3)\text{COOH}$

ii) $\text{HO} - (\text{CH}_2)_5 - \text{COOH}$

iii)
$$\begin{array}{c} \text{CH}_2 - \text{O} \\ | \quad \quad | \\ \text{CH}_2 - \text{CH}_2 \end{array}$$

iv)
$$\begin{array}{c} \text{CH}_3 - \text{C}_6\text{H}_4 - \text{NCO} \\ | \\ \text{OCN} \end{array} + \text{HO} - \text{CH}_2 - \text{CH}_2 - \text{OH}$$

v) $\text{H}_2\text{N} - (\text{CH}_2)_4 - \text{NH}_2 + \text{ClOC} - (\text{CH}_2)_5 - \text{COCl}$

b) Explain Interfacial Polymerization. [5]

OR

Q10)a) Give chemical reactions for the synthesis of polyvinyl alcohol. [5]

b) What are ion exchange resins? How are they prepared? [5]

c) Discuss the importance of solubility parameters w.r.t. formation of polymer solution. [5]



Total No. of Questions : 10]

[Total No. of Pages : 5

P1717

[3665]-772

M.E. (Polymer Engg.)

POLYMER RHEOLOGY

(2008 Course)

Time : 3 Hours]

[Max. Marks : 100

Instructions :

- 1) *Question Nos. 1 and 6 are compulsory.*
- 2) *Out of the remaining attempt 2 questions from Section - I and 2 questions from Section - II.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of graph paper, log-log graph paper and calculator is allowed.*
- 5) *Assume suitable data, if required.*

SECTION - I

Q1) Attempt any four :

[20]

- a) Write in short about tensile and shear viscosity.
- b) Explain the concept of normal stress differences. Discuss its effect in short.
- c) Derive an equation for velocity profile for polymer melt flow through an annulus.
- d) Write a note on Ryan Johnson criterion for transition between laminar and turbulent flow for polymer melts.
- e) Write a note on Hank's criterion for transition between laminar and turbulent flow polymer melts.

Q2) a) High pressure capillary viscometer data for PP is given below at temperature of 210°C. Fit Power law, Ellis and Carrean model for the data.

Shear rate (Sec ⁻¹)	Shear stress (Pa)
3.58	16,700
7.32	24,000
21.20	42,900
48.50	59,300
109	76,000
294	94,000

P.T.O.

658	1,25,000
1,400	1,56,000
3,510	1,90,000
6,740	2,08,000
12,700	2,24,000

Comment on the result. [12]

b) Describe in short Bingham plastic fluids. [3]

Q3) a) Describe governing equation for zener model used to describe viscoelastic behaviour of polymers. Explain its response under static creep and stress relaxation. [5]

b) Derive an equation for static creep and dynamic creep for a viscoelastic polymer obeying Kelvin or Voigt model. [5]

c) A Maxwell model with constants 12 MN/m² and 110 MN/m² represents the stress relaxation behaviour of a polymer. It is subjected to step changes in strain –

$t < 0$	$\gamma = 0$
100 sec. $\geq t > 0$ sec.	$\gamma = 0.5$
300 sec. $\geq t > 100$ sec.	$\gamma = 1.5$
500 sec. $\geq t > 300$ sec.	$\gamma = 3.5$
$t > 500$ sec.	$\gamma = 3.0$

Calculate stress in the sample using Boltzmann Superposition principle at $t = 320$ sec. and $t = 510$ sec. [5]

Q4) a) A test piece with dimensions 2.0×5×25 mm is subjected to a tensile force of 120 N. The force was removed at $t = 800$ sec. giving an instantaneous recovery. Calculate instantaneous compliance and compliance at 200 sec.

Time (Sec.)	0	10	50	100	200	300	500	600	800
Specimen length	50	75	101	114	130	141	153	158	168 to 144

[6]

b) Write in short about : [9]

- Dynamic modulus
- Dynamic compliance
- Dynamic viscosity.

- Q5)** a) Explain the significance of isochronous stress-strain plot. Explain how isometric and isochronous stress-strain plot data can be used in plastic product design. [5]
 b) Write in short about any one Rheological model for Extensional viscosity. [5]
 c) Write in short about non-linear viscoelasticity. [5]

SECTION - II

Q6) Attempt any four :- [20]

- a) Discuss the effect of pressure on polymer melt flow.
- b) Discuss the effect of molecular weight and molecular branching on polymer melt rheology.
- c) Write a note on estimation of wall slip velocity for polymer melt flow through a circular channel.
- d) Write in short about constant-stress and constant strain type rheometers.
- e) Write in short about on-line rheometry.

Q7) a) For a cone and plate type of viscometer derive an equation for torque and apparent viscosity. Also obtain an expression and explain how first normal stress difference can be estimated experimentally. [10]

- b) Derive an expression for pressure at the extruder exit for a wire coating die. [5]

Q8) a) A power law fluid is injected into a center gated disc cavity. The disc thickness is 4 mm and diameter is 300 mm. The zero shear rate viscosity of the polymer is 2×10^4 N-sec/m². The volumetric flow rate of injection is 8×10^{-5} m³/sec. [8]

- i) Derive and obtain an expression for mean effective pressure across the cavity assuming non-isothermal condition.
 - ii) If freeze-off time for above conditions is 10 sec., find clamping tonnage requirement.
- b) Derive an expression for maximum pressure and point of maximum pressure for melt processing in a two roll mill. Assume symmetric rolls. [7]

Q9) a) A wire of polyacetal of diameter 3.2 mm is extruded at 190°C into a water bath at 20°C. Calculate the length of water bath to cool the wire from 190°C to a centerline temperature of 140°C. The haul off rate of the wire is 0.5 m/sec.

Heat transfer coefficient $\alpha_a = 1700$ W/(m²°K).

Thermal diffusivity = 10^{-7} m²/sec.

Thermal conductivity of plastic = 0.23 W/(m°K).

Use fig no. 1 for fourier number. Where Θ_{T_b} is ratio of (centerline temp - water temp to initial temperature - water temp) and B_i is Biot number. [5]

- b) Derive the relation between activation energy at constant shear rate, constant shear stress and flow behaviour index. [10]

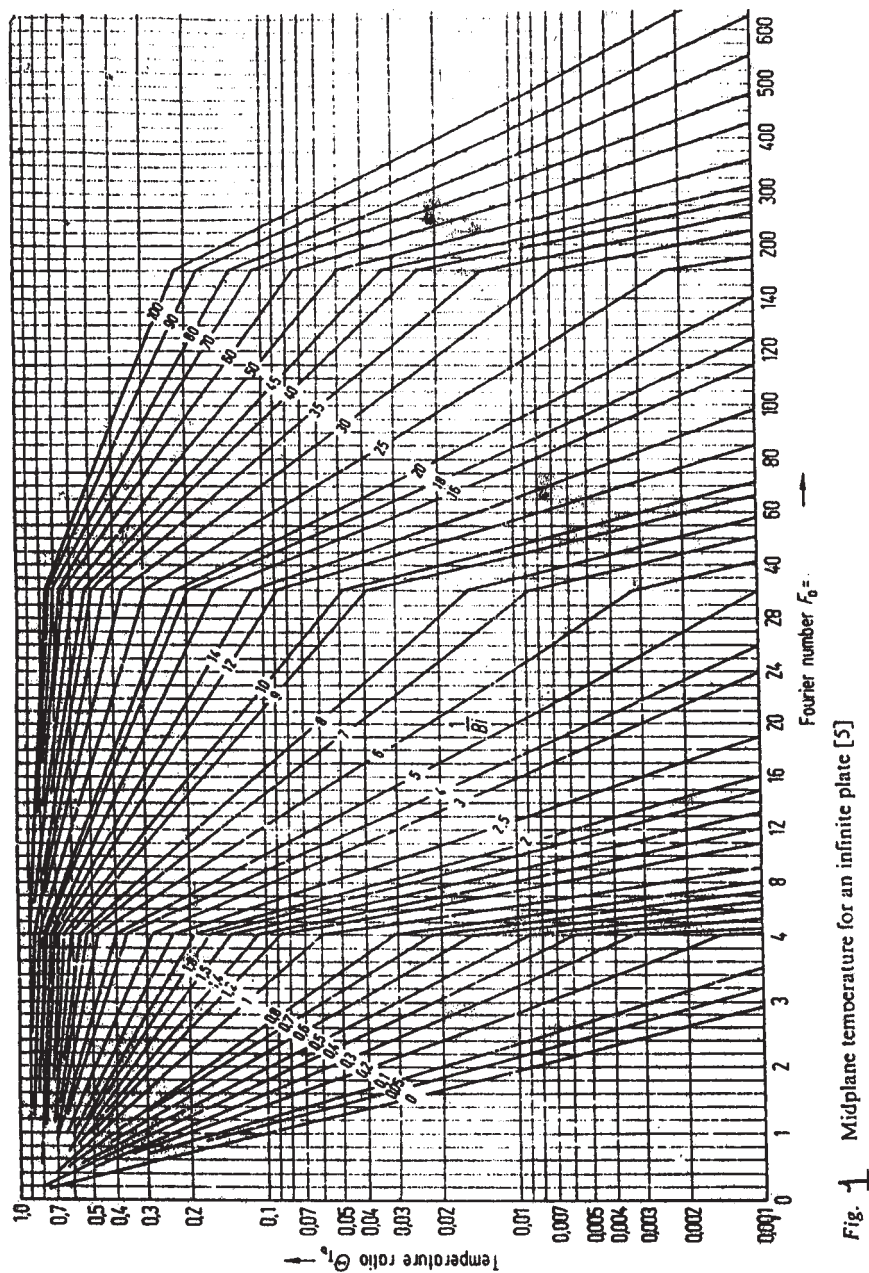


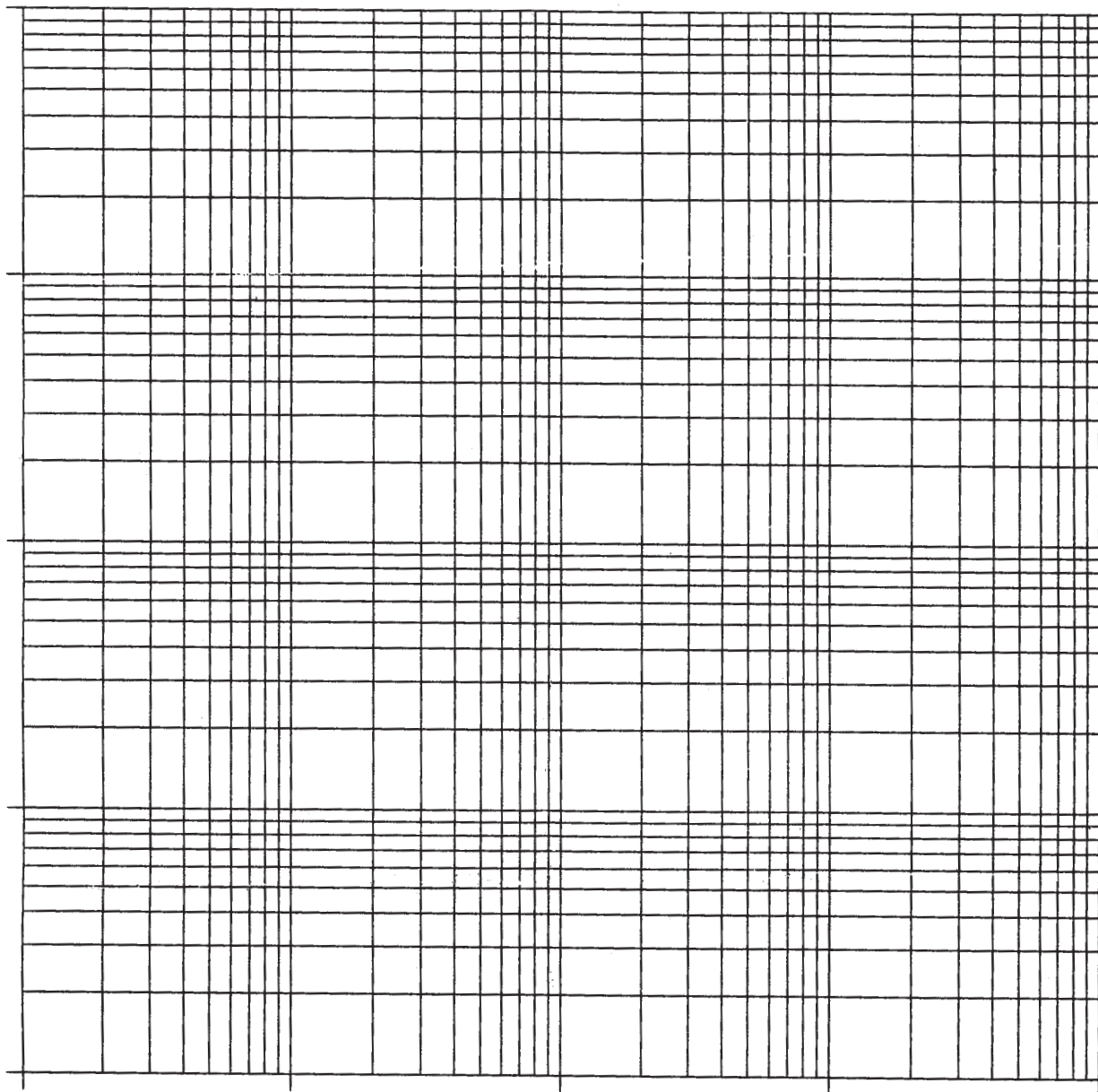
Fig. 1 Midplane temperature for an infinite plate [5]

- Q10)a) Pressure drop, volumetric flow rate data of melt extruded from a capillary with diameter 1.5 mm is given below. Calculate Baglay's correction if flow rate is $335 \times 10^{-9} \text{ m}^3/\text{sec}$. For capillaries of different L/D ratio.

L/D ratio	20	10	5	1
ΔP , MPa	64.3	37	24.8	14.5

[6]

- b) Write in short about Doi-Edward reptation theory. [6]
 c) Write in short about Deborah number and its significance in processing. [3]



□□□

Total No. of Questions : 8]

[Total No. of Pages : 4

P1552

[3665]-782

M.E. (E & TC) (Signal Processing)

LINEAR ALGEBRA AND RANDOM PROCESSES

(2008 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) 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) Prove that

[9]

$$\Delta = \begin{vmatrix} (b+c)^2 & a^2 & a^2 \\ b^2 & (c+a)^2 & b^2 \\ c^2 & c^2 & (a+b)^2 \end{vmatrix} = 2abc(a+b+c)^3.$$

b) Show that

$$\begin{vmatrix} -1 & 0 & 0 & a \\ 0 & -1 & 0 & b \\ 0 & 0 & -1 & c \\ x & y & z & -1 \end{vmatrix} = 1 - ax - by - cz. \quad [9]$$

Q2) a) Find the inverse of the matrix.

[8]

$$A = \begin{bmatrix} 1 & -2 & -1 \\ 2 & 3 & 1 \\ 0 & 5 & -2 \end{bmatrix}.$$

P.T.O.

- b) Find the rank of the following matrices. [8]

i) $\begin{bmatrix} 1 & 2 & -4 & 5 \\ 2 & -1 & 3 & 6 \\ 8 & 1 & 9 & 7 \end{bmatrix}$ ii) $\begin{bmatrix} 1 & -1 & 3 & 6 \\ 1 & 3 & -3 & -4 \\ 5 & 3 & 3 & 11 \end{bmatrix}$

- Q3)** a) Show that the equations: [8]

$$3x + 7y + 5z = 4,$$

$$26x + 2y + 3z = 9,$$

$$2x + 10y + 7z = 5$$

are consistent and solve them.

- b) Show that the matrices A and A' have the same eigen values. [4]

Given $A = \begin{bmatrix} 3 & 2 & 4 \\ 2 & 0 & 2 \\ 4 & 2 & 3 \end{bmatrix}$

- c) If A is non-singular, prove that the eigen values of A^{-1} are the reciprocals of the eigen values of A. [4]

- Q4)** a) Prove that the characteristic roots of a Hermitian matrix are real. [8]

- b) Show that the vectors $X_1 = (3, 1, -4)$, $X_2 = (2, 2, -3)$ form a linearly independent set. [4]

- c) Prove that the matrix is unitary. [4]

$$\begin{bmatrix} \frac{1+i}{2} & \frac{-1+i}{2} \\ \frac{1+i}{2} & \frac{1-i}{2} \end{bmatrix}.$$

SECTION - II

- Q5)** a) Explain conditional probability and statistical Independence with an example. [4]

- b) Each letter of the word ATTRACT is written on a separate card. The cards are then thoroughly shuffled, and four of them are drawn in succession. What is the probability of getting result as TACT? [4]

- c) A computer becomes inoperative if 2 components A & B both fail. Probability that A fails is 0.01 and probability that B fails is 0.005. However probability that B fails increases by a factor of 4, if A has failed.
- Calculate the probability that computer becomes inoperative.
 - Find probability that A will fail if B has failed. [8]

- Q6)** a) A random variable has an exponential PDF given by $f(x) = a \cdot e^{-bx}$, where a and b are constants. Find,
- The relationship between a and b .
 - The cumulative distribution function of x . [8]
- b) Let X & Y be 2 continuous random variables both with mean equal to $7/12$ and variance equal to $11/144$ and have the probability density function given by,

$$f_{X,Y}(x, y) = \begin{cases} x + y & 0 < x < 1, \quad 0 < y < 1 \\ 0 & \text{elsewhere} \end{cases}$$

Determine the correlation, covariance and correlation coefficient between X & Y . [8]

- Q7)** a) The joint probability distribution of X and Y is given by

$$P(X = x, Y = y) = \frac{X + 3Y}{24}, \quad x = 1, 2; y = 1, 2.$$

Find pdf of X & Y and show them diagrammatically. [6]

- b) Daily rainfall of a particular region is represented by random variable X whose pdf is,

$$f_X(x) = \begin{cases} \frac{3}{4}(2x - x^2) & 0 < x < 2 \\ 0 & \text{elsewhere} \end{cases}$$

Find the probability that on a given day in this region rainfall is

- Not more than 1 inch.
 - Greater than 1.5 inch.
 - Between 0.5 and 1.5 inch. [6]
- c) Explain marginal distribution and density function. State the relationship between them. [4]

- Q8)** a) Explain Autocorrelation and auto covariance for a Random process. Derive the relationship between them. [6]
- b) Derive an expression for mean of a Random Process $Y(t)$ at the output of an LTI filter with input $X(t)$. [6]
- c) List 4 properties of Poission's Process. Write the expression for mean, autocorrelation & and covariance for Poissions Process. [6]



If the image is passed through the gray level transform $g(x, y) = 2f(x, y) + 10$.
What is the mean value & standard deviation of transformed image.
Comment on effect on contrast of the image. [8]

- b) What is meant by histogram of an image. Explain about histogram specification. [8]

SECTION - II

Q5) a) Explain region growing algorithm for image segmentation. [8]

- b) Explain the use of statistical moment of the intensity histogram of the image for texture analysis. [8]

Q6) a) Explain Image segmentation using thresholding. [8]

- b) Define morphological ‘opening’ operation. Perform opening operation on following binary image (7×7) using structuring element ‘SE’ (3×3)

Image = [8]

$$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 1 & 1 & 0 & 0 \\ 0 & 1 & 1 & 1 & 1 & 1 & 0 \\ 0 & 1 & 1 & 0 & 1 & 1 & 0 \\ 0 & 1 & 1 & 1 & 1 & 1 & 0 \\ 0 & 0 & 1 & 1 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix} \quad 7 \times 7$$

$$SE = \begin{bmatrix} 0 & 1 & 0 \\ 1 & 1 & 1 \\ 0 & 1 & 0 \end{bmatrix}$$

Q7) a) What is Image restoration. Discuss the degradation models. [8]

- b) Explain the concept of homomorphic filter for image enhancement. [8]

Q8) Write short notes on: [18]

- a) Image Fidelity criteria. b) Hough transform.
c) Bit plane coding.



Total No. of Questions : 8]

[Total No. of Pages : 2

P1554

[3665]-785

M.E. (E & TC) Signal Processing

DIGITAL IMAGE PROCESSING

(Elective - I) (2008 Pattern)

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) Explain filtering using zonal mask. Can we do edge detection using Zonal mask? [8]

b) Let $h_1 = \begin{bmatrix} 0 & -1 & -2 \\ 1 & 0 & -1 \\ 2 & 1 & 0 \end{bmatrix}$

Find Fourier transform of h_1 . If h_1 is convolved with the image. Comment on effect of convolution on image. [10]

Q2) a) Define continuous wavelet transform & discrete wavelet transform. Explain multiresolution analysis using wavelet transform. [8]

b) Explain KL transform state its applications. [8]

Q3) a) Explain vector quantization. [8]

b) Find a set of code words and average word length using Huffman coding scheme for a set of input graylevels with probabilities as given below:[8]

Input	S_1	S_2	S_3	S_4	S_5	S_6	S_7	S_8
Probability	.02	.15	.03	.15	.05	.20	.10	.30

Q4) a) Assume that an eight bit image has a mean value of 100 & standard deviation of 10.

P.T.O.

Total No. of Questions : 8]

[Total No. of Pages : 2

P1424

[3665]-98

M.E. (Instru. - Digital System)
EMBEDDED SYSTEM DESIGN
(Revised Course 2004)

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) Draw and explain hardware and software architecture of an embedded system. [8]
- b) With the help of logic diagram explain timer / counter control logic of 8051 microcontroller. [8]
- Q2)** a) Explain in detail I2C protocol for communication between microcontroller (master) and I2C based peripherals (slaves). [8]
- b) Draw and explain the register organization of ARM processor. What are banked and unbanked registers. [8]
- Q3)** Explain the embedded system for 'Adaptive Cruise Control'. Also explain the task scheduling model of the system. [16]
- Q4)** Write short notes on : (Any three) [18]
- a) Data transfer modes in USB.
 - b) PCI read transaction.
 - c) Embedded system design metric.
 - d) Comparison of CISC and RISC processor features.

P.T.O.

SECTION - II

- Q5)** a) Explain the role of scheduler in RTOS? Compare preemptive and non preemptive scheduling techniques. [8]
b) Explain with suitable example how semaphores are used to solve shared data problem? What are counting semaphores? [8]
- Q6)** a) Describe the development cycle of an embedded system. [8]
b) Explain clearly the difference between CPLD, FPGA and ASIC. [8]
- Q7)** a) Explain in detail the architecture of TMS 320 C 62 X DSP processor.[8]
b) Explain the role of barrel shifter in ARM core. List the instructions that use barrel shifter. [8]
- Q8)** Write short notes on : (Any three) [18]
a) Mailbox and queues w.r.t. RTOS.
b) Features of μ COS - II.
c) Tools for system development using PLDs.
d) Features of Atmel's AVR microcontroller.



P1761

[3665]-588

**M.E. (E & TC) VLSI & Embedded Systems
SYSTEM ON CHIP (2008 Course)**

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.*
- 5) *For metal-2 : $C_{\text{metal-2, plate}} = 0.02\text{fF}/\mu\text{m}^2$, $C_{\text{metal-2, fringe}} = 0.06\text{fF}/\mu\text{m}$*

SECTION - I

- Q1)** a) Differentiate depletion Vs enhancement MOSFET. Which is preferred in CMOS fabrication? Why? [8]
b) Why copper is preferred over aluminum as interconnecting material? [8]
- Q2)** a) Define design rule and explain its role in: [8]
i) Fabrication error.
ii) Scalable design.
b) Explain rat's net plot algorithm? What are limitations of this algorithm? [8]
- Q3)** a) Prove that LOW to HIGH transition is 1/2 to 1/3 the speed of HIGH to LOW transition? [8]
b) Explain hierarchy of design abstraction? Draw logic diagram of full adder. Draw four bit adder from full adder. Name each component in full adder and define four bit adder as a type. Draw the component hierarchy, showing the four bit adder, the full adder and logic gates. [8]
- Q4)** Explain:
a) Why n-diffusion to p-diffusion spacing is so large? [6]
b) Why is metal-metal spacing is large than poly-poly spacing? [6]
c) Why is metal2-metal2 spacing is larger than metal1-metal1 spacing? [6]

P.T.O.

SECTION - II

- Q5)** a) What is maximum allowable skew as predicated by Hatiman and Cash constraint for the parameter values : $T = 10 \text{ ns}$, $t_{pr} = 1 \text{ ns}$, $t_{sr} = 1 \text{ ns}$, $t_{sl} = 1 \text{ ns}$, $t_{pl} = 5 \text{ ns}$, $t_{pi} = 5 \text{ ns}$. What is minimum allowable clock period under that value of skew? [8]
- b) List out different power estimation tools & tabulate their features? [8]
- Q6)** a) A chip core is $3000 \lambda \times 2500 \lambda$ and required 0.8 A . It needs single input and 19 single output pads. [8]
- i) How many V_{DD} and VSS pad are required assuming 12λ power ring?
- ii) Will the total chip size be limited by the chip core or by pad ring?
- b) 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? [8]
- Q7)** a) What is difference in fall time of two input static complementary NOR gate (assuming minimum size load capacitance) when one pulldown and when two pulldown are activated? [8]
- b) Which is current memory technology? State its technical features? Compare it over DDR-II. [8]
- Q8)** a) Describe two phase clocking rules. [4]
- b) Consider an ALU design to enumerate all the possible functions of two inputs ALU and for each possible function, list the control inputs to the three each arithmetic and logical functions for ALU. [14]
- i) Draw block diagram.
- ii) Write VHDL code for above ALU block diagram.
- iii) Write Test Bench for above VHDL code which will cover all state table conditions.



Total No. of Questions :6]

[Total No. of Pages :2

P1453

[3665] - 549

M.E. (Electrical) (Power System)
DIGITAL POWER SYSTEM PROTECTION
(2008 Course) (Sem. - II) (Elective - III)

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) Explain Mann & Morrison method of numerical distance protection of transmission line. [13]
- b) With neat diagram explain numerical transformer differential protection. Give algorithm for percentage differential relay for transformer protection. [12]
- Q2)** a) Explain digital protection scheme based upon fundamental signal. [12]
- b) Explain software design of digital protection of transmission line. [13]
- Q3)** a) Explain in detail different types of faults in synchronous generator. [13]
- b) Explain digital protection scheme based upon injection of subsynchronous component in the rotor circuit. [12]

P.T.O.

SECTION - II

- Q4)** a) With reference to digital protection of transformer explain [10]
i) Magnetising inrush current
ii) Overvoltage inrush current
- b) With reference to percentage differential scheme of power transformer, explain. [15]
i) Principle
ii) Reasons for taking high bias factor
iii) Derivation of Relay characteristics in complex β plane.
- Q5)** a) With reference to directional instantaneous IDMT over current relay explain in detail [18]
i) Characteristics
ii) Co-ordination criteria for two terminal lines along with time - delay operating setting.
- b) Write a note on applications of computer graphics. [7]
- Q6)** a) State assumptions for conducting short - circuit studies of a large scale power system network. [5]
- b) With reference to Ultra high speed protective relays for high voltage long transmission line, explain in detail [20]
i) Travelling wave based Relaying scheme.
ii) Fault locating relay scheme.



P1457

[3665] - 560

M.E. (E & T/C) (Microwave)
SPEECH PROCESSING AND APPLICATION
(2008 Revised 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 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) Draw the principal parts of vocal tract and explain how speech is produced? **[8]**
- b) Explain the following terms: **[10]**
- | | |
|---------------|---------------|
| i) Nasal | ii) Formant |
| iii) Bilabial | iv) Velar |
| v) Cepstrum | vi) Mel Scale |
- Q2)** a) Explain the term speech digitization. **[2]**
- b) Explain why speech digitization is essential. **[4]**
- c) Draw the general block diagram of speech digitizer and explain. **[5]**
- d) Compare the performance of various speech digitization techniques. **[5]**
- Q3)** a) Explain what are the basic steps in text to speech conversion with block diagram. **[12]**
- b) How to assess the Quality of coded speech. **[4]**

- Q4)** a) Explain the differences between automatic speech recognition and speaker recognition with the help of block diagram. [8]
b) What are the difficulties in the above task? [2]
c) What is acoustic echo? Draw the block diagram of acoustic echo canceller and explain. [6]

SECTION - II

- Q5)** a) Explain the basic concept of neural network approaches for speech recognition and explain any one neural network architecture used for this purpose. [10]
b) Explain the auditory nerve representation of speech processing. [6]
- Q6)** a) What is HMM (Hidden Markov Model)? Explain how HMM can be used for speech recognition. [8]
b) Explain any four issues related to HMM for speech recognition. [8]
- Q7)** a) Explain the hardware architecture of voice processing system with the help of block diagram. [9]
b) Explain in detail the voice processing functions. [9]
- Q8)** Write short notes on any three: [16]
a) Speech coding standards.
b) Short term Fourier transform approach for enhancing speech.
c) LPC spectral distance measures
d) Adaptive echo cancellation.



P1459**[3665] - 564****M.E. (E & TC) (Microwave)****MOBILE COMMUNICATION GSM AND CDMA****(2008 Course)*****Time : 3 Hours]******[Max. Marks :100******Instructions to the candidates:***

- 1) Q1 and Q5 are compulsory.*
- 2) Solve any two questions from the remaining in each section.*
- 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) State and explain traffic management units. **[6]**

- b) To determine voice traffic on a line, the following data was collected during a period of 90 min. Calculate the traffic intensity in Erlangs and CCS, using the given data **[6]**

Call no.	Duration of call (sec)
1	60
2	74
3	80
4	90
5	92
6	70
7	96
8	48
9	64
10	126

- c) Derive the expression for Binomial distribution and explain its significance. **[6]**

Q2) a) Explain how cochannel interference is reduced by using three and six directional antennas. **[10]**

- b) Explain the steps involved in a handoff process. **[6]**

P.T.O.

- Q3)** a) Explain basic GSM architecture in detail. [10]
 b) Explain the terms [6]
 i) Frequency reuse ii) Cell splitting

- Q4)** a) Explain GSM logical channels. [10]
 b) List out various standards for wireless communication. [6]

SECTION - II

- Q5)** a) Explain basic concept of spread spectrum system and how it is incorporated in CDMA. [10]
 b) Compare GSM & IS - 95 CDMA architecture w.r.t. following features:- [8]

- | | |
|----------------------|------------------------|
| i) Frequency band | ii) Channel band width |
| iii) Voice quality | iv) Interference |
| v) Handoff | vi) System capacity |
| vii) Radio interface | viii) Economics |

- Q6)** a) Explain QPSK. Write the expression for the error rates in it. [8]
 b) If BPSK signaling is used through a channel that adds white noise with single sided power spectral density $N_0 = 10^{-10}$ W/Hz, calculate the amplitude V of the carrier signal to give error rate $P_e = 10^{-6}$ for a data rate of 100 kbs. [8]

- Q7)** a) Explain the physical and logical channels of IS - 95 CDMA with neat diagrams. [10]
 b) Explain the significance of 'Pilot channel' and 'Sync channel'. [6]

- Q8)** a) Explain GPRS. [6]
 b) Suppose you are asked to design a wireless system, discuss the planning & engineering of the cellular radio system needed in detail. [10]



P1460

[3665] - 565

M.E. (E & TC) (Microwave) (Theory)

FIBER OPTIC COMMUNICATION

(2008 Course) (Elective - III) (504231)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) Answer three questions from Section I and three 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) Assume suitable data, if necessary.*
- 5) Use of log tables, electronic pocket calculator is allowed.*

SECTION - I

- Q1)** a) Define the relative refractive index difference for an optical fiber and show how it may be related to the Numerical aperture. A typical relative refractive index difference for an optical fiber is 1%. Estimate the NA and solid acceptance angle in air for fiber if core index is 1.46. Also calculate critical angle at core-cladding interface. **[10]**
- b) Briefly indicate with the aid of suitable diagrams the difference between meridional and skew ray paths in step index fibers. **[8]**
- Q2)** a) Describe the mechanism of intermodal dispersion in a multimode graded index fiber and derive an expression for rms pulse broadening in Graded index fiber. **[8]**
- b) For a multimode graded index fiber the rms pulse broadening at the output is 15 ns/ km. The length of optical fiber is 10 km. If refractive index of core is 1.4 calculate **[8]**
- i) Refractive index of cladding layer
 - ii) The delay difference at the output.
- Q3)** a) What are the different types of attenuation in optical fiber communication. **[8]**
- b) Show that the TE_{01} and TE_{10} modes in a rectangular waveguide do not exist. **[8]**

P.T.O.

- Q4)** a) What is OTDR? Explain its application in measuring parameters of the link. [8]
b) Explain the different splicing techniques and the difference between connectors and splices. [8]

SECTION - II

- Q5)** a) A planar LED is fabricated from GaAs has refractive index of 3.5 [10]
i) Calculate the optical power emitted into air as a percentage of internal optical power for the device when the transmission factor at the crystal air interface is 0.69.
ii) When the optical power generated internally is 40% of the electrical power supplied, determine the external power efficiency.
b) Explain the principle of working of Avalanche photodiode. [8]
- Q6)** a) Explain the stimulated emission as applied to LASER diodes. What advantages do semiconductor laser diodes have over LEDs when used for light emission over fibers [8]
b) What is meant by link power budget and how to calculate the required length of fiber, if rest parameters are given? [8]
- Q7)** a) Explain the gain process in a Raman fiber amplifier and comment upon the flexibility associated with the pumping process in this fiber amplifier type. [8]
b) Define quantum efficiency and responsivity of photo detector.
Derive an expression for responsivity of an intrinsic photo detector in terms of quantum efficiency and wavelength of incident radiation. [8]
- Q8)** a) Explain non linear effects in optical fibers. [8]
b) Write short note on any two of following [8]
i) EDFA amplifiers.
ii) WDM systems
iii) Electro optic switches.



P1461**[3665] - 582**

M.E. (E & TC) (VLSI & Embedded Systems)
EMBEDDED SIGNAL PROCESSING
(2008 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.*
- 4) *Assume suitable data if necessary.*

SECTION - I

- Q1)** a) Determine 4 pt. DFT of the given DT signals. Also plot their magnitude and phase spectra. **[8]**
i) $x[n] = \{1/3, 1/4, 0.5, 1\}$ ii) $x[n] = \{1, 5, 7\}$
b) Justify that the pipelining increases the performance and reduces the power consumption of DSP system with suitable example. **[8]**
- Q2)** a) Determine DCT of the given sequence **[10]**
i) $x[n] = \{1, 2, 0, 3\}$. ii) $x[n] = \{2, 3, 4, 7\}$.
b) Explain different retiming techniques. **[6]**
- Q3)** a) The transfer function of analog filter is given below
$$H(s) = \frac{1}{(s+1)(s+2)}$$
 [10]
i) Find $H(z)$ using impulse variance method.
ii) Calculate $H(z)$ when $F_s = 5$ sps, & 10 sps respectively.
b) Compare linear convolution and circular convolution. **[6]**
- Q4)** a) Define correlation. What are different types of correlation? Explain properties of correlation. **[6]**
b) Obtain autocorrelation for DT sequence given below and sketch the result. **[4]**
i) $x[n] = \{1, 0, 2, 3, 4\}$ ii) $x[n] = \{3, 4, 7, 8\}$
c) Write short note on: **[8]**
i) Signal flow graph.
ii) Advantages and disadvantages of window method for FIR filter design.

P.T.O.

SECTION - II

- Q5)** a) Why SFG are not used to represent the multirate DSP systems? Explain the method which is used to represent multirate DSP systems. [10]
b) State the advantages and disadvantages of using floating point DSP processors rather than fixed point DSP processors. [6]
- Q6)** a) Draw and explain the architecture of Blackfin processor. [8]
b) Explain with an example how FFT algorithm can be implemented on TMS320C67XX. [8]
- Q7)** a) Explain different addressing modes of TMS320C54XX [8]
b) Compare TMS320C67XX and TMS320C54XX with respect to architectures, MIPS/FLOPS, accumulators, memories, on chip peripherals and addressing modes. [8]
- Q8)** Write short notes on: [18]
a) IEEE floating point representation formats.
b) Selection of DSP processors.
c) Finite word length effects.



P1469**[3665] - 615**

M.E. (Production Engg.)
ADVANCED ROBOTICS
(2008 Revised 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) Use of calculator is allowed.
- 6) Assume suitable data, if necessary.

SECTION - I

- Q1)** a) Explain the basic differences amongst **[6]**
 i) Teach pendent robot and
 ii) Intelligent robot, bringingout the salient features of each.
 b) Describe the various characteristics used to specify robotic manipulators. **[6]**
 c) Define with reference to robotics **[6]**
 i) Positional accuracy ii) Repeatability
 iii) Resolution.

- Q2)** a) A five axis articulated robot has following kinematic parameters based on D-H algorithm. **[12]**

Axis	θ	d	a	α
1	θ_1	L_1	0	-90°
2	θ_2	0	L_2	0°
3	θ_3	0	L_3	0°
4	θ_4	0	0	-90°
5	θ_5	L_5	0	0°

Find out the position and orientation of the end effector with respect to origin if the joint variable vector is $[45^\circ -135^\circ 180^\circ 45^\circ 180^\circ]$ and the link parameters are $L_1 = 50$, $L_2 = L_3 = 140$ and $L_5 = 20$.

P.T.O.

- b) Explain the terms tool configuration space and work envelope. State the difference between two. [4]
- 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) What are the major differences between the open-loop and closed-loop servo systems? [8]
- b) Explain with neat sketches at least two types of grippers actuated by small electric motor. [8]

SECTION - II

- Q5)** a) Explain in brief the programming methods used in robotics. [6]
- b) Which is more important to robots and manufacturing automation, A/D converters or D/A converters? Why? [6]
- c) Compare range sensors and proximity sensors. [6]
- Q6)** a) Describe the various image processing steps in robotic vision system. [8]
- b) An image is digitized with 256 samples per line and 256-line scan. Determine the number of bits required to represent the images as (i) binary image. (ii) gray-level image with 4-bits for coding gray levels. [8]
- Q7)** a) Explain the role of Jacobian matrix in the path control strategy. [8]
- b) Explain the grasp planning considerations with suitable example. [8]
- Q8)** Answer any two:
- a) Compare Newton-Euler and Lagrange-Euler formulations and state the situations when you will prefer N.E. formulation / L.E. formulation. [8]
- b) Describe 'SCARA' robots and draw its schematic diagram. How many degrees of freedom are possible in it? How? [8]
- c) Using a neat block diagram, describe a position control system used in robotics. [8]



P1473**[3665] - 620****M.E. (Production)****MANUFACTURING MANAGEMENT****(Revised 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 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 calculator is allowed.*
- 6) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) What are the differences between products and services? What are the similarities between them? **[8]**

b) Name the prominent quality gurus? What are the sayings of W.Edwards Deming in relation to total quality management? **[8]**

Q2) a) Systems software(p) Ltd. is planning to develop a new software. It has identified the activities given below. For this project, it has estimated three time estimates in number of days for every activity. Find the expected duration of the project and the probability that the project will be completed within 30 days. **[8]**

Activity	Description	Predecessor (s)	Optimistic	Most likely	Pessimistic
A	Plan the objectives of the project	—	1	2	3
B	Choose the appropriate operating system	A	3	5	7
C	Generate algorithm	A	6	10	14
D	Choose a suitable programming language	A	4	6	8
E	Write the code	B, C, D	8	9	10
F	Test the software code	E	2	4	6
G	Get the approval for commercialization	F	1	3	5

P.T.O.

- b) A project work consists of four major jobs for which four contractors have submitted tenders. The tender amount quoted in thousands of rupees are: [8]

Contractor	Jobs			
	J ₁	J ₂	J ₃	J ₄
A	15	29	35	20
B	21	27	33	17
C	17	25	37	15
D	14	31	39	21

Find assignment which will have minimum total cost of the project.

- Q3)** a) Explain the basic frame work of Toyota production system (TPS). How production planning and production smoothening is done in TPS? [8]
 b) What is kanban visual system? Explain the various steps followed in operating the kanban system in a plant. [8]

Q4) Fast - Responce - Organizations and Total - Quality- Management:

A Fast Responce organization (FRO) is built around six dimensions of competition:

- Costs
- Quality
- Dependability
- Flexibility
- Time
- Service

Such as organization is capable of using different combinations of these dimensions of competitions of address the needs of its customers in different markets.

The Fast Responce organization (FRO) succeed by providing goods and services that satisfy their customer needs.

- Satisfying the custor requires the firm to develop the ability to compete simultaneously on cost, quality, dependability, flexibility, time and service.
- No single dimension of competition is universally more important than other, the importance of each depends on the product and its market and may vary over time. Therefore, the emphasis placed on each dimention differs from one company to the next.

- iii) Achieving the ability to compete on six dimensions call for establishment of the four structural prerequisites. Continuous improvements, research and development, adoption of advanced technology and integration of people and systems.
- iv) No single structural prerequisite is always important than the others, All four must be satisfied, but the emphasis placed on each varies from company to company. Read the above passage and attempt the following:
 - A) What is a fast response organization? Can you think of a better term for this form of organization? [6]
 - B) Describe the four structural prerequisites for a fast response organization. Which of these prerequisites is more important than the others? Why? [6]
 - C) Must all companies compete along all six dimensions of competition? Should all companies aspire to become fast response organisation? Explain. [6]

SECTION - II

- Q5)** a) Enlist the observations obtained in Hawthorne experiment conducted by Elton Mayo. What benefits are obtained by this experiment. [8]
 b) Differentiate between job enlargement and job enrichment with suitable example. [8]
- Q6)** a) Describe the Maslow's theory of hierarchy of needs and its effects on motivation in organization. [8]
 b) What are the major categories of leadership roles identified by Mintzberg? What are some of the subroles when leaders/managers give and receive information? [8]
- Q7)** a) What are the sources of inter personal conflicts? Explain the methodologies for their resolution. [8]
 b) What are the models and theories of leadership styles? [8]
- Q8)** Write short notes on any four: [18]
 a) The Gallup path.
 b) Herzberg's theory.
 c) Organizational commitment.
 d) Models of organizational behaviour.
 e) Theories of group formation.



P1484

[3665] - 247

M.E. (CSE) (Information Technology)

MOBILE COMPUTING

(Revised Course 2002) (510125)

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) Following is the summary of GSM network **[8]**
Bandwidth = 200 kHz
Multiple access = TDMA
Users/Carrier = 8
Speech coding rate = 13 kbps
FEC coded speech rate = 22.8 kbps
Show through manual calculations how GSM provides speech coding rate 13 kbps and FEC coded speech rate 22.8 kbps for the speech of 20 ms.
- b) Explain the logic of chip sequence in CDMA technique by giving suitable example. **[8]**
- Q2)** a) Explain the different frequencies used between MS, BTS, BSC, MSC and Gateway MSC in GSM cellular network. **[8]**
- b) What is the need of GPRS support in GSM and CDMA mobiles? Explain the building blocks in GPRS system. **[8]**
- Q3)** a) DAMPS have appreciably worse speech quality than GSM. Is this due to requirement that DAMPS be backward compatible with AMPS, where as GSM had no such constraint? If not, what is the cause? **[8]**
- b) Describe the GSM speech encoding mechanism by giving speech encoder block diagrams and manual calculations. **[8]**

- Q4)** a) State and explain the outgoing call setup in GSM cellular network. [8]
b) Why cellular networks and wireless networks require Spread spectrum technology? Explain the working of Direct Sequence Spread Spectrum technology (DSSS). [10]

SECTION - II

- Q5)** a) i) If a total of 33 MHz of bandwidth is allocated to a particular FDD cellular telephone system which uses two 25 kHz simplex channels to provide full duplex voice and control channels. Compute the number of channels available per cell if a system uses. [8]
(1) 4-cell reuse
(2) 12-cell reuse
ii) Calculate the minimum distance at which the same frequency can be reused for the following
For $N = 4$ and $R = 5$ km and For $N = 7$ and $R = 5$ km
b) List the major parameters need to consider for calculating performance of Cellular Networks. Explain the significance of parameter. [8]
- Q6)** a) Describe the algorithm to locate the destination mobile station from PSTN. [8]
b) Who makes the handoff decision in CDMA cellular network? How it is different in GSM cellular networks? [8]
- Q7)** a) What is broadband? Is it possible to carry out telephone conversation while surfing the net with broadband technology? If yes, justify your answer. [8]
b) What happens if there are insufficient resources at new AP? What are the methods available to overcome these problems? [8]
- Q8)** a) Normally the shapes of individual cells are typically irregular. Give a possible reason why this might be? [10]
b) Explain FHSS in detail with suitable example. [8]



P1498

[3665] - 158

M.E. (Electronics) (Computer)
COMPILER CONSTRUCTION
(Revised 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) Assume suitable data, if necessary.*

SECTION - I

Q1) 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

$P = \{E \rightarrow E + E \mid E * E \mid (E) \mid id\}$ 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]**

Q2) Construct LALR Parser table for the CFG given in Q1 above and explain how ambiguities are resolved? **[16]**

Q3) Write LEX and YACC specifications as well as auxiliary routines to convert a given infix expression into a syntax tree using the CFG given in Q1 above. **[16]**

Q4) Consider the following source language statement: [16]

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

- a) Assuming suitable syntax direction scheme, write the three address code statements.
- b) Represent the three address code statements triples, indirect triples and quadruples forms.

SECTION - II

Q5) 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]

Q6) a) Explain any code generation algorithm you know. [8]

b) What is peephole optimization? Illustrate with suitable examples. [8]

Q7) a) From the three code statements that you have written for the code fragment shown in Q4 above, find the basic blocks. Also draw the flow graph. [8]

b) Write a note on application of DAG in code optimization with suitable examples. [8]

Q8) a) Explain the role of Marker non-terminals with suitable examples. [8]

b) Describe the “Display” mechanism used by a PASCAL compiler. [8]



P1501**[3665] - 190**

M.E. (Production)
CAD-CAM-FMS
(Old & Revised 2002 Course)

Time : 3 Hours]**[Max. Marks :100****Instructions to the candidates:**

- 1) *Attempt not more than five questions of which at least two questions must be 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 electronic pocket calculator is allowed.*
- 7) *Assume suitable data, if necessary.*

SECTION - I

Q1) A rod of a linkage mechanism made of steel 40 crl ($S_{ut} = 550 \text{ N/mm}^2$) is subjected to a completely reversed axial load of 100 kN. The rod is machined on lathe and the expected reliability is 95%. **[20]**

There is no stress concentration.

K_a = surface finish factor = 0.78

K_b = size factor = 0.85

K_c = reliability factor for 95% reliability = 0.868.

Write a program in auto lisp to determine the diameter of the rod and to draw it, using a factor of safety of 2.0 for an infinite life condition.

Q2) a) CNC machining centre has been oriented with conveyor and a robot as a part of a flexible manufacturing system. The processing time of a component on such machine is 20.5 seconds. But time taking for handling operations of robots are following. **[10]**

Sr. No.	Description	Time (Sec.)
1	Pick up from conveyor	3.2
2	Move robot arm from conveyor to machine	1.8
3	Loading on to machine	1.7
4	Unload part from machine	0.8
5	Move load from machine to conveyor	2.0
6	Put on output conveyor.	0.4
7	Move part from output conveyor to output point.	3.6

P.T.O.

b) Show with block diagram cellular manufacturing with hierarchical control system at all possible stages. [10]

- Q4) a)** System equation in finite Element method is of the following form: [10]

b) Describe the steps in Finite Element Method. [10]

- ## SECTION - II

- | Parts
↓ | Machines → | | | | |
|------------|------------|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 |
| 1 | 1 | 0 | 1 | 0 | 1 |
| 2 | 0 | 1 | 1 | 0 | 1 |
| 3 | 1 | 0 | 0 | 1 | 0 |
| 4 | 0 | 1 | 0 | 1 | 1 |

- Q7)** a) Discuss the modular system of designing CNC machining centre. Discuss hardware and software configurations of than also. [10]
b) Discuss the principles of “Tool - oriented” F.M.S. and “JOb oriented” F.M.S. with the help of block diagram stating constructional features of the system. [10]
- Q8)** a) Classify various types of AGV’s used in F.M.S. Explain the measures taken for over loading. [10]
b) With a block diagram, show the various decisions to be taken for carrying out DFQ. [Design For Quality]. [10]
- Q9)** Write short notes on Any Four: [20]
a) Automated storage & Retrieval system.
b) Features of AutoCAD as a productivity tool.
c) Control architecture of computer aided manufacturing.
d) Fixed automation & flexible automation.
e) OPITZ System.



Total No. of Questions :8]

[Total No. of Pages :2

P1503

[3665] - 407

M.E. (Civil) (C & M)

CONSTRUCTION SAFETY HEALTH & WELFARE

(New Course) (501110)

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) Figures to the right indicate full marks.*
- 4) Assume data, if necessary.*

SECTION - I

- Q1)** Prepare a comprehensive “check list” to facilitate “Safety Inspection” to cover equipments, materials and personnel employed on a project site. **[18]**
- Q2)** a) Explain active and passive fire prevention you will provide in a High Rise Building. **[8]**
b) Discuss economic aspects of accidents. **[8]**
- Q3)** Design the ‘Management System’ to achieve best results in “Productivity, Safety and Quality” in an construction company. **[16]**
- Q4)** Write short notes on any three of the following: **[16]**
- a) Personal Protective Equipments.
 - b) Hazards in sewer works.
 - c) Lost – time accidents.
 - d) Safety Records.
 - e) Hazards in operational use of cranes.

P.T.O.

SECTION - II

Q5) Explain following terms:- **[16]**

- a) Injury - frequency rate.
- b) Injury - severity rate.
- c) Injury - index.
- d) Equivalent time charge.

Q6) Explain in details provisions you will make in framing “Safety Manual” for a construction company for the following items. **[18]**

- a) Policy of the company.
- b) Role of Engineers and employers in the safety organisation.
- c) Reports and Reviews.

Q7) What are the “training aims” and “responsibilities” you will provide for project managers, and supervisory staff on a project site. **[16]**

Q8) a) Give in details important provisions of “Workmen’s Compensation Act.” **[8]**

b) Which are different Acts and rules applicable to construction industry. **[8]**



P1506

[3665] - 454

M.E. (Civil) (Structures)

ADVANCED DESIGN OF CONCRETE STRUCTURES

(2008 Course) (Elective - 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) 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)** Draw yield lines for the following **[8]**
- i) Rectangular slab with fixed supports on three adjacent side with shorter side unsupported .
 - ii) Triangular slab fixed at one side and column at the apex opposite to the supported side.
- b) Explain Hillerborgs strip method with sketches. **[7]**
- c) Design a RCC slab for a circular hall of 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 = 1.2 kN/m^2 . Draw reinforcement details. **[10]**
- Q2) a)** Design a flat slab for a hall with column spacing $6 \text{ m} \times 6 \text{ m}$ c/c.the size of the column is $500 \text{ mm} \times 500 \text{ mm}$ each Use M20 Fe500 take Live load = 4 kN/m^2 & floor finish load = 0.9 kN/m^2 . Draw reinforcement details. **[10]**
- b) Design a grid slab for a floor of hall $13.5 \times 19.5 \text{ m}$ c/c having square grid of 1.5 m . Use M25 Fe500 take Live load = 4 kN/m^2 & floor finish load = 1.2 kN/m^2 . Apply the required check & draw reinforcement details. **[15]**

P.T.O.

- Q3)** Design a staging for circular type ESR for 1.5 lakh liters with staging height 10 m 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 calculations. Design the bracings, columns and foundations. Draw the reinforcement details. [25]

SECTION - II

- Q4)** Design deep beam of a hall for flexure and shear for the following: [25]

Clear span = 5 m, width of support = 500 mm, working UDL on the beam 1500 kN/m . Take the total depth of beam = 3.6 m Use M40 & Fe500. Show all Analysis and Design calculations & draw the reinforcement details.

- Q5)** a) Write detailed note on bell shaped shear wall. [7]
- b) A two span prestressed concrete continuous beam ABC having cross section $230 \times 750 \text{ mm}$ simply supported at A & C and continuous over B with M45 and multistrand cables 2 Nos 12T13 with $f_y = 1900 \text{ N/mm}^2$ stressed to 75% of f_y , each span is of 15 m, superimposed load on both the spans 12 kN/m , Assume 18% loss of prestress .
- i) Determine primary, secondary moment at support at prestress and dead load.
- ii) Calculate shift, and stress in extreme fibers at working load.
- iii) Draw the resultant line of thrust at working load. [18]

- Q6)** Design post tensioned prestressed concrete slab for a floor for the following: [25]

Flat interior panel of $6\text{m} \times 6\text{m}$, live load on slab 4 kN/m^2 , floor finish load on slab = 1.2 kN/m^2 , concrete grade M50 HT steel is cables of cross sectional area 120 mm^2 with $f_y = 1900 \text{ N/mm}^2$. Design cables to serve as beams. Assume 3 panels in each direction (floor size $18\text{m} \times 18\text{m}$) width of the beam on periphery of floor 600mm and column size $600\text{mm} \times 600\text{mm}$. Design must include check fiber stresses in concrete and deflection. Draw sketches showing cable profiles.



P1507**[3665] - 455****M.E. (Civil) (Structures)****STRUCTURAL DESIGN OF CONCRETE BRIDGES****(2008 Course) (Elective - 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) *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 classification of bridges. [8]
b) Differentiate between slab deck and cellular deck. [8]
c) Write detail note Data to be collected from a bridge site. [9]

- Q2)** a) Write short note on the concept of EUDL on railway bridges. [8]
b) Design the box culvert with the data: [17]
Clear span of the culvert = 5.5 m
Clear carriage way width = 7.5 m
Size of kerb = 200 mm × 600 mm
Average thickness of wearing coat 80 mm
Use material M25, Fe 500
Loading class AA
Safe bearing capacity of the strata = 200 kN/m²
Draw the cross section showing details of reinforcement at salient points.

- Q3)** Design intermediate post tensioned prestressed concrete Tee Beam Bridge for the following:
Effective span = 14 m, width of carriageway = 7.5 m, No. of beams 4, equally spaced along the carriageway width, Spacing of cross girders = 3.5 m c/c, width of footpath on either side of carriageway = 1.2 m loading class = IRC class AA, kerb size = 150 × 600 mm, concrete grade M45 and multistrand cables. Design should include detail load, calculation on slab and girder, adopt appropriate depth of slab (design of slab is not expected). Check fiber stresses in concrete Draw sketches showing cable profiles. [25]

P.T.O.

SECTION - II

- Q4)** a) Describe factor affecting the design of rigid frame bridge. [8]
b) Necessity and importance of expansion joint in bridges. [8]
c) Differentiate between rigid frame bridges and simply supported bridges. [9]
- Q5)** a) Explain with sketches, the forces acting on piers. [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 = 75 kN
Transverse lateral load = 40 kN
Longitudinal load = 60 kN
Longitudinal total translation 10 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) List the different forces to be considered for design of bridge foundation design, explain importance of each. [8]
b) Design well type RCC abutment for the following: [17]
Size of the abutment at base = 3 m x 10 m
Type of soil = sandy
Height of bearing above scour level = 12 m
Permissible horizontal displacement at bearing level = 0.5 mm
Height of abutment = 6 m
Net vertical Reaction = 16000 kN
Lateral force at scour level = 330 kN
Submerged unit wt. of sandy soil = 10 kN/m^3
Draw the details of reinforcement.



Total No. of Questions :12]

[Total No. of Pages :5

[3665] - 475
P1516
M.E. (Mechanical Engineering)
(Common to Heat Power, Mechatronics and Design Engg.)
TECHNOLOGY AND FINANCIAL MANAGEMENT
(2008 Course) (502803)

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 - 1

- Q1)** a) Write short notes on the following: **[10]**
- i) Needs for capital
 - ii) Sources of short term finance
- b) A company manufactures two products, A and B. A forecast of the units to be sold in the first seven months of the year s given below: **[6]**

Month	Product A	Product B
January	1,000	2,800
February	1,200	2,800
March	1,600	2,400
April	2,000	2,000
May	2,400	1,600
June	2,400	1,600
July	2,000	1,800

It is anticipated that there will be no work-in-process at the end of any month and finished units equal to half the sale for the next month will be in stock at the end of each month (including previous December)

Prepare a production budget for the six months period ending June 30.

OR

P.T.O.

Q2) a) What is the need of capital budgeting? Explain in brief the following methods of capital budgeting? [8]

i) Payback method

ii) Accounting rate of return method

b) The following data relate to the working of a factory for the current year:

Capacity worked, 50 percent

[8]

Fixed costs:

Salaries	Rs. 84,000	
Rent and rates	56,000	
Depreciation	70,000	
Other administrative expenses	<u>80,000</u>	Rs.2,90,000

Variable costs:

Materials	Rs. 2,40,000	
Labor	2,56,000	
Other expenses	<u>38,000</u>	Rs.5,34,000

Possible sales at various levels of working are:

<u>Capacity (percent)</u>	<u>Sales</u>
60	Rs. 9,50,000
75	11,50,000
90	13,75,000
100	15,25,000

Prepare a *flexible budget* and show the forecast of profit at 60, 75, 90 and 100 percent capacity operations.

UNIT - 2

Q3) a) What do you mean by marginal costing? Explain with an example how do income statements prepared under the absorption costing and marginal costing concepts differ? [10]

b) A company manufactures three products X, Y and Z. The unit selling prices of these products are Rs.100, Rs.160 and Rs.75 respectively. The corresponding unit variable costs are Rs.50, Rs.80 and Rs.30. The proportions (quantity wise) in which these products are manufactured and sold are 20%, 30% and 50% respectively. The total fixed costs are Rs.14,80,000. Calculate overall break-even-quantity and the product wise break up of such quantity. [8]

OR

- Q4)** a) What are the characteristics of contract costing method? Explain? [6]
 b) What is activity based costing? Why is it needed? [5]
 c) A product passes through two processes, A and B. During the month ended June 30, 1,500 units were produced. The detailed cost break-up is as follows: [7]

Particulars	Process A (Rs.)	Process B (Rs.)
Direct materials	90,000	75,000
Direct Labor	75,000	1,50,000
Direct Expenses	15,000	18,000

Indirect overhead costs during the period were Rs.60,000 apportioned to the processes on the basis of direct labor cost. No work-in-progress existed at the beginning and end of the period. Prepare relevant process accounts.

UNIT - 3

- Q5)** a) Define the law of demand? Explain the following types of elasticity of demand. [12]
 i) Price elasticity of demand
 ii) Income elasticity of demand
 iii) Cross elasticity of demand
 iv) Advertising elasticity of demand
 b) Distinguish between monopoly and oligopoly types of competition? [4]

OR

- Q6)** a) How does international trade affects domestic market? Explain in brief the methods to protect domestic trade? [12]
 b) Define the following: [4]
 i) Microeconomics
 ii) Scarcity

SECTION - II

UNIT - 4

- Q7)** a) Explain KAIZEN duties in different levels of management? [7]
 b) Explain in brief the purpose of quality standards? What are the quality management principles defined in ISO 9001 - 2000 series? [9]

OR

- Q8)** a) Distinguish between push and pull system? Explain the role of Kanban cards in JIT cycle with the help of a neat line diagram? [10]
 b) What is Juran trilogy diagram? Explain its importance in quality management? [6]

UNIT - 5

Q9) a) Explain the stages involved in project life cycle with a neat line diagram? [6]

b) For the network shown in Fig. 1, *calculate the probability of completing the project in 50 days*. The normal distribution table values corresponding to standard normal deviate of + 1.03 and + 1.04 are 0.3485 and 0.3508 respectively. Evaluate the following from the network diagram: [12]

- i) Evaluate earliest start time and Latest finish time of all the events
- ii) Critical path and Critical path duration
- iii) Variance and standard deviation along critical path

Activity	Optimistic time (days)	Pessimistic time (days)	Most likely time (days)
A	4	6	4.5
B	2	17	8
C	1	6	2
D	2	4	2.5
E	6	20	8
F	12	20	16
G	6	15	9
H	10	16	12
I	1	2	1.5

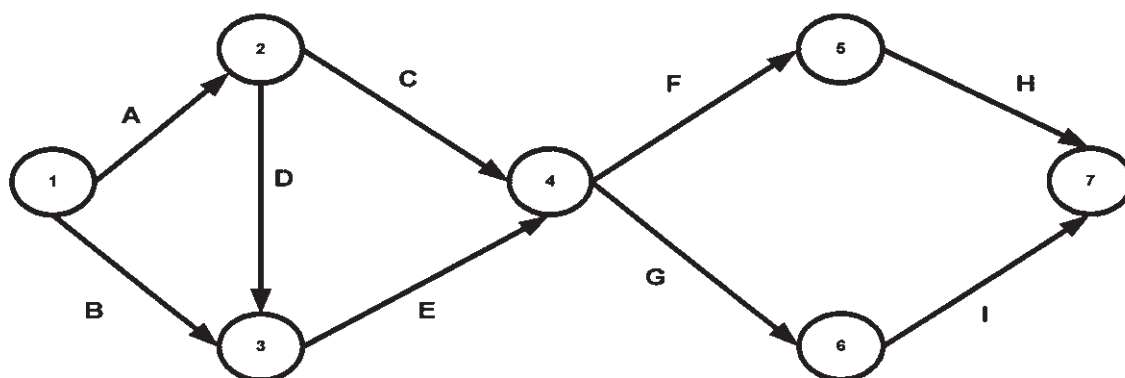


FIG 1. A Net Work

OR

- Q10)** a) Explain the concept of crashing of network with an example. How it is beneficial in project management decision making? [8]
- b) Explain in brief different types of concession contracts used in BOT policy of project management? [10]

UNIT - 6

- Q11)** a) Define manpower planning? Explain the process of manpower planning with its importance? [8]
- b) What do you understand by 'Management by Objectives'? Explain [8]

OR

- Q12)** a) How should one go about identifying training needs in an organization? Discuss important considerations in evaluating training effectiveness? [10]
- b) Distinguish between autocratic and custodial model of organizational behavior? [6]



Total No. of Questions :10]

[Total No. of Pages :2

P1518

[3665] - 486

M.E. (Mechanical) (Heat Power)
INTERNAL COMBUSTION ENGINES – FUELS
(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) 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) How S.I. engine fuels are rated? What is HUCR, explain in brief. [8]
b) Name the additives added to petrol to improve the antiknock characteristics. Explain how it helps in achieving this. [8]
- Q2)** a) Discuss the use of LPG and hydrogen as SI engine fuel. [10]
b) List the liquid fuels that can be used in IC engines as alternate fuels. Explain the requirements in selecting such fuels. [8]
- Q3)** a) Explain the stages of combustion in SI engines elaborating the flame front propagation. [8]
b) Explain the phenomenon of detonation in SI engines. List the variables that affect detonation. [8]
- Q4)** a) Explain the various types of combustion chambers used in S.I. engines with sketch. [8]
b) What will be the consequence if diesel fuel is used in SI engines? [8]

P.T.O.

Q5) Write note on: [16]

- a) Important properties of a good diesel fuel.
- b) Biodiesel as an alternate fuel.

SECTION - II

Q6) a) What is delay period? Explain the factors that affect delay period. [8]

- b) How C.I. engine combustion chambers are classified? Explain one type from each group. [10]

Q7) a) Differentiate between super charging and turbo charging with a neat sketch. [8]

- b) What is the necessity of super charging? What are its limitations? [8]

Q8) a) Explain any two methods of super charging. [8]

- b) What modifications are necessary for a super charged engine? [8]

Q9) a) What are the different air – fuel mixture on which an engine can be operated? Explain with sketch. [8]

- b) Explain why a rich mixture is required for the following: [8]
 - i) Idling
 - ii) Maximum power
 - iii) Sudden acceleration.

Q10) Write a note on: [16]

- a) Mixture requirement for CI engines.
- b) MPFI system
- c) Differentiate between pre - ignition and knocking.



Total No. of Questions :10]

[Total No. of Pages :2

P1519

[3665] - 488

M.E. (Mechanical) (Heat Power)
NON - CONVENTIONAL POWER PLANTS
(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) 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 are the potential renewable energy sources? List out and explain any 3 of them. [8]
- b) List the various thermal energy storage methods and explain each one of them. [8]
- Q2)** a) Explain the principle of working of a solar cell, with sketch. What are its applications? [8]
- b) What are the various issues and constraints in photovoltaic power generation? Explain. [8]
- Q3)** a) Discuss the prospects and status of wind energy in India. [6]
- b) Calculate the main dimensions of the rotor of a multiblade wind machine operating at a design speed of 25 kmph. The machine operates a water pump having a capacity of 5.1 m³/h and a lift of 9 m.
- Take, density of water = 996 kg/m³; Density of air = 1.2 kg/m³; $\eta_{\text{pump}} = 0.6$;
 $\eta_{\text{transmission}} = 0.9$; power coefficient, $C_p = 0.31$
Tip speed ratio, $\lambda = 0.75$; Solidity = 0.5
Number of blades = 18. [12]

P.T.O.

- Q4)** a) Explain with sketch working of a solar chimney? What are its applications? [8]
b) Write in brief economic analysis of a solar system (to calculate annual savings). [8]

- Q5)** Write notes on: [16]
a) CO₂ reduction potential of renewable energy.
b) Concentric solar thermal power plant.

SECTION - II

- Q6)** a) Explain the working of a geothermal power plant with sketch. Discuss the various technical developments. [8]
b) How ocean waves are produced? Discuss the resource and technology of wave energy. [8]

- Q7)** a) Discuss the technology of OTEC. Explain any one OTEC system. [8]
b) Discuss the popular biogas plants developed in India. Explain how the capacity of the plant calculated. [10]

- Q8)** a) What do you understand by Clean Development Mechanism? Explain. [8]
b) Explain financing mechanisms for non-conventional power plants. [8]

- Q9)** a) Explain the working of a fuel cell with sketch. What are its advantages and limitations? [8]
b) Explain how energy is generated from tides? What are its limitations? [8]

- Q10)** Write notes on: [16]
a) Economic and social considerations to be taken while deciding a non - conventional source of energy.
b) Energy wheeling and energy banking.



Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) Answer any three questions from Section I and Section II in separate answer books respectively.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures into the square bracket at right indicate full marks.
- 4) Assume suitable data, if necessary.
- 5) Use of non programmable calculator is allowed.

SECTION - I

- Q1)** a) Derive the compatibility equation in Cartesian co-ordinate system. [8]
 b) Investigate the validity of stress function

$$\phi = \left[C_1 r^4 + C_2 r^2 + C_3 + \frac{C_4}{r^2} \right] \cos 2\theta \text{ Where } r \text{ and } \theta \text{ are polar coordinates.}$$

[8]

- Q2)** Verify that

$$\phi = \frac{G\theta_1}{2} \left[x^2 + y^2 - 2ax + \frac{2b^2 ax}{x^2 + y^2} - b^2 \right] \text{ is a variant } \Phi \text{ function for the torsion}$$

of round shaft (Fig.1) with a semi circular keyway. The radius of the shaft is 'a' and that of keyway is 'b' and 'G' is constant. Derive an expression for maximum stress in shaft. [16]

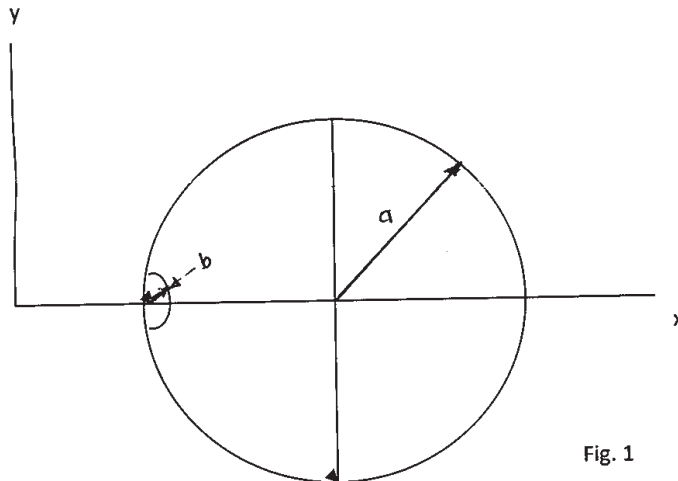


Fig. 1

Q3) Derive the expression for the bursting pressure of tube in terms of inner and outer radius and properties of tube material. State clearly the assumptions made by you. [16]

Q4) The dimensions and cross section of a beam composed of thin rectangle of 80 mm X 80 mm with uniform thickness of 5 mm. Locate the position of the shear center for the cross section of the beam. Derive the expression you have used from the first principle. [16]

Q5) Write short notes on any THREE: [18]

- a) Theorem of virtual work
- b) Membrane analogy
- c) Strain gauge rosette
- d) Stress in beams subjected to unsymmetrical bending.
- e) Castiglione's theorem

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) Explain fracture mechanics approach for estimation of residual life of the component. What do you understand by critical stress intensity factor? What is its physical significance as regard the strength of the material? [8]

- b) An edge cracked plate subjected to tensile load, is made up of a material having fracture toughness of $50 \text{ MPa}\sqrt{\text{m}}$ and tensile strength of 550 MPa . Width of the plate is 60 mm and initial crack length is 4 mm . Find the critical load that would cause unstable propagation of the crack. For the given geometry of the specimen the stress intensity factor is given by

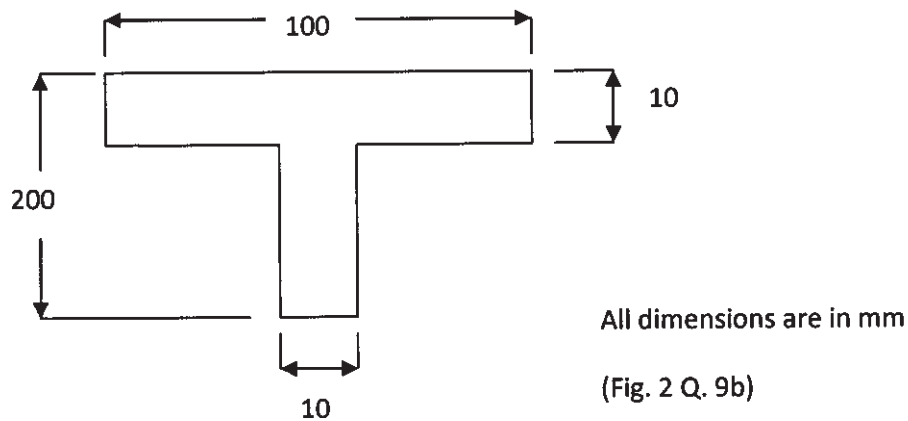
$$K_{IC} = f(a/w) \sigma \sqrt{\pi a}$$

$$\text{Where } f(a/w) = 1.12 - 0.231 (a/w)^2 - 21.72 (a/w)^3 + 30.39 (a/w)^4$$

[8]

- Q8)** a) Derive an expression for the contact stresses when two equal cylinders are in contact each other under contact force 'P'. [8]
- b) Explain how the wear strength in a pair of spur gear having involute profile is decided for having same hardness of the pair. [8]

- Q9)** a) A fringe order of 2.5 was observed at a point in stressed plane stress model with light having wavelength 589 nm. Assuming the stress optic coefficient remain constant, what order of the fringe would be expected at the same point when the light of wavelength 548 nm is used. Derive the expression used for the calculation of fringe order. [8]
- b) What is importance of shape factor in engineering application? Find out the shape factor of 'T' section as shown in Fig. 2. [8]



- Q10)** Write short notes on any THREE: [18]
- Plastic action in thick walled cylinders.
 - Brittle coating method.
 - Rayleigh Ritz method.
 - Spring back effect.
 - Dimensional analysis in experimental technique.



P1535

[3665] - 757

M.E. (Environmental Engg.)
INDUSTRIAL WASTE TREATMENT
(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.*

SECTION - I

Q1) a) Discuss about the Industrial water quality requirements. **[8]**

b) Give the details of monitoring of wastewater flow in industries. **[8]**

Q2) Discuss in detail about: **[18]**

- a) Water budgeting
- b) Reuse and recycling concept.
- c) Classification of industrial waste water.

Q3) Explain the treatment techniques for removal of following pollutants from industrial waste: **[16]**

- a) Fluoride
- b) Oil & Grease

Draw the essential diagrams.

Q4) Explain the concept, objectives, design and operation & maintenance of common effluent treatment plant. **[16]**

P.T.O.

SECTION - II

Q5) Draw the flowsheet for treatment of Dairy waste and focus on its cost benefit analysis. [16]

Q6) The BOD data for sample wastewater is given below: [16]

t, days	2	4	6	8	10
BOD, Mg/Lit	10	17	23	25	27

- a) Plot BOD curve.
- b) Calculate parameters K_1 & L_4 .

Q7) Explain the sources, characteristics and treatment of power plant waste water. Draw the flowsheet for complete treatment plant. [16]

Q8) Write short notes on: [18]

- a) Clean - up and cleaner technology.
- b) Design of Aerated Lagoons.
- c) Heavy metal Removal from Industrial waste water.



Total No. of Questions :6]

[Total No. of Pages :2

P1545

[3665] - 775

M.E. (Printing Engineering & Graphic Communication)

MODERN TRENDS IN PRINTING

(2008 COURSE) (508103)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) Answer any two questions from each sections.*
- 2) Answers to the two sections should be written in separate books.*
- 3) Assume suitable data, wherever necessary.*
- 4) Figures in right indicate full marks.*

SECTION - I

Q1) Answer the following.

- a) Explain selection of Substrate for Web Offset. **[9]**
- b) Explain Offset Printability and Print defects. **[8]**
- c) Explain roll of Fountain solution in Offset Printing. **[8]**

Q2) Answer the following.

- a) Explain configuration of Flexo Press and Types of Flexo Presses. **[9]**
- b) Explain Process of Flexo Plate making. **[8]**
- c) Explain in detail roll of Anilox Roller in Flexo. Printing. **[8]**

Q3) Answer the following.

- a) Explain process of Electronic Engraving of Gravure Cylinder. **[9]**
- b) Explain in detail Liquid inks used in Gravure Printing. **[8]**
- c) Explain the criteria used for selecting Gravure Printing press for particular job. **[8]**

P.T.O.

SECTION - II

Q4) Answer the following.

- a) Explain selection of Impression roller in Offset, Flexo and Gravure printing. [9]
- b) Explain chemistry and properties of Elastomer and their use in printing. [8]
- c) Explain roll of Rubber Hardness and its effect on Print Quality. [8]

Q5) Answer the following.

- a) Give comparison between Common Shaft Drive System and Electronic Line shaft Drive System. [9]
- b) Explain Pneumatic and Hydraulic system used in different printing processes. [8]
- c) What are the limitations of Common Shaft Drive? [8]

Q6) Answer the following.

- a) Explain in detail deciding factors in material handling in printing shop. [9]
- b) Explain climate requirements in printing press room. [8]
- c) Give types of maintenances carried out for printing press. [8]



P1548

[3665] - 778

**M.E. (Printing Engineering & Graphic Communication)
DESIGN OF EXPERIMENTS & RESEARCH
METHODOLOGY**

(2008 Course) (508104 C)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) Answer any two 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, wherever necessary.*

SECTION - I

Q1) Answer the following

- a) Explain in brief the concept of Design of Experiments. **[9]**
- b) What is Research? What are the characteristics & objectives of Research? **[8]**
- c) Explain the ideal workflow of carrying out research work. **[8]**

Q2) Answer the following

- a) What are the functions of literature review? Explain the concept of Literature review and write down any 4 sources of data collection for research? **[15]**
- b) What is quantification? What is role of quantification in experimentation? **[5]**
- c) Define following terms related to factorial experiment: **[5]**
 - i) Hypothesis
 - ii) Factor
 - iii) Result
 - iv) Treatment
 - v) Test

Q3) Answer the following

- a) Explain concept of mathematical modelling along with its components & advantages? **[13]**
- b) An open rectangular printed carton with square ends is fitted with an overlapping lid which covers the top and the front face. **[12]**
Determine the maximum volume of the box if 6m² of 5 ply corrugated board is used in its construction.

P.T.O.

SECTION - II

Q4) Answer the following

- a) Explain in detail the concept of experimental design. [8]
- b) What do you mean by full factorial and fractional factorial design? Discuss and compare with examples. [8]
- c) Describe [9]
 - i) Informal Experimental Design
 - ii) Randomized Block Design
 - iii) Latin Square Design

Q5) Answer the following

- a) What precaution one has to take while collecting data? [6]
- b) A product rating organization tested battery life for four comparable makes of portable radios. Six radios of each make were purchased off the shelf from local retail stores and identical fully charged batteries were inserted on random basis. The observations on battery playing hours at high volume as follow: [13]

Observation		Treatment(j)		
(i)	1	2	3	4
1	5.5	4.7	6.1	4.5
2	5.0	3.9	5.7	5.1
3	5.2	4.3	5.0	4.3
4	5.3	4.5	5.3	4.1
5	4.8	4.1	5.2	4.5
6	4.8	4.3	6.3	5.1

Obtain the ANOVA table and state which radio is better.

- c) Explain in brief simple and multiple linear regression? [6]

Q6) Answer the following

- a) Discuss in brief various types of research reports. [8]
- b) Explain a general format of research report. [9]
- c) What precaution one has to take while writing the research report. [8]



P1582

[3665] - 713

M.E. (IT) (Sem. - II)

**MANAGEMENT TRENDS IN INFORMATION
TECHNOLOGY (2008 Course)**

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) Question Nos. 4 and 8 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) Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Consider a network upgrade project. The network consists of workstations, servers and n/w printers. The network will be segmented through switches. The workstations and printers will be on one segment and the server on another. Create and evaluate a feasibility study for the same. **[10]**
- b) For the network upgrade project in Q1. a) create a milestone list and a contingency plan for each major phase of the project. **[6]**
- Q2)** a) In detail, explain how an ERP system acts as an information management tool. **[10]**
- b) “Relational database model has become a very popular MIS”. Justify. **[6]**
- Q3)** a) Consider the development of a new sales automation application. The system should have following features: **[8]**
- Database searchable by any property of the client. (sales, birth-date etc.)
 - Ability to block salespeople from viewing records they did not enter.
 - Ability for the contact information to be downloaded to a PDA.
 - Fax and email ability.
 - Ability to log sales calls activity to the contacts by the sales staff.

P.T.O.

As the project development progresses, you suddenly realize that the software should have the ability to retrieve a contact's record through caller ID when a contact calls into the centre. Create a project change request form for the new requirement. Depending on this determine if the change is valid and should be approved.

- b) Explain the significance of project network diagram in any project development. Explain with an example the methodology used to create a network diagram. [8]

Q4) Write short notes on: [18]

- a) Financial mgmt. as a MIS.
- b) Development of disaster recovery strategy.
- c) Knowledge management systems.

SECTION - II

- Q5)** a) Which are the diff. types of estimates to be considered while creating a budget for a project. Justify your answer with examples. [8]
b) Compare and contrast different project quality standards. [8]

- Q6)** a) "A work breakdown structure (WBS) is important in all projects". Justify the statement by defining a WBS for an example, its significance in project development, need for WBS etc. [8]
b) For the example considered in Q6. a) and with the help of different ways of project scheduling, explain how a project schedule should be a reflection of the WBS. [8]

- Q7)** a) Explain group dynamics w.r.t group types, group structure, group size, group roles, norms etc. [8]
b) Elaborate on conflict management beginning with what is conflict, reasons, indicators, constructive/destructive conflict and techniques for avoiding/resolving conflict. [8]

Q8) Write short notes on: [18]

- a) Energy audit / energy management.
- b) Consumer protection act.
- c) IT/IS audit.



P1591

[3665] - 12

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

HUMAN RESOURCE DEVELOPMENT IN CONSTRUCTION

(2002 Course) (Elective - I)

Time : 4 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) 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.*
- 6) All questions are compulsory.*

SECTION - I

Q1) Draw a flow diagram showing the complete process of HRD right from selection onwards. Briefly explain the historical development of the HRM function. **[18]**

Q2) Explain the HRD methodology adopted at the NTPC starting from its vision statement, for the different cadres. **[16]**

Q3) Explain the process of training needs assessment. As a HR manager design and develop a training program for the following construction personnel. **[16]**

- a) Stores Keeper.
- b) Supervisor.
- c) Site Engineer.
- d) Project Manager.

SECTION - II

Q4) Compare and contrast between the various systems used in performance appraisal. **[18]**

Q5) Draft a balanced score-card and a personal score card for evaluating the performance of the Project Manager of a construction company (MNC) doing Highway construction. **[16]**

Q6) Explain in brief the following: **[16]**

- a) Competency mapping.
- b) Leadership for managers.
- c) 360° appraisal.
- d) Construction workers training.



P1595**[3665] - 44****M.E. (Civil/Structural)****STRUCTURAL RELIABILITY****(2002 Course) (Elective - II) (501510)*****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) Assume suitable data, if necessary.*
- 4) Neat diagrams should be drawn whenever necessary.*
- 5) Use of electronic pocket non programmable calculator is allowed.*

SECTION - I

- Q1)*** a) Explain in details causes of failures and unreliability. **[8]**
 b) State and explain various techniques to improve the reliability. **[9]**
 c) Draw a histogram for various reinforcement bar diameters verses frequency and discuss what the histogram is revealing. **[8]**

Diameters (mm)	Frequency
6	25
8	12
10	18
12	25
16	20
20	08
22	06

- Q2)*** a) Define the followings: **[12]**
 i) Random Variables
 ii) Discrete Random Variables
 iii) Continuous Random Variables
 iv) Probability Distribution

P.T.O.

- b) Consider concrete beams which are tested before use. Let E denote the event that the beam is perfect. Further, let A denote the event that the beam pass the test. Experience show that $P(A) = 0.95$, $P(E|A) = 0.90$, $P(E|\bar{A}) = 0.10$. Find the probability that a perfect beam pass the test.

[13]

- Q3)** a) Discuss four levels/groups to measure the reliability of a structure. [12]
 b) For a statically determinate structure system with 7 elements. The failure probabilities $P_i = P(F_i) = P$ (Failure element i) of each element are determined to:

[13]

i	1	2	3	4	5	6	7
P_i	0.02	0.01	0.02	0.03	0.02	0.01	0.02

It is assumed that the failure events F_1, F_2, \dots, F_7 are independent. Find the probability of failure of the system.

SECTION - II

- Q4)** a) Write a note on Monte Carlo Simulation and also explain the solution of π using this method and random numbers or random digits. [12]
 b) Consider an example where the failure concrete surface on the standardized coordinates can be written as,
 $g(u) = 2u_2u_3 + 20u_2 + 8u_3 - 3u_1 + 71 = 0$. The reliability index is determined as $\beta = 3.305$ and the design point is $u^* = (0.540, -3.548, -0.188)$. The estimate of the failure probability using (3.38) is $P_f = \Phi(-3.305) = 0.000228$. Estimate the failure probability using Crude Monte Carlo (C.M.C) simulation.

[13]

- Q5)** a) Discuss stochastic models to calibrate Partial Safety Factors of I S codes by considering simply supported concrete and steel beams. [13]
 b) Discuss the process of evaluation of load combination factors for imposed loads and wind load. [12]

- Q6)** a) Draw the flow chart for decision analysis process. [6]
 b) Write a note on decision tree analysis. [7]
 c) Discuss Mycobacterium bovis herd breakdown decision problem. [6]
 d) Explain influence diagram approach to describe and structure decision problems. [6]



P1596

[3665] - 45

M.E. (Civil/Structural)

ADVANCES IN CONCRETE COMPOSITES

(2002 Course) (Elective - II) (501510)

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) Assume suitable data, if necessary.***
- 4) Neat diagrams should be drawn whenever necessary.***
- 5) Use of electronic pocket non programmable calculator is allowed.***

SECTION - I

- Q1)*** a) Discuss developments in the concrete composites from early 1960s of metallic straight fibers through 1965 polymeric fibers. **[10]**
- b) Classify and discuss various fibers used in concrete composites. **[15]**
- Q2)*** a) Discuss various factors affecting the fiber interaction with matrix. **[9]**
- b) Explain the concept of strong brittle fibers in ductile matrix and strong fibers in brittle matrix. **[9]**
- c) Discuss fiber pull-out test set up. **[7]**
- Q3)*** a) Write on laser holographic interferometry test setup to obtain the crack propagation at different loading stages on the composites. **[12]**
- b) Write the effect of fiber type and volume fraction on toughness of concrete composites. Also discuss new techniques for the measurement of toughness. **[13]**

SECTION - II

- Q4)** a) Write in details on fatigue loading test setup and draw typical S-N curve for concrete composites. [13]
b) Discuss instrumented impact tests to evaluate impact resistance of concrete composites. [12]
- Q5)** a) Write a note on compliance approach in the fracture mechanics [9]
b) Discuss various non-linear fracture mechanics models. [16]
- Q6)** a) Write a note on Alkali-resistant glass fibers. [4]
b) Explain spray-up fabrication processes used for fabricating Glass Fiber-Reinforced Concrete (GFRC). [7]
c) Enlist and explain various quality control tests on GFRC. [8]
d) What are the various applications of fiber reinforced concrete (FRC) as major structural components? [6]



P1608**[3665] - 401****M.E. (Civil) (Construction & Management)****MATHEMATICS**

**Probabilistic Methods, Statistical Methods and
Simulation Applications in Construction
(2008 Course) (501101)**

*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 and steam tables is allowed.*
- 6) *Assume suitable data, if necessary.*

SECTION - I

Q1) A contractor has kept data as regards the bonus amounts which he received, on 8 of his earlier similar works. The data is as follows. **[18]**

Project	Early completion in weeks	Bonus percentage received
1	4	3
2	1	0.5
3	2	1
4	6	8
5	3	2
6	1	0.5
7	2	1
8	8	10

Using Monte Carlo simulation, simulate the mean early completion and the mean bonus which should be considered for the next 4 works.

P.T.O.

- Q2)** a) Explain the Poisson distribution with an example. [6]
 b) A tenderer is bidding for 8 works in a year. Determine the probability that he [10]
 i) Gets at least 6 works. ii) Gets 4 works.
 iii) Does not get any work. iv) Gets not more than 2 works.

Determine the frequency of getting works in a period of 5 years. Also determine expected value, standard deviation, variance of the above distribution.

- Q3)** Explain use of the following mathematical models with an example. [16]
 a) Nunally
 b) Griffi's
 c) Vorster - Sears.

- Q4)** a) Explain use of sensitivity analysis with any example. [8]
 b) Explain how inventories can be optimized using mathematical analysis with any example. [8]

SECTION - II

- Q5)** a) Explain the Spearman's rank correlation coefficient and show its utility in the human resource management with an example. [6]
 b) MSRDC has observed cost growth on 10 of its infrastructure projects. It is as follows:- [12]

Project No	% cost growth
1	7.3
2	22.5
3	3.2
4	13.8
5	52.4
6	8.6
7	2.5
8	19.5
9	28.3
10	34.2

Perform statistical analysis using the dispersion tools. Also set the benchmarks for these tools. Identify possible reasons for the cost growth and remedies to overcome the cost growth in the future.

Q6) The delays occurring on a construction project were measured in the number of days. The contractor had asked for a extension of 4 months to the project management consultant (PMC). The (PMC) has kept a data as regards the party responsible for the delay and has awarded points out of 10 to each party. Higher score indicates poor performance of the party. Data related to 10 major construction activities on a major project is as follows. **[16]**

Sr No	Name of activity	Number of days delayed (x_1)	Clients Score (x_2)	Contractor's Score (x_3)
1	Land acquisition	30	8	0
2	Site investigation	10	6	4
3	Design	20	10	0
4	Site mobilization	6	2	8
5	Resource mobilization	20	4	6
6	Contract document preparation	30	9	1
7	Site management	15	0	10
8	Decision making	5	6	4
9	Financial management	30	7	3
10	Project clearances	20	8	2

Determine the partial and the total co-relation coefficients and interpret from the same. Decide whether the 4 months time extension asked by the contractor is justified. Support your decision.

Q7) a) Explain with examples the application of the Normal probability distribution in **[12]**

- i) Project Scheduling
- ii) Project Quality Control
- iii) Project pre-planning
- iv) Grading of Construction firms.

b) Explain the following terms used with an example each. **[4]**

- i) LOR costs.
- ii) AMI costs.

Q8) Determine the multiple linear regression equation relating the concrete strength with the cement content and the W/C ratio based on the data observed. [16]

Sr No.	Compressive strength N/mm ²	Cement content kg/m ³	W/C ratio
1	30	255	0.36
2	33	260	0.355
3	34	270	0.34
4	31	257	0.36
5	35	275	0.31
6	28	240	0.37
7	26	235	0.39
8	31	258	0.35

Use the equation to estimate the strength for a cement content of 250kg/m³ at a W/C ratio of 0.33.

APPENDIX 'C'

TABLE OF RANDOM NUMBERS

39 65 76 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 25 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 83 79	29 18 94 51 23	14 85 11 47 23
80 06 54 18 47	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 82 23 19	07 94 76 10 08	81 30 15 89 14	81 83 17 16 33
63 62 06 34 41	79 53 36 02 95	94 61 09 43 62	20 21 14 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 56 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 31	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 01 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 56	46 72 60 18 77	55 66 12 62 11	09 99 55 64 57
42 88 07 10 05	24 98 65 08 21	47 21 61 88 32	27 80 30 21 60	10 92 35 36 12
77 94 30 05 33	28 10 99 00 27	12 73 73 99 12	39 99 57 94 82	96 88 87 17 91



P1666

[3665] - 404

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

NEW CONSTRUCTION MATERIALS

(2008 Course) (Elective - 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) 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 a detail case study, explain the salient features of FRP application in retrofitting. **[18]**

Q2) With a detail case study, explain the use of serpentine in nuclear radiation shield. **[16]**

Q3) Explain the 3 basic requirements of a smart material. Explain the basic properties of any 4 smart materials. Explain any 2 applications in Civil Engineering involving use of smart materials. **[16]**

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

- a) Roller compacted concrete.
- b) Precautions in mass concreting works.
- c) Leed Rating.
- d) Nano technology and TQC.

P.T.O.

SECTION - II

- Q5)** What is SCC? What are its advantages? Explain with sketches any 2 tests in detail. Explain principles of mix design of SCC. **[18]**
- Q6)** Draw flow diagram of silica fume production. List out 6 applications involving use of silica fume concrete. Explain the construction methodology of any one application in detail. Discuss the advantages of SFC. **[16]**
- Q7)** What is flyash? What are its types? Which properties of flyash make it a good construction material? Explain in brief any 3 applications involving use of flyash? What precautions need to be taken? **[16]**
- Q8)** Explain in brief: **[16]**
- a) High performance concrete.
 - b) Eco-friendly materials.
 - c) Construction chemicals.
 - d) Glenium concrete.



P1687

[3665] - 583

M.E. (E & T/C) VLSI & Embedded Systems

RFIC DESIGN

(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) Use of electronic pocket calculator is allowed.*
- 5) Assume suitable data, if necessary.*

SECTION - I

Q1) Design RF amplifier for the following specifications. $A_v = 50$, Band width = 200 MHz, Source resistance = 50Ω load = 10pF, Supply voltage = 2.5 v. Assume suitable data. **[16]**

Q2) What are the bandwidth estimation techniques? Explore any one in detail with the help of suitable example & its analysis. **[16]**

Q3) a) What is SPICE model? Explain the MOSFET RF sensitive parasitics in detail. **[8]**

b) What are effects of channel length on RF design? Give the necessary mathematical expressions. **[8]**

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

- a) Series & shunt peaking
- b) Unilaterization
- c) Impedance matching techniques
- d) High selectivity tuned amplifiers.

SECTION - II

- Q5)** What is cause of cross talk? List the sources. Give the cross connect mechanism. What are its effects? Suggest probable solutions. **[16]**
- Q6)** a) Explore RFIC design flow in detail. **[8]**
b) How will you make EMI immune RF ASIC? Give the analytical justifications to the suggestions. **[8]**
- Q7)** a) What is noise model? Explain any one noise optimization technique in detail. **[8]**
b) With the help of schematic in detail, explore the design steps of single ended LNA. **[8]**
- Q8)** Write short notes on any three: **[18]**
- a) Linearity & isolation
 - b) Spurs & solutions
 - c) Balanced mixer
 - d) AM - PM conversion.



P1718

[3665] - 7

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

CONSTRUCTION TECHNIQUES

(Revised 2002 Course)

Time : 4 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) *Solve any three questions from each section.*
- 2) *Answers to each sections must be written in separate books.*
- 3) *Numbers on the right indicate full marks.*
- 4) *Neat diagrams must be drawn wherever necessary.*

SECTION - I

Q1) R.C.C. diaphragm wall was proposed for a multi-storeyed building with following data: **[18]**

- a) Size of basement 30 m × 60 m. (in plan)
- b) Depth of excavation – 8 m below G.L.
- c) Subsoil water table – 1.5 m below G.L.
- d) Diaphragm wall founded 10 m below G.L. in rock
- e) Subsoil data – G.L. to 7.0 m – marine clay
7.0 m to 9.0 m – weathered rock
9.0 m and below – hard rock

Work out and explain with sketches following:

- i) Number and size of primary and secondary panels you will propose.
- ii) Type and number of equipments required for boring, chiselling and concreting.
- iii) Sequence and method of construction you will adopt.

Q2) Write short notes with sketches on any two of the following: **[16]**

- a) Negative skin friction in piles.
- b) Sequence of construction of 1000 mm. dia pile 20 m. length in a Jetty.
- c) Method of load testing with reaction piles for 500 tonne capacity piles to a test load of 750 tonnes. using structural steel frame.
- d) Advantages of bored piles on Driven cast in situ piles.

P.T.O.

- Q3)** a) List out precautionary measures you will adopt before you start the work of underground metro railway passing through a congested area in the city. [8]
- b) Explain in details construction of micro piles used in underpinning works. [8]

Q4) Write short notes on any four of the following: [16]

- a) “Pyramid cut” - in rock tunneling.
- b) Advantages of ‘part full tunnel boring machines’.
- c) Shotcreting.
- d) Jet grouting technique
- e) “Rate of Advance” in tunneling in rock.
- f) ‘Tunnel form work’ in High Rise buildings.

SECTION - II

- Q5)** a) Name and explain the function of each part of a ‘single well point system’ give any specifications and materials used in the same. [8]
- b) What is the maximum output a single well point can give? What spacing you will recommend in following type of soils to match respective permeability of the same. [10]
- i) Clayey soil
 - ii) Silty sandy soil
 - iii) Fine to coarse sand
 - iv) Sandy gravel
 - v) Coarse gravel
- Q6)** a) Explain method of construction adopted in construction of “Open caissons” and “Pneumatic caissons”. [8]
- b) Give advantages and disadvantages in construction of “Open caissons” and “Pneumatic caissons”. [8]

Q7) Explain with sketches sequence of operations involved in “Launching of Prestressed Concrete Girders” in following site conditions. **[16]**

- a) Span – 20 m
- b) No. of Girders . ‘T’ shaped – 3 nos per span.
- c) No. of spans for the bridge – 12 nos. Assume suitable data as found necessary.

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

- a) ‘Tilts’ and rectification methods in well foundations.
- b) Inspection and Testing of bridges.
- c) Use of concrete pumps in high rise buildings.
- d) Roller compacted concrete.
- e) Destructive and Non-destructive testing of concrete.



P1728

[3665] - 677

M.E. (Chemical)

CATALYSIS & SURFACE PHENOMENA

(2008 Course) (Open Elective)

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 any two adsorption isotherms. [8]
b) How are the kinetic principles associated with adsorption isotherms. [6]
c) What happens following a collision of a gas molecule on a surface. [4]
- Q2)** a) Describe the gas adsorption method for estimating pore volume and diameter. [8]
b) Write about any two types of hysteresis loops. [8]
- Q3)** a) What is the significance of Thiele Modulus? Derive an equation for any one shape of pore. [8]
b) Explain the effect of external transport on isothermal & non - isothermal series reactions. [8]

Q4) Attempt any two:

- a) XRD Method. [8]
- b) Method for catalyst preparation (any one) [8]
- c) Dusty gas model. [8]

SECTION - II

- Q5)** a) What is effective diffusivity? [6]
b) What is meant by catalyst deactivation? State the methods by which deactivation may occur. [6]
c) What are three regions in a catalyst monolith? [6]
- Q6)** a) What are spinels? State their characteristics. [8]
b) What are Bronsted & Lewis acids? Explain. [8]
- Q7)** a) In Fischer - Tropsch process what is the co insertion mechanism? [6]
b) Give the reactions in Fischer - Tropsch process. [4]
c) What is hydromethylene concept. [6]
- Q8)** a) What is the dynamic model for deactivation? Find the equation for F. [8]
b) What is the Langumir - Hinshelwood model? [8]

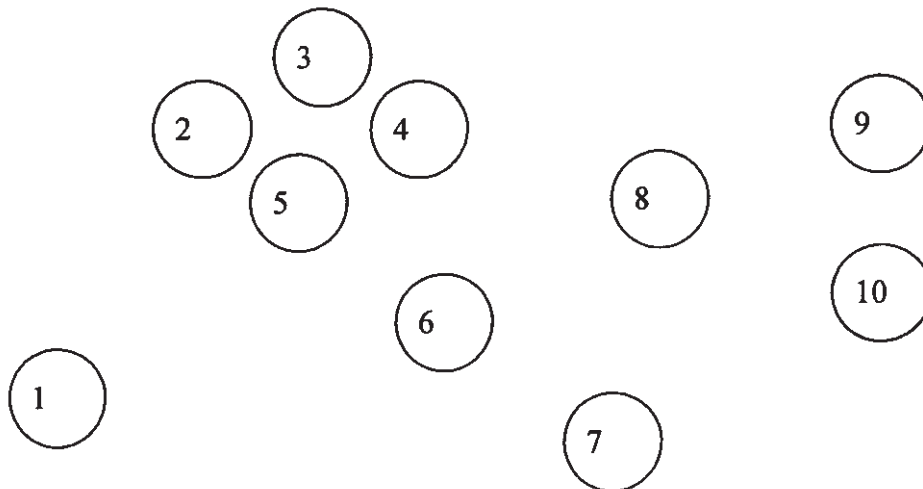


P1736**[3665] - 144****M.E. (Electronics) (Digital System / Computer)****COMPUTER NETWORKS****(Revised 2002 Course)****Time : 3 Hours]****[Max. Marks :100****Instructions to the candidates:**

- 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 calculator is allowed.
- 6) Assume suitable data, if necessary.

SECTION - I

- Q1)** a) Explain the Network design issues in brief. [9]
 b) For the terminals shown in figure apply the Dysart-Georganas algorithm for $k = 4$, to determine concentrator location list. [9]



- Q2)** a) Explain M/M/m/q systems and derive necessary equations. [8]
 b) Messages (independently) arrive to a system at the rate of 10 per minute. Their lengths are exponentially distributed with an average of 3600 characters. They are transmitted on a 9600 bps channel. A character is 8 bit long. [8]
 i) Assuming the system is M/M/1, what is the average time in the system?
 ii) Assuming the system is M/M/2, what is the average time in the system?

P.T.O.

- iii) If the channel capacity is increased to 19,200 bps and system is M/M/1, what is the average time in the system?
- iv) If the channel capacity is increased to 19,200 bps and system is M/M/2, what is the average time in the system?

- Q3)** a) Explain Address Resolution Protocol (ARP) and Reverse Address Resolution Protocol (RARP). [8]
- b) What are the advantages and the disadvantages of Adaptive Routing and Explicit Routing? [8]
- Q4)** a) Explain infrastructure based wireless LAN. Explain protocol architecture and bridging in 802.11. [8]
- b) Explain BG algorithm for flow measurement. [8]

SECTION - II

- Q5)** a) Suppose traffic with intensity 2 Erlangs is offered to 3 lines. What is the probability of loss predicted by the Erlang-B, Erlang-C and Poisson formulas? [8]
- b) Draw ATM reference model and explain functions of its different layers. [8]
- Q6)** a) What are the services offered by TCP to an Application Layer? Explain TCP/IP socket programming in brief. [8]
- b) What are the network performance parameters? How they can be estimated? [8]
- Q7)** a) What are the principle elements of a public key cryptosystem? Describe Encryption and Authentication process in public key cryptosystem. [8]
- b) Explain the principle of firewall and explain all the functions of firewall. What are its limitations? [8]
- Q8)** Write short notes (Any Three) [18]
- a) VoIP
 - b) IPv6
 - c) SNMP
 - d) Bluetooth



Total No. of Questions :10]

[Total No. of Pages :3

P1750

[3665] - 73

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

MACHINE TOOL DESIGN

(2002 Course)

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 900 rpm in twelve 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. **[14]**
- Q2)** a) With a neat sketch explain the method of obtaining a near approach to stepless speed using epicyclic mechanism. **[8]**
- b) Deduce condition for self-locking a cone type friction variator. **[8]**
- Q3)** a) Explain clearly the term 'dynamic rigidity' of a machine tool. State the factors affecting it. **[6]**
- b) Explain the effect of stiffener arrangement on bending and torsional stiffness of box type structure. **[4]**
- c) Discuss the design considerations of a rectangular column of drilling machine. **[6]**

P.T.O.

- Q4)** a) Compare the salient features of guides having hydrostatic and hydrodynamic lubrication. [4]
- b) Explain the methods of designing guides of a machine tool based on frictional characteristics of the slides. Is it possible to design a guide system with combined sliding and rolling friction? [6]
- c) Show that on any face of the table guide the total resultant force must pass through within a distance of $L/6$ from the centroid of pressure, L being the length of the table. [6]
- Q5)** Write short note on: (any three) [16]
- a) Vertical roller feed screw.
- b) Devices for intermittent motion.
- c) Selection of electric motors for machine tools.
- d) Preloading of ball screw.
- e) Wear compensation methods in machine tool slides.

SECTION - II

- Q6)** a) Explain with sketch, construction of a typical spindle unit with mounting used on machine tool. [5]
- b) How is optimum spacing between spindle supports determined? [3]
- c) With a neat sketch of the hydrostatic power pack used on machine tool. Show the functioning of each element on the system. [8]
- Q7)** a) Evaluate the magnitude of the total pitch error of a conventional lead screw. Show that in a conventional sliding friction lead screw the distribution of the load on the threads of the nut is non-uniform. [8]
- b) A B.L.S assembly using 3.5 mm diameter balls has an effective ball circle diameter of 30 mm, and pitch 6 mm. Calculate the static and dynamic loads that could be shared by the BLS if it works for a total 20 hours with speed ranging from 150 rpm to 10 rpm, the recirculation of balls being effected over 2 full circuits. The thread profile can be assumed semicircular with a semi contact angle of 45° . Assume 70% probability that the balls will carry maximum axial load and the ratio Q_{\max}/Q_{\min} may be taken as 1.5. [8]

- 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. [8]
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. [8]
- Q9)** a) Classify NC, CNC machines as against traditional machines, based on, functional movements etc. [6]
b) What is meant by static rigidity of a machine tool and how can it be measured? State any method of analyzing the dynamic rigidity of a machine tool based on self excited forced and damped vibrations. [10]
- Q10)** Write short notes on: (any three) [18]
a) Dynamics acceptance tests of machine tools.
b) Adaptive Control System.
c) F.M.S.
d) Recent trends in design of machine tools.
e) Retrofitting general purpose lathe into CNC lathe.



Total No. of Questions :6]

[Total No. of Pages :2

P1757

[3665] - 470

M.E. (Civil/Structural)

MECHANICS OF MODERN MATERIALS

(2008 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 answer books.*
- 3) Assume suitable data, if necessary.*
- 4) Neat diagrams should be drawn whenever necessary.*
- 5) Use of electronic pocket non programmable calculator is allowed.*

SECTION - I

Q1) a) Explain Glass Fiber, Carbon Fiber and discuss their mechanical properties. **[12]**

b) Explain engineering applications of various piezoelectric materials. **[6]**

c) State applicability of Shape Memory Alloy (SMA) and Functionally Graded Materials (FGM). **[7]**

Q2) a) Write generalized Hooke's law for an isotropic material in 1-2-3 coordinate system and hence write the compliance and stiffness matrices for plane stress condition in case of isotropic materials. **[16]**

b) What do you understand by transversely isotropic, anisotropic and generally orthotropic materials. **[9]**

Q3) a) Explain maximum stress failure criterions. **[10]**

b) Compare in details Tsai-Hill and Tsai-Wu failure criterions. **[15]**

P.T.O.

SECTION - II

- Q4)** a) Discuss the laminate configurations for following laminates with neat diagrams. [18]
- i) Unidirectional Laminates.
 - ii) Symmetric Laminates.
 - iii) Symmetric Cross-Ply Laminates.
 - iv) Symmetric Angle-Ply Laminates.
 - v) Balanced Laminates.
 - vi) Antisymmetric Angle-Ply Laminates.
- b) Explain stress resultants with neat diagram for a typical laminate. [7]
- Q5)** a) Discuss stress-strain relationship of a lamina subjected to moisture and thermal loading in plane stress condition. [6]
- b) If coefficients of thermal expansion of a unidirectional lamina of size $100 \text{ mm} \times 100 \text{ mm}$, in 1-2-3 material direction are $\alpha_1 = -0.017 \times 10^{-6}/^\circ\text{C}$ and $\alpha_2 = 22.3 \times 10^{-6}/^\circ\text{C}$ find transformed thermal expansion coefficients α_x , α_y , and α_{xy} and free thermal strains along 30° relative to x-axis. [14]
- c) Write a note on residual stresses in the composite laminates. [5]
- Q6)** a) Write on wet lay-up and spray-up processes in the formation of structural shapes. [10]
- b) What are the manufacturing defects observed in the composites. [6]
- c) Write a note on autoclave curing for the processing of high-performance composite materials. [9]



P1425

[3665] - 120

M.E. (E & TC) (Microwave)

MULTIPLE ACCESS COMMUNICATION SYSTEMS

(Revised Course 2004)

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) Explain the different types of satellite orbits. **[8]**

b) Explain the different major subsystems required on the space craft. **[8]**

Q2) a) A satellite at a distance of 20,000km from a point on the earth's surface radiates a power of 1 W from an antenna with a gain of 15dB in the direction of the observer. Find the flux density at the receiving point, and the power received by antenna with effective area of 10m². The satellite operates at a frequency of 10GHz. The receiving antenna has a gain of 50dB. Find the received power. **[10]**

b) Draw the block diagram of double conversion transponders and explain the functions of transponder. **[6]**

Q3) a) Explain the Doppler shift and its effects on satellite communication. **[8]**

b) Explain the subsystems telemetry, tracking and command with neat block diagram. **[8]**

Q4) Write short notes on (Any Three) : **[18]**

- a) ALOHA Channel.
- b) Tele Traffic.
- c) Noise Temperature.
- d) Antennas for Satellites.

P.T.O.

SECTION - II

Q5) Explain the following Multiple Access Techniques in detail : **[16]**

- a) CDMA
- b) TDMA
- c) FDMA

Q6) a) Enlist the ways of cell splitting and explain them in detail **[8]**

b) Explain the frequency management and channel assignment in GSM **[8]**

Q7) Explain the cordless telephone system in detail. **[16]**

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

- a) GMSK.
- b) Hand off Mechanism.
- c) GSM services and feature.
- d) CDMA services and features.



P1430

[3665] - 169

M.E. (Electrical) (Control System)

PROCESS CONTROL

(Revised Course 2002)

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) Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Explain proportional, Integral, Derivative control actions in details with advantages, disadvantages and applications. **[15]**
- b) Draw electronic proportional plus Integral controller diagram. Explain working of the same in details. **[10]**
- Q2)** a) What do you mean by process Identification. Explain Identification of unstable systems. **[10]**
- b) Explain ON line Identification and OFF line identification of process systems. **[10]**
- c) Explain Reset windup in details. **[5]**
- Q3)** a) Explain Ratio control system with neat block diagram. Give advantages and disadvantages of Ratio control system. **[10]**
- b) Explain cascade control system for Heat Exchanger application with neat diagram in details. **[15]**

P.T.O.

SECTION - II

- Q4)** a) What do you mean by process lag? Give different types of Lags. Explain Lags in Liquid flow & vapour flow. [10]
- b) Explain flow control, liquid level control, pressure control with respect to stability of Chemical Reactor. [15]
- Q5)** a) Explain Programmable Logic Controller with neat block diagram in details. Give advantages of PLC over conventional devices. [15]
- b) Write specifications of any Industrial PLC in details. [10]
- Q6)** Sketch neat process control schemes for fertilizer plant. Explain each block in details. [25]



P1431

[3665] - 171

**M.E. (Electrical) (Power System)
POWER SYSTEM PROTECTION
(Old & Revised 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) With neat diagrams explain the principle of directional overcurrent relay. [8]
- b) With neat diagram explain working principle of percentage differential relay. Draw its operating characteristics & explain. [10]
- c) Explain working of under frequency relay. [7]
- Q2)** a) Draw a diagram showing connections of a CT and a PT to supply, load and relay. Draw and explain equivalent circuit of CT and phasor diagram of CT. [13]
- b) Explain ratio error and phase angle error. [4]
- c) Explain working of CVT. [8]
- Q3)** a) Derive expressions for co-ordinates of circle and its radius for a Dual input phase comparator. [10]
- b) Explain the principle of following static distance relays along with characteristics. [15]
- i) Reactance relay.
 - ii) Impedance relay.
 - iii) Mho Relay.

P.T.O.

SECTION - II

- Q4)** a) Explain in detail 3-stepped distance protection scheme. [10]
b) Write a note on setting and synthesizing of distance relay characteristics. [8]
c) Write a short note on digital protection of EHV/UHV transmission line.[7]
- Q5)** a) Explain digital scheme based on second harmonic current for protection of synchronous generator. [10]
b) Explain digital protection scheme based upon injection of subsynchronous component in rotor circuit. [15]
- Q6)** a) Explain magnetising inrush current in power transformer. [8]
b) Explain working of Gas actuated relay. [8]
c) Explain overfluxing protection of power transformer. [9]



P1446

[3665]-256

M.E. CSE (IT)

DATA MINING AND WAREHOUSING

(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.*

SECTION - I

- Q1)** a) The current trends in hardware/software technology make data warehousing feasible. Explain via some examples how exactly technology trends do help. **[10]**
- b) You are the senior analyst in the IT department of a company manufacturing automobile parts. The marketing VP is complaining about the poor response by IT in providing strategic information. Draft a proposal to him explaining the reasons for the problems and why a data warehouse would be a viable solution. **[8]**
- Q2)** a) Describe any one of the options available to integrate ERP with data processing. **[10]**
- b) What do you mean by a Web enabled Data warehouse? Describe three of its functional features. **[6]**
- Q3)** a) Write a note on Clustering. **[8]**
- b) Write a note on Classifications in Data mining. **[8]**
- Q4)** a) You are the data transformation specialist for the first data warehouse project in an airlines company. Prepare a project task list to include all the detailed tasks needed for data extraction and transformation. **[8]**
- b) Write a note on capacity planning in a data warehouse. **[8]**

SECTION - II

- Q5)** a) Explain 4 distinguishing characteristics of a data warehouse architecture. [10]
b) Write a note on OLAP. [6]
- Q6)** a) For a manufacturing company design a family of three STARS to support the value chain. [12]
b) Write a short note on Star Schema. [4]
- Q7)** a) Write a note on Information filtering and pattern recognition techniques for exploration of data in database. [12]
b) Write a note on Meta data. [4]
- Q8)** Write short notes on : [18]
a) Feature Selection.
b) Item set associations.
c) Optimization tools and techniques.



P1447

[3665]-257

M.E. CSE (IT)

ENTERPRISE RESOURCE PLANNING (ERP)

(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 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) What is ERP? What are the facilities, which form multi-facility environment of ERP? Explain it with suitable example. [8]
- b) Explain how various resources are managed using ERP with respect to any domain of choice. [8]
- Q2)** a) What is business process engineering? Explain role of IT in implementation of it. [8]
- b) Enlist tangible and non-tangible benefits that ERP can provide. [8]
- Q3)** a) Discuss various challenges in ERP implementation with respect to large organization. [8]
- b) What are different core processes in Banking sector? Explain their importance in accordance with ERP. [8]
- Q4)** Write short notes on :- [18]
- a) Role of consultants in implementation of ERP.
- b) Technology management.
- c) Human capital.

SECTION - II

- Q5)** a) Enlist and discuss any two major vendors along with their products in ERP market? [8]
- b) What is gap analysis? Discuss about post-implementation options? [8]

P.T.O.

- Q6)** a) What are the key issues in determining the success of implementation of ERP? [8]
b) Explain what are order-winners & qualifiers with suitable examples. [8]
- Q7)** a) How is ERP application evaluated? Discuss with suitable example. [8]
b) Explain process of HR management in IT sector. Can ERP support it? [8]
- Q8)** Write short notes on :- [18]
a) Financial management.
b) ERP and attitude of managers.
c) Failure of ERP systems.



P1448**[3665] - 533**

M.E. (Electrical) (Control Systems)
ADVANCED DIGITAL CONTROL TECHNIQUE
(503110) (2008 Course) (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) *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 Warping and Prewarping of digital modeling. [8]
 b) Explain digital simulation with numerical integration. Explain each method briefly. [8]

OR

- Q2)** a) What is Partial matching of states? [8]
 b) Elaborate Stability consideration and Constraints on the selection of weighing matrix. [8]
- Q3)** a) What is phase lead lag controller in Discrete Data control Systems? Explain in detail. [8]
 b) Find the block diagram of direct digital program for the digital controller given as below. [10]

i)
$$D(z) = \frac{(0.2 - 0.3z^{-1} + 0.2z^{-2})}{(1 - 0.5z^{-1} - 0.4z^{-2})}$$

ii)
$$D(z) = \frac{(1.5 + 0.5z^{-1} + z^{-2})}{(1 - z^{-1})}$$

P.T.O.

OR

- Q4)** a) Explain Digital PD, PI & PID Controllers. [8]
b) The transfer function of the controlled process, including the zero-order hold, of the automatic forge and concentrate-proportioning system described is [10]

$$G_{ho}.G_p(z) = \frac{1.338(z + 0.7531)}{z^2 - 0.9398z + 0.4347}$$

The sampling period is 0.01 sec. Let the values of K_p , K_i and K_d so that the zeros of $D(z)$ cancel the poles of $G_{ho}.G_p(z)$ and the ramp-error constant $K_v=1$.

- Q5)** a) What are the necessary and sufficient conditions for arbitrary pole placement? [8]
b) Design Compensator by Separation Principal. [8]

OR

- Q6)** a) Explain Servo Design - introduction of reference input by feed forward control. [8]
b) Explain Digital Control Systems with deadbeat observer. [8]

SECTION - II

- Q7)** a) Give the applications and advantages of multirate digital signal processing. [10]
b) Draw and explain FIR Form Structure and IIR Form Structure. [8]

OR

- Q8)** a) Explain the interpolation process with an example. [10]
b) With an example explain the sampling process. [8]
- Q9)** a) What are the advantages of DSP processors in relation to general-purpose processors? [8]
b) Explain Von Neumann and Harvard architectures and explain why the Van Neumann architecture is not suitable for DSP operations. [8]

OR

Q10)a) Draw the schematic block diagram of a TMS320C1X processor and explain the major block diagram of the same. [8]

b) List the various addressing modes used in the TMS320C5X processor. [8]

Q11)a) List the enhanced features of the TMS320C5X processor. [8]

b) What is the major advantage of having on-chip memory? [8]

OR

Q12)a) Draw and explain the memory architecture of the TMS320C54X processor. [8]

b) Distinguish various features of the TMS320C5X processor. [8]



P1449

[3665]-539

M.E. (Electrical) Power Systems
COMPUTER APPLICATIONS IN POWER SYSTEMS
(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 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 optimization problem based on nature of equations involved. **[8]**

b) Explain multivariable optimization with inequality constraints. **[12]**

c) Find the solution of following optimization problem by using constrained variation method : **[5]**

$$\text{Minimize } f(X) = 2x_1^2 - 3x_2^2 + 8 \text{ subject to the constraint}$$
$$g(X) = x_1 - x_2 + 5 = 0$$

Q2) a) Explain Steepest Descent method. Draw its flowchart. **[8]**

b) Explain unrestricted search elimination method with a limited step size. State limitations of this method. **[12]**

c) State Kuhn Tucker conditions. **[5]**

Q3) a) Explain the Newton Raphson method of load flow analysis (Polar form). Draw its flow chart. **[13]**

b) Explain the fast decoupled method along with its flowchart. State the assumptions. **[12]**

SECTION - II

- Q4)** a) Explain economic dispatch using Newton Raphson method. Draw flow chart. [13]
b) Explain optimal power flow based on Gradient method. [12]
- Q5)** a) Derive the expressions for transmission loss coefficients. [12]
b) Describe three phase load flow analysis. [13]
- Q6)** a) Write a note on A.C. –D.C. load flow analysis. [13]
b) Explain formulation of sequence impedance matrix in terms of self and mutual impedances using transformation matrix. [12]



Total No. of Questions : 6]

[Total No. of Pages : 2

P1450

[3665]-540

M.E. (Electrical) (Power Systems)
POWER SECTOR ECONOMICS MANAGEMENT &
RESTRUCTURING
(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 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 regulatory reforms in Canada and California. [8]
b) Explain forward contracts and future contracts. [8]
c) What is transmission rights? How to acquire transmission rights? Also explain procedure of transmission right auction. [9]
- Q2)** a) Define ancillary services. State requirements of various ancillary services for deregulated power industry. How these services are acquired. [8]
b) Compare open access and pool type market structures. [8]
c) Explain following pricing structures. [9]
i) Market clearing price.
ii) Zonal & locational pricing.
iii) Dynamic spot pricing.
- Q3)** a) Explain power system models based on contractual arrangements. [9]
b) Explain non-price issues and social considerations in electricity reforms. [8]
c) Give salient features of electricity act 2003. [8]

P.T.O.

SECTION - II

- Q4)** a) Explain institutional structure of Indian power sector before and during reforms. [9]
b) Explain basis of rate of return regulation. Also state its merits and demerits. [8]
c) Explain factors required to be consider for deciding tariff for renewable sources & captive generation. [8]
- Q5)** a) Explain TOD tariff and tariff structure for agricultural consumers. [8]
b) In a project initial investment of Rs. 150000 is required. The project produce a savings of Rs. 20000 for 10 years. After 10th year project yields Rs. 8000 salvage value. Calculate net present value of the project at discounting factor 9% mention also economic viability of the project. [9]
c) Explain role of RECs and CERC. [8]
- Q6)** a) An investment of Rs. 1.0 lakh is made at the beginning of the year. Saving are expected over 4 years are Rs. 28000, Rs. 35000, Rs. 40000 and Rs. 40000 respectively. Find out IRR of the project. [8]
b) Explain different tariff setting principles. [8]
c) Explain role of CEA and performance based regulation. [9]



P1451**[3665]-542****M.E. (Electrical) (Power System)****DIGITAL SIGNAL PROCESSING AND ITS APPLICATIONS****(2008 Course) (Elective - 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, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
- 6) Assume suitable data, if necessary.

SECTION - I**Q1)** a) Prove the following properties of z transform.

$$\text{i) } \lim_{k \rightarrow \infty} f(k) = \lim_{z \rightarrow 1} F(z) (z - 1) \quad [5]$$

$$\text{ii) } \lim_{z \rightarrow \infty} F(z) = f(0) \quad [2]$$

b) Determine the response of the following system to the input signal

$$x(n) = 2^n \quad -1 \leq n \leq 3$$

$$= 0 \quad \text{elsewhere}$$

$$\text{i) } y(n) = x(n - 3)$$

$$\text{ii) } y(n) = \frac{1}{3} [x(n - 1) + x(n) + x(n + 1)] \quad [6]$$

c) Determine whether the systems described by the following input output equations are linear/non-linear, causal/non-causal. [6]

$$\text{i) } y(n) = x(n^2)$$

$$\text{ii) } y(n) = x^2(n)$$

$$\text{iii) } y(n) = A x(n) + B$$

d) State and explain sampling theorem. [6]

Q2) a) Prove :

$$\text{If } x(n) \xleftrightarrow{DFT} X(k)$$

$$\text{then } x(n + N) = x(n) \text{ for all } n$$

$$X(k + N) = X(k) \text{ for all } k \quad [4]$$

P.T.O.

- b) Find the circular convolution of the following two sequences. [4]

$$x_1(n) = \{-1, 1, 0, 3\}$$

$$x_2(n) = \{1, 2, 3, 4\}$$

- c) Explain Radix - 2 (decimation in time) FFT algorithm. [9]
 d) With the help of a block diagram and flowchart, explain how DFT method can be used for harmonic analysis. [8]

- Q3)** a) Explain any three methods in brief for FIR filter design using windows. [15]

- b) With the help of a block diagram and flowchart, explain DSP based detection of faults in bearings. [10]

SECTION - II

- Q4)** a) Obtain the direct form I and direct form II structures for the following system.

$$H(z) = \frac{(z + 1)(z + 3)}{z(z + 2)(z + 5)} \quad [8]$$

- b) Compare IIR filters with FIR filters. [8]
 c) Explain the concept of frequency warping in a bilinear transformation. [3]
 d) Design a first order digital low pass filter with 3dB cutoff frequency of $\omega_c = 0.25\pi$ by applying the bilinear transformation to the analog Butterworth filter. [6]

$$H(s) = \frac{1}{1 + s/\Omega_c}$$

- Q5)** a) Explain various addressing modes in DSPs. [8]

- b) Explain direct form realisation of linear phase FIR filter structure (M odd) and cascade structure. [10]

- c) Explain the concept of quantization process and error. [7]

- Q6)** a) Draw and explain in details architecture of TMS 320 C3X. [15]

- b) Compare DSP processors with conventional microprocessors. State applications of TMS 320 C5X, C3X, C4X, C6X and C8X. [10]



P1452**[3665]-546****M.E. (Electrical Engg.) (Power Systems)****POWER SYSTEM DYNAMICS****(503208) (2008 Course) (Sem. - II)****Time : 3 Hours]****[Max. Marks : 100****Instructions to the candidates:**

- 1) Answer any 2 questions from each section.
- 2) Answer 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) 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 power delivered in steady state by generator connected to an infinite bus in terms of power regulation coeff. ' b_p '. Also discuss with the help of suitable graphs effect of power regulation coefficient ' b_p ' on variation of [16]

- i) Maximum power transfer ' p_e '
- ii) Generator reactance ' x_g '

b) A generator is connected to an infinite bus through an external impedance of $Z_e = 0.1 + j0.2$.

The generator is represented by a voltage source $E_g < \delta$ in series with a reactance x_g .

If $E_g = E_b = 1.0$, $x_g = 0.3$ for $p_b = 1.0$ p.u. find the equilibrium values of ' δ ', in the range of $(-\pi, \pi)$. Test their stability. Assume infinite bus angle as zero. ' p_b ' is received power at the infinite bus. [9]

Q2) a) Derive the expression for calculation of initial conditions in steady state for synchronous generator represented by model 1.1. Draw phasor diagram. Also give the procedure for computation of initial condition. [16]

b) A generator is connected to an infinite bus through an external impedance of ' jx_e '. If $E_b = V_{to} = 1.0$ pu, $p_t = 1.0$ pu, $x_e = 0.25$ pu, find the initial conditions. The generator data : $x_d = 1.8$, $x_q = 1.7$, $x'_d = 0.17$, $x'_q = 0.23$, $R_a = 0.0$, $T'_d = 0.4$ sec, $T'_q = 0.1$ sec, $H = 4$ sec, $f_b = 60$ Hz, $S_{mo} = 0$. [9]

P.T.O.

- Q3)** a) Explain power system stabilizer with the help of suitable block diagram. [15]
b) Explain tuning of P.S.S. using [10]
i) Field test results and
ii) Analytical techniques.

SECTION - II

- Q4)** a) Discuss in detail effect of the following on the transient stability of a typical SMIB system with double circuit transmission link :
i) Location of fault.
ii) Type of fault.
iii) Duration of fault. [12]
b) Also discuss with the help of equal area criterion transient stability for the same system under automatic reclosure type CB and temporary fault. [6]
c) Describe the classical model of multimachine system useful for transient stability analysis. [7]
- Q5)** Derive expressions for the purpose of small signal analysis of [25]
a) Rotor
b) Torque angle loop and
c) Flux decay, for the single m/c represented by model 1.0.
Also draw appropriate block diagram, to represent it.
- Q6)** a) Explain load restoration and voltage stability dynamics. [13]
b) Discuss islanding methods and utility in preventing power system black outs. [12]



Total No. of Questions : 6]

[Total No. of Pages : 2

P1454

[3665]-552

M.E. (Electrical) (Power System)

PARTIAL DISCHARGE IN ELECTRICAL POWER APPARATUS

(503212) (2008 Course) (Elective - IV) (Sem. - 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 answer books.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Figures to the right indicate full marks.*

SECTION - I

- Q1)** a) Discuss the phenomenon of partial discharge in electrical power apparatus. Explain basic principles of internal discharges and surface discharges occurring in electrical insulation. **[12]**
- b) Draw an equivalent circuit for partial discharges in electrical insulation. Also draw waveform and characteristics of an individual PD pulse and discuss train of PD current pulses. **[13]**
- Q2)** a) Discuss procedure followed for calibration of partial discharge measuring setup. **[9]**
- b) With reference to partial discharge measuring techniques discuss :**[16]**
- i) Selectively wide band system
 - ii) Narrow band system
 - iii) Measuring impedance and
 - iv) Uncertainty of partial discharge measurements.
- Q3)** a) Discuss screening and filtering problems during partial discharge measurement. **[9]**
- b) Write short notes on : **[16]**
- i) Cavity resonance.
 - ii) Measurement of screening efficiency.
 - iii) Design of screens.
 - iv) Design of filters.

P.T.O.

SECTION - II

Q4) a) Discuss effects of PD on gaseous insulating materials. [9]

b) Explain effects of partial discharges on solid insulating materials and mixed dielectrics. [16]

Q5) With reference to evaluation of PD, write short notes on :

a) Relation between measured and actual charge. [12]

b) Relation between the time dependent occurrence of PD and the extent of damage due to it. [13]

Q6) With reference to the measurement and location of partial discharges in electrical power apparatus discuss : [25]

a) Development of PD measurement technique in cables.

b) Problems during PD measurement on long cables.

c) PD location according to pulse spacing method.

d) Methods of locating PD.

e) Reflecting and superposition effects.

□□□□

P1455

[3665]-555

M.E. (E&TC) (Microwave)

RF WAVE AND MICROWAVE CIRCUIT DESIGN

(2008 Course)

Time : 3 Hours]

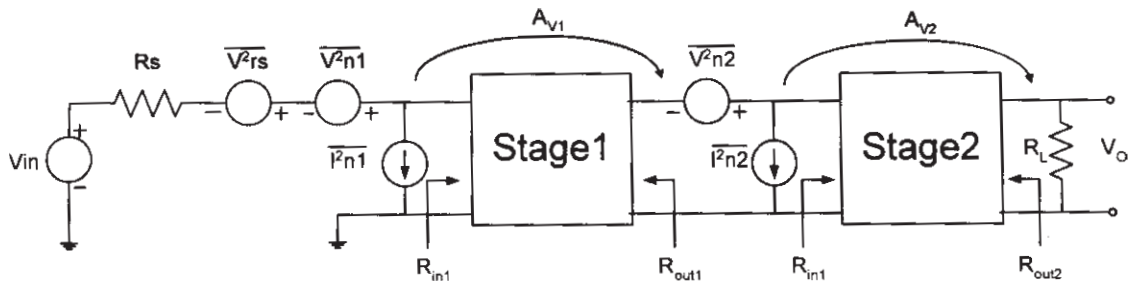
[Max. Marks : 100

Instructions to the candidates:

- 1) Solve any two questions from each section.
- 2) Figures to the right indicate full marks.
- 3) Assume suitable data, wherever necessary.

SECTION - I

- Q1) a)** Define noise in RF system. What are the different types of noise? Derive an expressions for overall noise figure in cascade noise stage amplifier as shown in figure below and for lossy circuits. [20]



- b) Write short note on sensitivity of RF receiver. [5]

- Q2) a)** How RF diode differs from conventional semiconductor diode? Explain Schottky diode with related parametric derivation. [10]
- b) An n-Ge-p-GaAs-n-GaAs heterojunction transistor at 300°K has the following parameters : [15]

Donor density in the n-Ge region : $N_d = 5 \times 10^{18} \text{ cm}^{-3}$

Acceptor density in the p-GaAs region : $N_a = 6 \times 10^{16} \text{ cm}^{-3}$

Hole lifetime : $T_p = 4 \times 10^{-6} \text{ sec}$

Bias voltage across n-p junction : $V_E = 0.80 \text{ V}$

Cross section : $A = 2 \times 10^{-2} \text{ cm}^2$

P.T.O.

Calculate :

- i) The built-in voltage in the p-GaAs side.
- ii) The hole diffusion constant.
- iii) The minority hole density in the n-Ge region.
- iv) The minority electron density in the p-GeAs region.
- v) The hole diffusion length.
- vi) The emitter junction current.

- Q3)** a) Discuss IMPATT diode in detail. [10]
- b) A Ku-band IMPATT diode has a pulsed operating voltage of 100V and a pulsed operating current of 0.9A. The efficiency is about 10%. Calculate output power and duty cycle if the pulse width is 0.1 ns and the frequency is 16 GHz. [7]
- c) An M-Si-M BARITT diode has the following parameters : [8]
- Relative dielectric constant of Si: $\epsilon_r = 11.8$
- Donor concentration : $N = 3 \times 10^{21} \text{m}^{-3}$
- Si length : $L = 6.0 \text{ } \mu\text{m}$.
- Calculate the breakdown voltage and breakdown electric field.

SECTION - II

- Q4)** a) Explain MESFET in term of Construction, Working and Frequency response. [10]
- b) A typical n-channel GaAs MESFET has the following parameters :
- Electron concentration : $N_d = 7 \times 10^{17} \text{ cm}^{-3}$
- Channel height = $a = 0.1 \text{ } \mu\text{m}$.
- Relative dielectric constant = $\epsilon_r = 13$
- Channel length = $L = 12 \text{ } \mu\text{m}$.
- Channel width = $Z = 36 \text{ } \mu\text{m}$.
- Electron mobility = $\mu = 0.08 \text{ m}^2/\text{V.s}$
- Drain voltage = $V_d = 5\text{V}$
- Gate voltage = $V_g = -2\text{V}$
- Saturation drift velocity = $V_s = 2 \times 10^5 \text{ m/s}$

Calculate :

- i) Pinch off voltage.
- ii) Compute the velocity ratio.
- iii) Determine the saturation current at $V_g = 0v$
- iv) Find the drain current = I_d

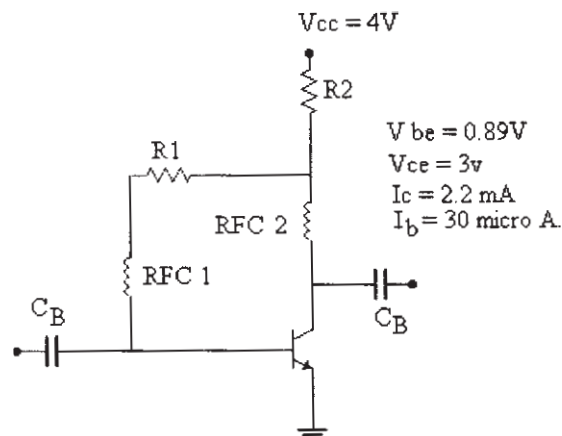
[15]

Q5) a) Discuss design approach for high power amplifier design. [10]

- b) A BJT with $I_c = 10 \text{ mA}$ and $V_{ce} = 5v$ is operated at a frequency of 3.0 GHz. The corresponding S parameters are : $S_{11} = 0.3\angle 30^\circ$, $S_{12} = 0.2\angle -60^\circ$, $S_{21} = 3\angle -80^\circ$ and $S_{22} = 0.2\angle -15^\circ$. Determine whether the transistor is unconditionally stable and find the values for source and load coefficient that provides maximum gain. [15]

Q6) a) Explain single-Ended mixers used in RF circuits. [10]

- b) For a single ended BJT mixer shown below, compute the values of the resistors R_1 & R_2 such that the biasing conditions are satisfied. Using this network as starting point, design a low side injection mixer for $F_{RF} = 200\text{MHz}$ and $F_{IF} = 250 \text{ MHz}$. The BJT is measured at the IF to have an output impedance of $Z_{out} = (677.7 - j2324)\Omega$ for short circuit input and an input impedance of $Z_{in} = (78 - j130)\Omega$ for short circuit output at RF frequency. [15]



Total No. of Questions : 8]

[Total No. of Pages : 2

P1456

[3665]-557

M.E. (E & TC) (Microwave)

DIGITAL IMAGE PROCESSING AND ANALYSIS

(2008 Course) (Elective - I)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Q. 1 and Q. 5 are compulsory.*
- 2) *Solve any two questions from the remaining in each section.*
- 3) *Assume suitable data if necessary.*
- 4) *Use of calculators is allowed.*
- 5) *Figures to the right indicate full marks.*

SECTION - I

- Q1)** a) Explain various statistical properties of an image. [8]
b) Explain the steps taken to convert an analog image into a digital one. Explain the concept of neighbourhood between the pixels along with its significance. [10]
- Q2)** a) Compute the DCT matrix for $N = 4$. [8]
b) State the techniques to remove salt-and-pepper noise from an image. Explain any one technique in detail and compare it with the other. [8]
- Q3)** a) State various colour models with applications of each. Explain the conversion of RGB colour model to YIQ. [8]
b) Explain weiner filtering for image restoration. [8]
- Q4)** a) Derive the kernel for second order derivative for detecting edges. Compare its performance with first order derivative considering an example. [8]
b) Explain any three point processing techniques with applications. [8]

SECTION - II

- Q5)** a) Explain Huffman coding for image compression considering an example. [8]
b) Write a note on dilation and erosion with the help of a binary image and a structuring element. [8]

P.T.O.

- Q6)** a) Explain region splitting and merging in detail. [8]
b) Explain chain code and derive the code for an image for 8 directions. [8]
- Q7)** a) Explain the characteristics of features. [8]
b) Write the algorithm for thinning an image. [8]
- Q8)** a) Write a note on Bayes' classifier for object recognition. [6]
b) Explain the architecture of backpropagation neural network along with its training algorithm. [10]



Total No. of Questions : 8]

[Total No. of Pages : 2

P1458

[3665]-563

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

SIGNAL PROCESSING FOR WIRELESS COMMUNICATION

(2008 Revised 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 rules, Molier charts, electronic pocket calculator and steam tables is allowed.*
- 6) Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) With the help of expression, statistical parameters, sketches etc compare various probability distribution models. [8]
b) What is maximum likelihood estimator? [3]
c) Explain the following terms : Hypothesis testing, observation, space, decision regions, null and simple hypothesis. [5]
- Q2)** a) Define noise and explain the different types of noise. [4]
b) Explain the correlation receiver for binary signal detection problem.[8]
c) Draw the receiver structure for colored noise. [6]
- Q3)** a) Define the following : [6]
i) Sufficiency.
ii) Stochastic process.
iii) Random process.
b) Explain Gauss Markov Model. [6]
c) A resistor 'R' is a random variable with uniform density between 900 and 1100 Ohms. Find the probability that R is between 950 and 1050 Ohms. How is PDF related to CDF for a continuous random variable? Sketch CDF for uniform PDF. [4]

P.T.O.

- Q4)** a) Explain what are adaptive filters. [4]
b) Give applications of adaptive filters and explain any one. [4]
c) What do you mean by minimum mean square error? [2]
d) Explain Kalman filter with any one application. [6]

SECTION - II

- Q5)** a) Explain what is parametric estimator and explain the different parametric power spectrum estimation (any two) [10]
b) Draw the ISI channel model for Kalman equalizer and explain. [6]
- Q6)** a) Explain the term power spectrum estimation. [4]
b) What is non parametric estimation. [2]
c) Explain Welch method of power spectrum estimation. [8]
d) What are the advantages and disadvantages of non parametric PSE.[2]
- Q7)** a) Explain the basic of Wiener filter theory and explain how LMS algorithm is derived from the same. [9]
b) Explain RLS algorithm. Explain its advantages and disadvantages with respect to LMS algorithm. [9]
- Q8)** Write short notes on : (any three) [16]
a) Radar target models.
b) BPSK spread spectrum system.
c) Performance of DS-BPSK receiver in interference.
d) Dynamic target tracking.



Total No. of Questions : 6]

[Total No. of Pages : 2

P1462

[3665]-592

M.E. (Electronics Digital Systems)
SIGNAL PROCESSING ARCHITECTURES
(2008 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 two questions from each section.*
- 3) Figures to the right indicate full marks.*
- 4) Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Explain the use of DFT in linear system analysis and its importance. Explain how DFT is used in linear filtering with example. [9]
- b) Determine 4 pt. DFT of the given DT signals. Also plot their magnitude and phase spectra. [8]
- i) $x[n] = \{0.5, 1, 3, 0.5\}$
- ii) $x[n] = \{2, 5, 1\}$
- c) What is DCT? Explain any two properties of DCT. [8]
- Q2)** a) Determine the DWT of the given sequence $x[n]$ using haar basis, till the signal gets decomposed. [10]
- $X[n] = \{1, 1, 1, 2, 3, 2, 1, 1\};$
- (Note - Simple average and difference).
- b) Explain the importance of anti-aliasing and anti-imaging filters in decimators and interpolators. [8]
- c) Explain different retiming techniques. [7]
- Q3)** a) The DT signal is given as $x[n] = \{2, 4, 3, 5, 6\}$. The filter coefficients are $a = 1$, $b = \{0.2, 0.5, -0.3\}$. Determine the output signal $y[n]$. [10]
- b) Explain how data flow graphs are used to describe multirate systems. [8]
- c) Compare linear convolution and circular convolution. [7]

P.T.O.

SECTION - II

- Q4)** a) What is fixed point and floating point processing with reference to digital signal processing? How to convert floating point algorithm into fixed point algorithm? Why? [10]
- b) Justify that the parallel processing reduces the power consumption of DSP system with suitable example. [8]
- c) Difference between C54XX and C67XX architectures. [7]
- Q5)** a) Draw and explain the architecture of TMS 320C54XX. [10]
- b) Describe the processor selection criteria for DSP algorithm implementations. [8]
- c) Explain with example importance of MAC in DSP architecture. [7]
- Q6)** a) Discuss Features of the DSP Architectures with example. [10]
- b) Discuss tools used in implementation of DSP algorithms. [10]
- c) How DTMF signals are detected using Goertzel algorithm. [5]



P1463

[3665] - 601

M.E. (Electronics - Digital Systems)

IMAGE PROCESSING AND PATTERN RECOGNITION

(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) 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 a Random Variable? Explain the following terms with respect to Discrete Random variable. [6]
- i) Expected value.
 - ii) K^{th} moment.
 - iii) K^{th} central moment.
- b) Assume that three samples of the feature vector (x, y) are $(2, 9)$, $(5, 3)$ and $(3, 7)$. Estimate the parameters $\mu_x, \mu_y, \sigma_x^2, \sigma_y^2$ and σ_{xy} using the unbiased estimates. Also estimate ρ_{xy} . [10]
- Q2)** a) Explain the following in brief: [4]
- i) Bay's theorem.
 - ii) Prior and Posterior probabilities.
- b) A pattern recognition system has been developed for classifying objects into six categories. It has been correct on 80 percent of the past testing data. What is the estimated probability that exactly four of the next five samples will be correctly classified. [6]
- c) Explain the "Model based estimation" method for evaluating the error rate of a classifier. [6]

P.T.O.

Q3) a) Briefly explain the following image enhancement methods indicating their application area. [6]

- i) Median filtering.
- ii) Contrast stretching.

b) What is histogram of an image? What will be the effect on histogram of the image in general if: [4]

- i) Lower order bit plane is set to zero.
- ii) Higher order bit plane is set to zero.

c) A three bit image has following gray level distribution. [6]

Gray level	G_0	G_1	G_2	G_3	G_4	G_5	G_6	G_7
Number of pixels	400	700	1350	2500	3000	1500	550	0

Determine gray level distribution for the output image using histogram equalization procedure.

Q4) Write short notes on (Any three): [18]

- a) Independent Component Analysis.
- b) Confusion Matrix.
- c) Conditionally Independent features.
- d) Geometric Image Scaling.

SECTION - II

Q5) a) What is partitional clustering? Explain Forgy's algorithm. How does k-means algorithm differ from Forgy's algorithm? [8]

b) A cluster contains two samples at (0, 1) and (0, 2). Another cluster contains two samples at (1, 7) and (1, 8). [8]

- i) What is the single - linkage distance between the clusters if city block distance is used?
- ii) What is the single - linkage distance between the clusters if Euclidean distance is used?
- iii) What is the complete - linkage distance between the clusters if city block distance is used?
- iv) What is the complete - linkage distance between the clusters if Euclidean distance is used?

Q6) a) Explain the need for multilayer Artificial Neural Network. How does 'Back propagation algorithm' solves the problem associated with single layer network [8]

- b) Design a Hopfield network for four bit bipolar patterns. The training patterns are : [8]

$$\text{Sample } S_a = [1 \ 1 \ -1 \ -1]$$

$$\text{Sample } S_b = [-1 \ 1 \ -1 \ 1]$$

$$\text{Sample } S_c = [-1 \ -1 \ -1 \ 1]$$

Find the weight matrix. Also find the energy for the sample S_a .

- Q7)** a) With the help of appropriate mask explain line detection and stripe detection operation. [8]

- b) Explain Laplacian edge detector. Explain why Laplacian of Gaussian (LOG) mask is preferred over Laplacian mask for edge detection. [8]

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

- a) Kernel and Window estimators.
- b) Adaptive decision boundaries.
- c) The Leaving-One-Out technique.
- d) Smoothing transformations.



P1465**[3665] - 608****M.E. (Production)****MATHEMATICS AND STATISTICS****(2002 & 2008) (Old & Revised) (Common)***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 pocket calculator is allowed.*
- 6) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) An electrostatic field in the XY - plane is given by the potential function $\phi = 3x^2y - y^3$ find the stream function. [5]
- b) Show that the function $u = e^{-2xy} \sin(x^2 - y^2)$ is harmonic. [5]
- c) Find Laurents series of $f(z) = \frac{1}{z^2 + 1}$ about its singular points. Determine the region of convergence. [6]
- Q2)** a) Evaluate $\int_C \operatorname{Re}(z) dz$ where C is [6]
- i) Shortest path from $1 + i$ to $3 + 2i$
 - ii) Along the straight line from $(1, 1)$ to $(3, 1)$ and then from $(3, 1)$ to $(3, 2)$.
- b) Evaluate $\oint_C \frac{e^z dz}{z(1-z)^3}$ where C is
- i) $|z| = \frac{1}{2}$ ii) $|z - 1| = \frac{1}{2}$ iii) $|z| = 2$. [6]
- c) Find bilinear transformation which maps the points $i, -i, 1$ of the z-plane into $0, 1, \infty$ of the w-plane respectively. [5]

P.T.O.

Q3) a) Solve the one dimensional heat equation $\frac{\partial u}{\partial t} = 2 \frac{\partial^2 u}{\partial x^2}$ with $u(0, t) = 10$,

$u(6, t) = 18$, $u(x, 0) = \frac{x^2}{2}$ with $h = 1$ and $k = \frac{1}{8}$ by explicit method. [9]

b) Solve the Laplace equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ in the rectangle bounded by

$0 \leq x \leq 3$, $0 \leq y \leq 3$. $u(x, y)$ being the temperature at (x, y) the boundary conditions are as follows.

$u = 180$ on $y = 3$, $u = 80$ on $x = 0$, $u = 0$ on $x = 3$, $\frac{\partial u}{\partial y} = 0$ on $y = 0$ obtain

the system of equations and only indicate any method for solving it. What is the physical significance of the boundary condition on y . [8]

Q4) a) On which curve the functional

$\int_0^{\pi/2} (y'^2 - y^2 + 2xy) dx$ with $y(0) = 0$ and $y(\pi/2) = 0$ be extremised. [8]

b) Use Galerkin's method to solve the boundary value problem $y'' - y + x = 0$ ($0 \leq x \leq 1$) with $y(0) = 0$, $y(1) = 0$ compare your approximate solution with exact solution. [8]

Q5) a) Using Cauchy's residue theorem evaluate $\int_0^{2\pi} \frac{\sin 2\theta}{5 + 4\cos\theta} d\theta$. [5]

b) Calculate the Numerical solution with $h = 0.2$, $k = 0.2$ solving $\frac{\partial^2 u}{\partial t^2} = \frac{\partial^2 u}{\partial x^2}$

with $u(x, 0) = \sin \pi x$, $u(0, t) = 0$, $u(1, t) = 0$ $\frac{\partial u}{\partial t}(x, 0) = 0$. [7]

c) Consider the transformation $W = e^{i\pi/4} Z$ and determine the region in w -plane corresponding to the triangular region bounded by the lines $x = 0$, $y = 0$ and $x + y = 1$ in the z -plane. [4]

SECTION - II

Q6) a) Reduce the given differential equation to the Bessel's equation and solve.

$$y'' + \frac{1}{x} y' + \left(1 - \frac{1}{4x^2}\right) y = 0. \quad [5]$$

b) Express x^5 in terms of Legendre's polynomials. [5]

c) Prove that [6]

i) $\frac{d}{dx} (x^n J_n(x)) = x^n J_{n-1}(x).$

ii) $\frac{d}{dx} (x^{-n} J_n(x)) = x^{-n} J_{n+1}(x).$

Q7) a) Show that $\int_{-1}^1 P_m(x) P_n(x) dx = \begin{cases} 0 & \text{if } m \neq n \\ \frac{2}{2n+1} & \text{if } m = n. \end{cases} \quad [8]$

b) Prove that [8]

i) $J_{1/2}(x) = \sqrt{\frac{2}{\pi x}} \sin x.$

ii) $J_{-1/2}(x) = \sqrt{\frac{2}{\pi x}} \cos x.$

Q8) a) A player has Rs. 300 at each play of a game. He losses Rs. 100 with probability $3/4$ but wins Rs. 200 with probability $1/4$. He stops playing if he has lost his Rs. 300 or he has won at least Rs. 300. [9]

i) Determine the transition probability matrix of the Markov chain.

ii) Find the probability that there are at least 4 players to the game.

b) Suppose the diameter of motor shafts in a lot have a mean of 0.249 inches and standard deviation if 0.003 inches the inner diameter of the bearing in another lot have a mean of 0.255 inches and standard deviation 0.02 inches. [8]

i) Find the mean and S.D. of clearances between shafts and bearings selected from these lots.

ii) If a shaft and bearing are selected at random find the probability that the shaft will not fit inside the bearing. Assume that both dimensions are normally distributed.

Q9) a) Fit a binomial distribution to the following data : [8]

x	:	0	1	2	3	4
f	:	30	62	46	10	2

- b) 1,000 students at college level are graded according to the I.Q. and their economic conditions. Use chi-square test to find out whether there is any association between economic conditions and the level of I.Q. [8]

Economic Conditions	I. Q.			Total
	High	Medium	Low	
Rich	160	300	140	600
Poor	140	100	160	400
Total	300	400	300	1000.

Q10)a) The data given below are the number of defectives in 10 samples of size 400 each construct a p-chart and np-chart and comment on the results.[8]

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) Which of the stochastic matrices are regular. [9]

i) $A = \begin{pmatrix} \frac{1}{2} & \frac{1}{2} \\ 0 & 1 \end{pmatrix}$ ii) $B = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$

iii) $C = \begin{pmatrix} \frac{1}{2} & \frac{1}{4} & \frac{1}{4} \\ 0 & 1 & 0 \\ \frac{1}{2} & \frac{1}{2} & 0 \end{pmatrix}$ iv) $D = \begin{pmatrix} 0 & 0 & 1 \\ \frac{1}{2} & \frac{1}{4} & \frac{1}{4} \\ 0 & 1 & 0 \end{pmatrix}$.



P1466

[3665]-609

**M.E. (Production)
CAD/CAM/CIM
(Revised 2008)**

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Attempt not more than Five questions of which at least Two questions must be 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) You are advised to attempt not more than Five questions.*
- 7) Your answers will be valued as a whole.*
- 8) Use of electronic calculator is allowed.*
- 9) Assume suitable data, if necessary.*

SECTION - I

Q1) Solve any two of the following :

[20]

- a) Perform the following transformation if the coordinates of the vertices of the pentagon are P(1, 2), Q(13, 2), R(19, 5), S(19, 8) and T(13, 12). The transformation are performed in the following sequence.
 - i) Scale the object by factor 1.5.
 - ii) Rotate the scaled object about P by 60° in counter clockwise direction.
- b) What is the best kind of geometric modelling system? What are the primitives used in solid modelling?
- c) Explain with neat diagram, how CAD/CAM has overwhelmed product life cycle?

Q2) Solve any Two of the following :

[20]

- a) Write down CNC program in G & M code for the job shown in Fig. No.1.

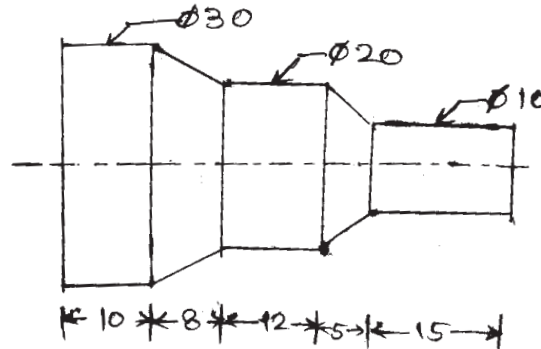


Fig. No. 1

- b) With a neat sketch, explain FMS, FMC & FMM.
c) Write down CNC program using G&M code for the job shown in Fig No.2.

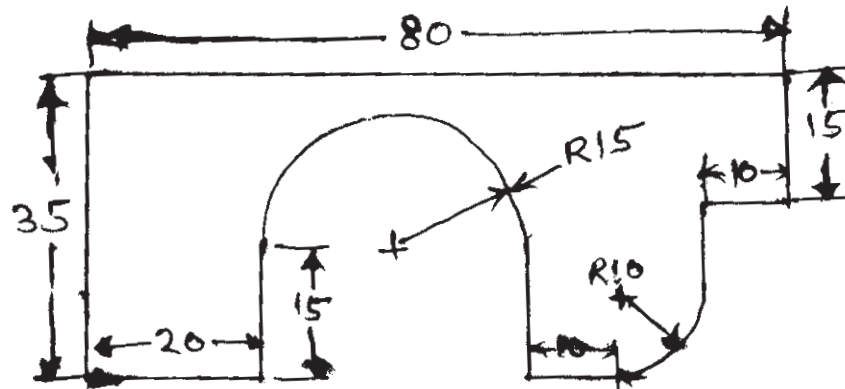


Fig No. 2.

- Q3)** a) Consider the bar shown in Fig. No.3. Determine the nodal displacement, element stresses & reactions. [10]

Assume $E = 200 \times 10^9 \text{ N/m}^2$. $A1 = 200 \text{ mm}^2$

Load = 275 kN. $A2 = 350 \text{ mm}^2$

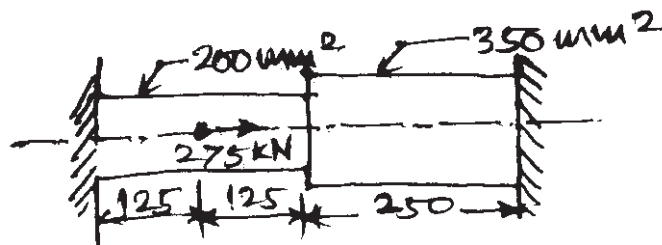


Fig. No. 3.

- b) Explain the following with sketch related to FEA. [10]
- i) Node and member.
 - ii) Global axis.
 - iii) Degree of freedom.
 - iv) Shape functions & boundary condition.
 - v) Element stiffness matrix & Global stiffness matrix.

SECTION - II

- Q4)** Solve any Two of the following : [20]
- a) What are the advantages of Computer Aided Process Planning? What are the computer aided codification methods available?
 - b) Differentiate between Generative CAPP and Varient CAPP.
 - c) Explain shopfloor control module in CIM.
- Q5)** a) Explain the role of computer in production management system. What kind of database management system is used for this purpose? [10]
- b) Explain with neat diagram - [10]
- i) Computer aided material requirement planning.
 - ii) Computer aided quality control.
- Q6)** a) Explain different methods of cell formation in cellular manufacturing system. What are the benefits of implementation of cellular manufacturing? [10]
- b) Classify FMS commonly used in industries as per the construction, layout and approach towards automation. What are the benefits obtained by implementation of FMS in industries? [10]



P1467

[3665] - 610

M.E. (Production Engineering)

ADVANCE MANUFACTURING PROCESSES

(2008 Course) (511103)

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 answer books.*
- 3) Figures to the right indicate full marks.*
- 4) Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Determine the solidification time of the slab shaped casting 100 mm thick of iron material when poured into a sand mold at the initial temperature 28° C. Assume following data : Freezing temperature of iron = 1540 °C, Latent heat = 272 KJ/kg, density of liquid metal = 7850 Kg/m³. Specific heat of mold sand = 1.17 KJ/Kg-K, Conductivity of mold sand = 0.865 W/m-K, Density of mold sand = 1600 Kg/m³. **[10]**
- b) Explain the design of gating systems of die casting dies. **[6]**
- Q2)** a) Explain distortion and residual stresses in fusion welding process and discuss. The method reduced them **[8]**
- b) What are the various defect in fusion welding? Explain any two method in detail for testing of welds. **[8]**
- Q3)** a) Explain the effect of feed rate, electrolyte flow velocity and voltage on dimensional inaccuracy in case of electro-chemical process. **[8]**
- b) Derive an expression for material removal rate in ultrasonic machining process using grain hammering model. **[8]**
- Q4)** Write short notes on : **[18]**
- a) Grain growth and structure.
 - b) Molecular dynamic analysis.
 - c) Modes of metal transfer in arc welding.

P.T.O.

SECTION - II

- Q5)** a) Explain and draw yield locus for Tresca and Von-mises yield criteria's each. [8]
- b) A strip of lead with initial dimensions $24 \text{ mm} \times 24 \text{ mm} \times 150 \text{ mm}$ is forged between two flat dies to a final size of $6 \text{ mm} \times 96 \text{ mm} \times 150 \text{ mm}$. If the coefficient of the friction between the workpiece and the dies is 0.25. Determine the maximum forging force. The average yield stress of lead in simple tension is 7 MPa. [8]
- Q6)** a) Explain important process parameters of electro hydraulic process. [8]
- b) Explain confined and unconfined system of explosive forming. [8]
- Q7)** a) Calculate the blank size required to form a cup of diameter 80 mm and height 50 mm having bottom corner radius 5 mm by graphical method. [8]
- b) Explain spring back in bending. Also explain various methods to reduce the spring back. [8]
- Q8)** Write short note on : [18]
- a) Stretch forming
 - b) Power spinning
 - c) Fine blanking



[3665]-612

M.E. (Production)

RELIABILITY & FAILURE ANALYSIS**(Revised Course 2008) (Elective - I) (511104)**

Time : 3 Hours]

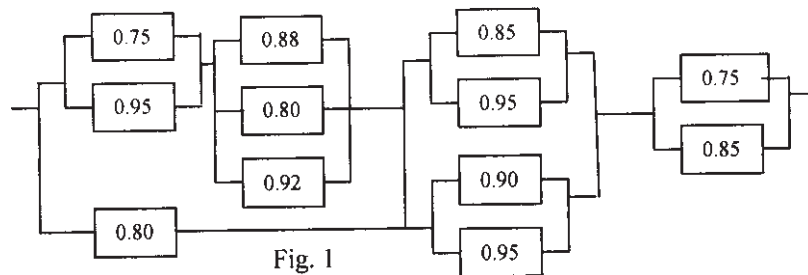
[Max. Marks : 100

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 calculator is allowed.

SECTION - I

- Q1)** a) Explain Log-normal and weibull distributions stating their significance. [6]
- b) Calculate the reliability of the system shown in Fig. 1. The values show the reliability of individual components in the system. [10]



- Q2)** a) A Logic gate diagram for FMEA study has been shown in Fig.2. The basic failure modes of A,B C and D have failure rates 0.002, 0.004, 0.05 and 0.08 per hour resp. Find out the failure rate of T_0 . Assume mission time of 100 hrs. [10]

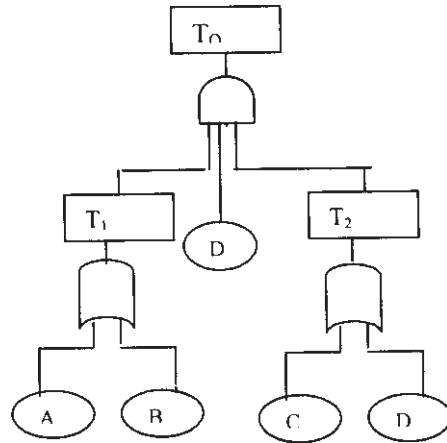


Fig. 2

b) Explain the elements in FMECA analysis. [6]

Q3) a) State the assumptions to be made while using AGREE Method. Find out the failure rates of the components so that the system reliability becomes 0.99 using AGREE method. The data being given below.[8]

Sr. No Components	No. of Component Modules (n_i)	Optg Time (t_i)	Importance factor (w_i)
1	55	10	1.0
2	80	9	0.97
3	45	10	1.0
4	65	7	0.93
5	77	10	1.0
6	25	10	0.95

b) The Fig.3 indicates the system block diagram with reliabilities of the each component. Find out the reliability of using [8]

- Star - Delta method and
- Conditional probability method.

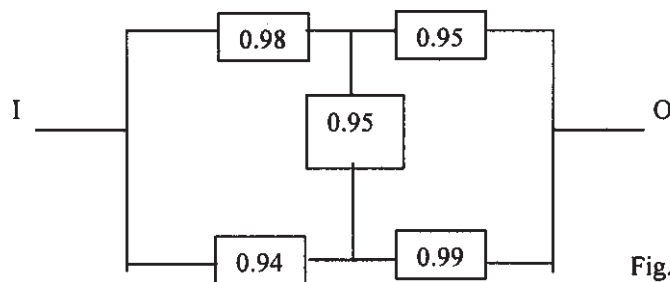


Fig. 3

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

- a) Risk Priority Number.
- b) Symbols used in Fault tree construction.
- c) Matrix Method of reliability evaluation.
- d) Cut set and Tie set methods for reliability evaluation.
- e) Event Tree Analysis.

SECTION - II

Q5) a) In a short sample testing of a system following data is recorded. Plot the variation of reliability against time using **[10]**

- i) Mean Ranking and
- ii) Median Ranking Method

Failure No.	1	2	3	4	5	6	7	8	9
MTTF(Hrs)	20	12	21	25	35	39	38	36	29

- b) Explain the terms **[6]**
- i) Loading roughness,
 - ii) Safety margin and
 - iii) Intrinsic Reliability.

Q6) a) Explain life cycle costing elements for engineering products. **[8]**

- b) The following data refer to predicted reliability of eight 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	7	8
Predicted reliability	0.994	0.998	0.990	0.996	0.990	0.980	0.991	0.95

Q7) a) Explain Hot ferrography technique used for analysis of the wear debris. **[8]**

- b) Explain Vibration Signature analysis in condition monitoring of the equipment. **[8]**

Q8) Write short notes on (any three) :

[18]

- a) Spectroscopic Oil Analysis Program.
- b) ARINC Method of reliability allocation.
- c) Reliability centered maintenance.
- d) Reliability Effort Function.
- e) Highly Accelerated Life Testing (HALT).



P1470

[3665]-616

M.E. (Production Engineering)

SHEET METAL PROCESSING

(2008 Course) (Elective - II) (511105) (Sem. - I)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Attempt 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) *Illustrate your answers, wherever necessary.*
- 5) *Make suitable assumptions, if necessary.*

SECTION - I

Q1) a) Enumerate the defects observed in 'draw process', giving probable reasoning, and remedies to avoid them. **[10]**

b) Discuss the functional requirements of lubricants for drawing operation. How is, the selection of right lubricant made? **[6]**

Q2) a) Explain the steps to be followed, when a product is to be developed, using sheet metal processes. **[8]**

b) How is the 'analytical prediction' of forming limits, is carried out? How does it help in product design process, using sheet metal operations?**[8]**

Q3) a) What is spring back? Show that the spring-back gap (g) of a circular bent strip of length-'l' and thickness 't' is **[8]**

$$g = \frac{3l^2 \cdot S}{2\pi t \cdot E}, \quad \text{where, S - yield stress of strip, and}$$

E - modulus of elasticity.

b) What is process analysis? How is it carried out, for 'axysymmetric deep drawn' parts? **[8]**

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

- a) Luder's lines.
- b) Plasma cutting and bending operations.
- c) L.D.R, its importance in draw process.
- d) Attributes of material behaviour affecting sheet metal processing.

P.T.O.

SECTION - II

- Q5)** a) Explain the working of diffusion bonding process, and give it's two applications. [8]
b) Describe hydroforming process of tube production. [8]
- Q6)** a) Make a brief classification of presses based on their structures and drives. Draw a neat figure of any one type and give its specific applications.[8]
b) Make a note on 'safety devices' used during press-operations and part handling. [8]
- Q7)** a) Describe the steps to be followed in process modeling. How, does it help in the study of forming operations. [8]
b) How are digital computers used in sheet metalforming processes? How are slip line fields drawn? How are the slip line fields help in the process study? [8]
- Q8)** Write short notes on (any three) : [18]
a) Centre of pressure.
b) Press brakes.
c) Multiple point blank holding.
d) Stretch forming.
e) Load instability and tears.



P1471

[3665]-617
M.E. (Production)
TOOL AND DIE DESIGN
(2008 Course) (Elective - II)

Time : 3 Hours]

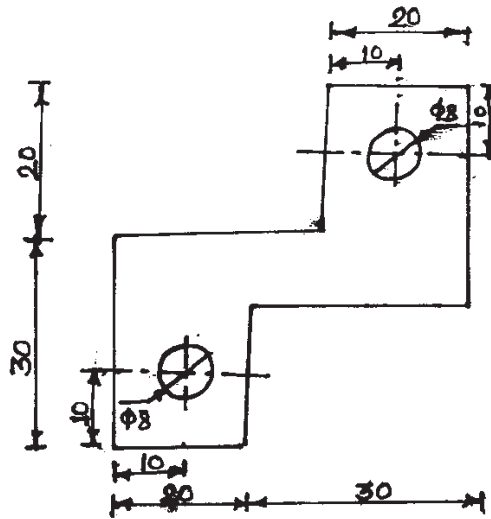
[Max. Marks : 100

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) *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) Design a progressive die for the component as shown in figure - 1. The stock thickness is 1.5 mm and ultimate shear stress of material is 360 N/mm². [18]

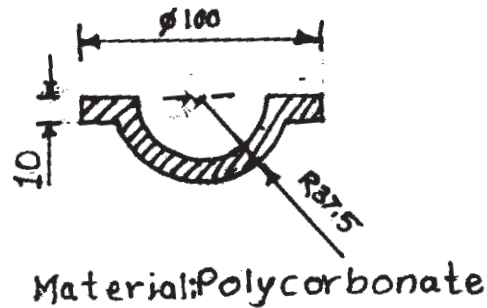


Q1. FIGURE 1

- Q2)** a) Explain compound dies and combination dies for press tool operations. [8]
- b) Explain various types of punches and methods of holding the punches. [8]

P.T.O.

- Q3) a) Determine the thickness of a cavity insert of four-impession injection mold for molding a component shown in figure 2. Given that runner diameter = 6.25 mm, runner length = 50 mm, sprue diameter is 12 mm, allowable stress for mold material is 70 MPa. [10]



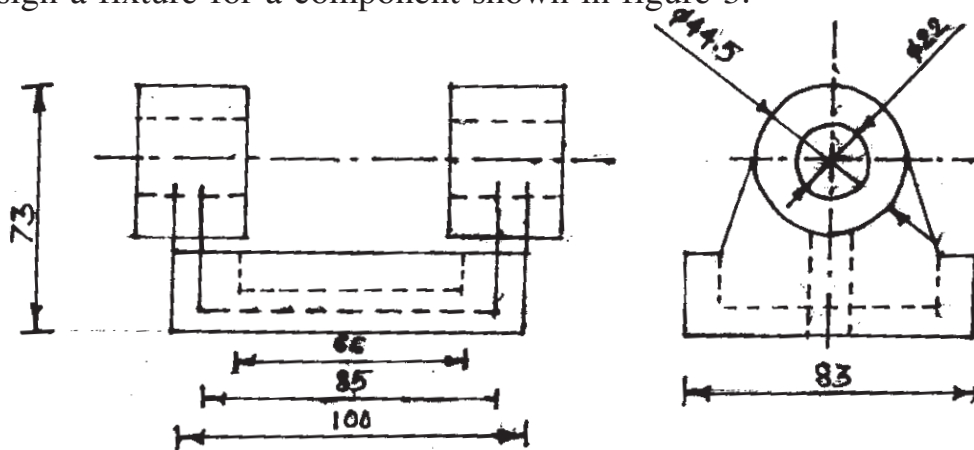
Q3.a) Figure 2

- b) Explain with neat sketch the working and application of basic underfeed mold. [6]

- Q4) a) Explain various types of dies used in die-casting operation. [8]
b) Explain ejection system in die casting operations with neat sketch. [8]

SECTION - II

- Q5) Design a fixture for a component shown in figure 3. [18]



Q5. Figure 3

- Q6)** a) Draw a neat sketch of orthogonal rake system for designation of cutting tools and define each term. [8]
b) Explain various conditions suitable for positive rake angles. [8]
- Q7)** a) A 10 mm dia. hole is to drilled in a block of magnesium alloy. The feed is 0.2 mm/rev. and the spindle speed is 800 rev./min. [8]
Calculate :
i) MRR
ii) Cutting power.
iii) Torque on drill.
b) Explain with neat sketch the effect of tool inclination angle on specific cutting energy and tool chip interface temperature. [8]
- Q8)** a) Explain the procedure to design of an edging impression of forging die. [8]
b) Explain the consideration of grain flow while forging a gear blank and crane hook. [8]



Total No. of Questions : 8]

[Total No. of Pages : 2

P1474

[3665]-621

M.E. (Production) (Manufacturing & Automation)

INDUSTRIAL AUTOMATION

(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) 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) In a operation of certain 15 station transfer line, the ideal cycle time is 0.58 min. Breakdown occurs at the rate once every 10 cycles and the average downtime per breakdown ranges between 2 and 9 min, with an average of 4.2 min. How many parts will the line be capable of producing during an average week if the company works for 40 hours per week. **[10]**
- b) Explain Kilbridge and Wester's methods for assembly line balancing. **[6]**
- Q2)** a) A reservoir of size $0.5 \times 0.5 \times 1.2$ m is used in a hydraulic system having pump flow 25 lpm with input power to pump drive of 15kW. The pump is loaded for 40% of the time and the overall efficiency when it is on is 75%. Calculate the maximum fluid temperature in the reservoir if the ambient temperature is 20°. **[10]**
- b) Explain with neat sketch the working of pressure and temperature compensated flow control valve. **[6]**
- Q3)** a) Draw a suitable pneumatic circuit for a driven by a single acting cylinder with actuation of at least two (of three) manually operated valves. **[8]**
- b) Draw the suitable pneumatic circuit using cascade system for sequential extension and simultaneous retraction of tree cylinders. **[8]**

P.T.O.

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

- a) 4/2-seat type direction control valve.
- b) Electro hydraulic servo valves.
- c) Pressure intensifiers.
- d) Assembly line balancing algorithms.

SECTION - II

Q5) a) Explain for a microprocessor, the roles of : **[8]**

- i) Accumulator
- ii) Status
- iii) Memory address
- iv) Program counter registers

b) Explain with suitable examples the use of timers in PLC. **[8]**

Q6) a) Explain with neat sketch any two types of rotary feeders. **[8]**

b) Explain various principles of material handling systems. **[8]**

Q7) a) Explain with neat sketches common robot configurations. **[8]**

b) State the rules for establishing the link co-ordinate frames of a manipulator. **[8]**

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

- a) Forward and inverse kinematics.
- b) Traffic control and safety for AGV's.
- c) Feedback control system.
- d) Position control system in robotics.



P1475

[3665]-623

M.E. (Production)

PRODUCT LIFE CYCLE MANAGEMENT

(2008 Course) (Elective - III) (511111)

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.*

SECTION - I

- Q1)** a) Explain the opportunities and benefits of PLM. [8]
b) Explain PDM system architecture. [8]
- Q2)** a) Explain phases of product life cycle. [8]
b) Explain product Data Associativity. [8]
- Q3)** a) Explain product configuration chain in relation to product design activity, design management activity and subcomponent design activity. [10]
b) Explain the impact on the organization of developing a strategy for PLM. [6]
- Q4)** a) Explain the concurrent engineering and techniques of concurrent engineering and their applications. [12]
b) Explain the importance of human factors in product design. [6]

SECTION - II

- Q5)** a) Explain the major guidelines for assembly improvement. [8]
b) Explain product realization process. [8]
- Q6)** a) Explain the concept DFA for finger-nail cutter product. [8]
b) Explain the factors to be maximized and minimized for reducing time-to-market. [8]

P.T.O.

- Q7)** a) Explain the design for higher quality and guidelines to promote quality. [8]
b) Explain 'Technology Forecasting' [8]
- Q8)** Write short note on : [18]
a) Re-engineering.
b) Design for environment.
c) Application of PLM software.



P1476

[3665]-624

**M.E. (Production)
WELDING AND JOINING
(2008 Course) (Elective - III)**

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) *Your answers will be valued as a whole.*
- 7) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 8) *Assume suitable data, if necessary.*

SECTION - I

Unit - I

- Q1)** a) Explain how welding and allied processes are classified? Give sub classifications also. [8]
b) With the help of figure explain the concept of epitaxial growth in solidification of weld. [8]

OR

- Q2)** a) Draw T.T.T diagram and explain effect of cooling rate on formation of different reaction products like pearlite, bainite and martensite. [8]
b) What is weld decay? Explain different ways to prevent weld decay?[8]

Unit - II

- Q3)** a) Explain the construction, manufacturing and functions of compounds contained in flux cored electrode wires. [8]
b) Define arc blow. What are the different factors which cause arc blow? What are the steps to reduce sensitivity of arc blow. [8]

OR

- Q4)** a) What are the different methods of arc initiation and maintenance? [8]
b) What do you mean by arc stability? Explain. [8]

Unit - III

- Q5)** a) Discuss the effect of stainless steel manual metal arc welding (MMAW) fume on human brain and free radical production. [9]

P.T.O.

- b) Discuss the “Influence of microstructure on fatigue crack of stainless steel welds. [9]

OR

- Q6)** a) Write on “Effect of process parameters of low current micro-plasma arc welding”. [9]
b) Write in brief “corrosion behaviour of electrosag welds”. [9]

SECTION - II

Unit - IV

- Q7)** a) What are the basic characteristics required for arc welding power sources? Explain different factors that influence selection of power sources. [8]
b) With the help of block diagram explain working of thyristor controlled rectifiers. [8]

OR

- Q8)** a) Explain different static characteristics (V - A curves) curves of welding power sources. [8]
b) Explain how arc length is controlled in mechanised welding process? [8]

Unit - V

- Q9)** a) Explain effect of gravity, surface tension, electromagnetic pinch effect and drag forces on metal transfer. [9]
b) Explain pulse transfer - plasma arc welding in brief. [9]

OR

- Q10)** a) Explain the mechanism of metal transfer from tip of electrode to the base metal. [9]
b) Explain the relation between current and melting rate of carbon steel electrodes of different sizes. [9]

Unit - VI

- Q11)** a) Explain the mechanism of cold welding? What are the application of cold welding? [8]
b) Enumerate different diffusion welding methods? Explain what are the different diffusion welding parameters? [8]

OR

- Q12)** a) With the help of block diagram explain explosive welding in detail. [8]
b) What are the advantages, disadvantages and applications of laser beam welding? [8]



P1477

[3665]-625

M.E. (Production Engineering)

SURFACE TREATMENT PROCESSES

(2008 Course) (Elective - III) (51111) (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) Draw figures wherever necessary.*
- 5) Make suitable assumptions, if necessary and state them clearly.*

SECTION - I

- Q1)** a) Explain the significance, necessity and importance of surface engineering. Give one illustration in each case. **[8]**
- b) Make a brief account of the various engineering properties, achieved with surface treatment. Give one example of surface treatment, which improves engineering properties of the surface. **[8]**
- Q2)** a) What do you mean by surface cleaning? What is the purpose? Which are the principal methods used cleaning of the component surfaces. **[8]**
- b) Suggest suitable surface cleaning processes used prior to surface treatment of the following components; with proper reasoning **[8]**
- i) Auto parts,
 - ii) Cutting tools,
 - iii) Recorating articles,
 - iv) Galvanised sheets.
- Q3)** a) Discuss the following points w.r.t. the process of diffusion coating :**[12]**
- i) Principle of operations,
 - ii) Various methods,
 - iii) Technology used and
 - iv) Applications.
- b) Which sequence of cleaning processes is carried out for H.R. Steel sheets before being Cold-Rolled? **[4]**

Q4) Write short notes on (Any Three) : **[18]**

- a) Spark hardening treatment,
- b) Use of ceramics in surface coating,
- c) Matrix metal coating,
- d) Conventionally deposited metals and
- e) Surface degradation.

SECTION - II

Q5) a) Discuss the influence of manufacturing processes on the properties of component surfaces. **[8]**

b) Explain the principle of operation, setup required and advantages of chemical vapour deposition process. **[8]**

Q6) a) How are the following terms related to the surface treatment : **[8]**

- i) Control properties,
- ii) Response properties and
- iii) Surface properties.

b) Make a brief comparison in between conventional methods with special methods of thickness measurements. **[8]**

Q7) a) Explain the tribological characteristics of engineering surface in Macro, Micro, and nano scale and method to evaluate them. **[10]**

b) Explain the construction, working and applications of tribometer. **[6]**

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

- a) Use of laser in surface engineering,
- b) Electro-lyzing process,
- c) Substrate characteristics and
- d) Ion implantation.



Total No. of Questions : 8]

[Total No. of Pages : 2

P1478

[3665]-198

M.E. (Computer Engineering)

DISTRIBUTED OPERATING SYSTEMS

(Revised Course - 2002) (510102)

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) Draw sketches wherever necessary.*
- 4) Figures to the right indicate full marks.*

SECTION - I

- Q1)** a) What is a distributed system? What are the challenges faced in distributed systems? State the characteristics of a distributed system. State in brief the different design issues in distributed systems. [10]
- b) Explain the Chandy-Misra-Haas algorithm for deadlock detection. State the advantages of this algorithm. [8]
- Q2)** a) What is RMI? What is the difference between static and dynamic RMI? [8]
- b) Describe the basic NFS architecture for UNIX systems with the help of a neat diagram. [8]
- Q3)** a) Describe the general architecture of a DSM system with the help of a neat diagram. State in brief the design issues of a DSM. [8]
- b) Explain with the help of a neat diagram how threads of a process are synchronized in Mach. [8]
- Q4)** a) Explain the Kerberos system architecture with a help of a neat diagram. State the details of the Kerberos authentication protocol. [8]
- b) Prove that the existence of a cycle in a general resource allocation graph is a necessary but not a sufficient condition for the existence of a deadlock. [8]

P.T.O.

SECTION - II

- Q5)** a) A system uses the preemption method for deadlock prevention. Suppose the system currently has five transactions T_1, T_2, T_3, T_4 and T_5 , their timestamp values being t_1, t_2, t_3, t_4 , and t_5 , respectively ($t_1 > t_2 > t_3 > t_4 > t_5$). Explain what happens if : [8]
- i) The system uses the wait-die scheme and T_2 requests for resource held by T_5 .
 - ii) The system uses the Wait-die scheme and T_4 requests for resource held by T_1 .
 - iii) The system uses the Wait-wound scheme and T_3 requests for resource held by T_4 .
 - iv) The system uses the Wait-wound scheme and T_5 requests for resource held by T_2 .
- b) Describe the 4 main types of architectural models. [8]
- Q6)** a) What is the primary motivation behind the development of a lightweight RPC system? Describe the four techniques used in a LRPC system that makes it more efficient than a conventional RPC system. [8]
- b) Describe the system architecture of Amoeba. State in brief the design goals of Amoeba. [8]
- Q7)** a) Discuss the relative advantages and disadvantages of the various data locating mechanisms that may be used in a DSM system that uses the NRMB strategy. [8]
- b) Explain the concept of logical clocks and their importance in distributed systems. A clock of a computer system must never run backward. Explain how this issue can be handled in an implementation. [8]
- Q8)** Write short notes on : (any three) [18]
- a) Consistency Models.
 - b) Ring algorithm.
 - c) Distributed object model.
 - d) Fault tolerance.



P1479**[3665] - 693****M.E. (Petroleum Engg.)**

**GEOGRAPHICAL INFORMATION SYSTEM AND COMPUTER
APPLICATIONS IN PETROLEUM INDUSTRY
(2008 and 2002 Course) (Old & New)**

*Time : 3 Hours]**[Max. Marks:100**Instructions to the candidates:*

- 1) *Answers to the two sections should be written in separate books.*
- 2) *Attempt any two questions each from section I and section II.*
- 3) *Neat diagrams should be drawn wherever necessary.*
- 4) *Use of semilog paper and graph paper is allowed.*

SECTION - I

- Q1) a)** What is meant by a "spatial process"? Give examples of how the spatial information in a GIS can provide the basis for understanding, explanation, and the development of theories of natural or human systems. **[15]**
- b)** What is a spurious polygon? How overlay operations in different vector data structures take care of this problem? **[10]**
- Q2) a)** You are given a quadtree organized as per Morton order. Square node in the figure shows non continuation of object, while circle node indicates continuation of object for next order. Convert this into a map representation. **[15]**

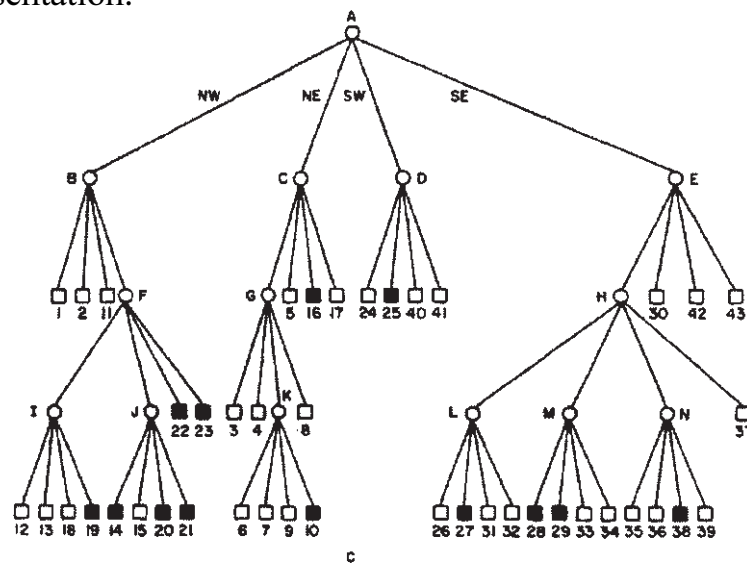


Figure for Q. 2 A

P.T.O.

- b) How georeferencing is carried out in case of a well location, fault and reservoir boundary? Discuss this with the help of neat diagrams. [10]
- Q3)** a) What is meant by a buffer operation? Write a detailed note on Buffer Function on Point, Line, and Polygon with appropriate examples. [15]
- b) Values given adjacent to points in the following figure are representation of depth of sandstone, a pay horizon, encountered and modeled during exploration. How is this database useful in the interpretation of continuous surface? What is the value at point P? [10]

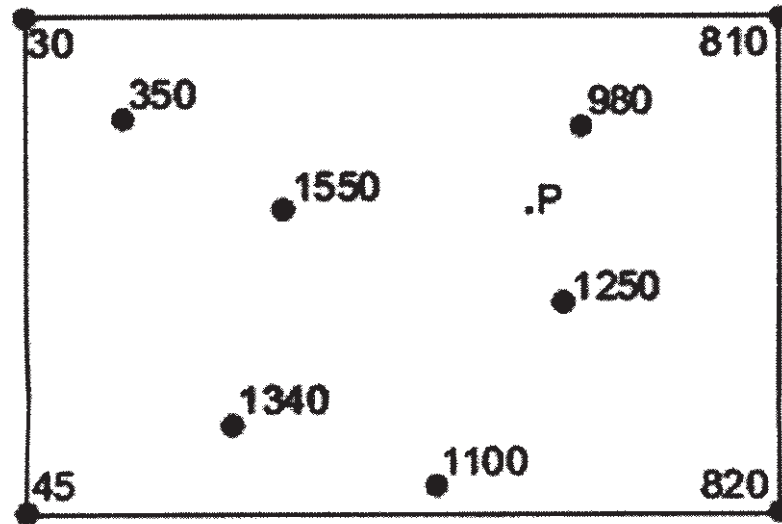


Figure for Q. 3 B

SECTION - II

- Q4)** Explain the difference between static maps and dynamic maps with supporting examples. How is anisotropy taken into consideration? [25]
- Q5)** Design a template for the creation of a 3D Reservoir model taking into consideration available geologic, geophysical and detailed reservoir data. Also list out information on attributes to be included in the DBMS, which would allow a means to review the reservoir model and update the same. [25]
- Q6)** An oil refinery is in operation for last 15 years adjacent to a river, which is a major source of water for many villages in the downstream. As per the norms, the developer and competent authorities are committed for green environment. The refinery is potentially releasing many different chemicals. A lot of residential and commercial activity has taken place in last five years adjacent to refinery. A small stream is flowing through refinery and is joining river. There are also many potential receptors. Many different transport mechanisms exist as well

including leaching to groundwater, groundwater movement, and discharges to surface water, and also soil contamination. These characteristics provide an interesting set of challenges to the environmental risk assessment process.[25]

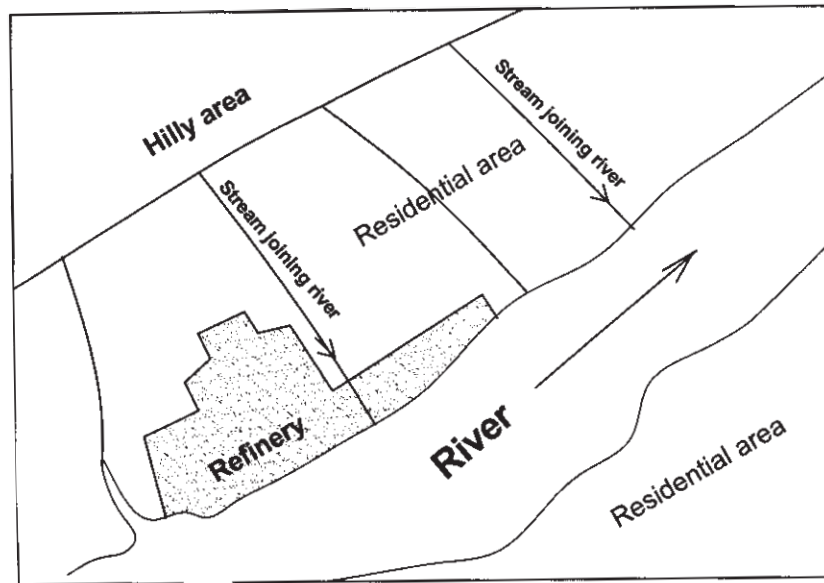


Figure for Q. 6

Develop a GIS based spatial model that will discuss aspects of environmental audit for the said refinery. Why is it necessary to add temporal component to project?



P1480**[3665] - 683****M.E. (Petroleum Engg.)****PETROLEUM RESERVOIR MANAGEMENT (2008 course)***Time : 3 Hours]**[Max. Marks:100**Instructions to the candidates:*

- 1) *Answers to the two sections should be written in separate books.*
- 2) *Attempt any two questions each from section I and section II.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Use of semilog paper and graph paper is allowed.*

SECTION - I**Q1) a) Explain any two of the following: [10]**

- i) Grain volume and pore volume.
- ii) Gross thickness and net thickness of a formation.
- iii) Directional permeability and uniform permeability.
- iv) Dynamic reservoir and earth model.

- b) The reserve of an oil field is being estimated by a probabilistic method. As a part of the study, the reservoir properties are being reviewed by any possible existing correlation between properties. The following porosity and saturation data is available for fifteen samples; [15]

Porosity, %	S _w fraction	Porosity, %	S _w fraction	Porosity, %	S _w fraction
14.5	0.24	17.3	0.22	17.6	0.227
20.6	0.203	19.7	0.214	17.3	0.209
15.1	0.230	20.4	0.228	17.0	0.211
15.6	0.235	1.9	0.225	17.9	0.206
16.6	0.220	17.5	0.214	18.5	0.200

Plot the graph of S_w and porosity, and produce the regression analysis. Are the parameters correlated? If so, is there any physical explanation for the correlation?

P.T.O.

- Q2) a)** Define hydrocarbon fluid saturation in a rock in terms of pore volume. What are the typical ranges of hydrocarbon fluid saturation in petroleum reservoirs at discovery? Consider a newly discovered oil reservoir with a gas cap. Describe the changes in fluid saturation expected to occur with increasing depth in the reservoir? [15]
- b)** Studies conducted in a gas reservoir following a few months of production yielded the following values of original gas in place : [10]
- Volumetric estimate= 900 MMscf.
 - Material balance = 1.080 bscf.
 - Decline curve - not recognizable due to rate controlled production.
- What would be the most likely reason or reasons for apparent discrepancy?
- Q3) a)** Write a detailed account of guidelines given by SPE and UN for the evaluation of petroleum reserves and resources. [15]
- b)** The initial rate of an oil reservoir was 11,300 stb/d. Over a period of a year, the rate declined to 9,500 stb/d. Using exponential, hyperbolic and harmonic decline equations, estimate the oil reserves and remaining life of the reservoir. Assume an abandonment rate of 850 stb/d. List all necessary assumptions. Which mode of decline leads to estimation of largest reserves? [10]

SECTION - II

- Q4) a)** Qualitatively interpret the diagnostic plot (figure below) obtained from the built up test. Can reservoir heterogeneity be obtained from the plot? If so what would be its distance from well test? (hint: see the vertical separation between the two zero slope portions on the diagnostic plot.) [15]

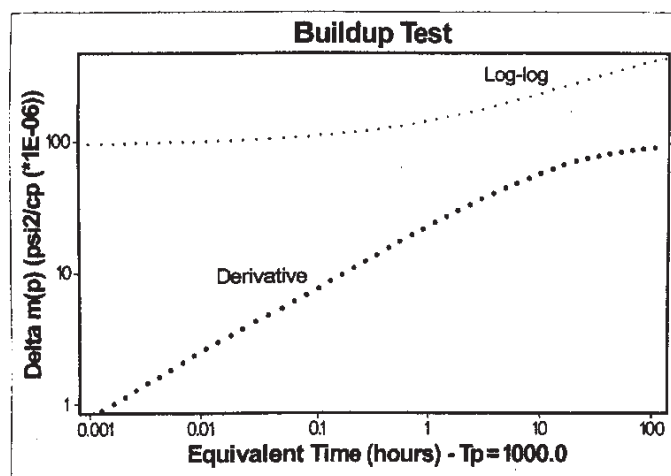


Figure for Q.4 A.

- b) Why is knowledge of well productivity (WI) index necessary in reservoir management? Illustrate with examples. What are the controlling factors for WI? [10]

Q5) a) Discuss effectiveness of waterflooding in any two of the following reservoirs. [10]

- i) Reservoir with a large gas cap.
 - ii) Very thick formation with vertical permeability.
 - iii) Different drives.
 - iv) Faulted sealing reservoir.
- b) 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]

Q6) a) Following is the production history of a field, which is under consideration for redevelopment. [15]

Year	Oil Production / Year Million bbl	CAPEX \$ MM	OPEX \$ MM
1		150	
2		130	
3	2.432		9.728
4	1.749		6.996
5	1.438		5.752
6	1.321		5.284
7	1.189		4.756
8	1.174		4.696
9	0.985		3.94
10	0.912		3.648
11	0.818		3.272
12	0.741		2.964
Total	12.759	280	51.036

Following are the assumptions for the analysis:

- i) Oil price is \$ 50 and is constant.
- ii) Royalty is 10 % on annual production, which has to deducted from gross revenue.

- iii) Cost recovery is 70 % and is allowed to deduce with the commencement of commercial production. The unrecovered cost is allowed to carry forward to next year.
- iv) Profit petroleum is to be sheared between government and contractor @ 60 % and 40 % respectively.

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.

- b) Write a detailed note on petroleum fiscal system. [10]



P1482

[3665] - 244
M.E. CSE (IT)
OPERATING SYSTEMS
(Revised 2002 Course)

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) Answers to the two sections should be written in separate books.*
- 4) Neat diagrams must be drawn wherever necessary.*

SECTION - I

- Q1)** a) What is the primary motivation behind the development of a light weight RPC system? Describe the four techniques used in a LRPC system that makes it more efficient than a conventional RPC system. [8]
- b) Explain what is meant by consistent ordering and causal ordering of messages. Give a mechanism to implement each one. [8]
- Q2)** a) Explain in detail the major issues in designing a distributed operating system. [10]
- b) Discuss the reasons why distributed computing systems are gaining popularity? [8]
- Q3)** a) Implement the Readers-Writers problem using semaphores and discuss how the critical section requirements are fulfilled. [8]
- b) Describe how address translation takes place with the help of neat diagrams in (i) Paging (ii) Segmentation. [8]
- Q4)** a) Describe the wait-for-graph (WFG) based distributed algorithm for deadlock detection. [8]
- b) Describe the implementation of logical clocks using: [8]
- i) Counters.
 - ii) Physical clocks.

P.T.O.

SECTION - II

- Q5)** a) Discuss the two protocols that are used to ensure sequential consistency in a DSM system that uses the RMB strategy. [8]
b) Describe the general architecture of a DSM system with the help of a neat diagram. State in brief the design issues of a DSM. [8]
- Q6)** a) Discuss the relative advantages and disadvantages of implementing a thread package in user space and in the kernel. [8]
b) Explain any two address space transfer mechanisms which are suitable for a process migration facility with high performance and high reliability goals. [8]
- Q7)** a) Discuss the desirable features of a good distributed file system. [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]
- Q8)** Write short notes (Any three) : [18]
a) Scalability.
b) Monitors.
c) Logical clock.
d) Group communication.



[3665] - 245

**M.E. CSE (Information Technology)
ADVANCED DATABASE 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 in separate books.*
- 3) Neat diagrams must be drawn wherever necessary*
- 4) Figures to the right indicate full marks.*

SECTION - I

- Q1)** a) Draw an E-R diagram to represent a world cup soccer tournament. [10]
b) Explain the differences between primary key, candidate key and superkey with examples. [6]
- Q2)** a) Design a relational database for a university registrar's office. Make suitable assumptions. [10]
b) Describe the differences between relation and relation schema by referring to your solution to the problem above. [6]
- Q3)** a) Write a note on Embedded SQL. [8]
b) Write a note on Dynamic SQL. [8]
- Q4)** a) Explain referential integrity in SQL with suitable examples. [8]
b) Explain with examples when to use Triggers and when not to use Triggers. [10]

SECTION - II

- Q5)** a) Using Armstrong's axioms prove the soundness of decomposition rule, pseudotransitivity rule and union rule. [10]
b) Write a note on BCNF. [6]

P.T.O.

- Q6)** a) For each of the following application areas, explain why a relational database system would be inadequate. List all specific system components that would need to be modified : [12]
- i) Computer aided design.
 - ii) Multimedia databases.
- b) Explain why ambiguity potentially exists with multiple inheritance. Illustrate your explanation with an example. [4]
- Q7)** a) Write a note on ACID properties. [12]
- b) What are Transient and Persistent Objects? Explain how they are implemented in OODBMS. [4]
- Q8)** Write short notes on : [18]
- a) Parallel Databases.
 - b) Distributed Databases.
 - c) Spatial Data Management.



P1485

[3665] - 248
M.E. CSE (IT)
NET CENTRIC COMPUTING
(Revised Course 2002) (510122)

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.*

SECTION - I

- Q1)** a) What are the similarities and differences between the functions of data link layer and transport layer? **[8]**
- b) What are the functions of switch in the computer network? How does switch helps to save the bandwidth of the network? **[8]**
- Q2)** a) Explain the working of CSMA/CD. How it has been practically implemented for Ethernet networks? **[8]**
- b) How Hybrid Switching makes the use of Packet switching, Circuit switching and Random access? Which kinds of networks need the hybrid switching? **[8]**
- Q3)** a) Explain the meaning of following terms with respect to queuing system. **[8]**
- i) Arrival Process.
 - ii) Service Mechanisms.
 - iii) Queuing Characteristics.
 - iv) Measures of System Performance.
- b) What is Frame Relay? Give and explain the architecture of Frame Relay. **[8]**
- Q4)** Write short notes on (Any Three) : **[18]**
- a) SPX/IPX Network Stack.
 - b) Network Planning.
 - c) Network performance.
 - d) Importance of topology in Network.

P.T.O.

SECTION - II

- Q5)** a) Explain the design of ATM switch. How ATM switch works faster as compare to other switching devices in the network? [8]
- b) How digital switching is better than analog switching? Give the network configuration and protocols for ISDN packet switching using B channel with circuit switched access. Can we use D channel for packet switching? [8]
- Q6)** a) Why Manchester encoding is not used in Fast Ethernet and Gigabit Ethernet? Which are the other techniques available for Fast Ethernet and Gigabit Ethernet? Explain any one multilevel signaling techniques used in Fast Ethernet. [8]
- b) List the types of firewall and explain any two firewalls. [8]
- Q7)** a) What do you mean by the DSL? How it is different from the ADSL? Explain the criteria for upstream and downstream in DSL lines. [8]
- b) Explain how SIP protocol is used to setup VOIP calls between two or more participants. [8]
- Q8)** Write short notes on (Any Three) : [18]
- a) ESAU William's algorithm.
 - b) Constrained Minimum Spanning Tree (CMST).
 - c) Signaling protocols H.225.
 - d) Topology for Internet.



P1487

[3665]-252

M.E. (CSE) (IT)

INTELLIGENT SYSTEMS

(Revised 2002 Course) (510128)

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.*
- 4) *Draw sketches wherever necessary.*
- 5) *Figures to the right indicate full marks.*

SECTION - I

- Q1)** a) What do you mean by Intelligent agents? Discuss the classification of Intelligent agents. [8]
- b) Explain with suitable example why problem formulation must follow goal formulation. [8]
- Q2)** a) Explain the properties of task environments. [8]
- b) Solve following problem using any of the Search technique. [8]
“You have to color a planar map using only four colors, in such a way that no two adjacent regions have the same color”.
- Q3)** a) What is memory bounded search? Explain SMA* with suitable example. [8]
- b) Solve following problem using any of the Search technique. [8]
“You have to color a planar map using only four colors, in such a way that no two adjacent regions have the same color”.
- Q4)** Write short notes on any three : [18]
- a) Problem-Solving Performance.
 - b) Simulated annealing.
 - c) Bidirectional Search.
 - d) Sensorless Problems.

SECTION - II

- Q5)** a) What is partial order planning? Explain partial order planning with blocks world problem. Also explain the concept of least commitment and causal links related to partial order planning. (Assume any initial and Goal state for the said problem). [8]
- b) What is planning? Solve following blocks world problem using STRIPS notation. [8]



- Q6)** a) Explain conditional planning in fully observable environment. [8]
- b) Using the axioms of probability, prove that any probability distribution on a discrete random variable must sum to 1. [8]
- Q7)** a) Compare and contrast between simple replanning agent vs. Unbounded indeterminacy. [8]
- b) Explain what do you mean by decision networks? Also explain how these networks are used to make simple decisions. [8]
- Q8)** Write short notes on any three : [18]
- a) Utility Theory.
 - b) Decision - Theoretic Agents.
 - c) Hierarchical Task Network Planning.
 - d) Knowledge engineering for planning.



Total No. of Questions : 8]

[Total No. of Pages : 2

P1488

[3665]-253

M.E. CSE (IT)

OBJECT ORIENTED 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 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 the advantages of Object Orientation? How reusability and flexibility issues are managed by object oriented concepts? [8]
- b) What is the difference between Generalization and Specialization? What is Information hiding? How it addresses object security? [8]
- Q2)** a) How objects are identified? What are the categories of objects? How object behaviour is determined? [8]
- b) Draw a deployment diagram showing the network of your college. [8]
- Q3)** a) What are the generic steps in Object Oriented Analysis? What are static and dynamic components? What is collaborative design? [8]
- b) What selection characteristics are needed for a class? What are the guidelines for associating responsibilities to a class? [8]
- Q4)** a) What are the factors considered for testing Object Oriented Analysis and Object Oriented Design Models? How unit testing is performed for object oriented software? [8]
- b) What is fault-based testing? What is scenario-based test design? List the differences between these two techniques? [10]

SECTION - II

- Q5)** a) For an online digital library, automation system is to be developed. The system records, the registered users, reference materials and transactions. It facilitates the upload/download of documents from users. Draw UML use case diagrams indicating system context and requirement capture. [10]

P.T.O.

- b) What is the relationship between use cases and functional requirements?
What are the structuring mechanisms in Use Case diagrams? [6]
- 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) What is the purpose of modelling interactions? Draw sequence diagrams for at least two scenarios for account holder transactions with bank? Assume suitable scope and indicate it. [12]
- b) What are Transient and Persistent Objects? When use of destructor is recommended in sequence diagram? [4]
- Q8)** a) Explain the following elements of a state : [8]
- i) Entry and Exit Actions.
 - ii) Internal Transition.
 - iii) Activities.
 - iv) Deferred Events.
- b) What are the notations for Interfaces and Roles? How Role definition avoids redundancy of classes? What is the purpose of Interface in class diagram? [10]



Total No. of Questions : 8]

[Total No. of Pages : 2

P1489

[3665]- 204

M.E. (Computer)

INTELLIGENT SYSTEMS

(Revised Course 2002)

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 if necessary.*
- 4) *Draw sketches wherever necessary.*
- 5) *Figures to the right indicate full marks.*

SECTION - I

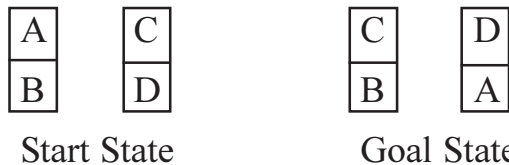
- Q1)** a) Explain the model of learning agent with diagram. [8]
b) Explain with suitable example why problem formulation must follow goal formulation. [8]
- Q2)** a) Solve Blocks world problem using best first search method. (Assume any Start and Goal state) [8]
b) Define in your own words the following terms : [8]
i) Reflex Agent.
ii) Model Based Agent.
iii) Goal based Agent.
iv) Utility based Agent.
- Q3)** a) Consider the problem of constructing crossword puzzles that is fitting words into rectangular grid. The grid, which is given as part of the problem, which specifies which squares are blank and which are shaded. Assume that list of words is provided and the task is to fill in the blank squares using any subset of the list. Formulate this problem. Choose an appropriate search algorithm; specify a heuristic function if needed and also explain : Is it better to fill in blanks one letter at a time or one word at a time. [10]
b) What is memory bounded search? Explain IDA* with suitable example. [8]

P.T.O.

- Q4)** a) Prove that if a heuristic is consistent, it must be admissible. Construct an admissible heuristic that is not consistent. [8]
 b) Explain the properties of task environments. [8]

SECTION - II

- Q5)** a) Explain four planning methods for handling indeterminacy. [8]
 b) Explain the following basic probability notations. [8]
 i) Propositions.
 ii) Atomic Events.
 iii) Prior Probability.
 iv) Conditional Probability.
- Q6)** a) What is planning? Solve the following blocks world problem using STRIPS notation. [8]



- b) Explain what do you mean by decision networks? Also explain how these networks are used to make simple decisions. [8]
- Q7)** a) Explain continuous planning with suitable example. [8]
 b) Explain the inferences in first order logic. [8]
- Q8)** Write short notes on any three : [18]
 a) Utility Theory.
 b) Practical Planning.
 c) Knowledge engineering for planning.
 d) Bounded vs. unbounded indeterminacy.



P1490

[3665] - 207

M.E. (Computer Engineering)

COMPUTER VISION

(Old Course) (510108)

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, if necessary.*
- 4) Draw sketches wherever necessary.*
- 5) Figures to the right indicate full marks.*

SECTION - I

- Q1)** a) Explain various data structures used for Image representation. **[8]**
b) Explain various basic gray level transformations used in Image Enhancement. **[8]**
- Q2)** a) Explain use of Machine Vision in product inspection for quality testing in industry. **[8]**
b) Explain the basic idea of active vision, and give some examples of how this approach eases vision tasks. **[8]**
- Q3)** a) Explain parallel version of edge detection algorithm for binary images considering black object on white background. **[8]**
b) Explain following type of fuzzy membership functions by drawing characteristic function. **[8]**
i) Normal fuzzy set.
ii) Sub-Normal fuzzy set.
iii) Convex fuzzy set.
iv) Non-Convex fuzzy set.

P.T.O.

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

- a) Correspondence problem.
- b) Hough transform.
- c) Architectural issues of intermediate processing.
- d) Machine Vision for industrial inspection.

SECTION - II

Q5) a) Explain contour based shape representation and description. **[8]**

b) Discuss the correspondence between Image and catalogued model. **[8]**

Q6) a) Discuss various issues in object recognition **[8]**

b) Explain Fourier descriptors for outer shape representation of an object. **[8]**

Q7) a) Explain syntactic pattern recognition. **[8]**

b) Explain any one parallel algorithm for intermediate processing. **[8]**

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

- a) Frame grabbers.
- b) Display Devices.
- c) Surface modeling strategies.
- d) 3-D model representation.



Total No. of Questions : 8]

[Total No. of Pages : 2

P1491

[3665]-2

M.E. (Civil) (Construction & Management)
CONSTRUCTION EQUIPMENT AND MANAGEMENT
(Old Course) (501102)

Time : 4 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 with sketches various parts and function in a “Ready mix concrete” plant. [9]
b) Explain various stages of erection in an R.M.C. plant and total time you will require to commission same on a project site. [9]
- Q2)** a) In a “Drill and Blast method” of tunneling list out and explain the factors on which “Rate of Advance” of the tunnel depends. [8]
b) What are the actions you will take to improve the efficiency of one complete cycle? [8]
- Q3)** Explain with neat sketches function of following items in an “Aggregate Crushing plant”. [16]
a) Primary Crusher.
b) Secondary Crusher.
c) Conveyor Belts.
- Q4)** Write short notes on any three of the following : [16]
a) Wagon Dril.
b) Poker Vibrator.
c) Vibro Hammer.
d) Explosives in rock tunneling.
e) Concrete pumps.

P.T.O.

SECTION - II

- Q5)** List out equipments and their capacities you will provide for following items in a construction of a “Roller compacted concrete dam” of 80 meters height [18]
- a) Site preparations.
 - b) Foundation construction.
 - c) Quarry operations.
 - d) Aggregate processing.
 - e) Concrete operations.
- Q6)** a) Explain working and function of “Paver Unit” and “Screed Unit” in construction of Asphalt roads. [8]
- b) Give in details advantages of ‘Rigid Pavements’ in construction of highways. [8]
- Q7)** List out and explain your selection of major “Earthmoving machineries” on a project site where 7,00,000 m³ of excavation is to be carried out in a time four months time. [16]
- Q8)** Write short notes on any three of the following : [16]
- a) Slip form pavers in road construction.
 - b) Bucket factor in shovel.
 - c) Cycle of operation for a ‘Scraper’.
 - d) Troughing idlers and Return idlers in a conveyor belt system.
 - e) Admixtures used in R.M.C plant to maintain and give good pumpable concrete for end user.



P1493

[3665] - 21

M.E. (Hydraulic Engineering)

SEDIMENT TRANSPORT AND RIVER MECHANICS

(Old) (501307) (Sem. - II)

Time : 3 Hours]

[Max. Marks:100

Instructions to the candidates:

- 1) Question Nos. 4 and 8 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) 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 graph the shield's analysis of sediment movement. [8]
b) State different flow regimes and explain their significance in resistance analysis. [8]
- Q2)** a) Explain Einstein's method of bed load transport. [8]
b) Write Meyer Peter Muller's equation and explain all parameters of the same. Explain Meyer Peter Muller's method of bed load transport. [8]
- Q3)** a) Differentiate between suspended load and total load. Explain the different methods adopted for measuring the same. [8]
b) Write a short note on application of remote sensing in determining the sediment load. [8]
- Q4)** a) Explain in detail the tractive force approach in design of stable channels. [8]
b) Enlist the design steps of stable channel by
i) Kennedy's method.
ii) Lacey's method. [10]

P.T.O.

SECTION - II

- Q5)** a) In a wide alluvial stream, a suspended load sample taken at a height of 0.28 m above the bed indicated a concentration of 990 ppm of sediment by weight. The stream is 5.25 m deep and has a bed slope of 1: 3800. The bed material can be assumed to be uniform size with a fall velocity of 2 cm/s. Estimate the concentration of sediment at mid depth. [8]
- b) On the basis of hydraulic aspects, explain the phenomenon of Aggradation and Degradation. [8]
- Q6)** a) Explain any four types of sediment loads in channel flow. [8]
- b) What is bifurcation and confluences? Explain their practical significance. [8]
- Q7)** a) State any four river gauging methods and explain any one in detail with help of sketch. [8]
- b) State causes & controlling measures of silting of reservoirs. [8]
- Q8)** a) Give river training work classifications. [6]
- b) State different river training methods. [6]
- c) State concept, advantages & construction of spurs. [6]



P1494

[3665] - 39

M.E. (Civil / Structures)

EXPERIMENTAL STRESS ANALYSIS

(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) 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 & explain stress optic law for two dimensional photoelasticity problem. Draw a neat sketch of isochromatic fringe pattern for solid disc under diametral compressive load. [12]
- b) Draw plane & circular polariscope setups. Distinguish between temporary & permanent double refraction. [13]
- Q2)** a) Explain principle of strain rosette. Taking a delta rosette explain step by step procedure in determination of principal stresses at a point. [15]
- b) How you will compensate temperature effect in strain gauge technique? Draw necessary electric circuit arrangement. [10]
- Q3)** Write short notes on :
- a) Shear difference method. [8]
- b) Calibration of photoelastic material. [8]
- c) Isoclinics & stress trajectories. [9]

P.T.O.

SECTION - II

- Q4)** a) Explain with neat sketches the phenomenon of Moire' fringes. [5]
- b) What are Moire' techniques for in-plane problems? Describe with sketches any one of them. [8]
- c) Explain the following with comments : [12]
- i) Moire' technique - a complement to photo-elasticity.
 - ii) Lightenberg's photo-reflective Moire' technique.
 - iii) Salet-Ikeda Moire' technique.
- Q5)** a) Comment on the advantages of the 'Brittle Coating Method' in experimental stress analysis. What are its short comings? [5]
- b) State in brief the equipment necessary and the procedure to be followed in the Brittle Coating Method. What are the characteristic properties of 'stress coat'? [5]
- c) Obtain necessary equations showing the relation between the stresses in the coating and the material. State the assumptions made in the derivation. [6]
- d) Explain the following, in connection with the Brittle Coating Method of stress analysis :-
- i) Direct loading test.
 - ii) Releasing the load.
 - iii) Refrigeration technique.
- Show the crack patterns in each case above. [9]
- Q6)** Write technical notes on any four of the following :- [25]
- a) Moire' fringe pattern for uniform and non-uniform strain fields.
 - b) Theories of failure for the brittle coating.
 - c) Compensation techniques in the photoelastic method.
 - d) Dynamic fringe recording techniques.
 - e) Construction and working of a scattered light polariscope.



P1495

[3665]-66

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

ADVANCED A/C HEATING AND VENTILATION

(2002 Course) (502110)

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 should be drawn wherever necessary.*
- 4) Figures to the right indicate full marks.*
- 5) Use of logarithmic tables, slide rule, Mollier charts, psychrometric charts & tables, electronic pocket calculator and steam tables is allowed.*
- 6) Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Using steam tables, obtain the relative humidity and degree of saturation under the following conditions. **[9]**
- i) Total pressure = 1 bar.
 - ii) Dew point = 288 K
 - iii) Moist air temperature = 303 K.
- Comment on the results. Develop the expression you use.
- b) Discuss - Human comfort, comfort charts and effective temperature. **[9]**
- Q2)** a) Explain the central Air Conditioning System and unitary air conditioning system giving their advantages and disadvantages. **[8]**
- b) Discuss : **[8]**
- i) All air system.
 - ii) All water system and
 - iii) Air water system.
- Q3)** Write notes on : **[16]**
- a) Solar heat gain.
 - b) Bypass factor.
 - c) GSHF.
 - d) Infiltration load.
- Q4)** Following data is given on an air conditioned system : **[16]**
- a) Out door conditions : 34°C DBT and 28°C WBT.
 - b) Indoor conditions : 25°C DBT, 50% RH.

P.T.O.

- c) Solar heat gain 8 kW.
- d) Occupancy = 20.
- e) Sensible and latent heat gain = 100 W and 105 W per person respectively.
- f) Sensible load from other sources = 10 kW.
- g) Lighting load = 3 kW.
- h) Infiltration load = 10 cmm.

Assume 50% fresh air mixed with 50% recirculated air before coil and a by pass factor of 0.15;

Find :

- i) ADP.
- ii) Capacity of A/C plant in TR.
- iii) Supply air conditions.

SECTION - II

Q5) Write notes on : **[16]**

- a) Fan selection.
- b) Centrifugal fan characteristics.
- c) Fan arrangements.
- d) Fan laws.

Q6) Explain with a neat layout and list of components used on air conditioning systems for : **[18]**

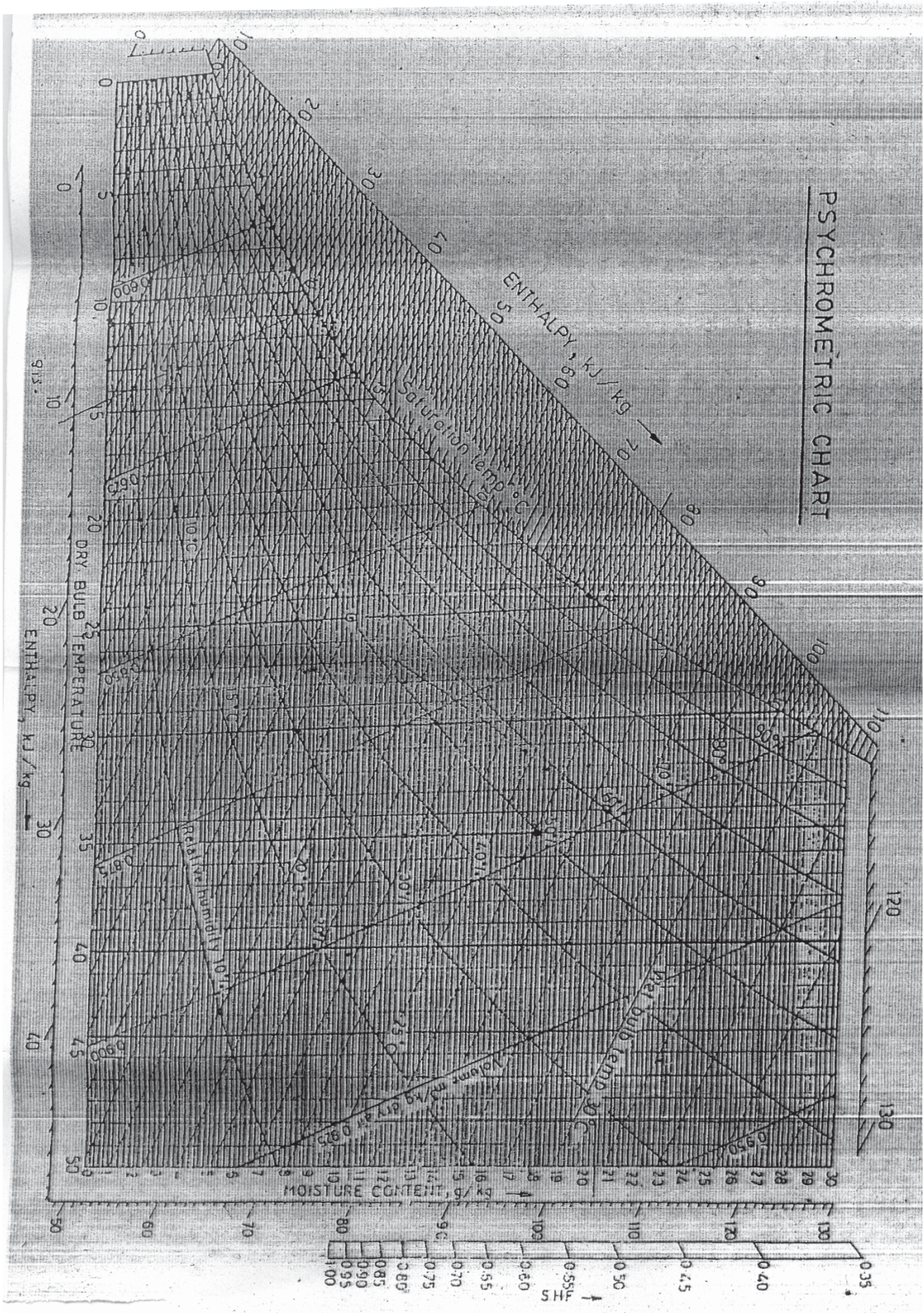
- a) Automobile.
- b) Railway coach.
- c) Air craft.

Q7) Discuss giving necessary sketches any three of the following : **[16]**

- a) Airlocks, Air curtains and air showers.
- b) Laminar flow clean rooms.
- c) Cycling and sequence controls.
- d) Various types of filters.

Q8) a) Discuss the important methods adopted for noise control. **[8]**

- b) Explain the thermodynamics of evaporative cooling. Discuss the different types of evaporative coolers used in practice. **[8]**



XXXX

Total No. of Questions : 10]

[Total No. of Pages : 3

P1496

[3665]-68

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) Assume suitable data, if necessary.*
- 6) Use of pocket non programmable electronic calculator is allowed.*

SECTION - I

- Q1)** a) Explain the terms 'Sequential Analysis' and 'Stress Relaxation'. [8]
b) What is the relation between the probability of survival and factor of safety? What is the significance of normal curve in reliability consideration. [8]
- Q2)** a) What are the advantages of flexibility in cam? List the major steps in designing polydyne cam. [6]
b) Give practical examples with reason for the following types of cams.[4]
i) 3-4-5 polynomial cam.
ii) Tangent cam.
c) Find particular displacement, velocity & acceleration equations for a follower that returns 15mm in 60° of cam rotation using 2-3 polynomial & sketch the curves. [8]
- Q3)** a) A helical spring with rectangular cross section as shown in the fig.1 with $b = 20\text{mm}$; $C_1 = 10\text{mm}$ & $R = 30\text{mm}$. The Static load on the spring is 1200 kg. Find the deflection if the no. of active coils are 6. Take values $\alpha_1 = 1.50$; $\alpha_2 = 0.231$; $\beta = 0.269$. [10]

P.T.O.

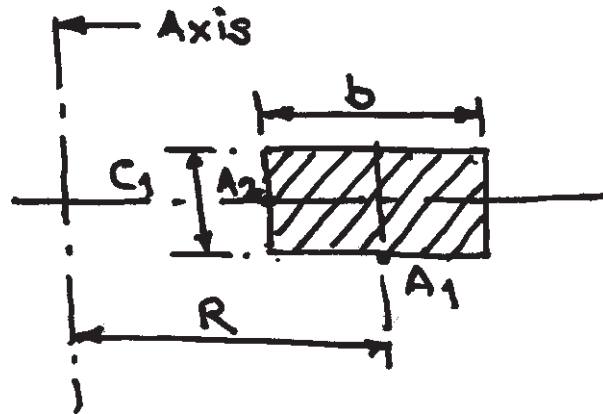


Fig No 1

- b) Explain load deflection & load stress curves for volute springs. [4]
- c) Show with neat sketch various forces acting on the elements of ring spring. [2]

Q4) a) For large values of time one may use the relation for minimum creep rate; $V_0 = k \sigma^n$ where k & n are the constant and σ the stress vlaue. Show that time for reduction in stress from ' σ_0 ' to σ is given by

$$t = \frac{1}{(n-1) k E \sigma_0^{n-1}} \left[1 - \left(\frac{\sigma}{\sigma_0} \right)^{n-1} \right]$$

where E is modulus of elasticity [8]

- b) Explain the following terms in details [8]
 - i) Exponential creep law.
 - ii) Hyperbolic sine creep law.

Q5) Write short notes on : [16]

- a) Spiral Bevel & Zerol Bevel gears.
- b) Buckling of helical spring.
- c) Materials for elevated temperature application.

SECTION - II

- Q6)** a) Explain Fracture mechanics concept in fatigue design. [8]
b) Discuss the aspects of cumulative fatigue damage including the order of loading. [8]
- Q7)** a) What are the advantages of following materials as against the regular materials [6]
i) Ceramics.
ii) Plastic.
iii) Composites.
iv) Semi conductor.
- b) Fibre in an E glass/epoxy composite are 0.0127 mm in diameter before coating with epoxy sizing 0.00254 mm thick with the sizing in place, matrix of epoxy & fibre are put together to achieve maximum fibre content. Following are the properties of fibre & epoxy. [10]
 $E_f = 72.4 \text{ Gpa}$ $E_m = 3.79 \text{ Gpa}$
 $V_f = 0.45$ & $V_m = 0.55$
Find the properties of the composites so formed.
- Q8)** a) Explain 'Extended centre distance system' for gearing. [8]
b) What are the advantages and limitations of Novikov gears? Discuss the basic procedure for design of Novikov gears. [8]
- Q9)** a) Discuss how monotonicity of constraints can be taken into account to simplify optimisation problems. [6]
b) What are the different search methods used in optimisation? Explain any two methods in detail. [8]
c) What do you understand by active semiactive and critical constraints. [4]
- Q10)** Write a short note on followings any three : [16]
a) Hypoid Gears.
b) Characteristics applications and advantages of Belleville spring.
c) ISO9001 clause 4.4.
d) Stress Intensity factor & critical strain energy release rate.



P1499

[3665]-166

M.E. (Electrical/Control and Power Systems)

DIGITAL CONTROL SYSTEM

(Revised)

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 a functional block diagram of a typical digital control system and explain its functioning. [7]
- b) Explain the concept of aliasing. [8]
- c) For the system with input output relationship
 $y(n) = A x(n+2) + B$
determine whether the system is
- i) Static or dynamic,
 - ii) Causal or noncausal,
 - iii) Linear or nonlinear,
 - iv) Time variant or time invariant,
 - v) Stable or unstable. [10]
- Q2)** a) Obtain z transform of following functions : [6]
- i) $x(n) = n u(n)$
 - ii) $X(s) = \frac{5}{s(s+1)}$
- b) Obtain the inverse z transform of following functions : [6]
- i) $X(z) = \frac{z}{(z-0.5)(z-0.8)}$
 - ii) $X(z) = (1+z^{-1})^3$
- c) List any five properties of discrete time fourier transform. [5]

P.T.O.

- d) Obtain DFT of following sequence using decimation in time FFT algorithm. [8]

$$x(n) = \{1, 1, 1, 1\}$$

- Q3) a) For the system with input output relationship [10]

$$y(k-2) + 3y(k-1) + 2y(k) = r(k)$$

Determine :

- Pulse transfer function.
 - Unit impulse response.
 - Unit step response.
- b) State and explain Jury stability test. [7]
- c) Determine the discrete time state model in phase variable form for the pulse transfer function. [8]

$$\frac{Y(z)}{U(z)} = \frac{(z+1)(z+2)}{(z-1)(z-2)(z-3)}$$

SECTION - II

- Q4) a) Find the range of K for the stability of the system shown in Figure No.1 [16]

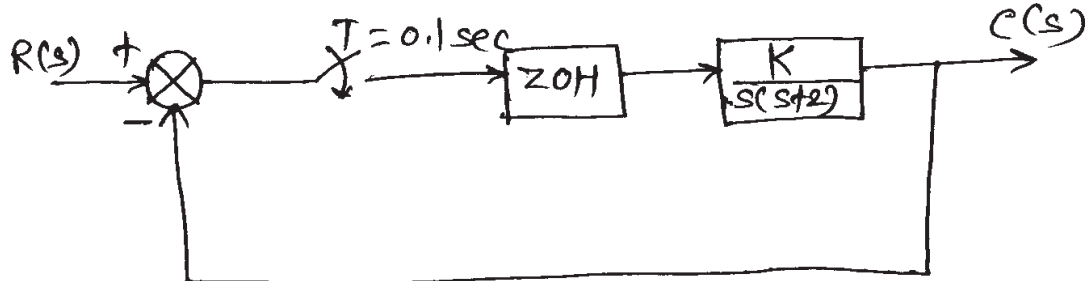


Figure No.1

- b) Diagonalize the following plant matrix. [9]

$$G = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -6 & -11 & -6 \end{bmatrix}$$

- Q5) a) Investigate controllability and observability of the system. [8]

$$x(k+1) = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -6 & -11 & -6 \end{bmatrix} x(k) + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u(k)$$

$$y(k) = [4 \quad 5 \quad 1] x(k)$$

- b) Using direct method of Liapunov, derive the following relationship for the linear discrete time system given by $x(k+1) = Gx(k)$.

$$[G^T P G - P] = -Q$$

Where P and Q are positive real symmetric matrices. [7]

- c) For the system with state model. [10]

$$x(k+1) = \begin{bmatrix} 0 & 1 \\ -0.16 & -1 \end{bmatrix} x(k) + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u(k)$$

determine the state feedback gain matrix k such that poles of system are placed at $-0.5 \pm j 0.5$ using any method.

- Q6)** a) Obtain the discrete state transition matrix for the system. [7]

$$x(k+1) = \begin{bmatrix} 0 & 1 \\ -0.16 & -1 \end{bmatrix} x(k)$$

- b) Using direct method of Liapunov, determine the stability of the equilibrium state of the system given by

$$x(k+1) = \begin{bmatrix} 0 & 1 \\ -0.5 & -1 \end{bmatrix} x(k)$$

and determine the Liapunov function $V[x(k)]$ [8]

- c) Consider a continuous time state equation

$$\dot{x}(t) = \begin{bmatrix} 0 & 1 \\ -3 & -2 \end{bmatrix} x(t) + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u(t)$$

Discretize it to get discrete state equation

$$x(k+1) = Gx(k) + Hu(k)$$

for sampling period $T = 1$ sec. [10]



[3665]-187

M.E. (Production)

ROBOTICS AND ITS INDUSTRIAL APPLICATIONS

(Old & Revised 2002 Course)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Attempt not more than five questions of which at least 2 questions must be from each section.*
- 2) Answers to the two sections should be written separately books.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Figures to the right indicate full marks.*
- 5) Use non-programmable electronic calculator is allowed.*
- 6) Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) What do you understand by inverse kinematics problem? How does one check existence and uniqueness of a solution to such problems?[5]
- b) A gripper is attached to the end of the IInd link of a two link revolute jointed planar manipulator. Both the links are 100 mm in length. While the Ist link makes an angle of 30° the IInd link makes 60° with x axis while maintaining y co-ordinate. Find the changes, possible only in steps of 0.1°, in angular positions of the two links so that change in 'y' direction is a minimum. [15]
- Q2)** a) What would be requirements for a Robot Manipulator to follow a continuous path motion? [5]
- b) Fig. 1 shows schematically a 4 axis Robot. The tool is to execute screw motion with a pitch 'p'. Find transformation to correspond to such a motion at various joints and indicate choice of actuators for such a motion. [15]

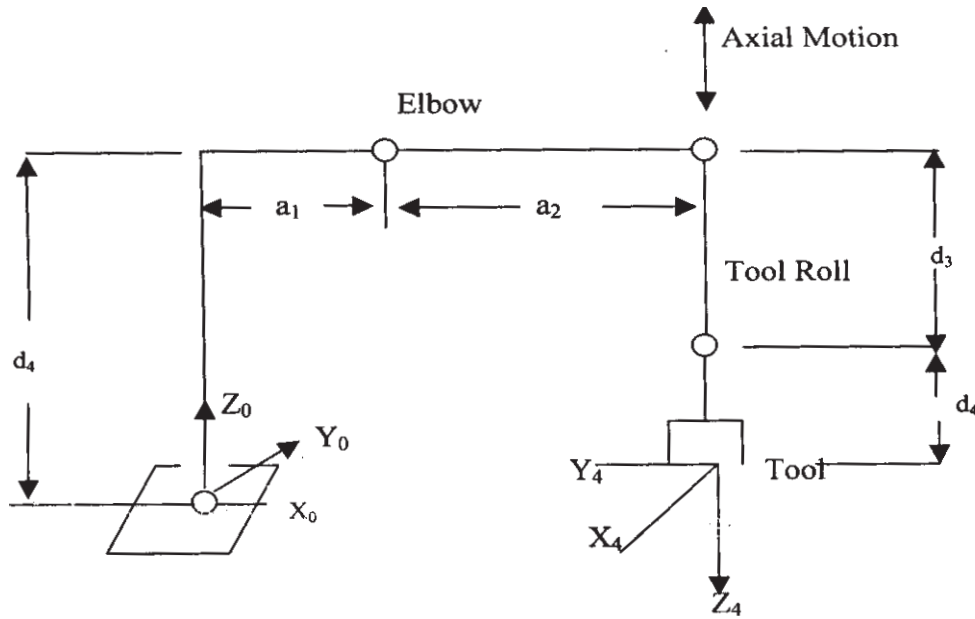


Fig. 1 A Four-axis Robot

Q3) a) First 3 axis of a chain of revolute jointed binary links are as follows:[15]
 O^{th} i.e the stationery joint axis is along 'z' axis.

Ist and IInd axes are defined parametrically in terms of t_I and t_{II} as :

$$x_I = 2t_I - 4, y_I = -t_I + 4, z_I = -2t_I - 1 \text{ \&}$$

$$x_{II} = 4t_{II} - 5, y_{II} = -3t_{II} + 5, z_{II} = -2t_{II} - 5$$

Define Denavit-H parameters for the three axis. Use suitable symbols.
 Draw a figure and indicate the respective parameters on it.

b) Establish the homogeneous transformation matrix to find the co-ordinates of a point on the third link of the above revolute jointed binary links.[5]

Q4) a) Show how the obstacles in the path of the robot movement can be avoided using Lee's algorithm. [5]

b) Explain the differences between a stepper motor and a DC servo system motor. [5]

c) What is meant by blending time? If α is the angular acceleration during the blending time show that [10]

$$\alpha \geq 4 \left(\frac{\theta_f - \theta_0}{T^2} \right)$$

where θ_f and θ_0 are the final and initial joint angle respectively and T is the cycle time.

SECTION - II

- Q5)** a) Explain Vidicon tube camera. Line & Area Scan Sensor as used in CCD, CID camera. [5]
b) Discuss the method of image processing. [5]
c) An 8×8 image has the intensity values as under : [10]

14 15 14 15 16 16 16 16
17 19 21 21 21 21 19 17
18 21 23 23 23 22 22 18
17 21 23 24 24 23 22 17
16 21 23 24 25 23 22 16
16 21 23 23 23 23 22 16
15 22 22 22 22 22 22 15
16 15 14 15 16 16 16 16

Construct its histogram and obtain threshold values and convert the picture into black and white image.

- Q6)** a) Explain the procedure of interfacing robots with P.C. [5]
b) Discuss the safety rules and measure to protect human operative from accidents in a robot work cell. [5]
c) Which is more important to robots and manufacturing automation, A/D converter or D/C converter? Why? [10]

- Q7)** a) Describe briefly the method of finding out the payback period of an industrial robot. [5]
b) Explain some of the methods that are used for smoothening binary images. [5]
c) Show that an algorithm $B_6 = \bar{p}(b.c.e). \overline{(a+d+f+g+h)} + p$ fills the lower left missing corner in an image shown below : [10]

1	1	1	1
1	1	1	1
1	1	1	1
0	1	1	1

Q8) Write short notes on any four :

[20]

- a) 'Lead through', manual and computerized programming of a robot path.
- b) Design considerations of grippers in Robots.
- c) Economics of robot.
- d) Use of polynomials to define path segments.
- e) Homogeneous Transformation for dynamic analysis.



P1502**[3665]- 402****M.E. (Civil) (Construction & Management)****MANAGEMENT & PROJECT PLANNING IN CONSTRUCTION****(2008 Course & 2002 Course)****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 logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
- 6) Assume suitable data, if necessary.

SECTION - I

Q1) The cost duration data for the various activities of a small construction project, are given in the following table. **[18]**

Activity Code i-j	Normal		Crash	
	Duration days	Cost Rs.	Duration Days	Cost Rs.
1-2	6	480	4	630
1- 3	10	900	5	1800
1 - 4	9	560	6	860
2 - 5	8	560	8	560
3 - 6	7	490	4	1090
4 - 7	7	510	4	960
5 - 8	10	940	10	940
6 - 8	9	540	2	1590
6 - 9	6	500	3	1100
7 - 10	6	520	3	745
8 - 11	10	920	5	1420
9 - 11	5	300	2	525
10 - 11	8	480	4	920
11 - 12	8	580	4	1280

The indirect costs are Rs. 200/- per day.

P.T.O.

- a) Draw the network, find the normal project duration and the critical path. Also find the corresponding total project cost.
- b) Carry out stage by stage compression and find :
 - i) The optimal duration and the corresponding minimum cost.
 - ii) All crash solution.
- c) Plot a graph of costs verses time.

Q2) a) Explain briefly any two theories of management. [6]

b) What are the various relationships in a precedence network? [6]

c) What are the circumstances under which PERT is used? [4]

Q3) The manpower requirement for the activities of the network given in Q.1 above, is given in the following table. Carry out resource levelling and scheduling if, only 16 men are available for work, at any given time. [16]

Act. code i-j	Duration (days)	Men Required
1 - 2	6	4
1 - 3	10	5
1 - 4	9	4
2 - 5	8	6
3 - 6	7	5
4 - 7	7	5
5 - 8	10	5
6 - 8	9	4
6 - 9	6	4
7 - 10	6	6
8 - 11	10	6
9 - 11	5	4
10 - 11	8	4
11 - 12	8	6

Calculate the improvement in EFR.

Q4) a) How will you mobilize the site for a Thermal Power Plant? [8]

b) What are the applications of MIS to construction? [8]

SECTION - II

- Q5)** a) Explain the project life-cycle concept with an influence-cost diagram. [4]
b) Explain different types of project feasibilities with an example. [8]
c) Explain the role of the project management consultant (PMC) on an infrastructure development project, with an example. [6]
- Q6)** a) Develop a comprehensive matrix form of organisation for a contractor who is executing major township projects. [8]
b) Explain the basic objective of conducting the work study and the major steps involved in it, with an example. [4]
c) Explain how the mechanical, electrical and plumbing (MEP) services are incorporated during the preparation of the initial construction programme. [4]
- Q7)** a) Explain the co-ordination necessary so as to incorporate the various (MEP) services correctly in the shop drawings to be submitted for the approval of the (PMC)-Project Management Consultant. [4]
b) Explain in brief the 4 types of financial incentives schemes generally used in the construction industry. [4]
c) In an earthmoving operation, the following data was recorded :

Obs No.	Time required for filling the bucket (secs)	Time of swing (secs)	Time for adjustment and filling the dumper (secs)
1	35	3	225
2	15	4	185
3	20	3	200
4	28	5	125
5	33	4	165

Determine :

- i) Minimum and maximum total cycle-time. [2]
ii) Standard deviation for the total cycle time. [2]
iii) Range for the total cycle time. [1]
iv) Reasons likely for variation in the time required to complete each sub-activity. [3]

Q8) a) Explain the basic steps in evaluating the performance of a construction manager. Explain in brief any 8 points on which the manager will be rated. [6]

b) A construction organisation has targetted an annual business turnover of 20 crores. The normal profit expected from the business is at 10%. As a company policy, 2% of this amount will be distributed as an annual bonus to its employees. For every additional 1 lakh generated as an annual profit, 15% of the amount will be given to its employees. As a company policy, employees who get the 15% incentive for consecutive 5 years will be automatically promoted to the next cadre. On a mega construction project, the following human resources are involved.

Nature of HR	No	Monthly Salary (Rs.)
Project Controller	1	50,000/-
Project Manager	2	40,000/-
Senior Engineers	4	35,000/-
Junior Engineers	8	20,000/-
Supervisors	8	12,000/-
Store Keepers	4	10,000/-
Watchman	4	6,000/-

An annual profit of Rs.80 lakhs was generated in a turnover of 6 crores, from the above site. The incentive is to be distributed in the proportion of the individual's salary with respect to the total salary on the human resource. Determine the total amount annually received by each individual in the form of the bonus. Also determine the additional percentage received for each individual because of the incentive. One project manager has secured the 15% incentive consecutively for last 5 years, including this year. Which promotional cadre he will get? [10]



P1505

[3665] - 452
M.E. (Civil) (Structures)
ADVANCED SOLID MECHANICS
(2008 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) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of a non-programmable electronic pocket calculator is allowed.*
- 6) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) A plane passing through a point (x, y, z) in a stressed elastic body has its normal 'n' with direction cosines $\cos(n, x)$, $\cos(n, y)$ and $\cos(n, z)$. Obtain expressions for the resultant stress ' T_n ' and its direction in terms of the six independent stress components at the point. **[8]**
- b) Obtain the strain-displacement relations for the six independent strain components in an elastic body. **[8]**
- c) Define, with an example, a plane stress problems in an elastic body. For such a case obtain the stress equations of equilibrium. **[5]**
- d) Check whether the following stress field is possible :-

$$\sigma_{xx} = -\frac{P \cdot xy}{I}$$

$$\sigma_{yy} = 0$$

$$\tau_{xy} = -\frac{P}{2I}(c^2 - y^2)$$

$$\sigma_{zz} = \tau_{yz} = \tau_{zx} = 0$$

where P, I and C are constants. Compute the values of the stress invariants at a point (1, 2) in the body. **[4]**

- Q2)** a) State and explain the Generalized Hooke's law. Hence obtain the relations between the Lamé's Constants and Engineering constants for an elastic, isotropic body. **[4]**

P.T.O.

- b) Write the stress-strain relations for a two-dimensional orthotropic body under plane stress conditions.

What are the relations above when the body is isotropic? [4]

- c) Define Airy's stress function ' ϕ '.
When the body forces are absent, prove that ' ϕ ' satisfies the governing equation $\nabla^4 \phi = 0$. [8]

- d) If

$$\phi = \frac{a}{12}x^4 + \frac{b}{6}x^3y + \frac{c}{2}x^2y^2 + \frac{d}{6}xy^3 + \frac{e}{12}y^4$$

Assuming $a=b=c=0$ and $d \neq 0$, obtain the stress distribution on the sides of a rectangular plate of size $l \times 2c$ (depth). Neglect the body forces. Check the stress distribution for the static equilibrium of the plate. [9]

- Q3)** a) In a plane elasticity problem, obtain the equations of equilibrium in polar co-ordinates. [8]

- b) Using polar co-ordinates for an axially symmetric stress distribution, show that the stress function $\phi(r, \theta)$ is

$\phi = A \log r + B r^2 \log r + Cr^2 + D$ start from the governing equation $\nabla^4 \phi = 0$. [9]

- c) A curved bar with a constant narrow cross-section and a circular axis is bent in the plane of curvature by moments ' M_0 ' applied at the ends. Obtain only the necessary equations to find the stress distribution (σ_r, σ_θ) in the bar. [8]

SECTION - II

- Q4)** a) Using equation for stress function ' ϕ ' in terms of r in polar coordinates (Refer Q.3 (b)) and selecting proper constants in σ_r & σ_θ relations obtain expressions for σ_r & σ_θ for thick cylinder subjected to external pressure ' P_0 '. Take ' a ' & ' b ' as internal & external radii of cylinder plot variation of stresses across the thickness of cylinder. [15]

- b) Show that value $(\sigma_r + \sigma_\theta)$ is constant for thick cylinder
What is the state of stress ' σ_θ ' when $b \rightarrow a$ but not exactly equal to ' a '. [10]

- Q5)** a) In case of circular & elliptical cross section subjected to pure torque show shear stress variation for points along any radius locate the point of maximum shear stress for elliptical cross section. [5]
- b) Derive from first principles, the condition to be satisfied by warping function $\Psi(x, y)$. [8]
- c) Assuming proper stress function ' ϕ ' for bar of equilateral triangle cross section subjected to torque ' T ', determine maximum shear stress & its location. [12]
- Q6)** A long beam AB is resting on elastic foundation of modulus ' K '. A concentrated downward load ' P ' acts at the centre ' C '. Taking origin C, x +ve towards right & y +ve upward, Develop the equations for deflection, foundation pressure, bending moment. Show variation of B.M. along the length. [25]



P1509

[3665]-458

M.E. (Civil-Structures)

ADVANCED DESIGN OF METAL STRUCTURES

(New 2008 Course) (501405) (Elective - I)

Time : 4 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Answer any two questions from each section.*
- 2) Answers to each section should be written in two separate answer books.*
- 3) Use of I.S. 800, 801, 875, 802, 806, 4014, 3908, 3909, 3921, 5384, 6445, 6476, 6475, 6449, 8147 is permitted.*
- 4) Use of electronic pocket calculator is permitted.*
- 5) Figures should be drawn wherever necessary.*
- 6) Assume suitable data if required.*

SECTION - I

Q1) A rectangular hoarding of dimensions $16\text{m} \times 8\text{m}$ is to be erected and supported on three builtup columns spaced 5m apart. The hoarding board is backed by steel grid size $0.5\text{m} \times 0.5\text{m}$. Assume loads due to electric fittings along with other necessary loads. Calculate the various loads on the hoarding. The height of bottom member of frame from ground level is 20m . The basic wind speed of location is 37 m/s. , $k_1 = 1.04$, $k_2 = 1.2$ $k_3 = 1.0$. Design the members, using steel sections for rectangular grid. Draw the sketch and show the design details. **[25]**

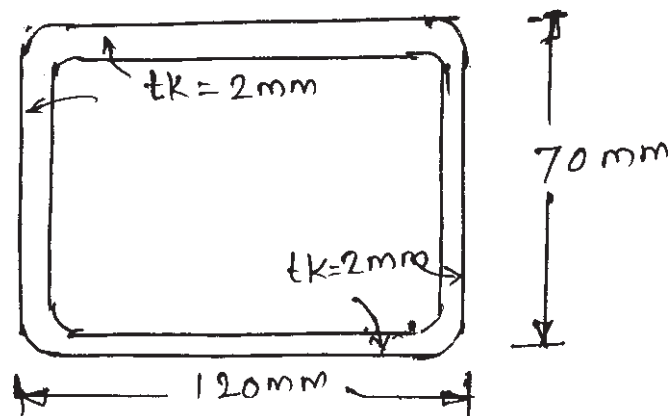
- Q2)** a) Design the strut using aluminium section to carry axial load of 150 kN . The effective length of strut is 1.5m , use appropriate factor of safety. **[10]**
- b) Compute the moment of resistance of aluminium beam ISALB 150 @ 12.1 kg/m when hinged at both ends. The effective length for lateral buckling is 0.85 times the actual length. The span of beam is 3.4m . **[10]**
- c) Explain merits & demerits of aluminium section as compared to steel section. **[5]**

P.T.O.

- Q3)** a) Enlist the design considerations for tubular sections. [6]
 b) Explain with suitable sketches the joints in tubular structures. [6]
 c) Enlist the types of structural tubes. [6]
 d) Design the tubular member to carry tensile load of 100kN and compressive load of 70 kN. due to load combinations. Length of member is 2.87 m. [7]

SECTION - II

- Q4)** a) Explain making of castellated beams, its advantages & disadvantages. [8]
 b) Obtain the expression for maximum shear stress in castellated beam. Use standard notation for sectional properties. The loading on beam can be taken as uniformly distributed. [8]
 c) Write in detail step by step method of analysis for castellated beam. [9]
- Q5)** a) Define flat to width ratio, effective design width for light gauge steel sections. [6]
 b) Write a note on 'Determination of sectional properties of light-gauge section. [6]
 c) Compute the allowable load on the light gauge steel beam section as shown in figure 5.C, take $f_y = 235 \text{ N/mm}^2$ span of beam is 3.5m. [13]



- Q6)** a) Explain with neat sketch & free body diagrams, the procedure for analysis of steel radio tower, assuming c/s as square structural configuration. [12]
 b) Explain the design of members of radio towers as per IS 802, also explain design procedure with respect to tension and compression members of tower & its related code provisions. [13]

GRADEWISE PERMISSIBLE STRESSES (IN N/mm²) IN TUBE SECTIONS

	<u>GRADE Y_{st} 22</u>	<u>GRADE Y_{st} 25</u>	<u>GRADE Y_{st} 32</u>
<u>SLENDERNESS</u>	<u>IN COMPRESSION (AXIAL)</u>		
<u>RATIO λ</u>			
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
<u>IN BENDING TENSION AND COMPRESSION</u>			
	140	170	205
<u>IN AXIAL TENSION</u>			
	125	150	190
<u>IN SHEAR</u>			
	90	110	135
<u>IN BEARING</u>			
	170	190	250



P1510**[3665] - 460****M.E. (Civil / Structures)****PLASTIC ANALYSIS & DESIGN OF STEEL STRUCTURES****(2008 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 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 : 800 - 2007 & steel table is allowed.*
- 6) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) A simply supported beam of span ' l ' is subjected to central load ' W '. In progressive loading when W reaches to W_p - plastic collapse occurs. Draw a neat sketch showing zone of plasticity in the beam. State the equation for depth of yielding ' e ' at any section in zone of plasticity. [8]
- b) A section having one flange of $100 \text{ mm} \times 8 \text{ mm}$ has two webs of $80 \text{ mm} \times 8 \text{ mm}$, one each at the end of flange so that total depth of section is 88 mm . The flange is at the top and section is subjected to bending moment ' M '. Draw neatly bending stress distribution diagram at the end of elastic as well as at the end of plastic stage. Indicate clearly neutral axis in both these cases. [10]
- c) Explain various factors considered to arrive for partial safety factor for material. State IS : 800 - 2007 values for this factor. [7]
- Q2)** a) A continuous beam ABCD is simply supported at A, B, C & D. Spans $AB = 4\text{m}$, $BC = 6\text{m}$ & $CD = 4\text{m}$. M_p is uniform. It is subjected to factored loads as under.
- i) Total udl value on AB & CD = W .
 - ii) Concentrated load $2W$ at centre of BC.
- Find collapse load W & draw statically admissible bending moment diagram. What is the type of collapse? [10]

P.T.O.

- b) A Rectangular Portal frame ABCD is fixed at A & D. Columns AB & DC are 6m in height & beam BC is 8m long. M_p for beam is twice that for columns. It is subjected to factored udl of 40 kN/m over BC & horizontal factored concentrated load of 60 kN at B in the direction BC. Sketch all possible mechanisms & obtain design moment M_p . Draw statically admissible bending moment diagram. [15]

Q3) A symmetrical gable portal frame ABCDE has bases A & E fixed 16 m apart. Vertical columns AB & ED each equal to 8m & apex C is 10m above base. It is subjected to horizontal load of 40 kN at B & concentrated load of 80 kN each at centre of each gable beam. M_p is uniform. [25]

- a) Draw all basic mechanisms & obtain M_p in each case.
b) Draw (Sway + Gable) mechanism & obtain M_p .

SECTION - II

Q4) a) Classify symmetrical 'I' section having width of flange 400 mm & overall depth 500 mm. Thickness of section is 10 mm uniform. $f_y = 280$ 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. 2 (a), for $W = 150$ kN & $f_y = 250$ MPa design rolled steel section for M_p . Check the section for combined action of moment & shear. Use IS : 800 - 2007 specifications. [15]

Q5) A column in a building is subjected to factored axial compressive load of 200 kN & factored bending moments of 80 kNm & 40 kNm at its top hinged end & bottom fixed end respectively. Both bending moments produce identical curvature about zz axis. Height of column is 6m & it is braced at its midheight 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) In a rectangular portal frame, a corner connection is to be designed. Bending moment at knee is 200 kNm. If designed section for beam & column both is ISMB 400, design & draw details at knee portion $f_y = 250$ MPa. Apply all checks & provide diagonal stiffener if required any. [25]



Total No. of Questions : 6]

[Total No. of Pages : 2

P1511

[3665]- 463

M.E. (Civil / Structures)

FINITE ELEMENT METHOD

(2008 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) *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 principle of minimum potential energy and hence evaluate element stiffness matrix of two dimensional CST element using proper polynomial displacement function. [15]
- b) How you will improve performance of CST element? How you will make use of higher order polynomials for more accuracy? [10]
- Q2)** a) What is effective node numbering in finite element mesh. Derive equation for half band width of overall stiffness matrix of a problem. [10]
- b) Explain characteristics of element stiffness matrix and overall stiffness matrix. Why you need to consider boundary conditions? [10]
- c) Write requirements of displacement function in finite element formulation. [5]
- Q3)** a) Derive shape functions for quadrilateral element with corner nodes using natural coordinate system test the correctness of all shape functions. [12]
- b) If element is to be isoparametric how you will express element geometry functions? Using 4 nodes quadrilateral and shape functions derived in Q 3(a), develop Jacobian matrix. [13]

SECTION - II

- Q4)** a) Explain Paseal's pyramid and its use in selecting terms in displacement function polynomials for 3D tetrahedron element. [8]

P.T.O.

- b) For isoparametric hexahedron element write shape function for any node of element write element geometry equations using the shape functions. [12]
- c) For axisymmetric element write stress-strain relations and hence obtain (D) matrix. [5]
- Q5)** Write displacement functions for both ACM and BFS elements. Explain how interelement compatibility is improved in BFS element. Verify conformity of both the elements. [25]
- Q6)** How many different types of shell elements exist in finite element technique. Draw sketch of each element with mesh pattern. How you will differentiate shell element in comparison with plate element? [25]



P1512

[3665]-464

M.E. (Civil Structures)

**MANAGEMENT IN STRUCTURAL ENGINEERING
(2008 Course) (501410)**

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) Write a short note on worker's financial incentive schemes. How do you classify them. [7]
- b) Explain standard costing methodology. [8]
- c) List the persons required for following work. [5]
- i) Carpentry work.
 - ii) RCC steel work.
 - iii) Painting work.
 - iv) Plumbing and sanitary work.
- d) Determine number of skilled and unskilled workers required to complete a task involving 160 m² fixing timber form work for a roof slab of a single storey building. The time marked for completion is four days working 8 hours per day. If a workers team consisting of two skilled workers and an unskilled worker can install the formwork at rate of 1.25 m²/hour. [5]
- Q2)** a) List different methods used to give fire protection. Explain the working of fire extinguisher. [7]
- b) Write a short note on factors affecting durability of concrete. [8]
- c) Explain in brief (any two) : [10]
- i) Quality control of materials of structures.
 - ii) Regular maintenance of road.
 - iii) Corrosion in steel.
- Q3)** a) Explain ultrasonic pulse velocity method. [7]

P.T.O.

- b) Write a short note (any two) : [8]
- i) Visual observations of cracks in distress concrete.
 - ii) Presentation of Report.
 - iii) Limitations on investigators.
- c) Explain the relationship between Client-Architect, consulting Engineers and contractor. [10]

SECTION - II

- Q4)** a) Answer the following : [8]
- i) Why adhesives of lower material of elasticity are desirable in concrete work?
 - ii) Why epoxy is suitable adhesive in construction work.
 - iii) Comment on viscosity required for adhesives used for repairs of cracks in concrete.
 - iv) Why acrylics are mostly used as protective coating.
- b) Define : [7]
- i) Repair.
 - ii) Restoration.
 - iii) Retrofitting.
 - iv) Polymers.
- c) i) Write a short note on specification for RCC Jacketing. [5]
- ii) Draw a figure, showing details of improved jacketing for beam. Draw any two options. [5]
- Q5)** a) Explain how to reduce cost of formwork. [5]
- b) Write a short notes on : [10]
- i) Safety during construction.
 - ii) Existing methods of formwork.
- c) Explain the design of formwork with following points. [10]
- i) Load on form-work.
 - ii) Design criterion.
 - iii) Design procedure.
- Q6)** Write short notes on : [25]
- a) Demolition safety.
 - b) Recycling of demolished material.
 - c) Wire Saw Technique of demolition.
 - d) Controlled demolition.
 - e) Role of structural drawing in demolition of structures.



P1514

[3665]- 469

M.E. (Civil-Structures)

BIOMECHANICS AND BIOMATERIALS

(2008 Course) (Open Elective - IV)

Time : 4 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 answer books.*
- 3) Figures to the right indicate full marks.*

SECTION - I

Q1) Solve any three out of the following :

- a) Define “Bio-mechanics”. How is it connected to engineering mechanics? [9]
- b) What is polymerization? Explain various polymerization methods. [8]
- c) Compare thermoplastic and thermo-sets. [8]
- d) Write a note on polymer composites. [8]

Q2) a) Write in brief about the various metallic bio-materials developed for human use. [10]

- b) Write a note on degradation and corrosion of bio-materials. [6]
- c) Write a note on joints of human skeletal system. [9]

Q3) a) Write down the mechanical properties of bone. [10]

- b) What is micro-motion? [5]
- c) What is fixation? Explain various types of fixation and their suitability. [10]

SECTION - II

Q4) a) Explain the characteristics of bone cement, silicon rubber, poly ethylene and ultra high molecular weight poly ethylene. [8]

- b) Explain the elastic behaviour of cortical bone. [8]
- c) Explain the geometry of articulating surfaces for knee joint. Illustrate with neat sketch. [9]

P.T.O.

- Q5)** a) What are the methods of testing mechanical properties of bone. [8]
b) Write a note on Gait analysis. [9]
c) Explain with sketch the device for testing wear of cartilage-on-cartilage in laboratory. [8]
- Q6)** a) Derive the joint force equation for knee joint. [8]
b) What are the classes of artificial fixation devices, explain them. [8]
c) Explain the steps in structural design of fixation device in biological environment. [9]



P1515

[3665] - 474

**M.E. (Mechanical - Heat Power)
ADVANCED THERMODYNAMICS
(2008 Course) (502102)**

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 calculators, Mollier charts, steam tables is allowed.*
- 5) Neat diagrams must be drawn wherever necessary*
- 6) Assume suitable data, if necessary.*

SECTION - I

Q1) Write short notes on (any three) : **[16]**

- a) Vaander waal's equation of state.
- b) Reduced properties.
- c) Compressibility factor and generalised compressibility chart.
- d) Availability function for closed & open systems.

Q2) a) The gas neon has a molecular wt of 20.18 and its critical temperature, pressure and volume are 44.5K, 2.73 MPa, and 0.0416 m³/kg-mol. Assuming a compressibility factor of 0.7 for a reduced pressure of 2.0 & a reduced temp. of 1.3, find the corresponding values of sp. volume, pressure & temperature and reduced volume. **[10]**

- b) Find the increase in entropy when 2kg of oxygen at 60°C are mixed with 6kg of nitrogen at the same temperature. The initial pressure of each constituent is 103 kPa and is the same as that of mixture. **[6]**

Q3) a) Draw p - T diagram for the substance :-

- i) Which expands on freezing.
- ii) Which contracts on freezing. **[4]**

P.T.O.

- b) Derive the relation,

$$(C_p - C_v) = -T \left(\frac{\partial v}{\partial T} \right)_p^2 \cdot \left(\frac{\partial p}{\partial v} \right)_T$$

Where, notations carry usual meanings. Hence show that :-

- i) C_p is always greater than C_v .
- ii) At absolute zero, $C_p = C_v$. [12]

- Q4)** a) Explain in brief :-

- i) Maxwell relations.
- ii) Second law efficiency. [6]

- b) Calculate the decrease in available energy when 25kg of water at 95°C is mixed with 35kg of water at 35°C, the pressure being taken as constant & the temperature of the surroundings being 15°C. [12]

SECTION - II

- Q5)** a) State & explain Amagat's law. [4]

- b) A gaseous mixture comprises of 28% N_2 , 47% H_2 & 25% CO_2 by volume. Calculate for the mixture :-
- i) Molecular weight.
 - ii) Specific gas constant.
 - iii) Adiabatic index, γ .
 - iv) Partial pressure of each component if mixture pressure is 1 bar.
 - v) Isothermal work & change in entropy per kg if the mixture is compressed to one third of its original volume. [12]

- Q6)** a) Estimate the enthalpy of vapourisation, h_{fg} , of Refrigerant "134 - a" at 20°C.

Given for "R-134 a" :-

- i) At 24°C; $p_{sat} = 645.66$ kPa.
- ii) At 16°C; $p_{sat} = 504.16$ kPa.
- iii) At 20°C ; $v_g = 0.0388$ m³/kg
 $v_f = 0.000815$ m³/kg [6]

- b) Write a note on Gibb's phase rule. [5]
- c) Explain in brief Adiabatic flame temperature. [5]

Q7) a) Prove that at the triple point, Gibb's function will have the same value in all the three phases of H_2O . At triple point, the enthalpy & entropy of ice are, -333.3 kJ/kg and -1.22 kJ/kgK , respectively. [6]

b) Pentane, C_5H_{12} , is burned with 150% (percent) theoretical air. Determine:-

i) Stoichiometric air-fuel ratio.

ii) Composition of products when burned with 150% theoretical air.[10]

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

a) Entropy and probability.

b) Bose-Einstein statistics.

c) Fermi : - Dirac statistics.

d) Inversion curve and Joule-Thompson coefficient.



P1517**[3665]-482**

M.E. (Mechanical) (Heat Power)
CONVENTIONAL POWER PLANTS
(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) *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) List the various losses in steam turbines and explain. **[8]**
b) A boiler plant comprises of a boiler, superheater, economiser and air preheater. The feedwater enters the economiser at 45°C. Air is preheated from a temperature of 15°C to 150°C. Steam is generated in the boiler at a pressure of 35 bar, 0.98 dry. and leaves the superheater at 350°C. When using oil of calorific value of 42 MJ/kg, the evaporation rate is 10 kg steam/kg of fuel and the air-fuel ratio is 20 : 1 by mass. Neglecting heat losses and pressure drop, estimate the heat transfer per kg fuel in each component and the plant efficiency. Assume C_p for air and flue gas as 1.005 kJ/kg K and 1.045 kJ/kg K respectively. **[10]**
- Q2)** a) What are the advantages of reheat and regenerative cycle? Explain with the help of schematic and T-S diagram. **[8]**
b) Explain with neat sketch combined gas turbine and steam power plant. Write down the energy balance to calculate the overall efficiency of the plant. **[8]**
- Q3)** a) What do you understand by compounding of steam turbines? Explain its necessity. **[8]**
b) Draw a modern steam power plant and explain the fuel circuit. **[8]**
- Q4)** a) With a neat sketch explain the working of a circulating fluidised bed combustion system. **[8]**

P.T.O.

- b) Differentiate between a dry and wet cooling tower. What are the advantages and disadvantages of each. [8]
- Q5)** a) What are the functions of [8]
- Moderator
 - Control rod
 - Coolant
- in a nuclear power plant.
- b) Write a note on : [8]
- Shielding against nuclear radiation.
 - Co-generation plant and its advantages.

SECTION - II

- Q6)** a) What are the constraints for hydropower development? What are the environmental problems? Discuss in detail. [9]
- b) Discuss the construction of underground power houses and list their advantages and disadvantages. [9]
- Q7)** a) Explain the working of a hydrogen-oxygen fuel cell. List its advantages and disadvantages. [8]
- b) Discuss the modern control room instrumentation in a thermal power plant. [8]
- Q8)** Explain with neat sketches. [16]
- Mini hydel power plant.
 - Latent heat storage system.
 - Compressed air energy storage system.
- Q9)** a) Discuss the projection of energy demand and planning of different power plants in Maharashtra. [8]
- b) Following data is given for a 200 MW thermal power plant.
 Capital cost : Rs. 800 crores ; Rate of interest : 12% ;
 Load factor : 50%; Annual cost of fuel, salaries and taxation Rs. 10 crores.
 Calculate the cost of generation per kWh. [8]
- Q10)** Write notes on : [16]
- Safety in power plants.
 - Load management.
 - Clean Energy Technology.



P1525**[3665]-501****M.E. (Mechanical-Design Engineering)****ADVANCED MACHINE DESIGN****(Revised 2008 Course) (502209)****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, calculator is allowed.
- 6) Assume suitable data, if necessary.

SECTION - I

- Q1)** a) Explain the phenomenon of creep. What is the effect of temperature, time and stress on it? How do you proceed to calculate permissible life under given stress. **[6]**
- b) A cantilever beam has a rectangular cross-section 5cm wide and 9cm deep. The length of beam is 200cms with a load of 12000 N on it at the end. The material is carbon steel with $\eta = 7$ and $B = 40 \times 10^{-39} (\text{cm}^2 / \text{N})^\eta$ day. Find permanent deflection after 10 years. **[10]**
- Q2)** a) Derive an expression between maximum free length, deflection, radius of coil etc, for a closed coiled helical spring. **[6]**
- b) Find the percentage of deflection of a 76.2mm × 152.4mm slab of 65 durometer hardness number rubber, 25.4mm thick that carries a load of 22.24 kN.
- Take ratio of the length to the breadth of the slab as '2'. Also percentage of deflection of 65 durometer rubber and modulus of elasticity for the same as 56.2% and 2.15 MPa respectively. **[10]**
- Q3)** a) What are the factors that affect endurance limit of machine part? **[6]**
- b) A transmission shaft carries a pulley midway between the two bearings. The bending moment at the pulley varies from 200 N-m to 600 N-m, as the torsional moment in the shaft varies from 70 N-m to 200 N-m. The frequencies of variation of bending and torsional moments are equal to the shaft speed. The shaft is made of steel FeE400 ($S_{ut} = 540 \text{ N/mm}^2$ and $S_{yt} = 400 \text{ N/mm}^2$). The corrected endurance limit of the shaft is 200 N/mm². Determine the diameter of the shaft using a factor of safety of 2. **[10]**

P.T.O.

- Q4)** a) Write in short about composite material and increasing use of these materials in mechanical engineering with specific application. [6]
- b) A graphite fibre/Epoxy composite contains 50.6% graphite fibre by volume. The graphite fibre is 12.7 micrometers in diameter and 13.79 GPa in transverse direction. The epoxy material has a corresponding value of 3.5 GPa. Evaluate the modulus of elasticity along principle axis. Comment on effect of temperature and presence of moisture on composite. [10]
- Q5)** Write a short note on the following : [18]
- a) Hybrid materials & applications.
- b) ANOVA Test.
- c) Fault tree analysis.

SECTION - II

- Q6)** a) How do you identify the optimum solution in the simplex method? [6]
- b) Formulate the problem of minimum weight design of a helical spring under axial load as a geometric programming problem. Consider constraints on the shear stress, natural frequency and buckling of the spring. [10]
- Q7)** a) Explain the term peaking and topping as applied to gear. [6]
- b) Two $14\frac{1}{2}^\circ$ full depth gears of 10 and 20 teeth are to be designed on the extended centre distance system using the recommended values for 'q' clearance = $0.25/P_d$. Make calculations for $P_d = 1$. Find the following : [10]
- i) Values of q_1 and q_2
 - ii) The actual pressure angle.
 - iii) The radius of actual pitch circle and the centre distance.
 - iv) The tooth thickness on the actual pitch circles.
- Q8)** a) What is design for assembly? Explain the general principles to be followed while designing the parts for assembly. [6]
- b) A straight tensile bar of diameter 10 ± 0.1 mm are made of plain carbon steel 40C8 having tensile yield strength of 330 ± 30 N/mm². The load on the bars is 23.5 ± 5 kN. If the diameters, strengths and loads are normally distributed, estimate the reliability of with standing the load by the bars.
- The area under the standard normal distribution curve from zero to z are as follows :

Z	1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.4	2.6	2.8	3.0
Area	0.3413	0.3849	0.4192	0.4452	0.4641	0.4772	0.4861	0.4918	0.4953	0.4974	0.4987

[10]

Q9) a) Discuss the various design consideration for cam shaft with valve opening mechanism. [6]

b) Design a mild steel connecting rod with an I-section for a single cylinder S.I. engine with following data. [10]

Diameter of the piston = 0.104 m

Weight of reciprocating parts = 18.2 N

Length of connecting rod from centre = 0.314 m

Stroke length = 0.14m

Speed of engine = 1500 EPM

Maximum explosion pressure = 2.28 MPa gauge,

Assume that the maximum thrust takes place at T.D.C. during the explosion stroke.

Q10) Write a short note on the following : [18]

a) Design for fatigue failure.

b) S and S₀ spur gears.

c) Multivariable search methods.



P1528

[3665]-505

**M.E. (Mechanical - Design Engineering)
COMPUTERAIDED ENGINEERING
(2008 Course) (Elective - III) (Semester - II) (502211)**

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 role of assembly in CAE. [6]
b) Classify solid modeling techniques and explain any one advanced solid modeling technique. [6]
c) Discuss Analytical techniques for thermofluid systems. [6]
- Q2)** a) Explain generalized procedure for analysis and simulation of mechanical systems. [8]
b) Discuss role of features in modeling and design of the product. [8]
- Q3)** a) Explain the sequence of steps to start meshing in finite element analysis. [8]
b) Discuss effect of mesh density and biasing in critical regions of meshing. [8]
- Q4)** a) Explain types of data exchange formats used in CAE. [8]
b) Discuss role of CAE in product design. [8]
- Q5)** Write short notes on :
a) Assembly modeling approaches. [6]
b) Numerical methods used in FEA. [5]
c) Use of FEA software to determine dimensions. [5]

SECTION - II

- Q6)** a) What are the discretization techniques used in CFD and explain any one in detail. [6]
b) Differentiate between linear and non-linear FEA. [6]
c) Give advantages and disadvantages of explicit approach over implicit approaches used in CFD. [6]
- Q7)** a) Give classification of 3D meshing techniques of FEA and explain any one in detail. [8]
b) Enlist advantages of dynamic analysis over static analysis. [8]
- Q8)** a) Enlist different ways to apply force and moment in FEA and explain any two in detail. [12]
b) Explain with suitable example, how to apply constraints for the solid elements in FEA. [4]
- Q9)** a) Define divergence of velocity. Write mathematical expression for divergence of velocity and its physical meaning. [8]
b) State and explain three fundamental physical principles of CFD. [8]
- Q10)** a) Write conservation form of energy equation and explain meaning of each term. [6]
b) Explain some modern developments in grid generations related to CFD. [5]
c) Write short notes on features of CFD modeling for steady incompressible flow. [5]



P1529

[3665]-511

M.E. (Mechanical-Mechatronics)

DESIGN OF MACHINE ELEMENTS

(2008 Course) (Sem. - I) (502804) (Elective - I)

Time : 3 Hours]

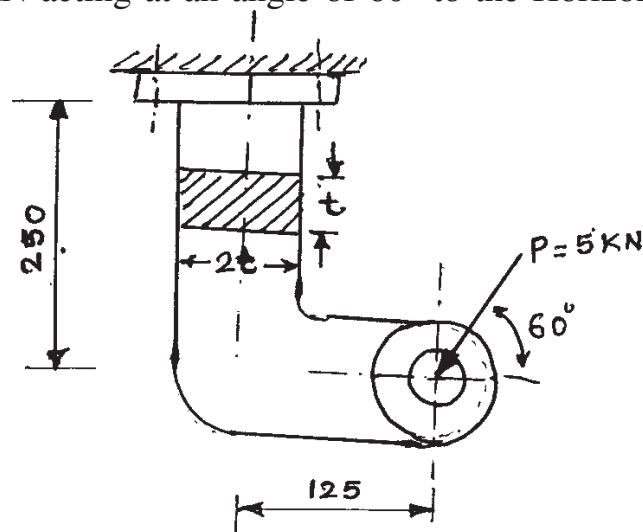
[Max. Marks : 100

Instructions to the candidates:

- 1) Use separate answer book for each section.
- 2) Answer any three questions from each section.
- 3) Draw neat sketches wherever necessary.
- 4) Figures to the right indicate full marks.
- 5) Use of logarithmic table and non programmable calculator is allowed.
- 6) Assume suitable data, if necessary and state it clearly.

SECTION - I

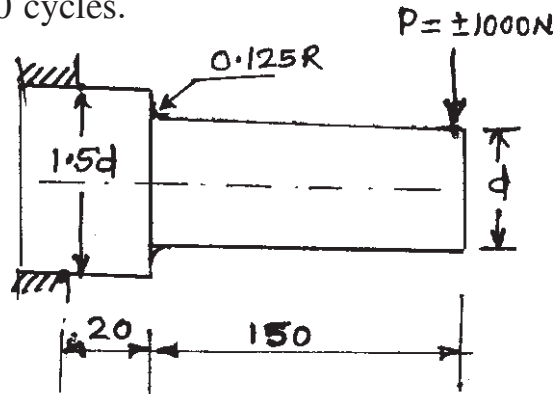
- Q1)** a) What is the scope of Ergonomics in product design. [6]
 b) What is standardization and explain briefly basic type of standards used in design office. [6]
 c) Explain briefly the mechanical properties of material which describe the behaviour of material. [6]
- Q2)** a) Enlist advantages of using the theories of elastic failure and state where do you use these theories. [8]
 b) A bracket, made of steel FE 200 ($S_{yt} = 200 \text{ N/mm}^2$) and subjected to a force of 5kN acting at an angle of 60° to the Horizontal, is shown in Figure 1. [8]

Q2(b): FIGURE 1

P.T.O.

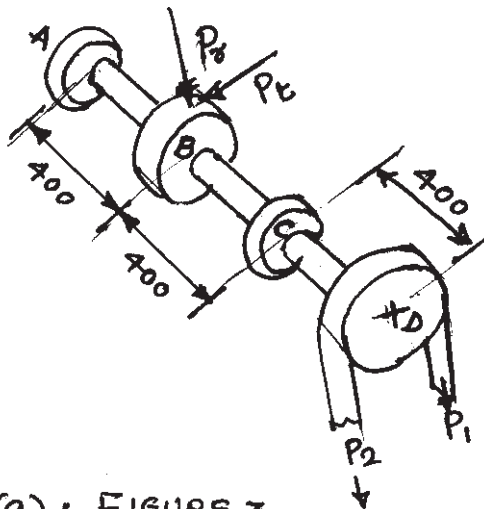
Q3) a) Explain the methods of reducing stress concentration. [8]

- b) A cantilever beam made of cold drawn steel 20C8 ($S_{ut} = 540 \text{ N/mm}^2$) is subjected to a completely reversed load of 1000 N as shown in figure 2. The notch sensitivity factor q at the fillet can be taken as 0.85 and expected reliability is 90%. Determine the diameter d of the beam for a life of 10,000 cycles. [8]



Q 3 (b): figure 2.

- Q4) a) A transmission shaft supporting a spur gears B and pulley D is shown in figure 3. The shaft is mounted on two bearings A and G. The diameter of pulley and the pitch circle diameter of gear are 450 and 300 mm respectively. The pulley transmits 20 kW power at 500 rpm to the gear. P_1 and P_2 are belt tensions in the tight and loose sides, while P_t and P_r are tangential and radial components of gear tooth force. Assume $P_1 = 3P_2$ and $P_r = P_t \tan(20^\circ)$ the gear and pulley are keyed to the shaft. The material of the shaft is steel 50C4 ($S_{ut} = 700$ and $S_{yt} = 460 \text{ N/mm}^2$) the factors k_b and k_t of ASME code are 1.5 each. Determine the shaft diameter using the ASME code. [12]



Q 4 (a): FIGURE 3

- b) A rigid coupling is used to transmit 20kW power at 720 rpm. There are four bolts and the pitch circle diameter of the bolts is 125 mm. The bolts are made of steel 45C8 ($S_{yt} = 380 \text{ N/mm}^2$) and the FOS is 3. Determine the diameter of the bolts. Assume that the bolts are finger tight in reamed and ground holes. [4]

- Q5) a)** Design a muff coupling which is used to connect two steel shafts transmitting 25 kW power at 360 rpm the shaft & key are made of plain carbon steel 30C 8 ($S_{yt} = S_{yc} = 400 \text{ N/mm}^2$) the sleeve is made of gray cast iron FG 200 ($S_{ut} = 200 \text{ N/mm}^2$) the factor of safety for the shaft and key is 4 for sleeve, the FOS is 6 based on ultimate strength. [10]
- b) What are functions of key and differentiate between splines and keys. [6]

SECTION - II

- Q6) a)** Derive stress deflection equation for the design of helical springs. [9]
- b) A helical compression spring is used to absorb the shock. The initial compression of the spring is 30 mm and it is further compressed by 50mm while absorbing the shock the spring is to absorb 250j of energy during the process the spring index can be taken as 6. The spring is made up of patented and cold drawn steel wire with $S_{ut} = 1500 \text{ N/mm}^2$ and modulus of rigidity is 81370 N/mm^2 . The permissible shear stress for the spring wire should be taken as 30% of S_{ut} . Design the spring and calculate [9]
- i) Wire diameter.
 - ii) Mean coil diameter.
 - iii) No. of active turns.
 - iv) Free length.
 - v) Pitch of the turns.
- Q7) a)** Draw neat labeled sketch of multi leaf spring and explain what is nipping of leaf spring. [6]

- b) It is required to design a helical torsion spring for a window shade. The spring is made at patented and cold drawn steel wire of grade 4. The yield strength of the material is 60% of the ultimate tensile strength and the FOS is 2. from space considerations. The mean coil diameter is kept as 18 mm. The maximum bending moment acting on the spring is 250 N-mm. The modulus of elasticity of the spring material is 207000 N/mm². The stiffness of the spring should be 3N-mm/rad. Determine the wire diameter and the number of active coils. [10]
- Q8)** a) State the laws of gearing and derive an equation to obtain constant velocity ratio. [8]
- b) Following data is given for hydrostatic thrust bearing thrust load = 500 kN, shaft speed = 720rpm, shaft diameter = 500mm, Recess diameter = 300mm, film thickness = 0.15mm, Velocity of lubricant = 160 sus specific gravity = 0.86. Calculate [8]
- Supply pressure.
 - Flow requirement in litres/min.
 - Power loss in pumping, and
 - Frictional power loss.
- Q9)** a) Write short notes on static and dynamic load carrying capacity of bearings. [6]
- b) A pair of spur gears with 20° full depth involute teeth consists of a 20 teeth pinion meshing with a 41 teeth gear. The module is 3mm while the face width is 40 mm. The material for the pinion as well as for the gear is steel with ultimate tensile strength of 600 N/mm². The gears are heat treated to a surface hardness of 400 BHN. The pinion rotates at 1450 rpm and the service factor for the application is 1.75. Assume that velocity factor accounts for the dynamic load and the factor of safety is 1.5. Determine the rated power that the gears can transmit. The Lewis factor for 20 teeth is 0.32. [10]

- Q10)** a) State the guidelines for selection of particular drive system for power transmission. [6]
- b) What are commonly used material for sliding contact bearing. [4]
- c) Explain the following terms used in gears : [6]
- i) Module.
 - ii) Backlash.
 - iii) Pressure angle.



P1530

[3665]-521

**M.E. (Mechanical) (Mechatronics)
EMBEDDED SYSTEMS
(2008 Course) (Elective - IV)**

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 802.11 architecture. [8]
b) Explain the protocol architecture of Bluetooth. [8]
- Q2)** a) Explain and compare CAN and MODBUS. [8]
b) What are expected features of processors to be used in embedded systems? [8]
- Q3)** a) Explain the software architecture of embedded system. [8]
b) Explain with example any commercial development tool used for design of embedded system. [8]
- Q4)** Write short notes on : [18]
a) Memory selection for embedded system.
b) Real time operating system.
c) Design Metrics.

SECTION - II

- Q5)** a) Explain the objects of an operating system kernel. [8]
b) What is difference between message queue and mailbox. What is the application of each. [8]
- Q6)** a) What are different scheduling algorithms used in general? Explain basic scheduling policy of RTOS? [10]
b) Why symbian OS is best in class mobile operating system. [6]

P.T.O.

Q7) a) With respect to block diagram, memory, processor, algorithms explain design of digital camera. **[10]**

b) Explain challenges in real time development. **[6]**

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

a) Adaptive Cruise Control system.

b) RFID.

c) Smart card.



P1531

[3665] - 525

M.E. (Electrical) (Control Systems)
NON LINEAR CONTROL SYSTEMS
(503103) (2008 Course)

Time : 3 Hours]

[Max. Marks:100

Instructions to the candidates:

- 1) Answer any one question from each pair of questions Q. 1 & Q. 2; Q. 3 & Q. 4; Q. 5 & Q. 6; Q. 7 & Q. 8; Q. 9 & Q. 10; Q. 11 & Q. 12.*
- 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) How are the nonlinearities classified? Give examples of each type of nonlinearities. [8]
- b) Discuss the unusual characteristics of nonlinear systems which cannot be explained on the basis of linear theory. [9]

OR

- Q2)** a) Classify different types of singular points and discuss their significance.[9]
- b) Compare nonlinear control system with linear control system. [8]
- Q3)** a) Describe Delta method for constructing phase plane trajectory. [8]
- b) Using isoclines method draw phase plane trajectory of second order equation $d^2x/dt^2 + 4 dx/dt + 5x = 0$ take starting point as $dx/dt = 1.5, x = 0$ [9]

OR

- Q4)** A unity feedback control system has the forward path transfer function $G(s) = 2/S(S+1)$ in cascade with relay whose output equal to ± 2 . For unit step input using isoclines method, construct the phase plane trajectory. Also determine overshoot if exist and comment on stability. [17]

P.T.O.

Q5) Explain the following for the absolute stability : **[16]**

- a) Popov Criterion.
- b) Circle Criterion.

OR

Q6) a) Derive the describe function for ON-OFF relay. **[8]**

- b) In a unity feedback control system an ideal relay with output equal to ± 1 is connected in cascade with the forward path transfer function $G(s) = 20/s(s+2)$. Determine the frequency and amplitude of the limit cycle if it exists by describing function method. Comment on stability of the system. **[8]**

SECTION - II

Q7) a) Select : **[9]**

i) $V = 2x_1^2 + x_2^2$

ii) $V = x_1^2 + 2x_2^2$

as Lyapunov function and investigate the stability for each case for the system Given by :

$$\dot{x}_1 = x_2 \qquad \dot{x}_2 = -x_1 - 2x_2$$

- b) Explain briefly-positive definite and semi definite function, Negative definite and semi definite function. **[8]**

OR

Q8) a) Explain Krasovskii's method for determination of Lyapunov function. **[9]**

- b) An autonomous system is given below: **[8]**

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

Examine the stability using Lyapunov theorem.

Q9) a) For linear time-invariant system $dx/dt = Ax$, derive the expression $A^T P + PA = -Q$ where P & Q are square, symmetric and positive definite matrices. **[9]**

- b) Explain the terms in the sense of Lyapunov : [8]
- i) Stability.
 - ii) Asymptotic stability.
 - iii) Global Asymptotic stability.
 - iv) Instability.

OR

Q10) A nonlinear system is represented by the state equations: [17]

$$\dot{x}_1 = x_1 - x_1^2 - x_1 x_2$$

$$\dot{x}_2 = \frac{1}{4}x_2 - x_2^2 - \frac{3}{4}x_1 x_2$$

- a) Obtain all the equilibrium points of the system.
- b) Using linearization at each equilibrium point, determine the type of equilibrium point and hence behavior of the phase portrait near each equilibrium point.

Q11) Explain clearly steps involved in Input-Output Linearization and Input-state linearization. [16]

$$\dot{x}_1 = x_2 + x_1^3 + u$$

$$\dot{x}_2 = -u$$

Is I/O linearization possible for the system with $y = h(x) = x_1$?

OR

Q12) Write short notes on : [16]

- a) Notion of sliding mode control.
- b) State Feedback Linearization.



Total No. of Questions : 8]

[Total No. of Pages : 2

P1534

[3665]-756

M.E. (Environmental Engineering)

SOLID WASTE MANAGEMENT

(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.*

SECTION - I

- Q1)** Discuss the sources, types and composition of solid waste. How does the biological properties affect the atmosphere. **[16]**
- Q2)** a) What are factors affecting the storage and collection of solid waste. **[8]**
b) Discuss the guidelines for sorting of solid waste and material recovery. **[8]**
- Q3)** Enlist the factors affecting composting of solid waste. Discuss advantages and disadvantages of technological options of thermal processing. **[16]**
- Q4)** Write short notes on : **[18]**
a) Hierarchy of integrated solid waste management.
b) Means and Methods of transportation of solid waste.
c) Enlist types of collection systems for solid waste.

SECTION - II

- Q5)** Discuss the fundamentals of Pyrolysis. Give advantages of Incineration and compare it with Pyrolysis with suitable examples. **[18]**
- Q6)** Define landfilling and explain the essential components, site selection and various landfilling methods. **[16]**
- Q7)** What are various elements of financial management plan for solid waste system? **[16]**

P.T.O.

Q8) For a solid waste disposal site, the avg.speed data obtained is :

Distance x km/trip	4	8	12	16	20	24
Avg. Haul speed y km/hr	10	15	20	25	30	35
Total time (hr.)	0.4	0.53	0.6	0.64	0.66	0.68

Find the haul speed constants a and b and the total time for site located 15km. away. **[16]**

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P1537

[3665] - 762

M.E. (Instrumentation and Control)

TRANSDUCER DESIGN

(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) 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) Design a pressure transducer to monitor the pressure in wave basin wall. The pressure is fluctuating and has typical rise time of 5mS. The maximum pressure expected is 1000 Pa (N/ sqm). The transducer having maximum diaphragm diameter of 12 mm is preferred. The pressure acting on the wall is both static plus fluctuating. Suggest a type of sensing element that should be employed. The output expected is 20mV for maximum pressure. Make suitable assumptions for the design. Draw a neat cut section sketch showing details of transducer. Suggest amplification and signal conditioning to measure peak, average and rms values of a pressure. **[18]**

Q2) a) Suggest a scheme to measure velocity in a wind tunnel using both contact type and non-contact (Laser light) Sensors. Discuss merits and demerits of both types. **[10]**

b) Describe LVDT displacement transducer with DC output. Discuss an IC AD 598 for the purpose. **[6]**

Q3) a) Stress measurement is planned on a concrete portion of Earthen Dam using Vibrating wire transducer. Describe the device with formula to calculate stress. Suggest Electronics for signal conditioning. **[10]**

b) Describe an accelerometer to monitor steady state acceleration. **[6]**

P.T.O.

- Q4)** a) Describe a device to monitor angle of a Satellite antenna to an accuracy of 20 seconds. The maximum azimuth angle expected is 90 degrees and vertical angle is expected to be 60 degrees. Both angular measurement must be displayed separately and effective resultant angle also be displayed. [12]
- b) Describe merits of strain gauge, Inductance, capacitance, piezo-electric, vibrating wire and fiber optic filament as sensing element for static and dynamic performance monitoring transducers. [4]

SECTION - II

- Q5)** a) Discuss Linear regression method using MS Excel to calculate slope, intercept and correlation coefficient of an RTD for monitoring temperature. How this method helps in correctly determining accuracy of the device? [6]
- b) Discuss MEMS type accelerometer. [10]
- Q6)** Write notes on any two of the following : [18]
- i) Ring Laser Gyro
 - ii) Michelson interferometer with Laser Light as source, and
 - iii) Sensor for measuring partial pressure of CO₂.
- Q7)** Design a weigh bridge to Measure vehicle upto 80 Tons
Prefer a Canister or shear Beam Load Cell. Use Strain gauges as sensing element. Design a display for Indicating Tare weight, Total weight and cost of material by weight. Discuss all possible considerations in the selection of various components of the weighbridge. [16]
- Q8)** a) Describe the use of Laser in air rifle shooting or in similar weaponry.[8]
- b) Elaborate with a case study the use of Gas/ Bio/ Chemical sensor and its roll in parameter under measurement. [8]



P1538

[3665] - 767

M.E. (Instrumentation & Control)

Specialization (Biomedical Instrumentation)

FUNDAMENTALS OF BIOMEDICAL INSTRUMENTATION

(Elective - I) (5061201 (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) Explain the importance of electrode in biopotential measurement. Draw equivalent circuit model of two electrodes attached to skin. **[8]**
- b) Discuss four different types of transducers used for sensing physiological parameters explaining what they measure and their principles involved. **[8]**
- Q2)** a) For a cardiac patient, his routine activity is to be monitored for 24 hours. Suggest a suitable ECG monitor and explain its working. Elaborate on its specifications. **[12]**
- b) Define : **[6]**
- i) All or Nothing law.
 - ii) Action Potential.
 - iii) Electrode Offset Potential.
- Q3)** a) Explain Ultrasound blood flow measurement technique based on Doppler Shift principle and Transit Time principle. **[12]**
- b) What is Evoked Response? State any one application of it. **[4]**

P.T.O.

- Q4)** a) With the help of neat diagram explain a pure tone audiometer. Also explain the calibration procedure for same. [10]
b) Explain different types errors related to eye. [6]

SECTION - II

- Q5)** a) On a time axis show the correlation between Electrocardiogram and phonocardiogram. Draw and explain the block diagram of an electronic stethoscope. [10]
b) Define microshock. What are the different situations which can create it? [6]
- Q6)** a) Design a fixed rate pacemaker for 60 BPM with amplitude of 5 volts and T_{on} of 20 ms. What are the advantages and disadvantages of fixed rate pacemaker. [10]
b) What is the need of cardioverter? How it is implemented. [8]
- Q7)** a) List various instruments related to Respiratory system and explain any one of it in detail. [10]
b) Explain semiautomatic Blood Pressure Measurement technique with the help of a suitable diagram. [6]
- Q8)** a) Explain instrumentation on dialysate side in hemodialysis with the suitable block schematic. [8]
b) Write a note on 'Shock Wave Lithotripsy'. [8]



P1539**[3665]-768****M.E. (Polymer)****MATHEMATICAL AND STATISTICAL METHODS****(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) Use of electronic pocket calculator is allowed.
- 6) Assume suitable data, if necessary.

SECTION - I**Q1) a)** Solve the following tri-diagonal system using LU-decomposition method

$$x_1 - x_2 = 0$$

$$-2x_1 + 4x_2 - 2x_3 = 0$$

$$-x_2 + 2x_3 = 0 \quad [9]$$

b) Solve the following system of equations, using Gauss-Seidel method

$$10x_1 - 2x_2 - x_3 - x_4 = 3$$

$$-2x_1 + 10x_2 - x_3 - x_4 = 15$$

$$-x_1 - x_2 + 10x_3 - 2x_4 = 27$$

$$-x_1 - x_2 - 2x_3 + 10x_4 = -9 \quad [8]$$

Q2) a) Find z-transform of the following (any two) : **[8]**

i) $f(k) = \cos \left(\frac{k\pi}{4} + \alpha \right), k \geq 0$

ii) $f(k) = 4^k \sin(2k + 3), k \geq 0$

iii) $f(k) = k 5^k, k \geq 0$

P.T.O.

- b) Find the largest eigen value and corresponding eigen vector of the matrix using power method : [9]

$$A = \begin{bmatrix} -2 & 0 & -1 \\ 1 & -1 & 1 \\ 2 & 2 & 0 \end{bmatrix}$$

- Q3)** a) Find inverse z-transform of the following (any two) : [8]

i) $z^{-1} \left[\frac{z^2}{\left(z - \frac{1}{2}\right) \left(z - \frac{1}{3}\right)} \right], \frac{1}{3} < |z| < \frac{1}{2}$

ii) $z^{-1} \left[\frac{z^2 + z}{z^2 - 2z + 1} \right], |z| > 1$

iii) $z^{-1} \left[\frac{1}{(z-2)(z-3)} \right]$ (use inversion integral method)

- b) Find the inverse of the matrix [8]

$$A = \begin{bmatrix} 1 & 1 & 1 \\ 4 & 3 & -1 \\ 3 & 5 & 3 \end{bmatrix}$$

using Gauss-Jordan method and hence solve the system

$$x_1 + x_2 + x_3 = 4$$

$$4x_1 + 3x_2 - x_3 = 12$$

$$3x_1 + 5x_2 + 3x_3 = 15$$

- Q4)** a) Derive relation between z-transform and Fourier transform. [8]

- b) Solve the following system by Cholesky's method [8]

$$4x_1 + 2x_2 + 14x_3 = 14$$

$$2x_1 + 17x_2 - 5x_3 = -101$$

$$14x_1 - 5x_2 + 83x_3 = 155$$

Q5) a) Using the Householder's transformation reduce the matrix [8]

$$A = \begin{bmatrix} 2 & 1 & 1 \\ 1 & 1 & 0 \\ 1 & 0 & 1 \end{bmatrix}$$

into a tridiagonal matrix

b) Solve the following difference equation : [8]

$$f(k+1) + \frac{1}{2}f(k) = \left(\frac{1}{2}\right)^k, k \geq 0, f(0) = 0$$

SECTION - II

Q6) a) Use Runge-Kutta method to solve the following system at $t = 0.2$ [8]

$$\begin{bmatrix} y_1' \\ y_2' \end{bmatrix} = \begin{bmatrix} 2 & 1 \\ 1 & -3 \end{bmatrix} \begin{bmatrix} y_1 \\ y_2 \end{bmatrix},$$

$$\text{given that at } t = 0, \begin{bmatrix} y_1 \\ y_2 \end{bmatrix} = \begin{bmatrix} 1 \\ 0.5 \end{bmatrix},$$

taking step size equal to 0.1

b) Using Adams-Bashforth method, obtain the solution of $\frac{dy}{dx} = x^2(1+y)$ at $x = 1.4$, given $y(1) = 1, y(1.1) = 1.2, y(1.2) = 1.4662, y(1.3) = 1.8213$. [8]

Q7) a) Use Newton-Raphson method to solve the equations : [7]

$$4 - 8x + 4y - 2x^3 = 0 \text{ and}$$

$$1 - 4x + 3y + y^2 = 0,$$

with the initial values $x_0 = 0.5, y_0 = 0.5$.

Carry out three iterations.

b) Solve $\frac{\partial^2 u}{\partial t^2} = 100 \frac{\partial^2 u}{\partial x^2}$, subject to the conditions [9]

$$u(0, t) = u(3, t) = 1$$

$$u(x, 0) = 4x, 0 < x < 3$$

$$\frac{\partial u}{\partial t} = 0 \text{ at } t = 0.$$

Taking $h = \Delta x = 1$ and $k = \Delta t = 0.1$, find the values of u upto $t = 0.3$ for $0 \leq x \leq 3$.

Q8) a) Find the extremal of the functional $\int_{x_0}^{x_1} y \sqrt{1 + y'^2} dy$ [8]

b) Solve the boundary value problem $y'' + y + x = 0$, ($0 \leq x \leq 1$), $y(0) = y(1) = 0$, by Rayleigh-Ritz method. [8]

Q9) a) Use Galerkin's method to solve the boundary value problem $y'' = 3x + 4y$, $y(0) = 0$, $y(1) = 1$, taking the approximate solution $\bar{y}(x) = cx(1 - x)$. Compare your result with exact solution, by tabulating the results for $x = 0.25, 0.5$ and 0.75 . [10]

b) For the data given below, use χ^2 test to test the effectiveness of inoculation in preventing the attack of small pox. [7]

	Attacked B	Not Attacked β	Total
Innoculated A	25	220	245
Not Innoculated α	90	160	250
Total	115	380	495

Given : $\chi^2 = 3.84$, at 5% level of significance, for one degree of freedom.

Q10)a) A sample of 800 products from a factory are examined and found to be 2% defective. Another sample of 600 similar products from another factory are found to have only 1.5% defective. Can we conclude that the products of the first factory are inferior to those of the second?

Given : $|z| = 1.96$ at 5% level of significance. [5]

- b) It was found that a machine has produced pipes having thickness 0.50 mm. To determine whether the machine is in proper working order, a sample of 10 pipes is chosen for which the mean thickness is 0.53 mm. and s.d. is 0.03 mm. Test the hypothesis that the machine is in proper working order, at 5% level of significance.

Given : $|t| = 2.26$, for nine degrees of freedom. [5]

- c) The following table gives the production of 3 workmen on 3 machines. Prepare the Analysis of variance table and test whether the 3 workmen differ in respect of mean productivity : [7]

Machines	<u>Workmen</u>		
	A	B	C
1	38	33	46
2	36	44	42
3	49	42	39

Given : $F_{0.05} = 19.0$ for (2, 2) degrees of freedom.



P1540**[3665]-769**

M.E. (Polymer Engineering)
PRINCIPLES OF MANAGEMENT
(2008 Course) (509102)

*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 from section-I and answer any other two from section-II.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of graph paper, log-log paper, pocket calculator is allowed.*
- 4) *Assume suitable data, if required.*

SECTION - I

Q1) Attempt any four :

- a) What are the elements of costing? Explain in brief. [5]
- b) Write in short about balance sheet. Describe various asset and liability heads shown in balance sheet. [5]
- c) Write in short about resource smoothing and resource levelling with respect to PERT/CPM. [5]
- d) Discuss in short XYZ - analysis based on inventory value and FNSD - analysis based on usage rate of items. [5]
- e) Explain briefly main characteristics of queueing system. [5]

Q2) a) There are five jobs, each of which must go through the two machines A & B in the order AB. Processing times are given below : [8]

Processing time (hours)

Job	1	2	3	4	5
Time for A	5	1	9	3	10
Time for B	2	6	7	8	4

Determine the sequence for five jobs that will minimise the elapsed time T. Calculate the total idle time for the machines in this period.

P.T.O.

- b) A firm plans to begin the production of three new products on its three plants. The unit cost of producing 'i' at plant 'j' is as given below. Find the assignment that minimises the total unit cost. [7]

		Plant		
		1	2	3
Product	1	10	8	12
	2	18	6	14
	3	6	4	2

- Q3)** a) The following information is obtained from the accounts of Alpha Limited.

Direct material cost	-	Rs. 10,000
Direct wages	-	Rs. 6,000
Direct expenses	-	Rs. 200
Factory overheads	-	Rs. 3,000
Administrative overheads	-	Rs. 1,000
Selling and distribution overheads	-	Rs. 1,800
Sales	-	Rs. 25,000

Prepare a statement of cost and profit under absorption method showing prime cost, works cost, cost of production, total cost and profit. [5]

- b) Explain :
- Break even point.
 - Margin of safety.

Shyam company limited had sales of Rs. 1,00,000. The variable cost was Rs. 60,000 and fixed cost was Rs. 30,000. Find break even point and margin of safety. [5]

- c) For simple deterministic EOQ model, demand is uniform, lead time is zero, production rate is infinite and shortages are not permitted. Obtain an expression for optimal economic order quantity and optimum inventory cost. [5]

- Q4)** a) Solve following transportation problem. [8]

		Destination				
		A	B	C	D	
Source	I	21	16	25	13	11
	II	17	18	14	23	13
	III	32	27	18	41	19
Requirement		6	10	12	15	43

Availability

- b) For the following pay-off matrix for firm A, determine the optimal strategies for both the firms and the value of the game using maximin-minimax principle. [7]

	Firm B				
Firm A	3	-1	4	6	7
	-1	8	2	4	12
	16	8	6	14	12
	1	11	-4	2	1

Q5) For the project network given in the Fig.1, activity times in number of days are shown on the arrow depicting activity. Find critical path, earliest expected time and latest allowable time. Define and find following types of floats.

- Total float.
- Free float.
- Independent float.

[15]

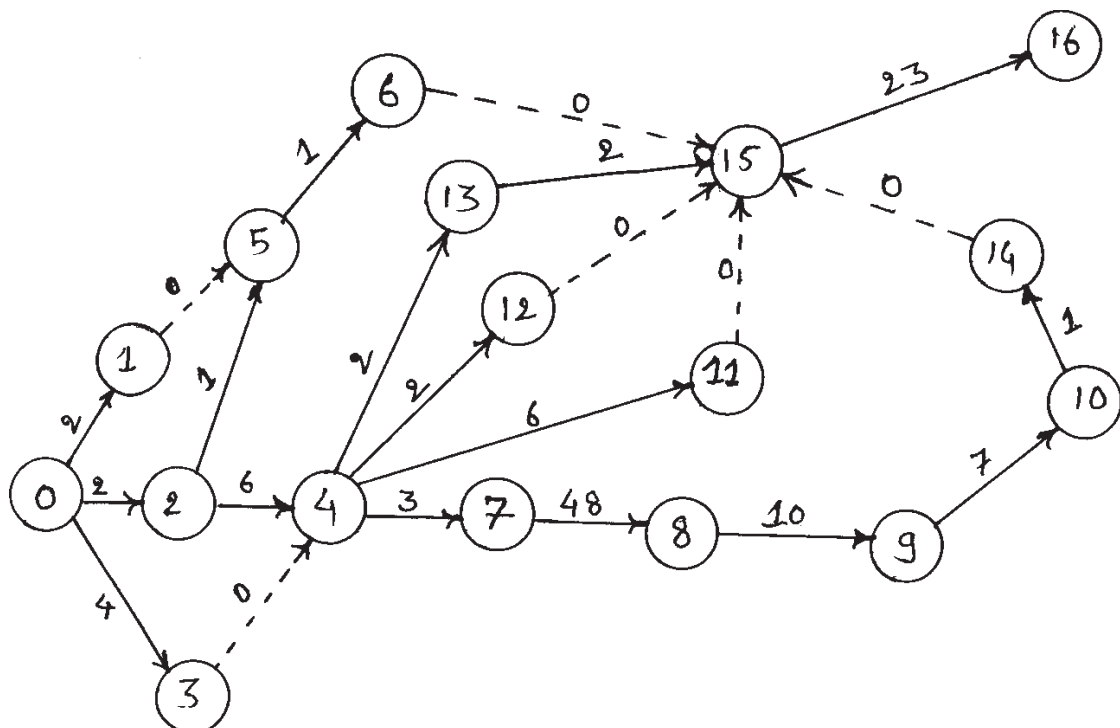


Fig 1

SECTION - II

- Q6)** Write short notes on (any four) : **[20]**
- a) Five P's of marketing.
 - b) Methods of pricing.
 - c) Difference between need, want and demand.
 - d) Concept of product life cycle.
 - e) Difference between sales and marketing.
- Q7)** a) Discuss the 'STP plus (Segmentation, Targeting and Positioning) marketing mix' approach to formulation of marketing strategy. **[12]**
- b) What is 'cost plus' pricing? **[3]**
- Q8)** a) What is a brand? Discuss the following concepts in light of the above definition - Brand extension, rejuvenation, relaunch and acquisition. **[12]**
- b) What do you mean by 'e-marketing'? **[3]**
- Q9)** a) Define marketing channels. Discuss the various levels of marketing channels. **[12]**
- b) Discuss in short 'CRM' (Customer Relationship Management). **[3]**
- Q10)** a) What is the difference between conventional and direct marketing. **[12]**
- b) What is meant by physical distribution? **[3]**



P1541

[3665] - 770

M.E. (Polymer Engineering)

POLYMER PROCESSING AND TESTING

(2008 Course) (509103)

Time : 3 Hours]

[Max. Marks:100

Instructions to the candidates:

- 1) Q.1 from section I and Q. No. 6 from section II are compulsory. Answer any other two from section I and answer any other two from section II.*
- 2) Figures to the right indicate full marks.*
- 3) Use of graph paper, log-log paper and pocket calculator is allowed.*
- 4) Assume suitable data, if required.*

SECTION - I

Q1) Attempt any four :

- a) Discuss the use of accumulator type extrusion blow moulding machines. Give specific applications. **[5]**
- b) Discuss twin sheet roll fed thermoforming process. **[5]**
- c) Write in short about reaction injection moulding. **[5]**
- d) How does plasticizing consistency affect the short weight consistency? Discuss various methods to improve the plasticizing consistency. **[5]**
- e) Write in short about rheology of convergent and divergent type of die/mandrel assembly used in continuous extrusion blow moulding. **[5]**

- Q2)** a) 50 mm diameter extruder has pitch equal to diameter and metering depth is 5 mm. Length of the extruder is 30 times diameter. The viscosity of the polymer melt is 500 N-sec/m². If extruder is operated at 100 rpm, plot extruder screw characteristics. If a capillary die having 50 mm length and 20 mm diameter is coupled with this extruder, find operating point of extruder/die combination. If same extruder is coupled with die of 50 mm length and 10 mm diameter, find new operating point. Comment on result. If tensile yield strength of barrel material is 1000 MN/m² and factor of safety of 4 is used, find suitable barrel thickness. **[7]**
- b) Discuss various velocity to pressure techniques explain how P-V-T diagram of material can be used for process control in injection moulding. **[8]**

P.T.O.

- Q3)** a) Explain the concepts of 'Gel effect' and 'ceiling temperature'. Discuss their significance in reactive extrusion giving kinetic models. Give suitable example. [10]
- b) Obtain an expression for time taken to inflate extrusion blow moulding bottle. [5]
- Q4)** a) Discuss and explain various process parameter issues related to injection stretch blow moulding of mineral water PET bottles with reference to single stage as well as two stage process. [10]
- b) Bring out the differences in thermoforming of amorphous and crystalline polymers. [5]
- Q5)** a) Discuss the pulsations and the use of melt/gear pump in extrusion process. [4]
- b) Discuss internal calibration systems for rigid pipes. [4]
- c) Compare the pressure loss across runner of 100 mm length for following cases.
- Round runner of 5 mm radius.
 - Half round runner of 5 mm radius
- Polymer follows the power law of the
- Form $\tau = k_R \dot{\gamma}_a^{n_R}$ where
- $$k_R = 1,60,000 \text{ N} \cdot \text{sec}^{0.5} \text{ m}^{-2}$$
- $$n_R = 0.5$$
- Assume flow rate of 50 kg/hr. [4]
- d) Write in short about devolatilisation in single screw extrusion. [3]

SECTION - II

Q6) Answer any four :

- Explain in short brittle coating non-destructive test method. [5]
- Explain the concept of Brittle temperature explain its importance in cryogenic applications. [5]
- Describe flexural test and relevant standards. Draw neat sketch of test arrangement and explain the significance of the test. [5]
- State and explain the criteria of selection of non-destructive testing methods for plastic products. [5]
- Explain the reasons of variability in test results of composites. Discuss the use of weibul distribution. [5]

- Q7) a)** Explain ‘hydrostatic pressure measurement tests’ for plastic pipes. Discuss both short term and long term test methods and design procedure for determination of pressure rating of pipes. [10]
- b)** Define and discuss power factor and permittivity. Explain the use of these concepts in selection of material for main circuit breaker (MCB). [5]
- Q8) a)** List various environmental tests and explain the significance of each in short explain the use of these tests in design of overhead water storage tanks. [8]
- b)** Discuss ultrasonic non-destructive testing method for plastic products.[7]
- Q9) a)** List various electrical tests used for plastics explain test method for determination of dielectric constant. Discuss its significance for wire|cable coating application. [7]
- b)** Explain different test methods for determination of various thermal properties. Explain in detail test method for determination of either Vicat Softening Temperature or Heat Distortion Temperature. [8]
- Q10)a)** What are barrier properties? Discuss their importance in food packaging application. Explain test methods for measurement of permeability of plastic films. [10]
- b)** Discuss the significance of track resistance / arc resistance in electrical applications. [5]



P1543**[3665]-773**

M.E. (Printing Engg. & Graphic Communication)
PROBABILITY, STATISTICS AND QUEUEING THEORY
(508101) (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 books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Assume suitable data wherever necessary.*
- 5) *Figures on right indicate marks.*

SECTION - I

Q1) a) The number of surface flaws in plastic panels used in the interior of automobiles has a Poisson distribution with a mean of 0.05 per square foot of plastic panel. Assume an automobile interior contains 10 square feet of plastic panel. [7]

- i) What is the probability that there are no surface flaws in an auto's interior?
- ii) If 10 cars are sold to a rental company, what is the probability that none of the 10 cars has any surface flaws.
- iii) If 10 cars are sold to a rental company, what is the probability that at most one car has any surface flaws?
- iv) In 10 cars, what is probability of having 2 cars with surface flaws?

b) The probability of number of errors in a part is given as below: [10]

Number of errors	0	1	2	3	4	5
Probability of errors	0.13	0.13	0.12	0.1	0.1	0.09
Number of errors	6	7	8	9	10	11
Probability of errors	0.09	0.07	0.07	0.06	0.03	0.01

P.T.O.

- i) Find mean errors.
 - ii) What is variance of errors?
 - iii) If parts with more than 2 errors are of interest. What is the probability that 8th part randomly selected will be the 2nd part of our interest?
 - iv) Out of 8 parts, what is the probability of having 3 parts with four errors?
 - v) Prepare a probability distribution table for presence of exactly two errors in parts if sample size is 5.
- c) The exponential distribution is applied to waiting times between successes in Poisson process. If there are average 5 calls per hour arriving with Poisson distribution, the average time between two calls becomes 1/5 hours. [8]
- i) Find the probability that the time between two calls exceeds 30 minutes.
 - ii) Find the probability that the time between calls is less than 10 minutes.
 - iii) What is the probability that two successive calls in 3 randomly chosen calls will have time between them more than 30 minutes.
- Q2) a)** The average life of a certain brand of shoes is 400 days with standard deviation of 50 days. If the life of shoes is normally distributed, find :
- i) The probability that the life of a pair of shoes goes beyond 500 days.
 - ii) If 5 players buy 5 pairs of shoes for them, what will be the probability that their shoes will last at least 450 days?
 - iii) What should be the guarantee (in days) provided by the manufacturer if he wishes to replace only 4% of shoes those he has sold? [8]
- b) Determine the 90% and 95% confidence intervals of difference between two population means with standard deviations 30 and 40 respectively. The two samples from these populations were chosen and following data was recorded:

Sample of Population 1		Sample of Population 2	
540	537	587	565
531	552	538	611
570	547	600	583
550	554	552	563
549	534	603	592
546	561	568	548
543	543	590	602
520		608	568

State whether the two population means are matching at 0.01 level of significance. [8]

- c) Can we say that mean value of the sample given in table is statistically below 380? Also comment if it is matching 320? Find the limits of population mean at 0.1 level of significance. [9]

328	351	313	337	321
331	315	326	341	319
357	325	348	336	341
338	329	345	321	350

- Q3) a)** The moisture of the wet mix of a product is considered to have an effect on the finished product density. The moisture of the mix was controlled and finished product densities measured as shown in the following data: [15]

Mix Moisture (Coded)	Density (Coded)
4.7	2
4.7	3
5.0	3
5.0	4
5.2	3
5.2	4
5.2	5
5.3	7
5.6	6
5.9	6
5.9	9
5.9	10

- i) If the data is fitted in linear model find the equation for regression.
 - ii) Determine if there is any linear relation between input and output variables.
 - iii) If input and output are in linear relation, check if the model is adequate.
 - iv) Test if the slope of the regression line is 7.
- b) In an experiment on new type of automobile model, the speed and stopping distance were recorded. [10]

Speed, v(kmph)	35	50	65	85	105	120
Stopping distance, d(m)	18	27	41	62	88	119

- i) Fit a multiple regression curve of the form

$$\mu_{D/V} = \beta_0 + \beta_1 v + \beta_2 v^2$$
- ii) Estimate the stopping distance when car is running at 70kmph.

SECTION - II

- Q4) a)** Dimensions (in mm) of a product being produced were studied for first 20 samples and then the next 10 samples were observed. If each of the samples contains 4 readings, construct the control chart and determine the limits. Comment on the last 10 samples, whether the process appears to be in control? The recorded data is as below: [6]

Sample No.	Mean	Range	Sample No.	Mean	Range	Sample No.	Mean	Range
1	22.5	8	11	22.8	4	21	23.5	7
2	22.3	5	12	20.3	9	22	22.4	11
3	22.3	8	13	21.8	8	23	23.9	11
4	21.5	11	14	23.8	3	24	21.6	5
5	21.8	7	15	20.8	6	25	21.5	8
6	22.3	4	16	22.8	6	26	22.8	4
7	23	6	17	22.8	8	27	23.3	6
8	21.8	7	18	22.8	11	28	20.9	9
9	23.5	9	19	22.5	11	29	21.2	10
10	23.5	5	20	22.8	7	30	23	12

- b) An acceptance-sampling scheme consists of taking a sample of 25 from large batch of components and rejecting the batch if 3 or more non-conforming items are found. What is probability of accepting batches containing 2%, 4%, 6%, 10%, 15% and 20% non-conforming?

- i) With these calculations, draw OC curve.
- ii) From this curve estimate the probability of accepting the batch that contains 11% non-conforming items.
- iii) What is the probability of rejecting more than 1 out of next 7 batches if the non-conformity in all batches is 5%? [12]
- c) Samples of size 500 were taken after a fixed period and number of defective items in a sample was recorded. Total 20 samples were taken. Construct a control chart for proportion defective. [7]

No.	Number of Defectives	No.	Number of Defectives	No.	Number of Defectives	No.	Number of Defectives
1	7	6	2	11	1	16	4
2	6	7	7	12	3	17	6
3	6	8	5	13	0	18	0
4	1	9	3	14	7	19	2
5	5	10	4	15	3	20	4

Q5) a) In a pilot experiment, the experimenter wants to determine the effective variables out of 5 chosen variables. If all of them are having two levels and the experimenter is not willing to conduct more than 8 experiments, construct a resolution III design. Also find the aliases of the main effects.[15]

- b) A print job was divided into 6 different batches and completed on 6 different machines. 7 samples were taken from each machine and measured for color difference with respect to ideal target. From the data collected, perform analysis of variances at 0.05 level of significance and indicate whether or not the mean color difference (ΔE) observed on all 6 machines is significantly different. [10]

Machine 1	Machine 2	Machine 3	Machine 4	Machine 5	Machine 6
1.5	1.6	1.7	1.6	2.2	2.1
2.1	2.5	1.8	2.3	1.7	1.8
1.6	2.1	2.0	1.8	1.9	1.9
1.8	1.5	1.9	1.9	2.1	1.7
1.8	1.8	1.9	2.1	1.8	2.0
2.0	1.9	1.9	2.0	1.7	2.3
1.9	2.2	1.9	1.8	1.6	2.1

- Q6)** a) i) Explain queueing theory. [16]
ii) Write about Kendall's Notation.
iii) Explain M/M/1 model with Little's formulae.
- b) Consider a switch, which has an infinite buffer and an infinite number of users generating messages according to a Poisson process with average inter-arrival time of 800 milliseconds. The switch serves requests with a service time that is exponentially distributed with an average service time of 500 milliseconds. [9]
- i) What is the average waiting time in system and in queue?
ii) On an average how many messages will be in the queue on given time?
iii) The reduction by 10% in average waiting time in system reduces the cost by 4%. So what should be the average service time of switch to save the cost by 20%.
iv) Suppose that the switch is upgraded to reduce average service time to 400 milliseconds. How would that affect the average waiting time and queue length?



P1544**[3665]-774**

M.E. (Printing Engineering & Graphic Communication)
PRINTING TECHNOLOGY MANAGEMENT
(2008 Course) (508102)

*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) *Assume suitable data, if necessary.*
- 4) *Figures to the right indicate full marks.*

SECTION - I**Q1)** Answer the following.

- a) Considering Publicational workflow describe the planning operation to be carried out to enhance the print production in medium scale industry.[9]
- b) For a job production of International Journal Printing, following are the data of no. of International Journals printed at International level Vs. no. of International Journals printed in India only. Find the relation between the jobs printed at International level and India for 7 days. Estimate International production when the Indian production is 38,000 and estimate actual variations in international production.

Job Production of International Journal for 7 days (in thousands) [9]

Day	International	India
Day 1	76	23
Day 2	79	26
Day 3	83	29
Day 4	80	27
Day 5	90	41
Day 6	85	37
Day 7	84	32

- c) Classify the types of production. [7]

Q2) Answer the following.

- a) From the following data select the most advantageous location for setting a plant of commercial printing press. [9]

Sr. no	Description	site-X (Rs)	site-Y (Rs)	site-Z (Rs)
i	Total initial investment	2,00,000	2,00,000	2,00,000
ii	Total expected sales for the period	2,50,000	3,00,000	2,50,000
iii	Distributional expenses	40,000	40,000	75,000
iv	Raw material expenses	70,000	80,000	90,000
v	Power & water supply expenses	40,000	30,000	20,000
vi	Wages and salaries	20,000	25,000	20,000
vii	Other expenses	25,000	40,000	30,000
viii	Community attitude	indifferent	want Business	Indifferent
ix	Employee housing facilities	Poor	Excellent	Good

- b) Explain different stages as well as factors to be considered while product design. [9]
 c) Describe the steps in Product Development. [7]

Q3) Answer the following.

- a) A newspaper publishing establishes a fact that there is a relation between sale of newspaper and population of city. The market research carried out reveals the following information. Fit a linear Regression equation and establish the demand for newspaper for a city with a population of 50 million. [8]

Population (million)	5	7	15	22	27	36
Sale of newspaper Rs. (thousand)	28	40	65	80	96	130

- b) Explain difference between
 i) Forecasting and Prediction,
 ii) Econometric and Time Series method of forecasting. [8]
 c) The data in the table represents the load on the Heidierg Printing machine as follows : [9]

Month	May	Jun	Jul	Aug	Sep	Oct	Nov
Machine Load Quantity	585	610	675	700	775	820

- i) Compute the three month moving average values. (ignore decimal values)
 ii) Forecast the demand for Jan 2003.

SECTION - II

Q4) Answer the following.

- a) Compare the following Inventory Analysis methods. [8]
 - i) ABC and VED.
 - ii) ABC and XYZ.
- b) Derive The Deterministic Economic Order Quantity model for Inventory Shortage. [8]
- c) The rate of use of particular raw material from store is 20 units per year, the cost of placing and receiving an order is Rs. 40, the cost of each unit is Rs. 100, the cost of carrying inventory in percent per year is 0.16 and it depends upon average stock. Determine the economic order quantity. If the lead time is 3 months, then calculate the reorder point. [9]

Q5) Answer the following.

- a) Explain DMAC in six sigma with respect to print process control. [8]
- b) Explain FMECA on the performance of print product. [8]
- c) For standardization of Offset press the printer decides to keep the target density for yellow as 1 ± 0.01 the experiments were conducted for L16 Orthogonal array for 5 repetitions. The response values under the experimental conditions of process parameters are as mentioned below :

Ex.No.	Repetition				
	1	2	3	4	5
T1	0.92	1.01	1	1.04	1.08
T2	1.04	0.97	1.02	0.99	1
T3	0.96	0.98	0.99	0.96	0.97
T4	1.07	1.06	1.03	1.04	1
T5	1.09	0.99	0.95	1.05	1.1
T6	0.99	0.95	0.94	1	1.1
T7	0.92	0.98	0.97	0.97	0.96
T8	0.88	1	1.02	0.97	1.04
T9	1.05	1.01	1.07	1.05	1.04
T10	1.06	1.04	1.03	0.99	1
T11	1	0.98	1.03	0.98	1.02
T12	1.04	1.03	1.02	1.07	1
T13	1	0.92	0.97	0.95	0.96
T14	0.98	0.99	0.97	0.99	0.99
T15	1.06	1.05	1	0.99	1.04
T16	1.05	1.01	1.02	0.97	1.04

Calculate Process Capability and Centeredness of Process.

[9]

Q6) Answer the following.

- a) The amount of Ink filled in 2 litter can by an automatic canning machine is Monitored using a control chart. **[10]**

Draw X-bar and S charts for the data collected at 10 different times. Is the process in control? Assume $A_2 = 0.577$, $d_2 = 2.326$, $D_3 = 0$, $D_4 = 2.115$, $B_3 = 0$, $B_4 = 2.089$.

1	2	3	4	5	6	7	8	9	10
2.01	2.00	1.99	1.98	1.96	2.10	2.02	2.01	1.96	1.99
2.02	1.98	1.98	1.99	2.01	2.04	2.00	1.98	1.99	2.00
2.00	1.99	2.1	2.00	2.03	2.07	1.99	1.97	2.03	2.04
2.01	2.00	2.2	1.96	2.12	2.02	1.97	1.99	2.06	2.01
2.01	1.97	2.00	1.95	1.99	1.99	2.04	2.02	2.10	2.02

- b) A double sampling plan is as follows :

Select a sample of 2 from a lot of 20. If both the articles inspected are good then accept the lot. If both are defective then reject the lot. If one is good and one is defective, take a second sample of one article. If article in second sample is good, accept the lot. If it is defective reject the lot. If the lot with 20% defectives are present in the lot submitted then what is the probability of acceptance of lot? Compute by method that is theoretically correct and verify by approximation method. **[10]**

- c) For the following data, calculate the sample size and AOQ for a single sampling plan. **[5]**

- i) Probability of acceptance for 0.4% is 0.558.
- ii) Lot size $N = 10,000$ units.
- iii) Acceptance number $c = 1$.
- iv) $n_p = 1.5$.
- v) Detectives found in the sample are not to be replaced.



P1546

[3665]-776

**M.E. (Printing Engineering and Graphic Communication)
WORKFLOW MANAGEMENT IN PRINTING INDUSTRY
(2008 Course) (Elective - I) (508104 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) Assume suitable data wherever necessary.*
- 5) Figures on right indicate marks.*

SECTION - I

- Q1)** a) Suggest ideal process for a Digital Prepress Setup for a Printing Press. **[15]**
b) Elaborate on comparative benefits achieved with digital prepress workflow against conventional prepress workflow. **[10]**
- Q2)** a) Short Notes :
i) Preflight checks in Prepress workflow. **[7]**
ii) Job proofing and correction process. **[7]**
b) Write briefly about RIPing systems. **[11]**
- Q3)** a) Elaborate the process of job estimating and explain the elements involved in job estimation process. **[15]**
b) Customer communication handling in prepress workflow and its importance. **[10]**

SECTION - II

- Q4)** a) Infrastructural requirements for setting up Hardware for Digital Prepress. **[10]**
b) Software setup for use with Digital workflow. **[15]**

- Q5)** a) Standardization of print workflow - its need and process. **[15]**
b) Briefly explain the JDF format and its significance in Print Production Format (PPF). **[10]**
- Q6)** a) Explain different types of workflows with neat diagrams and latest developments in workflow management systems. **[15]**
b) Explain various components of financial management system and its role in printing industry. **[10]**



Total No. of Questions : 6]

[Total No. of Pages : 2

P1547

[3665]-777

M.E. (Printing Engg. & Graphic Communications)

PRINTING AND PACKAGING MATERIALS

(2008 Course) (508104B)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Answer any two questions from each sections.*
- 2) Answers to the two sections must be written in separate answer papers.*
- 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) Explain the Utilization of computer for Conventional Printing Process. **[10]**

b) Explain the workflow of Gravure Cylinder preparation. **[15]**

Q2) a) Write comment on substrate-ink interaction and its effect on printability. **[9]**

b) Mention the properties and applications of the following (any two):**[8]**

i) PET.

ii) HDPE.

iii) BOPP.

c) Explain the importance of surface smoothness and roughness and describe one of the methods of measurement. **[8]**

Q3) a) Explain the identification tests for polyethylene. **[16]**

b) Explain the tearing, burning and solubility tests for polyester. **[9]**

P.T.O.

SECTION - II

- Q4)** a) Explain the inks used for printing, its basic composition and role of vehicle. [9]
b) Compare solvent based inks and water based inks. [8]
c) Describe good and bad wetting conditions in printing of nonporous substrates such as BOPP, LDPE, HDPE and the main defects caused by poor ink formulation. [8]
- Q5)** a) Explain different tests carried out for packaging materials. [9]
b) Co-relate mechanical strength, tensile strength and modulus of elasticity for printing materials. [8]
c) How COF plays role in the selection of material? [8]
- Q6)** a) Explain the effect of viscosity on print quality. [9]
b) State the causes and remedies of the following (any two) : [8]
i) Mottling.
ii) Striations.
iii) Improper Adhesion of Ink and substrate.
c) Explain different tests carried out on supplied viscosity. [8]



Total No. of Questions : 6]

[Total No. of Pages : 2

P1549

[3665]-779

M.E. (Printing Engineering & Graphic Communication)

DIGITAL PRINTING

(2008 Course) (508105 A) (Elective - 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) Assume suitable data wherever necessary.*
- 5) Figures on right indicate marks.*

SECTION - I

- Q1)** a) Explain electrophotography, its principles, image generation and toners. [15]
- b) What is re-imageable DI technology? Give different technologies used for re-imageable DI. [10]
- Q2)** a) Give types of screening techniques used for digital halftone generation. Explain the AM screening technologies. [8]
- b) Compare PS and PDF. Which are levels of PDF-X and what are the differences? What care should be taken to make the job PDF-X compliant. [9]
- c) What is color management? What are different color rendering intents and their importance? [8]
- Q3)** a) Explain the digital proofing systems. Write briefly about soft and hard proofs and write about color transformation mechanisms in each case. [15]
- b) What is preflight in digital printing? Write advantages of preflighting with respect to digital printing. [10]

P.T.O.

SECTION - II

- Q4)** a) Write about image quality assessment methods, their tools and procedures. [10]
b) Short notes :
i) SWOP. [7]
ii) UGRA/FOGRA digital print control strip. [8]
- Q5)** a) What are POD and VDP? Explain them with their uses, features and advantages. [12]
b) Which are the specialty applications, those are or can be developed with the help of digital printing technology? How a digital printing technology is used in those cases? [13]
- Q6)** a) State the importance of eco-friendliness in digital printing? What are different companies doing to improve eco-friendliness of their digital printing machines. [14]
b) What are modern developments in digital printing presses/machines? [11]



Total No. of Questions : 6]

[Total No. of Pages : 2

P1550

[3665]-780

M.E. (Printing)

ENTREPRENEURSHIP IN PRINTING AND ALLIED FIELDS

(2008 Course) (508105 (B)) (Elective - II) (Sem. I)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) All questions carry equal marks.*
- 2) Answers to the two sections should be written in separate books.*
- 3) Solve any two questions from section I and II out of three.*
- 4) Figures to the right indicate full marks.*

SECTION - I

- Q1)** a) Classify the print production activities. Explain the workflow of each of these print production activity with suitable examples. [9]
- b) Define Production Management. Explain the functions of a production manager. [8]
- c) What are the reasons for success and failure of enterprise? [8]
- Q2)** a) Explain the Press and Registration of Books act, 1967 along with its scope and limitations. [9]
- b) Enumerate the interaction PPC will have with other departments such as marketing, finance, purchase, design, quality and personnel. [8]
- c) Explain the copy right act, 1957 along with its scope and limitations.[8]
- Q3)** a) What do you understand by the term Product Life Cycle? How will you manage the product in the Product Life Cycle? [9]
- b) Describe the need for new product development in the emerging industrial ambience. Trace the steps involved. Explain each step. [8]
- c) Define materials management. Explain various functions of materials management. [8]

P.T.O.

SECTION - II

- Q4)** a) Explain need, purpose and objectives of MIS in brief. MIS is an instrument for the organizational change-Explain. [9]
- b) What is ERP? Explain the prerequisites for implementations of ERP systems. [8]
- c) What is Standard Costing? Explain the structure of standard cost with reference to composite machine hour rate. [8]
- Q5)** a) ‘Organizations view the abilities of their operations as a core competence and a distinctive capability’, Explain. [9]
- b) Define Manpower Planning, its objectives and short term manpower planning with suitable examples. [8]
- c) ‘The role of purchasing is now one of supply management’, comment on this statement. [8]
- Q6)** a) Define International Business, and explain the process of International Financing. [9]
- b) Who is a Consumer? What are his rights? What reliefs are available to him under Consumer Protection Act of 1986? [8]
- c) Comment on the statement, ‘All contracts are agreements, but all agreements are not contracts’. [8]



P1551

[3665]-781

**M.E. (Printing Engineering & Graphic Communication)
QUALITY CONTROL SYSTEM AND PRODUCTIVITY
(2008 Course) (Elective - II) (508105 C)**

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) Answer the following :

- a) Explain the major printing processes along with variables involved w.r.t to followings Substrate, ink, image carrier and applications. **[15]**
- b) Explain the role of post press operations in printing industry with suitable example. **[10]**

Q2) Answer the following :

- a) With references to press activity; explain the needs of methods of Calibration and Standardisation. **[10]**
- b) Explain different standards followed in printing industry and how these standards are implemented. **[15]**

Q3) Answer the following :

- a) Explain the meaning of Colour Space and Colour Gamut in context with printing industry. **[10]**
- b) Explain in detail various quality control aids followed in printing industry. **[15]**

SECTION - II

Q4) Answer the following :

- a) Explain the concept of Six Sigma with respect to printing industry. [15]
- b) Define quality and state its objectives. Explain in detail, Quality specification and Quality assurance. [10]

Q5) Answer the following :

- a) In a capacity study of a punching machine used in preparing the cartons with the specification of 23.75 ± 0.10 mm, a sample of 5 consecutive pieces was taken each day for 5 days. The dimensions in mm of these cartons are given below. Construct X & R chart. State whether the machine is capable of meeting the tolerance or not. [10]

$$d_2 = 2.326, A_2 = 0.58, D_3 = 0, D_4 = 2.11$$

1 st day	2 nd day	3 rd day	4 th day	5 th day
23.80	23.78	23.78	23.78	23.76
23.77	23.76	23.76	23.70	23.76
23.79	23.78	23.77	23.77	23.74
23.75	23.79	23.73	23.74	23.72
23.78	23.80	23.75	23.76	23.79

- b) 10 Printed samples of size 100 were studied critically for total number of defectives in it. The details of number of defectives in each sample is given below. [7]

Sample No.	1	2	3	4	5	6	7	8	9	10
No. of Defectives	2	1	1	3	2	3	4	2	2	0

All samples are 'Accepted' by Quality control Department of the company. Construct a control chart for the number of defects and comment on the result.

- c) 10 samples each of size 50 of offset machine blowers were tested in pressure testing. The results of the inspection are given below. [8]

Sample No.	1	2	3	4	5	6	7	8	9	10
No. of Defects	2	3	2	0	2	3	2	1	2	3

Draw P chart and state conclusion.

Q6) Answer the following :

- a) Perform the **ANOVA** and find **F** values for Graphica 771, offset machine parameters as mentioned below. **[15]**

Ex. No.	Surface Temp.	Pressure (Plate and Blanket)	pH (Damp.Sol.)	Response (Yellow Print Density)
1	(-)22	(-)0.08	(-)5.2	1.22
2	(-)22	(-)0.08	(+)5.6	0.88
3	(-)22	(+)0.10	(-)5.2	1.17
4	(-)22	(+)0.10	(+)5.6	1
5	(+)27	(-)0.08	(-)5.2	1.04
6	(+)27	(-)0.08	(+)5.6	1.16
7	(+)27	(+)0.10	(-)5.2	0.92
8	(+)27	(+)0.10	(+)5.6	0.89

- b) Explain the meaning of process capability in context with printing industry. Determine whether the process is capable or not based on following data.

Target value = 27.2 ± 0.3 , Standard deviation = 0.9, Observed mean of process output = 27.23. Also calculate process capability index and conclude the result. **[10]**



P1553**[3665]-784**

M.E. (E & TC) (Signal Processing)
SIGNAL PROCESSING TECHNIQUES
(2008 Course) (504502)

*Time : 3 Hours]**[Max. Marks : 100**Instructions to the candidates:*

- 1) Answer any three questions from section-I and any three questions from section-II.
- 2) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
- 3) Assume suitable data, if necessary.

SECTION - I

Q1) a) Input to discrete-time L.T.I system is given by **[12]**

$$x(n) = \left(\frac{1}{2}\right)^n u(n) - \frac{1}{4} \left(\frac{1}{2}\right)^{n-1} u(n-1) \text{ and}$$

the out put is

$$y(n) = \left(\frac{1}{3}\right)^n u(n).$$

- i) Determine the impulse response $h(n)$ and the system function $H(z)$ of a system.
 - ii) Find the difference equation.
 - iii) Determine a realization of the system that requires the minimum possible amount of memory.
 - iv) Determine if the system is stable?
- b) Compute the response of the system. **[6]**
 $y(n) = 0.7 y(n-1) - 0.12 y(n-2) + x(n-1) + x(n-2)$ to the input
 $x(n) = n u(n)$. Is the system stable?

Q2) a) Compute 8-pt F.F.T using D.I.T algorithm of a Hamming window. **[8]**

b) Compute the 8-point circular convolution for the following sequences.

$$x_1(n) = \{1, 1, 1, 1, 0, 0, 0, 0\}$$

$$x_2(n) = \sin \frac{3\pi}{8} n ; 0 \leq n \leq 7. \quad \text{[8]}$$

Q3) a) Prove that for F.I.R filter if z_1 is a zero or root of F.I.R system $H(z)$ then $1/z_1$ is also zero or root. **[6]**

P.T.O.

- b) Design a F.I.R low pass filter using window method from the following specifications. [10]

Cut off frequency $f_c = 2000$ Hz.

Sampling frequency $F_s = 8000$ Hz.

Transition Bandwidth $\Delta f = 3000$ Hz.

Stop band attenuation $A_s = 41$ dB.

- Q4)** a) Design a F.I.R high pass filter with following desired frequency response. [8]

$$H_d(e^{jw}) = \begin{cases} 0 & ; -\pi/4 \leq w \leq \pi/4 \\ e^{-j4w} & ; \pi/4 < |w| \leq \pi \end{cases}$$

Determine the filter coefficients $h_d(n)$ if the window used is Hanning window.

- b) Realize F.I.R filter with minimum numbers of multipliers in direct form and cascade form. For the transfer function of an F.I.R filter given by

$$H(z) = \left(1 - \frac{1}{4}z^{-1} + \frac{3}{8}z^{-2}\right) \left(1 - \frac{1}{8}z^{-1} - \frac{1}{2}z^{-2}\right). \quad [8]$$

SECTION - II

- Q5)** a) Explain frequency warping effect in IIR filter design. [6]
 b) Explain analog frequency transformation techniques used in IIR filter design. [6]
 c) Convert the analog filter into a digital filter whose system function is

$$H_a(s) = \frac{s + 0.4}{(s + 0.4)^2 + 16} \text{ using impulse invariant method.} \quad [6]$$

- Q6)** a) Show that for $N = 7$ and $\Omega_c = 1000\pi$, position of poles for Butterworth filter are on the circle in s-plane. [8]
 b) Design a F.I.R filter using frequency sampling method for $M = 15$ which has a symmetric unit sample response and a frequency response that satisfies the conditions. [8]

$$H_r\left(\frac{2\pi k}{15}\right) = \begin{cases} 1 & k = 0, 1, 2, 3 \\ 0.4 & k = 4 \\ 0 & k = 5, 6, 7 \end{cases}$$

Q7) a) Explain why impulse invariant method is not suitable for designing high pass filter. [6]

b) Obtain the direct form-II, cascade and parallel structures for the following system having output.

$$y(n) = \frac{3}{4} y(n-1) - \frac{1}{8} y(n-2) + x(n) + \frac{1}{3} x(n-1). \quad [10]$$

Q8) a) A digital low pass filter require to meet the following specification. [10]

Pass Band ripple : ≤ 1 dB

Pass Band edge : 1 kHz

Stop Band attenuation : ≥ 40 dB

Stop Band edge : 6 kHz

i) Find order N for Butterworth filter.

ii) Find filter coefficient a_k and b_k .

iii) Realize filter in direct form-II structure.

b) Explain why it is not possible to design. Linear phase and stable IIR filter. [6]



P1555

[3665] - 789

M.E. (E & TC) (Signal Processing)
WIRELESS AND MOBILE COMMUNICATION
(2008 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) 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 need for air pressurized cables at the base station antennas. **[4]**
b) The Cellular Systems have migrated to smaller cells, in order to increase capacity. Name at least 3 design issues that become complicated because of this trend. **[6]**
c) Consider a channel with Rayleigh fading and averaged received power $P_r = 20$ dBm. Find the probability that the received power is below 10 dBm. **[6]**
- Q2)** a) What are the major attributes of CDMA system. **[4]**
b) Estimate the number of mobile users that can be supported by a CDMA system, using an RF BW of 1.25 MHz to transmit data at 9.6 kbps. Assume $E_b/N_0 = 6$ dB. The interference from neighbouring cell $\beta = 60\%$, the voice activity factor $\gamma = 50\%$ & the power control accuracy factor $\alpha = 0.8$. **[8]**
c) Explain the forward link traffic channel structure for RS2 of IS - 95 CDMA system. **[6]**
- Q3)** a) Write a short note on RAKE receiver. **[4]**
b) Justify that now a days most cellular systems are interference limited systems. **[4]**

P.T.O.

- c) Draw and explain the flow diagram for a CDMA call termination along with significance of pilot and synch channel. [8]
- Q4)** a) Derive the equation for total electric field at a distance 'd' away from the source, considering direct path and ground reflected signals. [8]
- b) Determine the critical distance for a 2-ray model in an urban microcell with $h_t = 10$ m, $h_r = 3$ m & an indoor microcell with $h_t = 3$ m & $h_r = 2$ m for $f_c = 2$ GHz. Comment on the result. [6]
- c) Why does minimizing the reuse distance, maximize the spectral efficiency of a cellular system. [2]

SECTION - II

- Q5)** a) Draw and explain the architecture of a second generation mobile cellular system. [8]
- b) Explain the need of GMSK type of modulation in a cellular system design. [4]
- c) A channel has a Doppler spread of 80 Hz. Find the time separation required in samples of the received signal, in order that they are approximately independent. [4]
- Q6)** a) Explain various Co-channel interference reduction techniques in GSM. [6]
- b) What do you mean by a Cluster? Draw a cluster for reuse factor $N = 3$ & $N = 7$. [4]
- c) A lossless half wave dipole antenna of $(173 + j 42.5) \Omega$ having directive gain of 2.15 dB is driven by a 10 V, 50Ω generator. Determine \vec{E} at a distance of 10 km in a plane perpendicular to the antenna. [8]
- Q7)** a) A person is driving a car on an highway. During the journey he calls his friend in the same MSC. Draw a flowchart for such a type of Call processing. [6]
- b) With the help of field equations for Hertzian dipole, relate the near field and far field with the frequency of operation. Show that at a distance of $\lambda/6$, both the fields become approximately equal. [6]
- c) Write a short note on Microstrip Antenna. [4]

- Q8)** a) Write the equations for S/I ratio in a 3 sector and 6 sector case. From these equations prove that for a cluster size $N = 7$, $S/I = 29$ dB for a 6 sector case and $S/I = 24.5$ dB in a 3 sector case. Also relate the 6 sector case with trunking efficiency. [8]
- b) Write a short note on Turbo Coding. [8]



P1556

[3665]- 626

M.E. (Production)

OPTIMISATION TECHNIQUES

(2008 Course) (Elective - IV) (Sem. - II) (511112)

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 neat sketch - 'constraint surface'. Show various points on it. [8]
- b) Sketch and explain - 'objective function surface'. [5]
- c) Match the following types of problems with their descriptions. [5]
- | | |
|-------------------------------------|--|
| (1) Geometric programming problem | (i) Classical optimisation problem |
| (2) Quadratic programming problem | (ii) Objective and constraints are quadratic |
| (3) Dynamic programming problem | (iii) Objective quadratic and linear constraints. |
| (4) Non linear programming problems | (iv) Objective and constraints arise from serial system. |
| (5) Calculus of variations problem | (v) Objectives and constraints are positive polynomials. |
- Q2)** a) For minimise $f(x) = 0.65 - [0.75/(1 + x^2)] - 0.65 x \tan^{-1} (1/x)$ in the interval $[0,3]$ by the Fibonacci method using $n = 6$, find resolution in accuracy in locating the optimum point. [8]
- b) Write a computer program, in the form of sub routine to implement golden section method. [8]

P.T.O.

- Q3)** a) Find the minimum of the function $f(\lambda) = 0.65 - \frac{0.75}{1 + \lambda^2} - 0.65 \lambda \tan^{-1} \frac{1}{\lambda}$ using the Newton-Raphson method with the starting point $\lambda_1 = 0.1$. Use $\epsilon = 0.01$ for checking the convergence. [8]
- b) Write a program, inform of subroutine to implement the secant method. [8]
- Q4)** Write a computer program to implement : [16]
- a) Powell's method for one dimensional search.
- b) Steepest descent method for one dimensional search.

SECTION - II

- Q5)** a) Discuss the characteristics of a constrained problem. [6]
- b) Discuss generalised reduced gradient method. [10]
- Q6)** a) Discuss BALA's algorithm for zero-one programming problems. [9]
- b) Discuss how unconstrained GP problem are solved by using calculus. [9]
- Q7)** a) Draw the flow chart for simulated Annealing. [8]
- b) How GA differs from the traditional methods of optimisations. [8]
- Q8)** a) Explain how the genetic operators are implemented during the numerical optimisation. [8]
- b) What are the difficulties with classical optimisation algorithms. [8]



P1558

[3665] - 632

M.E. (Computer & Computer Network)
PRINCIPLES AND PRACTICES FOR IT MANAGEMENT
(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) Your answers will be valued as a whole.*
- 6) Assume suitable data, if necessary.*

SECTION - I

Q1) You are a project manager for Dummy company. You are suppose to host webserver for your company currently you have website hosted by third company. The average monthly band width transferred is roughly 8 gigabytes. You are suggesting vendor for deployment of webserver. Your company have it's T1 line & manager is concerned for additional band width req.

- a) Create a executive summary for above project. **[4]**
- b) Based on the above, create an opening statement for your presentation to management. **[3]**
- c) Write report of the feasibility study you might carry out when you will be incharge of above project. **[3]**
- d) Write minutes of meeting for kick-off meeting. **[2]**
- e) Write down estimations for above project. **[2]**
- f) Which approach will be better Bottom-up estimating or Top-down. **[2]**

Q2) In the ship operations noise monitoring is important we have now a days electromechanical systems to carryout this. But your shipping company decided to upgrade that & use current technology of wireless sensor networks. For this you are working as manager. You have decided to deploy appropriate motes (nodes) to sense vibrations of the machineries & then after some signal processing, information will be forwarded to sink node. From there it will be transmitted to company webserver via satellite. The officer incharge at ground station will take the appropriate action to control total noise pollution on board and in the sea. **[18]**

P.T.O.

- a) Write down WBS for above mentioned project.
 - b) Create the PND.
 - c) Write down the project plan.
 - d) Provide your action plan on the delay.
- Q3)** a) Write down the scope statements for following problem definitions. [8]
- i) Inventory control of the automobile industry.
 - ii) On line examination system for first year students.
- b) What is meant by 'risk'? Comment on risk management in IT Information Technology projects. [8]
- Q4)** Write short notes on (any 4) : [16]
- a) Supply chain management.
 - b) Customer relationship.
 - c) Health care software development.
 - d) Banking project management.
 - e) Quality control in IT projects.

SECTION - II

- Q5)** a) Discuss any four functions of management. [8]
- b) In your opinion what are the social responsibilities of the business in our country? Whether and how the IT sector is full filling these? [10]
- Q6)** a) Discuss the steps involved in Energy management for any business? What sort of incentives are offered by the Electricity companies for energy Efficiency implementation. [8]
- b) By the application of IT what improvement can you foresee in the near future in one of the following sectors in India, Transportation, Agriculture, Water Management. [8]
- Q7)** a) How does group dynamics help in business? State the possible advantages through team working. [8]
- b) What are the reasons leading to stress in a business organisation? How can it be taken care off? [8]
- Q8)** a) Explain the possible reasons for the requirement of review of I.T. projects.[6]
- b) Differentiate between formal Groups & Informal Groups. [6]
- c) Discuss the qualities required for a team leader. [4]



P1563

[3665]-642

**M.E. (Computer/Computer Networking)
HIGH PERFORMANCE DATABASE SYSTEMS
(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.*

SECTION - I

- Q1)** a) Explain TP-Monitor architecture and TP-Monitor components with neat diagram? [8]
b) Explain in detail tunable parameters? [8]
- Q2)** a) Let R and S be the relations with no indices, and assume that the relations are not sorted. Assuming infinite memory, what is the lowest cost way (in terms of I/O operations) to compute $R \bowtie S$ (Natural join)? What is the amount of memory required for this algorithm? [8]
b) Explain : DBMS buffers, Cache. [8]
- Q3)** a) Draw a wait-for graph indicating a deadlock. Explain three actions that need to be taken for recovery from deadlock. Also explain any one method for dealing with deadlock in a distributed system. [8]
b) In a database system using write-ahead logging. What is the worst-case number of disk accesses required to read a data item from a specified disk page. Explain why this presents a problem to designers of real time database systems. [6]
c) Is a high-performance transaction system necessarily a real-time system? Why or why not. [2]
- Q4)** a) Explain the two types of view used in multidimensional model. Also discuss about types of tables and schema used in multidimensional model. [8]
b) Suppose that a datawarehouse consists of the three dimensions time, doctor and patient and two measures count and charge, where charge is the fee that a doctor charges a patient for a visit. [8]

P.T.O.

- i) Enumerate three classes of schemas that are popularly used for modelling datawarehouses.
 - ii) Draw a schema diagram for the above dataware-house using one of the schema classes listed in (i).
 - iii) Starting with the base cuboid [day, doctor, patient], what specific OLAP operations should be performed in order to list the total fee collected by each doctor in 2008?
- c) Explain in brief BI? [2]

SECTION - II

- Q5)** a) Explain : SQL3, SQL extension for XML. [8]
 b) Explain different data transformation techniques with examples? [8]
- Q6)** a) Explain an algorithm for finding frequent itemsets? [8]
 b) Assume that the following set of six records : [8]
 (7, 55), (21, 202), (25, 220), (12, 73), (8, 61) and (22, 249) are given.
- i) Assuming that all six records belong to a single cluster, compute its center and radius.
 - ii) Assume that the first three records belong to one cluster and the second three records belong to a different cluster. Compute the center and radius of the two clusters.
 - iii) Which of the two clusterings is 'better' in your opinion and why?
- Q7)** a) Show by giving a DTD, how to represent the non-1NF for following book relation using XML. [8]

TITLE	AUTHOR-ARRAY	PUBLISHER {NAME, BRANCH}	KEYWORD SET
Database	{Korth, Sudarshan}	{Mc Graw, New Delhi}	SQL, XML
Network	{Jones, Frick}	{Oxford, London}	Internet, Web

- b) Explain how multi-valued attributes are handled in OR databases? [4]
 - c) What is valid time and transaction time in temporal database? [4]
- Q8)** Write short note on (any 3) : [18]
- a) Main memory databases.
 - b) Hibernate.
 - c) Multi attribute indexing.
 - d) Materialized views.



Total No. of Questions : 8]

[Total No. of Pages : 2

P1565

[3665]-645

M.E. (Comp.)

PATTERN RECOGNITION AND MACHINE VISION

(2008 Course) (Elective - III) (510111(B))

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) Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) What is the use of discriminant function? Explain the functional structure of general statistical pattern classifier with diagram. Define it for minimum error rate classification. [10]
b) Discuss with suitable example the unbiased estimation model. [6]
- Q2)** a) Explain the nearest neighbour approach for multcategory classification. Give suitable example. [10]
b) How Bayesian estimation technique can be used to calculate a posteriori density and the desired probability density? [8]
- Q3)** a) Describe the pattern classification problem using Manhattan distance discriminant function. [8]
b) Define within-class scatter matrix and between-class scatter matrix. Discuss the discriminant analysis for 2-class problem. [8]
- Q4)** a) Explain the projective transformation for Image formation. [8]
b) Describe the EM algorithm for Image Segmentation with suitable example. [8]

P.T.O.

SECTION - II

- Q5)** a) What is tracking? What are its applications? State and discuss linear 1-D Kalman filter for motion estimation. [10]
b) Define and discuss the use of fundamental (F) matrix for locating epipoles and motion estimation. [8]
- Q6)** a) Discuss the optical flow estimation using suitable algorithm. [8]
b) Define path coherence function. Explain the tracking of an object or a feature using path coherence function. [8]
- Q7)** a) Explain the Image correspondence using stereo data fusion approach with multi-scale edge matching. [8]
b) What are Geometric Invariants? Discuss in brief object recognition using geometric hashing. [8]
- Q8)** a) Explain the following w.r.t. object recognition : [8]
i) Invariant for plane figures.
ii) Affine Invariants for co-planar point.
b) Explain with example a pose clustering method for object recognition. [8]



P1566**[3665] - 650****M.E. (Computer Engg.)****DATA WAREHOUSING AND DATA MINING****(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) *Your answers will be valued as a whole.*
- 6) *Assume suitable data, if necessary.*

SECTION - I**Q1)** Consider the data in the following table.**[18]**

Name	Gender	Height	Class
MEENA	F	1.6	SHORT
MILIND	M	2.0	TALL
JYOTI	F	1.9	MEDIUM
SURUCHI	F	1.88	MEDIUM
NEHA	F	1.7	SHORT
NILESH	M	1.85	MEDIUM
YOGITA	F	1.6	SHORT
SATISH	M	1.7	SHORT
MANOJ	M	2.2	TALL
NITIN	M	2.1	TALL
ANAGHA	F	1.8	MEDIUM
VASANT	M	1.95	MEDIUM
SEEMA	F	1.9	MEDIUM
PRATIBHA	F	1.8	MEDIUM
RUPALI	F	1.75	MEDIUM

To facilitate classification, suppose the height attribute is divided into following six ranges

(0,1.6], (1.6,1.7], (1.7,1.8], (1.8,1.9], (1.9, 2.0], (2.0, ∞)

P.T.O.

To what class the Bayesian classifier will classify the new tuple <PRAKASH, M, 1.95>? Justify your answer by providing the details of the steps that will be followed by the Bayesian classifier.

Q2) a) What is Sampling? Explain ‘Random sampling’ with and without replacement and ‘stratified sampling’ techniques. [6]

b) Suppose that the data for analysis include the attribute age. The age values for the data tuples are: 13, 15, 16, 16, 19, 20, 20, 21, 22, 22, 23, 25, 25, 25, 30, 33, 33, 35, 35, 35, 35, 36, 40, 45, 46, 52, 70. [10]

i) Plot an equivalent histogram of width 10.

ii) Using sample size of 5 and strata “young”, “middle-age” and “senior”. sketch the three sampling techniques you discussed in Q 2 (a) above.

Q3) a) What do you mean by attribute selection and instance selection? Draw a flow chart to summarize the “forward selection” and “backward elimination” procedures used for attribute selection. [8]

b) W.r.t. the data provided in Q 2 (b) above. [8]

i) Use min-max normalization to transform the value 35 for age onto the range [0.0, 1.0].

ii) Use smoothing by bin means to smooth the data. using a bin depth of 3. Illustrate your steps.

Q4) a) Explain the k-means clustering algorithm. [8]

b) Show the dendrograms created using i) Single link, ii) Complete link and iii) Average link techniques using following adjacency matrix. [8]

Item	A	B	C	D	E
A	0	1	2	2	3
B	1	0	2	4	3
C	2	2	0	1	5
D	2	4	1	0	3
E	3	3	5	3	0

SECTION - II

Q5) a) How a data warehouse different from a database? How are they similar? [6]

b) Suppose that a data warehouse consists of three dimensions time, doctor and patient and the two measures count and charge, where charge is the fee that a doctor charges a patient for a visit. [12]

- i) Draw the Star, Snowflex and Fact Constellation schemas for above data warehouses.
- ii) Starting with the base cuboid [day, doctor, patient], what specific OLAP operations should be performed in order to list the total fee collected by each doctor in the year 2008?

Q6) a) What is Data Mining? Explain the following data mining tasks using a real-life dataset that you are familiar with **[10]**

- i) Classification. ii) Clustering.
- iii) Characterization. iv) Association.

b) Describe challenges to data mining regarding i) data mining methodology, ii) User Interaction and iii) performance issues. **[6]**

Q7) a) Explain the following terms : **[12]**

- i) Spatial Data Mining. ii) Web Mining. iii) Text Mining.

b) Write a note on Web Usage Mining. **[4]**

Q8) a) What is Association Rule Mining? Explain the “Apriori” algorithm with suitable example. **[8]**

b) Draw a neat diagram showing architecture of a data mining system and explain. **[8]**



Total No. of Questions : 8]

[Total No. of Pages : 2

P1567

[3665]-659

M.E. (Computer Networking)

NETWORK PROGRAMMING

(2008 Course) (Elective - III) (510311) (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) Explain the TCP state machine with suitable diagram. Explain the handshaking process for three way and four way synchronisation. [8]
b) Explain the Karn's algorithm to avoid the problem of ambiguous acknowledgement. [8]
- Q2)** a) Write a server side & client side socket program for Echo server. The server must be capable of handling multiple concurrent connections make necessary assumptions. [10]
b) What is difference between echo client/server and Telnet client to communicate with echo server. [6]
- Q3)** a) What is socket abstraction? How an end points are identified? What are RAW sockets? What kind of application require raw sockets? [8]
b) Explain the Interface name and Index function with IB structure. [8]
- Q4)** a) Explain the difference between DNS and advanced DNS with respect to their functions & implimentations. [10]
b) Explain the fetching & printing a routing table entry process. Write first half of program to issue RTM-GET command on socket. [8]

P.T.O.

SECTION - II

- Q5)** a) Explain the IPv₆ addressing testing macros with suitable pseudocodes. [10]
b) What are multicast socket options? Explain. [6]
- Q6)** a) Compare and contrast unicasting, broadcasting and multicasting on a WAN & LAN. [10]
b) Explain the Primitives in 'Simple Network Time Protocol'. [6]
- Q7)** a) A company is granted a site address 301,80,64,0. The company needs to form a subnet, for four departments A,B,C,D of hosts as follows
A : 72 Hosts, B : 35 Hosts, C : 20 Hosts, D : 18 Hosts. Give a possible arrangement of subnet masks to make this possible. Suggest what the organisation might do if department D grows to 34 hosts. [10]
b) Write and explain with suitable code that uses a single mutex to lock the counter between the two threads. [8]
- Q8)** a) Explain the process of 'TCP preforked server' with suitable pseudocode. [10]
b) Explain 'Thread locking around accept'. [6]



P1568

[3665] - 662

M.E. (Computer) (Computer Networking)

CONVERGENCE TECHNOLOGIES

(2008 Course) (Elective - IV)

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) Relate and explain these two equations **$T=Bc/CIR$** & **$T=Be/Access$**
Rate related to Frame Relay traffic rate management. [8]
- b) Explain NT1, NT2, TE1, & TE2 ISDN functional groupings with their functions. Also give one example of each. [8]
- Q2)** a) What is the need of high bandwidth technologies? Compare various Broad Band technologies with their data link layer protocols. [8]
- b) X.25 and most other layer 3 protocols provide techniques for flow control and error control. Why are such features not provided in Q.931? [8]
- Q3)** a) Explain LAPF core protocol frame format (address field 4-bytes) [8]
- b) Suppose that AAL 5 is being used and that the receiver is in an idle state (no incoming cells). Then a block of user data is transmitted as a sequence of SAR-PDUs. [8]
- i) Suppose that a single bit error in one of the SAR-PDUs occurs. What happens at the receiving end?
 - ii) Suppose that one of the cells with SDU type bit= 0 is lost. What happens at the receiving end?
 - iii) Suppose that one of the cells with SDU type bit= 1 is lost. What happens at the receiving end?

P.T.O.

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

- a) GFC algorithm in ATM.
- b) SS7 Protocol Architecture.
- c) Rate-based & windows-based control for BECN.
- d) Difference between AAL 3/4 & AAL 5.

SECTION - II

Q5) a) How the drawbacks of Circuit Emulation Service (CES) are removed in Dynamic Bandwidth Circuit Emulation Service (DBCES)? **[8]**

b) Derive the formula **BT=(MBS-1) / (1/SCR) - (1/PCR)**. **[8]**

Q6) a) Explain the features and benefits of VOIP. **[8]**

b) Explain various types of media gateways that are controlled by MGCP. Also explain in brief the interconnection of MGCP with PSTN, H.323 & SIP. **[8]**

Q7) a) Discuss various pros & cons of G.711, G.726 & G.729 speech codec. **[8]**

b) Explain a call setup based on SIP signalling. **[8]**

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

- a) IP Telephony Architecture.
- b) H.323 Terminal.
- c) ATM signalling - call release.
- d) Q.2931 Message header.



P1569**[3665]-663****M.E. (Chemical)****APPLIED STATISTICS FOR CHEMICAL ENGINEERING
(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)** The distribution of lengths of wooden logs is given below - **[18]**

Length in cm :	60-61	61-62	62-63	63-64	64-65	65-66	66-67
No. of logs :	8	11	17	22	19	13	10

- a) Find the mean, mode and median of the distribution.
 - b) Find M.D., S.D. & Variance.
 - c) Find Karl Pearson and Bowley's coefficient of skewness. Comment on symmetry of the distribution.
- Q2)**
- a) In a large city A, 20% of a random sample of 900 school boys had a slight physical defect. In another large city B, 18.5% of a random sample of 1600 school boys had the same defect. Is the difference between the proportions significant? Take $Z_{\alpha} = 1.96$. **[4]**
 - b) A sample of 100 students is taken from a large population. The mean height of the students in this sample is 160 cm. Can it be reasonably regarded that, in the population, the mean height is 165 cm & the SD is 10 cm? Take $Z_{\alpha} = 2.58$. **[4]**
 - c) In a random sample of size 500, the mean is found to be 20. In another independent sample of size 400, the mean is 15. Could the samples have been drawn from the same population with SD 4? Take $Z_{\alpha} = 2.58$. **[4]**

- d) The SD of a random sample of 1000 is found to be 2.6 and the SD of another random sample of 500 is 2.7. Assuming the samples to be independent, find whether the two samples would have come from populations with the same SD. Take $Z_{\alpha} = 1.96$. [4]
- Q3)** a) Define Statistical hypothesis, null hypothesis, alternative hypothesis, level of significance & test of significance. [6]
- b) If θ_0 is a population parameter and θ is the corresponding sample statistic, then set up the null hypothesis and alternative hypothesis (both left and right tailed). [5]
- c) With suitable examples explain type I and type II errors in testing the hypothesis which of these errors represent the LOS. [5]
- Q4)** a) It is observed that 20% of a manufactured product is of top quality. In one day's production of 400 articles, only 50 are of top quality. Show that either the production of the day chosen was not a representative sample or the hypothesis of 20% was wrong based on the particular day's production find also the 95% confidence limits for the percentage of top quality products. Take $Z_{\alpha} = 1.96$. [6]
- b) A cubical die is thrown 9000 times and a throw of 3 or 4 is observed 3240 times. Show that the die cannot be regarded as an unbiased one. Also find the extreme limits (i.e. $\mu \pm 3\sigma$) within which the probability of a throw of 3 or 4 lies. Take $Z_{\alpha} = 1.96$. [6]
- c) A sample of 100 students is taken from a large population. The mean height of the students in this sample is 160 cm. Can it be reasonably regarded that, in the population the mean height is 165 cm and the SD is 10 cm. Take $Z_{\alpha} = 2.58$. [4]

SECTION - II

- Q5)** a) Explain basic principles of design of experiments - randomisation, replication, and local control. [6]
- b) Explain the RBD and LSD designs of experiments. Compare these methods. Also state the ANOVA table for these designs. [10]
- Q6)** a) A completely randomised design experiment with 10 plots and 3 treatments gave the following results.

Plot No. :	1	2	3	4	5	6	7	8	9	10
Treatment :	A	B	C	A	C	C	A	B	A	B
Yield :	5	4	3	7	5	1	3	4	1	7

Find ANOVA table for this experiment; and state whether the effects of treatments A, B, C differ significantly.

Take $F_{5\%} (v_1 = v_2 = 2) = 19.35$. [10]

b) Explain CRD design of experiments. State ANOVA table for the same. [6]

Q7) a) A sample of computers of size 5 are selected from 3 makes A, B, C of computers and the frequency of repair during the first year of purchase is observed. The results are given below.

A	5	6	8	9	7
B	8	10	11	12	4
C	7	3	5	4	1

Determine whether there is significant difference in the durability of the 3 makes of computers. Take $F_{5\%} (v_1 = 2, v_2 = 12) = 3.88$. [10]

b) Explain 2 power, 2 factorial method of design of experiments. [6]

Q8) Write short notes on the following : [18]

- Transportation LP problem.
- Assignment LP problem.
- Simplex method for solving LP problem.



Total No. of Questions : 8]

[Total No. of Pages : 3

P1571

[3665]-670

M.E. (Chemical)

INDUSTRIAL POLLUTION CONTROL

(2008 Course) (Elective - 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) Explain Gaussian plume model and its limitations. [6]
- b) A power plant burns 5.45 tonnes of coal per hour and discharges the combustion products through a stack that has an effective height of 75m. The coal has a sulfur content of 4.2% and the wind velocity at the top of stack is 6 m/s. Determine the ground level concentration at a distance of 3 km downwind at the centreline of the plume and at a crosswind distance of 0.4 km on either side of the centreline. $\sigma_z = 170$ m, $\sigma_y = 280$ m. The atmospheric conditions are moderately to slightly stable. [8]
- c) Explain the phenomena of inversion. [4]
- Q2)** a) A multipay settling chamber handles $6\text{ m}^3/\text{s}$ of air at 20°C . There are 8 trays including the bottom surface, spaced 0.25 m apart. The chamber is 4 m long and 1m wide for particles of density 2000 kg/m^3 and sizes (i) $70\text{ }\mu\text{m}$ (ii) $25\text{ }\mu\text{m}$ calculate the residence time, the distance settled and the efficiency of collection. Is the tray spacing sufficient to collect all the particles of each size. Assume laminar flow. What will be the efficiency if the flow regime is turbulent in each case? [8]
- 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 can be used for controlling the same. [16]

- Q4)** a) Write a note on selection of treatment PFD. [6]
 b) A settling test was conducted in a 40 cm high cylindrical jar. The following data was obtained.

Interface height, cm	40	22	14	11	10	9	8.5
Time, min	0	5	10	15	20	25	30

The initial concentration of solids was 3000 mg/lit. Determine the thickner area if an underflow concentration of 20,000 mg/lit is desired. The sludge is to be settled in a continuous flow unit operated at a rate of 0.03 m³/s. [10]

SECTION - II

- Q5)** a) Ordinary municipal wastewater is to be treated by the conventional activated sludge process. The design loading is 0.1m³/s and 250 mg/L BOD. The design criteria and operating values of the conventional process are as follows :

BOD removal = 90%

Organic loading = 0.5kg BOD/day per kg MLVSS,

The target for MLSS in aeration tank = 2000 mg/L

Excess sludge production = 0.5 kg sludge solids per kg BOD destroyed.

Air flow rate = 100 m³/day per kg BOD/day,

Final settling tank overflow rate = (30 m³/day)/m² surface,

Solids concentration in recycled sludge = 10,000 mg/L

Solids conc. in effluent leaving the system = 25 mg/L

Calculate i) Aeration period

ii) Amount of solids leaving the system.

iii) Amount of BOD destroyed.

iv) Air flow requirement.

v) Surface area of the settling tank. [10]

- b) Explain the following advanced wastewater treatment processes. [8]

i) Reverse Osmosis.

ii) Solvent extraction.

- Q6)** a) Derive an equation for finding the concentration of substrate in the effluent in a complete mix reactor without recycle. [8]
b) Write short notes on the following : [8]
i) Deep well injection.
ii) Gases and leachates in land fill.
- Q7)** a) With neat sketches explain the variations in activated sludge process with reference to aeration, stabilization, mixing etc. [6]
b) Find the theoretical diameters of two trickling filters in a two stage trickling filter process for an installation with the following requirements and characteristics. [10]
i) A flow of 6 mgal/d with a BOD_5 of 210 mg/L.
ii) To maintain stream standards the effluent BOD_5 must be equal to or less than 21 mg/L.
iii) Both the filter depths are to be 5 ft with recirculation ratio of 2:1 and $E_1 = E_2$.
iv) Use NRC two-stage trickling filter loading criteria.
Also find the organic loading/ 10^3 ft³ and hydraulic loading to each filter.
- Q8)** a) Explain incineration and composting. [8]
b) Write a note on sources and classification of solid wastes. [8]



P1573**[3665]-675**

M.E. (Chemical Engineering)
ADVANCED TRANSPORT PHENOMENA
(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) *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 is Lennard-Jones Potential. **[4]**
b) Derive the analog of Hagen-Poiseuille's equation for Ostwald-de Wade model (Power law). **[12]**
- Q2)** a) The analytical expressions for dot and cross products may be used to prove vector identities hence show that
$$[u \times [v \times w]] = v(u \cdot w) - w(u \cdot v)$$
 [8]
b) Explain Vector and Tensor components in curvilinear coordinates. **[8]**
- Q3)** a) Stating clearly all the assumptions, derive equation of continuity in three dimensional co-ordinate for a flow of fluid through isothermal system. **[9]**
b) Derive the equation for steady state viscous flow in a horizontal tube of radius r_0 , where the fluid is far from the tube inlet. The fluid is incompressible and μ is a constant. The flow is driven in one direction by constant pressure gradient. **[9]**
- Q4)** A flat plate heated to a temperature T_0 is suspended in a large body of fluid, which is at temperature T_1 . In the neighbourhood of the heated plate the fluid rises because of the buoyancy force. From the equations of change deduce

the dependence of the heat loss on the system variables. The physical properties of the fluid may be considered constant, except that the free convection form of the equation of motion should be used. [16]

SECTION - II

- Q5)** a) What are Ficks first and Second laws. Under what circumstances are they applicable. [6]
b) Explain multicomponent fluxes in terms of the transport properties.[10]
- Q6)** a) Find time-smoothed velocity distribution for turbulent flow in a long tube, using the prandtl mixing-length relation. The radius and length of the tube are R & L. [8]
b) Define instantaneous pressure, time smoothed pressure and pressure fluctuation. [8]
- Q7)** Air at 70 °F and 1 atm is to be pumped through a straight 2 in ID tube at a rate of 70 lbm/hr. A section of the tube is to be heated to an inside wall temperature of 250 °F to raise the air temperature to 230 °F. What heated length is required. [16]
- Q8)** Write short note on : [18]
a) Heat, Mass transfer and Momentum transfer analogies.
b) Binary Mass transfer coefficient in one phase.
c) Concept of wind chill temperature.



P1574**[3665]-676****M.E. (Chemical)****ADVANCED PROCESS CONTROL
(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) *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 basic principles of step response identification. [6]
b) With suitable examples, explain inverse response systems. [6]
c) Define controllability and observability of MIMO control systems. [6]
- Q2)** a) The impulse response of the process is given in the table below. Fit the First-order model to this data. [10]

Time (t_k) min	Impulse Response $g(t_k)$
0.5	3.03
1.0	1.84
1.5	1.12
2.0	0.68
2.5	0.41
3.0	0.25
3.5	0.15
4.0	0.09
4.5	0.06
5.0	0.03
5.5	0.02
6.0	0.01
6.5	0.008
7.0	0.005

P.T.O.

- b) From the model estimated in above example, sketch unit step response of the process. Also sketch the response if the process has dead time of 0.5 min. [6]

Q3) a) State properties and use of RGA for MIMO processes. [4]

- b) A 3×2 MIMO system has transfer function model. [12]

$$\begin{bmatrix} y_1 \\ y_2 \end{bmatrix} = \begin{bmatrix} \frac{0.5 \exp(-0.2s)}{3s+1} & \frac{0.07 \exp(-0.3s)}{2.5s+1} & \frac{0.04 \exp(-0.03s)}{2.8s+1} \\ \frac{0.004 \exp(-0.5s)}{1.5s+1} & \frac{-0.003 \exp(-0.2s)}{s+1} & \frac{-0.001 \exp(-0.4s)}{1.6s+1} \end{bmatrix} \times \begin{bmatrix} m_1 \\ m_2 \\ m_3 \end{bmatrix}$$

- i) Find RGA's for the subsystems -

$$y_1, y_2 \rightarrow m_1, m_2$$

$$y_1, y_2 \rightarrow m_1, m_3$$

$$y_1, y_2 \rightarrow m_2, m_3$$

- ii) Determine which subsystem offers the best control?

- iii) In the selected subsystem, determine the best pairing of input and output variable.

Q4) a) The output y of the process having transfer function G_{PI} (primary process) is controlled using a PID controller having transfer function G_{CI} (primary controller) by manipulating the input variable MV_1 of the process.

The manipulated variable is affected by another input variable MV_2 and this effect is represented by transfer function G_{PII} (i.e. secondary process). Draw block diagram of open-loop process and single-loop feedback control with $G_f = G_{m1} = 1$.

- b) If variations in input MV_2 of secondary process are controlled using feedback controller having transfer function G_{C2} (secondary controller), draw block diagram of such cascaded control system, clearly showing the primary and secondary control loops.
- c) Assuming $G_{m2} = G_f = 1$, for the secondary loop, derive the open-loop transfer functions for primary and secondary control loops.

- d) How will you tune the cascade controller.
- e) Sketch and explain cascade control strategy for controlling temperature inside the jacketed CSTR by manipulating flow rate of coolant liquid circulated through the jacket, with temperature of the coolant liquid as the secondary variable.

[16]

SECTION - II

- Q5)** a) Draw block diagram of single-loop feedback control system for the process having transfer function G_p disturbance d and output y .
- b) Derive the expression for estimation of disturbance $\bar{d}(s)$ in terms of approximate process model $\tilde{G}_p(s)$. Derive the expression for manipulated variable $\bar{m}(s)$ in terms of estimated $\bar{d}(s)$. Represent this IMC control strategy on suitable block diagram.
- c) State the conditions under which you will get perfect and offset-free control.
- d) Design IMC controller for a first order process having transfer function $G_p(s) = 5/8s+1$ using a first-order filter with $\lambda = 1$. Convert this controller to conventional feedback controller.

[16]

- Q6)** a) Explain the real time optimization (R.T.O) approach towards process control (i.e. optimal control). [8]
- b) Draw block diagram and explain MPC control strategy. Also state advantages of MPC over conventional feedback control strategy. [8]
- Q7)** a) Explain distinguishing issues related to plantwide control system. Also explain interaction of plant design and control system design. [8]
- b) Explain the strategy used for batch process control. [8]
- Q8)** Write short notes on the following : [18]
- a) ANN control systems.
 - b) Fuzzy logic tuned set-point weighted PID-controller.
 - c) State estimation control.



P1575

[3665] - 691

M.E. (Petroleum)

WELL TESTING AND ANALYSIS

(2008 Course) (512105) (Elective - 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) Derive the radial dimensionless Diffusivity Equation. **[25]**

Q2) What is an interference test, pulse test and fall-off test. **[25]**

Q3) Explain the Diagnostic Plot with 5 examples. **[25]**

SECTION - II

Q4) Explain different skin factors. **[25]**

Q5) Explain the DST and its analysis. **[25]**

Q6) What are type curves? How are they used? **[25]**



P1576**[3665]-702****M.E. (IT)****APPLIED ALGORITHMS****(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.*

SECTION - I

Q1) a) Define 'O' (Big-Oh), Omega and Theta notations used to specify time complexity. Using an example of $f(n) = 12n^5 + 13n^3 + 20$, specify the $g(n)$ for the above notations along with suitable constants.

What is the idea of tight lower and tight upper bound? **[8]**

b) Write notes on : **[8]**

- i) Persistence and multi-dimensional trees.
- ii) Randomized algorithms.

Q2) a) You are interested in analyzing some hard-to-obtain data from two separate databases. Each database contains n numerical values – so there are $2n$ values total- and you may assume that no two values are the same. You'd like to determine the median of this set of $2n$ values. However, the only way you can access these values is through queries to the databases. In a single query, you can specify a value k to one of the two databases, and the chosen database will return the k th smallest value that it contains. Give an algorithm that computes the median using at most $O(\log n)$ queries. **[10]**

b) Let G be a directed graph with n vertices. Let $\text{length}(u, v)$ be the length of the edge (u, v) . A path starting at a given vertex v_0 going through every other vertex exactly once and finally returning to v_0 is called as a tour. The length of the tour is the sum of the lengths of the edges on the path defining the tour. We are concerned with finding a tour of minimum

length. A greedy way to construct such a tour is : Let (P,v) represent the path so far constructed; it starts at v_0 and ends at v . Initially P is empty and $v = v_0$, if all vertices in G are on P , then include the edge $\langle v, v_0 \rangle$ and stop; otherwise include an edge $\langle v, w \rangle$ of minimum length among all edges from v to a vertex w not on P . Prove whether this greedy method necessarily generates a minimum-length tour. [6]

Q3) a) Let $G = (V, E)$ be a directed graph with nodes v_1, \dots, v_n . We can say that G is an ordered graph if it has the following properties : [8]

- i) Each edge goes from a node with a lower index to a node with a higher index. That is every directed edge has the form (v_i, v_j) with $i < j$.
- ii) Each node except v_n has at least one edge leaving it. That is, for every node $v_i, i = 1, 2, \dots, n-1$, there is atleast one edge of the form (v_i, v_j) .

The length of the path is the number of edges in it. We need to find the length of the longest path that begins at v_1 and ends at v_n . Does the following algorithm do the job? Prove your conclusion.

Set $w = v_1$

Set $L = 0$

While there is an edge out of the node w

Choose the edge (w, v_j) for which j is the smallest

Set $w = v_j$

$L = L + 1$

End while,

Return L as the length of the longest path.

b) Here is another way to find shortest path of a graph: [10]

Let $OPT(i, v)$ denote minimum cost of a v - t path using at most i edges.

If $i > 0$ then

$OPT(i, v) = \min (OPT(i-1, v), \min (OPT(i-1, w) + c_{vw}))$

c_{vw} is the cost of edge vw . The second minimum is over all vertices ' w ' that are connected to ' v '.

Develop the code for computing a solution based on the above formulation. Would this algorithm solve all graphs with negative edges?

Using this algorithm find length of the longest path for the problem in 3.a.

Q4) a) Write an algorithm to perform parallel addition using POINTER Doubling strategy. [8]

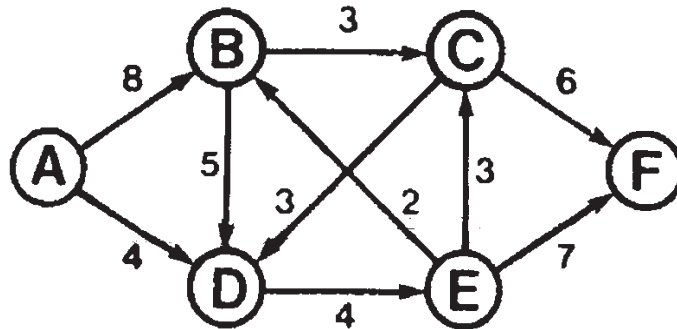
b) Write a parallel algorithm to compute 'All pairs Shortest path'. Is it Work Optimal? [8]

SECTION - II

Q5) a) Give a three-dimensional linear programming problem which illustrates the difference between the greatest increment and steepest descent column selection methods. [10]

b) Describe what happens if the simplex algorithm is run on a matrix with a column of all 0's. [6]

Q6) a) What paths are traced by the algorithm given in the text when finding the maximum flow in the following network? [10]



b) Write a program to find maximum flows in random networks with V nodes and about $10V$ edges. How many calls to *sparsepfs* are made, for $V = 25, 50, 100$? [6]

Q7) a) Suppose that vertices in a bipartite graph represent jobs and people and that each person is to be assigned to *two* jobs. Will reduction to network flow give an algorithm for this problem? Prove your answer. [8]

b) Implement the breadth-first search solution to the network flow problem, using *sparsepfs* (priority graph traversal algorithm). [8]

Q8) a) Give a “brute-force” method (which might require time proportional to N^2) for computing the Voronoi diagram. [8]

b) Write programs to solve the nearest-neighbor problem, first using the grid method, then using 2D trees. [10]



P1578

[3665] - 708

M.E. (Information Technology)
INFORMATION ASSURANCE AND SECURITY
(2008 Course) (514405 (A)) (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) Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Draw architecture and explain Model for network security? [8]
b) Explain more about the vulnerabilities of DES from the Internet. [8]
- Q2)** 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. [10]
b) Software, hardware, network, data, and peoples are the five important components of an information system. Which are the most directly affected by the study of computer security? Explain. [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) Cryptographic hash functions are commonly used for storing passwords. Examples include etc/passwd (using crypt or MD5) and LDAP (using SHA1). Why are encryption algorithms such as DES and AES not used for storing password. Explain. [8]
- Q4)** a) Define - passive and active attack? Explain the different types of passive and active attacks. [8]
b) Buffer overflows are one type of programming flaw exploited by hackers. What portion of memory is a real target in buffer overflow attack? What type of variable is targeted in a buffer overflow attack? [8]

P.T.O.

- Q5) a)** What is IDS? Explain in brief various types of IDS? [8]
b) In an RSA system, the public key of given user is $e=3$, $n=3599$. What is the private key of this user? [8]

SECTION - II

- Q6) a)** Explain three design goals for a firewall. What are the four techniques used by firewalls to control access and enforce a security policy? [10]
b) What is difference between worm and virus? Explain micro virus. List three names of system threat and program threat. [8]
- Q7) a)** Define Biometrics and distinguish between two broad categories of the techniques. [8]
b) How do you establish an e-mail and Web Surfing Policy? [8]
- Q8) a)** Explain in brief field of Authentication Header (AH) format. [8]
b) Explain in brief following hacker's tools: [8]
i) Root-kits.
ii) Vulnerability Scanners.
iii) Port Scanners.
iv) Sniffers.
- Q9) a)** Which are the system security levels defined in Orange Book? Which are the primary requirements of B1 standard? [8]
b) Define Cyber-law terms. Integrate concepts of Cyber-law into everyday business practices by reviewing Cyber-law Internet security issues. [8]
- Q10) a)** Explain various web security threats in brief. [8]
b) What are the different properties of Digital Signature? What requirement should a digital signature scheme satisfy? [8]



P1579

[3665]-704

M.E. (Information Technology)
ADVANCED OPERATING SYSTEMS
(Revised Course 2008)

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) *Answers to the two sections should be written in separate books.*
- 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) Discuss the two protocols that are used to ensure sequential consistency in a DSM system that uses the RMB strategy. [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) Discuss the desirable features of a good process migration mechanism. [8]
- Q3)** a) Describe the implementation of logical clocks using : [8]
i) Counters.
ii) Physical clocks.
b) What is a stub? How are stubs generated? Explain how the use of stubs helps in making an RPC mechanism transparent. [8]
- Q4)** a) What is the primary motivation behind the development of a light weight RPC system? Describe the four techniques used in a LRPC system that makes it more efficient than a conventional RPC system. [8]
b) Explain the four types of buffering strategies in a message passing system. [8]

SECTION - II

- Q5)** a) Explain the different issues involved in designing a load balancing algorithm. [8]
b) Describe the system architecture of Mach. State in brief the design goals of Mach. [8]
- Q6)** a) Describe Ricart-Agrawala's algorithms for implementing mutual exclusion in a distributed environment. Discuss how this algorithm satisfies the critical section requirements. State the drawbacks of this algorithm. [8]
b) What are the important issues to be considered in the design of an IPC protocol for a message passing system? [8]
- Q7)** a) Explain the three cache location policies. Which of these policies can be preferred to extend scalability and reliability? [8]
b) Explain the task assignment approach in resource management with the help of a suitable example. [8]
- Q8)** Write short notes (Any three) : [18]
a) Transparency.
b) Gifford Quorum protocol.
c) Granularity.
d) Unix emulation approach in Chorus.



P1581

[3665]-712

M.E. CSE (IT)

ADVANCED TRENDS IN DATABASE SYSTEM

(2008 Course) (514409)

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) Discuss the issue of transparency in a distributed database system? [8]
b) Define complete, minimal and relative predicates with example in the context of primary fragmentation of a distributed database. [8]
- Q2)** a) Which indexing is best suited for a data warehouse? [10]
b) Explain capacity planning and fine tuning of a data warehouse. [6]
- Q3)** a) Explain an algorithm to find association rules. [8]
b) Contrast the two styles of data mining, directed data mining (top down approach) and the undirected data mining (bottom up approach). [8]
- Q4)** Write short notes on any three : [18]
a) Business intelligence.
b) OLTP vrs OLAP.
c) Information filtering technology for exploring data in database.
d) Neural Network.

SECTION - II

- Q5)** a) Describe design and implementation issues in active database. [8]
b) What is a active database. Explain with an example. How is it different from an passive database? [8]

- Q6)** a) How can multiple inheritances in OO database lead to potential ambiguity. [8]
b) Explain the architecture of TP system and TP monitors. [8]
- Q7)** a) How does web crawler identify itself to a web server? Why is it important to do so? [6]
b) Explain the web crawler architecture in detail. [10]
- Q8)** Write short notes on any three : [18]
a) Heterogeneous databases and data integration.
b) R trees.
c) OR mapping classes and inheritance.
d) XML database.



Total No. of Questions : 10]

[Total No. of Pages : 2

P1583

[3665]-717

M.E. (IT)

MOBILE COMPUTING & M-COMMERCE

(2008 Course) (514411 (C)) (Elective - III)

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 the : IMEI, IMSI, TMSI and SIM. [8]
b) Why VLR regarded as distributed HLR? What particulars about mobile will you like to keep in the VLR database? [8]
- Q2)** 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) Define functions performed within the following procedure. [10]
i) Identification.
ii) Encryption and ciphering.
iii) Call Clearing.
iv) IMSI attach and detach.
v) Location Update.
- Q3)** a) Describe the GPRS architecture and protocols. How many of them already exist in GSM? [8]
b) Describe 3G networks, how is a 3G network different from 2G CDMA network. [8]

P.T.O.

- Q4)** a) What is the major difference between the main functionality of mobile-originated messaging and GSM call-origination procedures? [8]
b) Describe the following types of short messages : [8]
i) User Specific.
ii) ME Specific.
iii) SIM Specific.
- Q5)** Write a short note on (any two) : [16]
a) Mobile OS.
b) VLR Database Overflow.
c) EDGE.

SECTION - II

- Q6)** a) What do you understand by security algorithms and security protocols? What are the differences between them? How are they related? [10]
b) Explain the security framework for mobile computing. How do we ensure security in a mobile environment through Mobile VPN? [8]
- Q7)** a) Write a short note on m-commerce life cycle. [8]
b) What is Wi-Max? How it is different than Wi-Fi? [8]
- Q8)** a) Explain the relation between GSM/CDMA One and WAP. [8]
b) What are the design guidelines for WAP? What are disadvantages of implementing TCP/IP directly over mobile network? [8]
- Q9)** a) Explain framework for m-commerce and levels of framework. [8]
b) Explain at least 4 emerging applications of m-commerce. [8]
- Q10)** a) What is WAP Push? How is PUSH different from pull? [8]
b) What are the emerging issues in mobile commerce? [8]



P1586

[3665]-746

**M.E. (Environmental Engineering)
ENVIRONMENTAL CHEMISTRY
(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.*

SECTION - I

- Q1)** What are 26 principles and discuss their impact on cyclic pathways in the environments. **[16]**
- Q2)** Describe the adsorption of contaminants in soil and discuss soil pollution by mining. **[16]**
- Q3)** Give the classification of surfactants and pesticides and comment on the pollution due to pesticides. **[16]**
- Q4)** Write short notes on : **[18]**
- a) Hydrogen bonding in biological systems.
 - b) Mutation of gene control during embryogenesis.
 - c) Biochemistry of proteins.

SECTION - II

- Q5)** a) Explain the principle, construction and working of gas chromatograph and give a neat diagram. **[12]**
- b) What are effects of carcinogenic compounds on organisms. **[4]**
- Q6)** a) Define following terms and discuss the determination procedure of any two with necessary diagrams. **[12]**
- i) pH.
 - ii) Conductivity.
 - iii) e.m.f.
 - iv) Viscosity.
- b) Enlist the methods used for estimation of elements at minor trace and ultra trace level. **[6]**

P.T.O.

Q7) Explain the principle and working of [16]
a) Neutron Activation Analysis.
b) Ion exchange chromatography.

Q8) Write short notes on : [16]
a) Isotope dilution analysis.
b) Scope of Environmental chemistry.



P1588

[3665] - 750

M.E. (Chemical) (Environmental)

**MEMBRANE TECHNOLOGY IN ENVIRONMENTAL
ENGINEERING
(2008 Course) (509135)**

Time : 3 Hours]

[Max. Marks:100

Instructions to the candidates:

- 1) Question no. 1 & 5 are compulsory and remaining 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 logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 6) Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Outline industrial applications of membrane technology. What are its prominent features? [6]
- b) Which are the driving forces used in membrane technology? How pressure driven membrane processes are classified according to particle size. [6]
- c) Explain the term phase. How phase separation in polymer systems is presented for membrane preparation. [6]
- Q2)** a) Give a brief account of membrane materials. [4]
- b) Explain the importance of the state of the polymeric membrane material. [4]
- c) Explain material properties for the selection of inorganic membranes. [4]
- d) How will you explain glassy state and rubbery state of a polymer? [4]
- Q3)** a) Which different polymer membranes are used in filtration process? [4]
- b) How will you define linear and cross linked polymers? [4]
- c) Explain the relation of structure and functionality in biological membranes. [4]
- d) Explain depression of glassy temperature. [4]

P.T.O.

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

- a) Polymer bends.
- b) Natural Membranes.
- c) Inorganic Membranes.
- d) Retention and Selectivity.

SECTION - II

Q5) a) How modules are selected for the membrane process? **[6]**

b) Explain why extra precautions are necessary during membrane dialysis? **[6]**

c) How asymmetric membranes are prepared? **[6]**

Q6) a) Explain the phenomenon of polarization in membrane filtration. **[4]**

b) Describe important structural properties of the membrane. **[4]**

c) How will you explain micro filtration? States its industrial application. **[4]**

d) Explain bubble -point method used for pore size determination. **[4]**

Q7) a) What is the difference between osmosis and reverse osmosis? Which membranes are Preferred? **[4]**

b) Explain electro dialysis process. **[4]**

c) Explain advantages of membrane dehydration process. **[4]**

d) Explain merits of cascade operation in membrane technology. **[4]**

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

- a) Membrane Reactors.
- b) Flow patterns in membrane technology.
- c) Fouling.
- d) Ion exchange membranes.



P1589

[3665] - 754

M.E. (Chemical) (Enviro.)

**GROUNDWATER CONTAMINATION & POLLUTION
TRANSPORT**

(2008 Course) (Open Elective - IV)

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 are aquifer? Draw neat sketch, & explain different types of aquifers. **[8]**
- b) What are the necessary conditions for groundwater occurrence? Explain different modes of occurrence of groundwater. **[4]**
- c) Discuss specific yield & factor effecting safe yield. **[6]**
- Q2)** a) Derive the condition for steady flow into an unconfined aquifer. **[8]**
- b) A lake has a water surface elevation of 100.20 m above another lake with elevation 98.40m. The lakes are separated by land mass having average permeability of 34.6 m/day & lies on an impervious horizontal layer having an elevation of 90.00m. Determine the flow between lakes, if separating distance is 2800m. Also find the seepage discharge if the aquifer on bottom 5m has a permeability of 15m/day. **[8]**
- Q3)** a) Explain the condition for occurrence of steady & transient state of flow. **[6]**
- b) What is hydraulic conductivity? Discuss the laboratory method of determining hydraulic conductivity by falling head permeometer. **[6]**

P.T.O.

- c) Derive the Laplace condition to be satisfied by flow through homogeneous, isotropic medium under steady condition. [4]

- Q4)** a) Discuss the necessary conditions for constructing flownet & what are the different methods for constructing flownet. [4]
 b) Derive the Theim's equation for determining discharge through an unconfined aquifer. [6]
 c) Determine the maximum ground water flow for an groundformation as shown in fig 1. The formation has sandy soil of $K = 2.8 \text{ m/day}$ & an average slope of 5% & thickness of soil mass above impermeable layer is 10 m. If an industrial effluent is spilled over area of width x , at a rate of 5 cm/day compute the maximum value of x so that there is no surface runoff. [6]

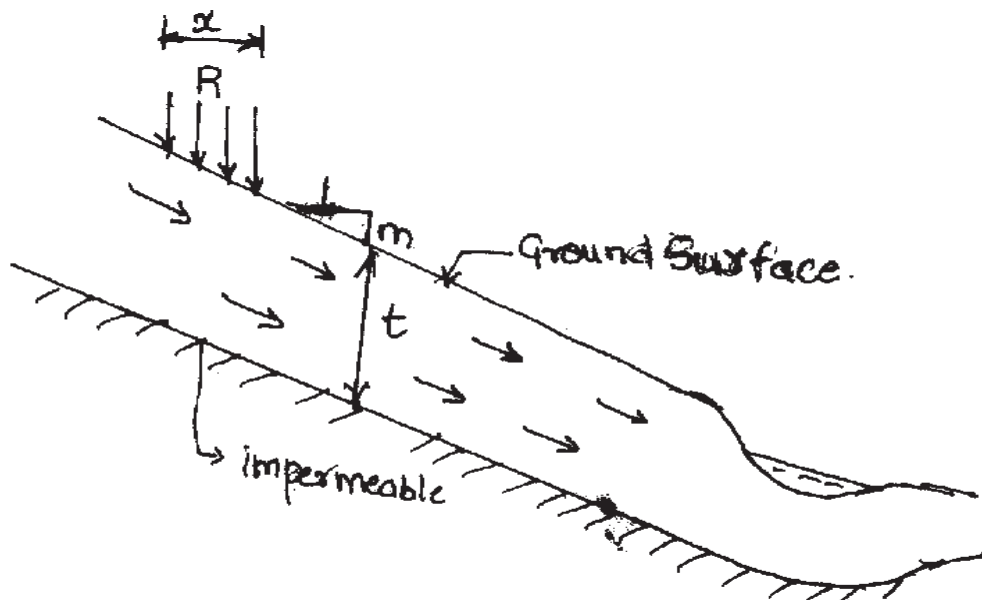


fig (1)

SECTION - II

- Q5)** a) Explain the underground travel phenomenon of groundwater contaminants. [6]
 b) Justify that “adsorption is the most important purifying process during groundwater flow”. [4]
 c) Discuss various aspects of land filling method of disposal of solid waste. [8]

- Q6)** a) Why is artificial Recharge of groundwater necessary? Discuss with necessary sketch. [8]
- i) Artificial recharge by pits & shaft.
- ii) Artificial Recharge by spreading water with basin.
- Also state the condition under which each is employed.
- b) Show that induced Recharge into an artesian aquifer is given by
- $$q = \frac{1}{2}q_0e^{-x/\lambda}$$
- where q_0 = induced recharge.
 x = characteristics length of formation. [6]
- c) List out any 2 conditions of natural Recharge of aquifer. [2]
- Q7)** a) Discuss Heleshaw model study for salt water intrusion and what are the disadvantages. [6]
- b) Explain control of salt water intrusion by Recharge wells. [4]
- c) Describe pollution cycle between water and land. [6]
- Q8)** a) Discuss Gaussian plume model for groundwater contamination, with necessary sketch. [6]
- b) Describe the solute transport phenomenon & what are the factors affecting solute transport. [4]
- c) Explain how the contamination water is extracted for controlling groundwater pollution. [6]



Total No. of Questions : 8]

[Total No. of Pages : 2

P1590

[3665]-8

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

PROFESSIONAL PRACTICES IN CONSTRUCTION

(2002 Course)

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 and steam tables is allowed.*
- 6) Assume suitable data, if necessary.*

SECTION - I

Q1) Explain the salient features of the following types of contracts: **[18]**

- a) Item rate.
- b) Lump sum.
- c) Turnkey.
- d) BOT.

Q2) Explain the provisions made in any 8 contract conditions as suggested by the MOS and PI. **[16]**

Q3) Differentiate between cost price and value. Discuss the various factors which affect the value of a property consisting of land and building with suitable examples. **[16]**

Q4) With the help of any case study, explain the quantified system of evaluating pre-qualifications of any tender. Explain concept of Evaluated Bid Price (EBP) with an example. **[16]**

P.T.O.

SECTION - II

Q5) Explain with examples any 6 sections of the Indian contract Act (1872), in brief. **[18]**

Q6) Which are the various forms of Alternate Dispute Resolution (ADR) systems? Explain the following in detail **[16]**

- i) Dispute Resolution Board.
- ii) Mediation and Conciliation.

Q7) a) Explain duties and powers of an arbitrator. **[8]**

- b) Explain the process of arbitration as expected from the Indian Arbitration and Conciliation Act 1996, in sequence. **[8]**

Q8) Explain in brief the following : **[16]**

- a) FIDIC document.
- b) 3 bid system.
- c) Unbalanced tender.
- d) Construction claims management.



P1594**[3665]-43**

M.E. (Civil) (Structures)
STRUCTURAL STABILITY
(2002 Old 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 separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of a non-programmable electronic pocket calculator is allowed.*
- 6) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Explain, with an illustration, the following approaches to obtain the critical load ' P_{cr} ' on a column : **[6]**
- i) Neutral equilibrium approach.
 - ii) Energy approach.
- b) Explain Shanley's theory of inelastic column behaviour, with the help of a simple column model. **[6]**
- c) A prismatic column has unspecified boundary conditions so that there exist a moment and shear at each end of the member.
Starting from the 4th order governing differential equation, obtain the general form of the deflection curve for the column.
Hence obtain the deflection form when both ends are pinned. **[8]**
- d) A column of length ' l ' with pinned ends has an initial curvature. Starting from the fundamentals, obtain the load-displacement relationship and show it graphically. **[5]**
- Q2)** a) Explain the principle of conservation of energy to obtain the critical load on a column.
Hence obtain the critical load ' P_{cr} ' on a column of length ' L ' with pinned ends and choosing the displacement function as
- $$y = A \sin \frac{\pi x}{L} . \quad \text{[12]}$$
- b) Check your result above using the finite difference method and dividing the span into four equal intervals. **[13]**

P.T.O.

Q3) a) Discuss the failure of beam-columns. Obtain the load-deflection relationship as long as the stresses remain within the elastic limit at failure. [8]

b) A beam AB of length L and having a uniform section is pinned at A and supported on a roller at B. It carries a u.d. load of intensity q_0 along with end-thrust of 'P' each at A & B.

Starting from the fundamentals obtain the equation for the displacement curve. Hence obtain the maximum values of the deflection and bending moment in the beam. [12]

c) If in (b) above, the cross section of the beam is $60 \text{ mm} \times 150 \text{ mm}$ (depth) $L = 3 \text{ m}$ and $P = 30 \text{ kN}$, compute the value of q_0 if the maximum fibre stress is limited to 15 MPa . Take $E = 12 \text{ GPa}$ for the beam material. Calculate also the maximum deflection produced in the beam. [5]

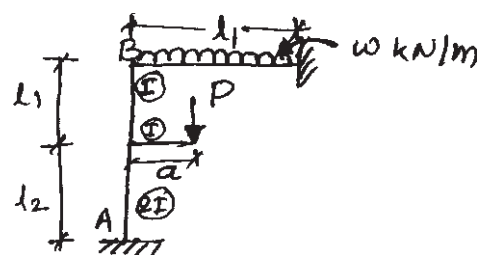
SECTION - II

Q4) a) A beam column fixed at one end & hinged at other carrying uniformly varying load over half span from fixed support and a anticlockwise moment load at mid of other half. Analyse the beam column. [20]

b) Write in detail "Importance or Effect of Earthquake load in structural stability". [5]

Q5) a) Find rigidity modulus reduced in case of hexagonal cross-section of strut in elastic conditions. [10]

b) Derive the relation of critical load on a frame using principle of neutral equilibrium. [15]



Q6) a) Derive the curve for numerical values of 'K' and table for buckling of thin plate when one side is fixed and other is hinged. [10]

b) Find the deflection of cantilever beam subjected to uniformly varying load over entire span and a clockwise moment at free end at distance 'a' from free end. [15]

□□□□

P1597

[3665] - 48

M.E. (Mech.) (Design Engg. & Heat Power Engg.)
INSTRUMENTATION & AUTOMATIC CONTROL
(Revised Course 2002)

Time : 3 Hours]

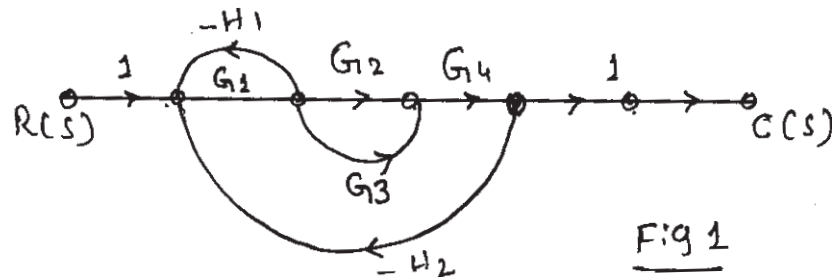
[Max. Marks:100

Instructions to the candidates:

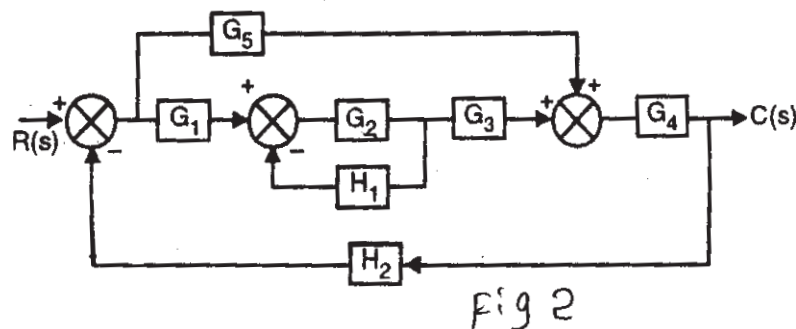
- 1) Answer any 3 questions from each section.
- 2) Answer 3 questions from Section I and 3 questions from Section II.
- 3) Answers to the two sections should be written in separate books.
- 4) Figures to the right indicate full marks.
- 5) Use of logarithmic tables, slide rule, Mollier charts, electronic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

SECTION - I

- Q1) a)** Obtain the overall transfer-function of the system shown in fig 1. **[8]**



- b)** Find the transfer function of block diagram shown in fig 2. **[10]**



- Q2) a)** What is meant by stability of system? Explain the criteria for stability. **[8]**

P.T.O.

- b) Find frequency specifications for $G(s) = \frac{16}{s(s+8)}$ for unity feedback system. [8]
- Q3)** a) Discuss control system used for an air compressor, used in a medium scale industry. [8]
 b) Explain P + I control action mode. [8]
- Q4)** a) Explain the various elements of signal conditioning system. [8]
 b) Explain the various elements of PLC. [8]

SECTION - II

- Q5)** a) Explain the following terms : [8]
 i) Resolution. ii) Repeatability.
 iii) Linearity. iv) Sensitivity.
 b) Explain P+I+D Pneumatic controller [8]
- Q6)** a) Compare impulse - response of first order and second order instruments. [8]
 b) Discuss step response of second order instrument. [8]
- Q7)** a) Explain working principle and calibration method of an accelerometer. [8]
 b) Explain the electromagnetic flowmeter. [8]
- Q8)** Write short notes on (Any Three) : [18]
 a) Hot wire anemometer.
 b) Ultra low pressure measuring device.
 c) Controls used in boiler.
 d) Power measurement Technique.



P1598

[3665]-74

M.E. (Mechanical) (Design Engg.)
PROCESS EQUIPMENT DESIGN
(Old & Revised Course 2002) (Elective - I) (Theory)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Answer any three questions from each section.*
- 2) Answers to 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 steam table and electronic pocket calculator and steam table is allowed.*
- 7) Assume suitable data, if necessary giving reasons.*

SECTION - I

- Q1)** a) Explain significance of following preliminaries in process equipment design. (any four) **[8]**
- i) Design stress.
 - ii) Weld joint efficiency.
 - iii) Corrosion allowance.
 - iv) Dilation of pressure vessel.
 - v) Factor of safety.
- b) Explain various types of roofs used for storage vessels. **[6]**
- c) What are causes for loss of liquid in fixed volume tanks? **[2]**
- Q2)** a) Calculate the thickness of torispherical head for a vessel having a internal diameter of 3000 mm. Design pressure is 5 kg/cm². Knuckle radius and crown radius are 21 mm and 300 mm. permissible stress is 1200 kg/mm², welded joint efficiency is 85%. **[6]**
- b) What are different types of “removable closures” for high pressure vessels? Explain any three of them. **[8]**
- c) Name the steels used for high temperature and low temperature applications. **[2]**

- Q3)** a) Classify unfired pressure vessels and give their application. List the essential nozzles and mountings. [6]
- b) A pressure vessel is to be designed for an internal pressure of 0.5 N/mm². The vessel has nominal diameter of 1.2 m. The material used for vessel has permissible stress of 120 N/mm². If the weight of vessel and its content is 3200 kg and torque due to offset piping is 400 N.m. Find stresses due to combined loading. [10]
- Q4)** a) Explain skirt supports and design aspect related to them. [8]
- b) What are Hortonspheres? Why they are rarely used for high pressures? [2]
- c) What are the general design considerations for pressure vessel subjected to external pressure? [6]
- Q5)** Explain with neat sketches (any three) [18]
- a) Self supporting roof design.
- b) Types of constructions for high pressure vessels.
- c) Reinforcement of nozzles.
- d) Protective coatings and their applications.

SECTION - II

- Q6)** a) Explain main design consideration in design of shell and tube heat exchanger. [10]
- b) What are the types of baffles used in heat exchanger? [4]
- c) Name standard used for design of heat exchanger. [2]
- Q7)** a) Explain important features of packed or plate columns. [8]
- b) Classify agitators giving their schematic sketches and applications. [4]
- c) Give classification of vacuum pumps or explain any one metering pump. [4]
- Q8)** a) Explain the effect of seismic load and wind load on tall vessels. [8]
- b) Differentiate between vacuum filters and centrifugal filters. Explain either rotary disc filter or leaf filter. [8]
- Q9)** a) List the important types of dryers used in process industry. Explain with sketch either tray direr or Film drum drier. [8]
- b) What are integral, fabricated and formed nozzles? [6]
- c) What is a reboiler and bottom product? [2]

Q10) Explain with sketches (any three) :

[18]

- a) Optimization techniques.
- b) Process equipments in Cement Industry.
- c) Process Flow Diagrams.
- d) Theories of failure.



Total No. of Questions : 10]

[Total No. of Pages : 2

P1599

[3665]-78

M.E. (Mech.) (Design Engg.)

TRIBOLOGY

(Old & Revised 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 book.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Figures to the right indicate full marks.*
- 5) All questions carry equal marks.*
- 6) Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) With reference to 'Jost's Report' discuss the importance of tribology in industry. [8]
b) What is Autocorrelation? Explain significance of it. Is it dependent on manufacturing process? [8]
- Q2)** a) State and discuss various factors affecting wear. [8]
b) Explain Archard's hypothesis about abrasive wear. Show that volume of wear $Q = K \frac{W}{3P_0}$. Comment on factor K. [8]
- Q3)** a) Explain apparent area, of contact, Real' area of contact and contact area. [6]
b) Discuss the modern Research/Experimental methods to determine the real area of contact. [10]
- Q4)** a) Discuss in detail the lubrication regimes. [8]
b) Discuss characteristics of frictional vibrations. [8]

P.T.O.

- Q5)** Write short notes on any three : [18]
- a) Thixotrophy and dilitancy in lubricating oils.
 - b) Delamination wear.
 - c) Laws of wear.
 - d) Sintered bearings.
 - e) Engine oil additives.

SECTION - II

- Q6)** a) State various applications of gas lubricated appliances with their advantages and limitations. [8]
- b) An air lubricated hydrostatic step bearing has following details.
shaft dia - 150 mm, Recess dia - 50 mm filmthickness 0.04 mm, supply pr - 300 kPa, viscosity of air - 0.018 cp atmospheric pressure - 101.6 kpa Recess depth - 0.5 mm.
Determine volume of air required for above bearing. [8]
- Q7)** a) State assumptions made in deriving the Reynolds equation discuss importance of each assumption. [8]
- b) Stating the boundary conditions and help of Reynolds equation write equations for infinitely short and long bearing. [8]
- Q8)** a) Explain the phenomenon of Elastohydrodynamic lubrication state the applications. [8]
- b) Write the Ertel-Grubin equation state the assumptions made and explain various terms involved. [8]
- Q9)** a) Explain mechanism of squeeze film lubrication where does it occur?[8]
- b) What are the properties desired for bearing materials? What materials are used for bearings for high speed shafts? [8]
- Q10)** Write short notes on any three : [18]
- a) Electrical analogy method.
 - b) Lubrication devices.
 - c) Lubricants used in cold metal working.
 - d) Stick-slip phenomenon.



P1601

[3665]-148

**M.E. (Electronics) (Digital Systems)
NETWORK SECURITY SYSTEMS**

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 book.*
- 3) Neat diagram must be drawn wherever necessary.*
- 4) Figures to the right indicate full marks.*
- 5) Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Compare and contrast passive and active security attacks and security threats. [8]
- b) Briefly explain : [8]
- i) Caesar Cipher.
 - ii) Monoalphabetic Cipher.
 - iii) Playfair Cipher.
 - iv) Transposition Cipher.
- c) What is steganography? [2]
- Q2)** a) What is the difference between confusion and diffusion? [4]
- b) Explain the avalanche effect. [4]
- c) What is the difference between the AES decryption algorithm and the equivalent inverse cipher? [8]
- Q3)** a) List important design considerations for a stream cipher. [8]
- b) Compare and explain any three modes of block cipher operation. [8]

P.T.O.

- Q4)** a) What are the principal elements of a public-key cryptosystem? Hence explain the roles of public and private key. [8]
b) Demonstrate RSA public key encryption and decryption algorithm with a suitable example. [8]

- Q5)** a) Describe Deffie Hellman key exchange algorithm with example. [8]
b) Whether Deffie Hellman key exchange algorithm is secure against man-in-the-middle attack? Justify your answer. [8]

SECTION - II

- Q6)** a) What are the types of attacks addressed by message authentication?[6]
b) Enlist the approaches for producing message authentication. [6]
c) What is the difference between MAC and a one-way hash function?[6]

- Q7)** a) Comment on the security of HMAC algorithm. [8]
b) Describe message digest generation using SHA-512. [8]

- Q8)** a) Enlist the requirements for a digital signature. What is Direct and Arbitrated digital signature? [8]
b) Explain DSS approach for signing and verifying. [8]

- Q9)** a) Explain Kerberos and hence compare Kerberos version 4 and version 5. [8]
b) Explain X.509 authentication procedure. [8]

- Q10)**a) Explain general format of PGP message. [8]
b) Describe PGP message generation and reception. [8]



P1603

[3665]-178

M.E. Electrical (Power System)

SPECIAL TOPICS IN HIGH VOLTAGE ENGINEERING

(Revised 2002 Course) (503210 (a))

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Explain the various theories that explain breakdown in commercial liquid dielectrics. [9]
- b) What is thermal breakdown in solid dielectrics, and how is it practically more significant than other mechanisms? [8]
- c) Describe the mechanism of short term breakdown in composite insulation. [8]
- Q2)** a) Describe, with a neat sketch, the working of a Van de Graaff generator. What are the factors that limit the maximum voltage obtained? [13]
- b) Describe, with a neat sketch, the working of a cascade connection of transformers for producing very high a.c. voltages. [12]
- Q3)** a) Draw a neat sketch, and describe the Marx circuit arrangement for multistage impulse generators. How is the basic arrangement modified to accommodate the wave time control resistances. [12]
- b) Give the schematic arrangement of an impulse potential divider with an oscilloscope connected for measuring impulse voltages. Explain the arrangement used to minimise errors. [13]

SECTION - II

- Q4)** a) List out the common test facilities available in high voltage laboratories. [6]
- b) What are the criteria used in selecting the ratings of the testing equipment for high voltage laboratories. [10]

- c) Why is grounding very important in a high voltage laboratory? Describe a typical grounding system used. [9]
- Q5)** a) Explain the importance of radio interference voltage measurements for EHV power apparatus. Describe with a schematic diagram, one method of measuring RIV of transmission line hardware. [13]
- b) Describe with a neat sketch, a method of comparative tracking index measurements of solid insulating material. [12]
- Q6)** Write short notes on :
- a) Straight detection method used for partial discharge measurement. [9]
- b) Artificial pollution tests on high voltage insulators. [8]
- c) Capacitance and dielectric loss measurements. [8]



Total No. of Questions : 10]

[Total No. of Pages : 3

P1604

[3665]-188

M.E. (Production)

ADVANCED MACHINE TOOL DESIGN

(Old & Revised Course 2002) (511103)

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) 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 m.s. 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./cm². 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/m² at a speed of 300 rpm.

The screw dimensions are :

Outside diameter = 70 mm

$D_{\text{average}} = 65 \text{ mm}$

Pitch $p = 10$;

Depth of thread $t_2 = 5 \text{ mm}$

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 = $1.5 D_{\text{av}} = 97.5 \text{ mm}$ [10]

Q4) a) Give the comparative evaluation of machine tool structures on the basis of :

- i) Materials for machine tool structures.
- ii) Static and Dynamic Stiffness.
- iii) Profiles of machine tool structures. [8]

- 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) What are the basic consideration in designing the spindle unit supports and spindle ends in a high speed machine tools? Sketch unit supports and spindle ends in a high speed machine tools? [8]
b) Explain the concept of static and dynamic rigidity of machine tool and state the procedure for estimating them. [8]
- Q7)** 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 structures.
b) Analyze the forces acting on a vertical knee-type milling machine during end milling operation and explain the design procedure of the table.[8]
- Q8)** a) What do you understand by stick-slip motion in machine tool? What are the various methods of minimizing the stick-slip vibration in 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) Compare the following systems : [8]
i) Stepper motor and DC servomotors.
ii) DNC and Stand-alone NC machine.
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 characteristic of the cutting process.
b) Electrical automatic control systems.
c) Design considerations for CNC machine tools.
d) Retrofitting.



P1606

[3665]-210

M.E. (Petroleum Engineering)

**NUMERICAL METHODS AND SIMULATION IN PETROLEUM
ENGINEERING
(Revised 2002 Course)**

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Answers to the two sections must be written in separate answer books.*
- 2) Answers 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) For the following system of equations, find x , y , z using SOR, LUD decomposition, and Gauss Jordan method. $w = 1.1$

$$x + y + z = 7$$

$$2x + 3y + z = 12$$

$$x - y + z = 3 \quad [25]$$

Q2) a) Solve the following system of equations by Newton Raphson method

$$x^2 y + \sin(xy) = 54$$

$$\sin(x^2 y) + xy = \cos y$$

b) Find the roots of the equation by Graeffe method :

$$x^3 + 3x^2 + 5x - 4 = 0 \quad [25]$$

Q3) Solve $y' = x^2 y + \cos(x) + 4$, $y(1) = 2$, using Heun, RK-5 and Adam Bashforth predictor corrector method. [25]

SECTION - II

Q4) Given a 1D reservoir. Find the pressures in the interior of the reservoir, if the pressures are at 50 psi for one well and 3000 psi at the other well, both at each boundary. Length of the reservoir are 400 ft. Assume $\Delta x = 100$ ft. Solve by explicit, cranknicolson and implicit method. Only set up the matrix.

[25]

P.T.O.

Q5) Find the finite difference approximations for the following : **[25]**

- a) First derivative forward of order Δx squared.
- b) Second derivative backward of order Δx squared.
- c) Second derivative central of order Δx squared.

Q6) Write a detailed Essay on Reservoir Simulation. **[25]**



Total No. of Questions : 6]

[Total No. of Pages : 1

P1607

[3665]-216

M.E. (Petroleum Engineering)

ADVANCED NATURAL GAS ENGINEERING & TECHNOLOGY

(Revised 2002 Course)

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 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 the properties B_g , z , μ_g , P_{pc} , T_{pc} , EOS, H and explain how these properties are obtained by some suitable correlation. **[25]**
- Q2)* Derive the pipe line flow equation. **[25]**
- Q3)* Distinguish between reciprocating and centrifugal compressors. Explain how any one of the design formulas is obtained. **[25]**

SECTION - II

- Q4)* Explain phase behaviour of a gas reservoir. **[25]**
- Q5)* Draw a process flow diagram to show two methods how H_2S is removed from a natural gas stream. **[25]**
- Q6)* Derive the equation used to calculate flow rate in a orifice meter. Explain all the constants. **[25]**



Total No. of Questions : 8]

[Total No. of Pages : 3

P1609

[3665]-403

**M.E. (Civil) Construction & Management
CONSTRUCTION TECHNOLOGY
(2008 Course)**

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) Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Explain with sketches [6]
- i) Primary and
 - ii) Secondary panels in the diaphragm wall construction.
- b) Explain with sketches sequence of lowering of reinforcement cage in a diaphragm wall pannel and list out precautions you will take during placement of the cage. [6]
- c) Explain process of concreting of a diaphragm wall pannel using tremic pipes and list out precautions you will take during concreting operations. [6]

- Q2)** A bridge pier foundation of $2\text{m} \times 5\text{m} \times 1.5\text{m}$ depth is to be placed at 3meter depth below bed level on a suitable founding strater.
- a) Depth of water - 2meter above bed level.
 - b) Select any one shape of cofferdam
 - i) Circular in plan
 - ii) Rectangular in plan
 - c) Select any one alternative
 - i) With larsen 26 sheet piles
 - ii) 1.0m dia-circular interlocking piles.

P.T.O.

- 1) Draw a sketch and explain step by step sequence of construction of cofferdam & its removal. [8]
 - 2) Work out quantities of sheet piles/circular piles, and struts and working beams you propose for the cofferdam. [8]
- Q3)** a) Give reasons of failures in bored piles and precautions you will take during construction. [8]
- b) Explain with sketches different types of pile driving hammers used in driven piles. [8]
- Q4)** Write short notes on any three of the following : [16]
- a) Admixtures used in grouting.
 - b) Tilts in well foundations.
 - c) Mucking and ventilation in rock tunneling.
 - d) Low viscosity chemical grouts.
 - e) Under reamed piles.

SECTION - II

- Q5)** a) Give advantages of manufactured sand over the natural sand used in concreting. [8]
- b) Explain characteristics of Barmac rock on rock impactor and discuss in details the nature of sand produced and its suitability while making concrete. [8]
- Q6)** Explain how efficiency of an RMC plant depends on the following : [18]
- a) Testing facilities at the plant.
 - b) Control on properties of concrete produced.
 - c) Methods of transporting concrete to end user.
 - d) Care taken in deciding the mix proportions consistency, type of aggregates and use of admixtures to make good pumpable concrete.
- Q7)** a) Explain bio-technical problems faced in rock tunneling. [6]
- b) Explain different methods of “tunnel lining” used in hard soil tunneling. [10]

Q8) Write short notes on any three of the following :

[16]

- a) Vibro-hammers in driven piles.
- b) Burn cut & Pyramid cut in rock tunneling.
- c) Roller compacted concrete.
- d) Advantages of tunnel formwork.
- e) Use of slip form techniques in High rise buildings.



P1611**[3665] - 408****M.E. (Civil) (Construction and Management)****RESOURCES MANAGEMENT****(2008 Course) (Elective - II)***Time : 4 Hours]**[Max. Marks:100**Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Question No. 1 and 5 are compulsory. Out of the remaining attempt any two questions from Section I and two questions from Section II.*
- 3) *Answers to the two sections must 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)** Carry out A-B-C analysis on the basis of following data related to annual consumption of a construction company: **[10]**

(all figures in thousands of Rs.)

Structural Steel	2400	Precast Piles	200
Cement	6000	Reinf. Steel	800
Bricks	1000	Steel Fixtures	50
Aggregates	500	Timber	500
Paints	600	Rubble	150
Tools and Plant	300	Plumbing	1500
Plastering materials	250	Fuel items	95

Plot the ABC Curve.

- b) Discuss the concept of Integrated Materials Management with relevant example from Construction sector. **[8]**

P.T.O.

- Q2)** a) With suitable examples explain the process of materials purchasing. Discuss the factors to be considered by a construction organization for empanelment of material suppliers and vendors. [6]
- b) Discuss the importance of total quality approach in materials management.[6]
- c) Formulate a materials requirement plan based on project bar chart for canal project. (assume suitable data). [4]
- Q3)** a) Discuss the importance of value engineering as a control tool in materials procurement and management. [6]
- b) List out various inventory control techniques. Which technique do we adopt for the following cases [5]
- i) Purchase of materials.
- ii) Material classification based on consumption pattern.
- iii) Ease in availability of materials.
- iv) Materials in transit.
- c) Bring out the importance of site layout in efficient materials management with suitable examples. [5]
- Q4)** a) Discuss the concept of Just In Time Inventory management with relevant example from construction sector. [5]
- b) Discuss the aspects to be considered in deciding safety stock of A class items under following scenarios- [5]
- i) More demand, less supply, good market conditions.
- ii) Less demand, less supply average market conditions.
- c) What do you mean by efficient stores layout? Discuss the guidelines to be considered for designing efficient stores layout. [6]

SECTION - II

(HR Management and Equipment Management)

- Q5)** a) What do you mean by the terms **preservation** and **conservation** of HR? Discuss strategies to achieve both the above aspects in a construction organization. [6]
- b) Will type of organisation structure influence HR Development in the organisation. In either case justify your answer with suitable examples.[6]
- c) With the help of systems concept explain the concept of HR Management. Discuss the components of HR Development system. Are HRM and HRD same? Justify. [6]

- Q6)** a) State various factors considered for predicting equipment requirements. [4]
- b) Discuss the merits and demerits of Standardization of Construction equipments in a construction organisation. [5]
- c) Will versatility of construction equipment affect the reliability and efficiency of construction equipments. Will it also have bearing on the warranty conditions. Justify with suitable examples. [3]
- d) State various steps in procurement of new construction equipments. Will these steps remain same for purchase of second hand equipments? If there are differences what are these differences. [4]
- Q7)** a) List out the steps involved in determining ownership and operating costs in detail. State the assumptions that are to be considered. Justify the need for these assumptions. [6]
- b) State the controllable and uncontrollable factors that affect the operation and efficiency of construction equipment. Explain this concept with example for earthwork operation. [6]
- c) For a medium sized construction organization intending to bid for an international contract, as an equipment manager what strategy do you recommend for procurement of equipment (Purchase or lease or hire). Assume necessary data for your decisions. [4]
- Q8)** Write short notes on (any four) : [16]
- a) Various types of needs of HR.
- b) Skill and knowledge levels required to make strategic, tactical and operational level decisions by HR.
- c) Criteria for selecting a new equipment.
- d) Concept of LAD. For what equipments will be LAD high and/or low.
- e) Factors considered for replacing new equipment in use with the advanced version of same equipment.
- f) Difference between Training and Education.



P1612

[3665] - 412

M.E. Civil (Const & Mgmt)

**CONSTRUCTIONS CONTRACTS ADMINISTRATION
AND MANAGEMENT
(2008 Course)**

Time : 4 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)** Compare and contrast between item rate, lump-sum and cost plus contracts giving suitable examples. **[18]**
- Q2)** Differentiate between RFQ and RFP with an example. Explain the weighted point score average method used for pre-qualifying the tenderers in global bidding, in detail. State its advantages. **[16]**
- Q3)** Explain any 4 clauses of the Indian Contract Act (1872) in brief giving suitable examples. **[16]**
- Q4)** Explain the typical provisions made in any 8 general conditions of contract as suggested by the MOS and PI. **[16]**

SECTION - II

- Q5)** List the various types of the FIDIC books, clearly stating the area of its use for each book Explain the clause of “Force Majeure” in context of the FIDIC document, in detail, giving suitable examples. **[18]**

P.T.O.

Q6) Explain the various purposes of valuation. Explain any 2 methods of valuation. [16]

Q7) List out the various parameters which lead to construction claims. Explain the claims which may arise for which the Employer is entitled. [16]

Q8) Explain in brief the following : [16]

- a) Duties of Arbitrator.
- b) Advantages of DAB.
- c) Reversionary value of land.
- d) B.O.T form of contract.



P1613

[3665]-416

**M.E. (Civil Construction and Management)
INFRASTRUCTURE DEVELOPMENT
(2008 Course) (Elective - III)**

Time : 4 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer any three questions from each section.*
- 2) *Question No. 1 and 6 are compulsory. Out of the remaining attempt any two questions from section-I and two questions from section-II.*
- 3) *Answers to the two sections must 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, Moiller charts, electronic pocket calculator and steam tables is allowed.*
- 7) *Assume suitable data, wherever necessary.*

SECTION - I

- Q1)** a) What do you mean by the term FDI? Why does government allow FDI? In what sectors of Infrastructure Development has Govt. of India allowed FDI? **[8]**
- b) List out various problems associated with successful completion of urban transport projects. Discuss the need and status of Slum Rehabilitation projects. **[10]**
- Q2)** a) List out the reasons for power shortage. What is the impact of reduced power generation on economic growth of countries like India and China? **[5]**
- b) What are the problems associated with urban water supply and sewerage systems? How to improve these systems? **[6]**
- c) According to you why there is difference in rate of development of urban and rural areas. How do we bridge this divide? **[5]**
- Q3)** a) What are the current problems faced by the aviation industry? Will these problems have impact on the rate of development of aviation infrastructure? **[6]**
- b) Do infrastructure projects get affected by economic slowdown? In either case explain with examples. **[5]**
- c) Discuss various alternatives available/proposed for improving urban transport system in Pune city. **[5]**

P.T.O.

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

- a) Providing Urban Amenities in Rural Areas (PURA).
- b) PMGSY.
- c) NREGA.
- d) JNNURM.
- e) Metro railway vs. sky bus project.
- f) Facilities for pedestrians in urban transport systems.

SECTION - II

Q5) What are the incentives and opportunities given by the Govt. for PPP to local investors in development of infrastructure planning in **[16]**

- a) Construction of roads.
- b) Aviation industry.
- c) Development of ports.
- d) Power projects.

Q6) a) What are the logistics followed for infrastructure necessary in development of major ports? **[9]**

b) To make the projects viable/workable what are the facilities and services you will provide? **[9]**

Q7) a) What are the sources of financing adapted in case of NHDP projects by the Govt. of India? **[8]**

b) What are the internal sources of port trust in creating the required funds necessary for investment in further development? **[8]**

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

- a) Quality control system adopted in PMGSY projects.
- b) Advantages BRTS proposal.
- c) Sources of finance for development of ports.
- d) Incentive offered in the road projects by PPP in infrastructure planning.
- e) Alternative source of energy.



Total No. of Questions : 8]

[Total No. of Pages : 2

P1614

[3665]- 417

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

INTERNATIONAL CONTRACTING

(2008 Course) (Elective - III)

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 and steam tables is allowed.*
- 6) Assume suitable data, if necessary.*

SECTION - I

- Q1)** Explain the salient aspects involved in International Contracting from concept to completion and handling over, with the case study of Basrah Housing Project. **[18]**
- Q2)** Explain the CIDC-SIAC Institutionalized arbitration process in detail. What are its advantages? Which are the various projects which have used the above process? (Name any four) **[16]**
- Q3)** Explain the provisions made in the FIDIC document with respect to : **[16]**
- a) Owners role and responsibility.
 - b) Force Majeure.
 - c) Mechanism of dispute resolution.
 - d) Contract closure.
- Give suitable examples to explain these provisions.
- Q4)** Explain in brief : **[16]**
- a) Multi-attribute risk evaluating decision models.
 - b) Types of BOT mechanisms.
 - c) Risk assessment in Chinese construction market.
 - d) Types of FIDIC documents.

P.T.O.

SECTION - II

- Q5)** a) List out possible ‘Alleged interference or deficiencies of owner which results in disputes in an international contract. [8]
b) List out “Alleged deficiencies of contractor” resulting in disputes in an International Contract. [8]
- Q6)** a) Explain importance of “Risk Management” in international contracts and explain following : [9]
i) Direct costs.
ii) Consequential costs.
iii) Indirect costs.
b) Explain in details any two “Risks” in the following : [9]
i) Site-specific risks.
ii) Design team risks.
iii) Construction risks.
iv) Third-party controlled risks.
- Q7)** Which are the project logistics you will cover in taking decisions to submit a tender for a contract in U.A.R. countries? [16]
- Q8)** Write short notes on any two of the following : [16]
a) Political risks in contract.
b) FIDIC conditions of contract.
c) Prequalification requirements for international contract.
d) Various steps taken in an arbitration procedure.



P1615**[3665] - 451****M.E. (Civil/Structures)****STRUCTURAL MATHEMATICS****(501401) (Revised Course 2008) (Sem. - I)***Time : 4 Hours]**[Max. Marks:100**Instructions to the candidates:*

- 1) *Attempt three question 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) Using Flexibility method, analyze the beam shown. **[12]**

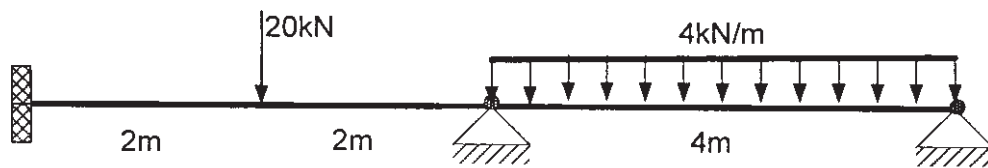


Fig.1.a

- b) i) Compare force and displacement methods.
ii) Enumerate the properties of stiffness matrix. **[5]**

Q2) a) A 2.4 m long boom is held by ball and socket joint at A and by two cables BD and CD as shown in the Fig .2.a, find the displacement of joint D if weight of 280 N is attached at D. Use stiffness method. **[12]**

P.T.O.

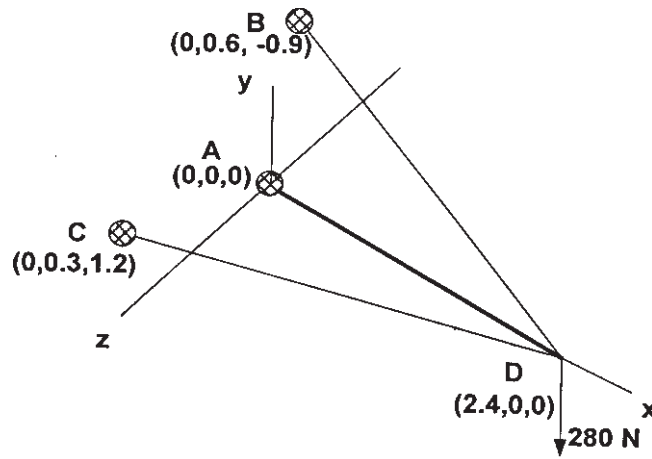


Fig. 2.a

- b) Estimate the lowest buckling load of a uniform pin ended column of length L and flexural rigidity EI using Eigen value technique. Divide the column in three equal parts. [5]
- Q3)** a) For a space frame member, develop the member stiffness matrix with proper sketches. [8]
- b) Derive the transformation matrix for the grid member. [8]
- Q4)** a) Using Euler's method, find an approximate value of y when $x = 0.3$, given that $dy/dx = 2xy$ and $y = 0.5$ when $x = 0$. Take $h = 0.1$. [6]
- b) Given the equations
 $dy_1/dx = x + y_1 + y_2$, $y_1(0) = 1$
 $dy_2/dx = 1 + y_1 + y_2$, $y_2(0) = -1$
 Estimate the values of $y_1(0.1)$ and $y_2(0.1)$. [10]

SECTION - II

- Q5)** a) A fixed beam of variable flexural rigidity supports a concentrated load W as shown in Fig 5.a. Estimate the deflection under the load considering three sub intervals of the beam. Use finite difference method. [9]

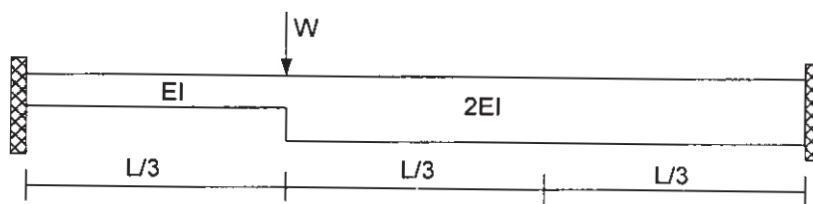


Fig. 5.a

- b) A simply supported uniform rectangular plate of size 3m by 6m supports a uniformly distributed load of intensity 500 kN/m² over one half of the plate as shown in Fig 5.b. Estimate the deflections at the interior nodes, assuming the thickness of the plate $t=50$ mm, Poisson's ratio $=0.25$ and Modulus of elasticity $E=2 \times 10^5$ N/mm². Divide the plate into 2×4 mesh. Use finite difference method. [9]

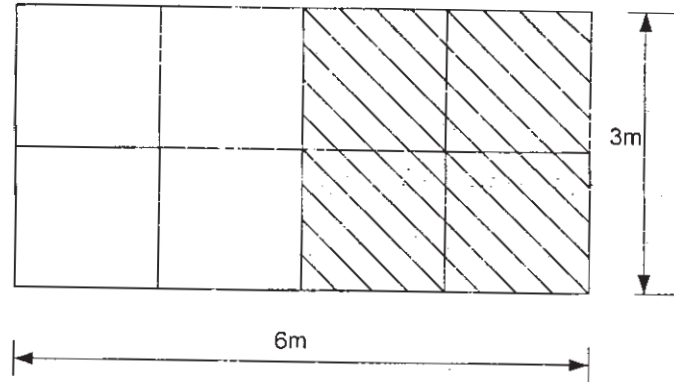


Fig 5.b

- Q6)** a) Given the points below, obtain a polynomial using Lagrange formula :

x	1.0	1.1	1.2
cos x	0.5403	0.4536	0.3624

Use it to estimate cos 1.15. [10]

- b) What do you understand by Spline interpolation? What are cubic splines? State the conditions for a spline to be cubic. [6]

- Q7)** a) With a schematic diagram show the coefficients of different operators for the second order, third order and fourth order central differences. [5]

- b) The data given in table, fit a formula of the type $y = a x^n$. Find the values of a and n and hence the required formula.

x	10	20	30	40	50	60	70	80
y	1.06	1.33	1.52	1.68	1.81	1.91	2.01	2.11

[11]

- Q8)** a) Compute the Integral $\int_2^4 (1+x^4) dx$ using Gaussian three point formula.

Compare it with Simpson's $3/8^{\text{th}}$ rule by taking $h=1$. [8]

- b) Find the Fourier series of the periodic function $f(x) = x \sin x$ in the interval $0 \leq x \leq 2\pi$. [8]



Total No. of Questions : 6]

[Total No. of Pages : 3

P1616

[3665]-453

**M.E. (Civil) Structure
STRUCTURAL DYNAMICS
(2008 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) 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

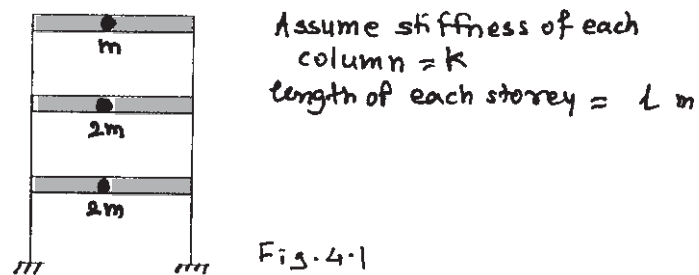
- Q1)** a) What is the difference between response of structure to static loading and dynamic loading? [7]
b) What is the necessity of modeling a structure? Explain with suitable examples the various type of analytical modeling. [8]
c) Define vibrations. What are the types of vibrations? Obtain the equation for natural frequency for damped free vibrations of SDOF system.[10]
- Q2)** a) Obtain expressions for Dynamic Amplification Factor (DAF) for un-damped SDOF system subjected to harmonic loading. Also state when the displacement will remain in phase with applied load? [7]
b) What is logarithmic decrement? Prove that logarithmic decrement $\delta = 2\pi\xi$ for very small values of ' ξ '. [8]
c) In a free vibration test on single storey RC structure following observations are recorded : [10]
i) Lateral force = 36000 kg.
ii) Initial horizontal displacement = 50.8 mm.
iii) Time required for 4 complete cycles = 2 sec.
iv) Amplitude at the end of 4 complete cycles = 25.4 mm.
Compute, 1) Damping ratio,
2) Natural period of un-damped vibrations,
3) Stiffness,
4) Number of cycles required for the displacement amplitude to decrease to 5.08 mm.

P.T.O.

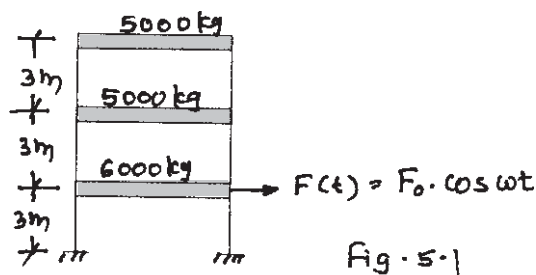
- Q3)** a) Using Duhamal's Integral, determine response of an un-damped system to a rectangular pulse force of magnitude ' F_0 ' and time ' T '. [7]
- b) Explain non-linear analysis by Linear Acceleration Variation Method for response of SDOF. [8]
- c) Elaborate the concept of transmissibility and vibration isolation. Also obtain transmissibility and force transmitted for a mass of 100 kg supported on springs of constant 7.84×10^5 N/m and subjected to disturbing force of 392N due to unbalanced element rotating at frequency 314 rad/s. Assume damping ratio = 0.20. [10]

SECTION - II

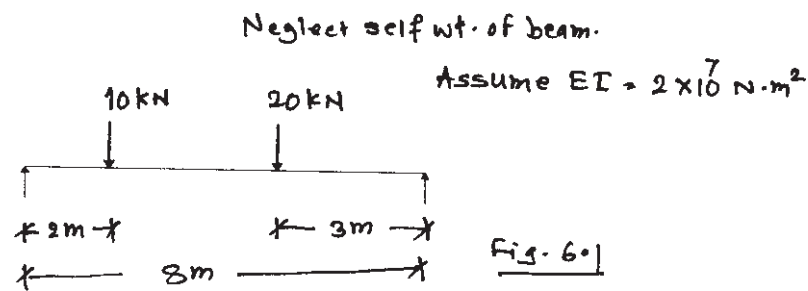
- Q4)** a) State and prove the Orthogonality Property of mode shapes. [7]
- b) Explain the Stodola Method of determining the fundamental frequency of MDOF. [8]
- c) Obtain natural frequency for a 3 d.o.f. structure shown in figure 4.1. [10]



- Q5)** a) Write a note on Modal Combination Rules. Explain each of them. [7]
- b) Explain non-linear analysis by Wilson-theta Method. [8]
- c) Obtain natural frequency of vibrations and plot all mode shapes using normalization. Write equations of motion considering the building to be shear building with EI for each column 4.5×10^6 N/m². Refer Figure 5.1. [10]



- Q6)** a) Derive the equation of motion for free vibrations of a cantilever beam by Rayleigh-Ritz Method assuming prismatic cross section. [7]
- b) Using Rayleigh's method, determine fundamental frequency of vibration of a cantilever beam AB of span L with concentrated mass M at free end and total mass of M_b uniformly distributed along span. Assume shape function of deflection during vibration as $y = y_b(3L x^2 - x^3) / 2L^3$ where y_b = static deflection of at B due to M . [10]
- c) Obtain fundamental frequency of vibrations for prismatic simply supported beam as shown in figure 6.1. [8]



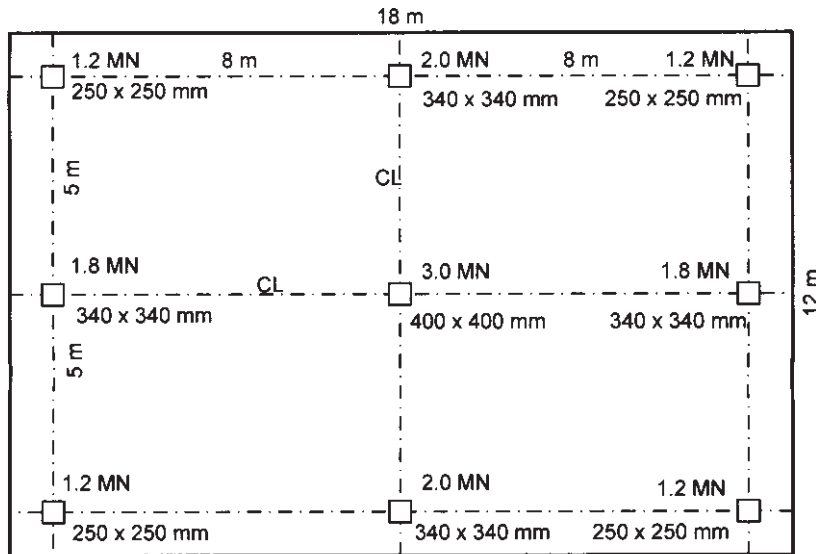
P1617**[3665] - 457****M.E. (Civil / Structures)****DESIGN OF FOUNDATIONS****(2008 Revised)***Time : 4 Hours]**[Max. Marks:100**Instructions to the candidates:*

- 1) *Answer any Two questions from each section.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Assume suitable data, if necessary.*
- 4) *Neat diagrams must be drawn wherever necessary.*
- 5) *Use of electronic pocket non programmable calculator is allowed.*

SECTION - I

- Q1)** a) Discuss various steps involved in the choice of the foundation. [9]
 b) Explain various geotechnical design parameters. [8]
 c) Write in details various factors that affects the settlement of the structure. [8]

- Q2)** Design a raft foundation of the 'flat slab' type for the given plan as shown in Fig. 2 with column loads in MN and dimensions are in mm. The raft size is 18 m x 12 m. Columns are symmetrically placed on the raft along both the axes. [25]

**Fig. 2****P.T.O.**

- Q3)** a) Discuss various design parameters while designing the foundations for rotary and impact machines. [12]
b) Explain vibration characteristics in concern with the machine foundation. [13]

SECTION - II

- Q4)** a) Classify pile foundations according to their functionality. [8]
b) Draw and discuss various pile group patterns and their suitability. [8]
c) Write a note on followings : [9]
i) Capacity of pile.
ii) Efficiency of Pile in a group.
iii) Negative Skin Friction.
- Q5)** a) Discuss analytical method for the analysis of piles in group. [13]
b) Mention IS code recommendations for the following piles. [12]
i) Bored Cast in-situ piles.
ii) Driven Precast piles.
iii) Bored precast piles.
iv) Underreamed piles.
- Q6)** a) Classify shell foundations with neat diagrams. [8]
b) Differentiate between shells in roof and shells in foundations. [8]
c) Draw typical reinforcement details for combined hyper shell foundation. [9]



P1618

[3665]- 466

M.E. (Civil) (Structures)

STRUCTURAL STABILITY

(2008 Course) (501411) (b) (Elective - III)

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 a non-programmable electronic pocket calculator is allowed.
- 6) Assume suitable data, if necessary.

SECTION - I

- Q1)** a) Based on the load-characteristic displacement relationship, explain the classification of structural instability. [5]
- b) Explain the 'Neutral Equilibrium' approach to obtain the critical load (P_{cr}) on a column. What is the linear theory of analysis? [5]
- c) A column of prismatic section and length 'L' has one end pinned, the other end being built in. Using the 'Neutral Equilibrium' approach, calculate the critical load P_{cr} on the column, when loaded axially. [10]
- d) By taking an example, illustrate the Rayleigh Ritz method to obtain the critical load on a column. [5]
- Q2)** a) A column of length 'L' has pinned ends. The moment of inertia for the crosssection is $2EI$ for the central half portion while it is EI for the end quarter portions of the column. Using the finite difference method, obtain the critical load ' P_{cr} ' for the column. [12]
- b) Check your result in (a) using the Rayleigh Ritz method and choosing any suitable displacement function. [13]
- Q3)** a) A beam-column with pinned ends is subjected to a combined action of end-compressive loads 'P' each and a central concentrated load 'Q' acting in the transverse direction. Starting from the fundamentals obtain expressions for :
- i) The lateral deflection ' δ '
 - ii) The bending moment 'M'
- at any section in the beam-column. Hence obtain their maximum values.

[15]

P.T.O.

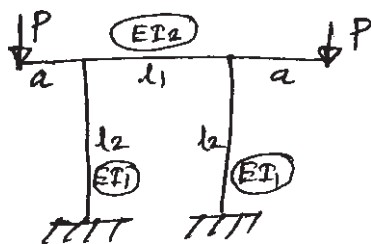
- b) Explain with sketches, the load-deflection characteristics for this case, showing :
- Variation of ' δ ' versus ' Q '. and
 - Variation of ' δ ' versus P/P_{cr} P_{cr} being the exitical load. [10]

SECTION - II

Q4) a) Derive an expression for maximum bending stress for a plate in pure bending and in pure torsion. [15]

b) Explain deflection of rectangular plates with fixed edges. [10]

Q5) a) Derive the relation of critical load on a frame. [18]



b) Explain Buckling of frames. [7]

Q6) Write a brief note on : [25]

- Inelastic stability for biaxially loaded column.
- Dynamic stability.
- Reduced modulus.
- Beam in flexure loaded beyond elastic limit.
- Large deflections of buckled plate.



P1620**[3665] - 494****M.E. (Mechanical) (Design - Engg.)****INSTRUMENTATION & AUTOMATIC CONTROL****(2008 Course)***Time : 3 Hours]**[Max. Marks:100**Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answer 3 questions from Section I and 3 questions 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

- Q1)** a) What are the properties of correlation co-efficient? [8]
 b) Calculate the Spearman's co-efficient of correlation between the marks assigned to 10 students by two judges. [8]

	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

- Q2)** a) Determine the correlation co-efficient between height of father and height of son from data given. [10]

S.No.	1	2	3	4	5	6	7
Height of father inch	64	65	66	67	68	69	70
Height of son inch	66	67	65	68	70	68	72

- b) Explain the classification of measuring instruments. [6]

P.T.O.

- Q3)** a) Explain the terms related to sound. [6]
 i) Decibel.
 ii) Sound pressure level.
 iii) Sound Power level.
- b) If the pressure of sound measured at 1 m from an unmuffled engine was found to be 15.0 N/m^2 , find the corresponding sound pressure level in decibels, take reference pressure = $0.0002 \mu \text{ bar}$. [6]
- c) Explain the measurement of humidity. [6]
- Q4)** a) A LVDT has an output of 6V rms when the displacement is $0.4 \times 10^{-3} \text{ mm}$. Determine the sensitivity of this device in V per mm. A 10V voltmeter with 100 scale divisions is used to read the output. Two tenths of a division can be estimated with ease. Determine the resolution of the voltmeter. [8]
- b) Explain the method of ultralow pressure measurement device with a neat sketch. [8]
- Q5)** Write short notes on any Three : [16]
 a) Ultrasonic flow meter.
 b) Measurement of thermal expansion of a material.
 c) Materials & Installation of strain gauges.
 d) Total radiation pyrometer.

SECTION - II

- Q6)** a) Explain with neat sketch, the principle, working advantages, limitations of Infrared spectrophotometer. [10]
 b) Classify Chromatography. With a schematic diagram explain gas chromatograph with its application. [8]
- Q7)** a) A quartz crystal has the dimensions of $2 \text{ mm} \times 2 \text{ mm} \times 1 \text{ mm}$. It has the following properties. Charge sensitivity = 21 C/N , Young's Modulus = $8.6 \times 10^{10} \text{ Pa}$, permittivity = $40.6 \times 10^{-12} \text{ F/m}$. Determine the value of Force, charge and voltage if the crystal is subjected to a strain of $10 \times 10^{-6} \text{ m/m}$. Take voltage sensitivity = 50×10^{-3} . [8]
 b) Explain the method of measurement of power by any one type of transmission dynamometer. [8]

- Q8)** a) Compare electronic controllers with other types of controllers. [8]
 b) Given the error graph as shown in fig 1, discuss the response of P+I+D control mode. [8]



- Q9)** a) Explain the typical application of a hydraulic controller used in furnace. [8]
 b) Explain the working principle of hot-wire anemometer. [8]

Q10) Write short notes on any Three : [16]

- Vortex-shedding flow meters.
- Vibrometer.
- Errors in instrument.
- Force measuring device.



P1621**[3665] - 498**

M.E. (Mechanical) (Design Engg.)
PROCESS EQUIPMENT DESIGN
(2008 Course) (Elective - II) (Theory)

*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 rules, Mollier chart, electronic steam table and electronic pocket calculator and steam table is allowed.*
- 7) Assume suitable data, if necessary giving reasons.*

SECTION - I

- Q1)** a) Explain the method for calculating thickness of torispherical head subjected to internal and external pressure. **[8]**
- b) A cylindrical vessel with inside diameter 1.5 m and height 4 m is subjected to an internal pressure of 3 kg./cm². Calculate the required thickness and corresponding deflection if allowable stress is 900 kg/cm². and weld joint efficiency is 85%. Poissons ration = 0.33 and E = 19.6 × 10⁵ kg/cm². Also estimate the thickness of (80-20) torispherical head. **[8]**
- Q2)** a) A tall vessel of 1.5 m in diameter and 13m in height is to be provided with skirt support. The weight of vessel with attachments is 90,000 kg. Skirt diameter is equal to diameter of vessel and height is 2.2 m. Wind pressure on the vessel is 110kg/m³. Seismic coefficient = 0.08. Permissible stress in skirt material is 900 kg/cm². and permissible compressive stress is 800 kg/ cm². Estimate thickness of support. **[10]**
- b) Explain testing and inspection of pressure vessels. **[6]**
- Q3)** a) Explain with neat sketches design of self supporting conical roof. **[6]**
- b) Explain design of pressure vessel subjected to external pressure. **[6]**
- c) What are entrainment separators? Explain their applications. **[4]**

P.T.O.

- Q4)** a) A high pressure vessel is to be operated at 150 MN/m^2 . The inside diameter of vessel is 30.5 cm. The steel plate with yield strength of 400 MN/m^2 is to be used for fabrication. Estimate wall thickness by maximum shear stress theory with factor of safety of 1.5. [6]
- b) Explain importance of weld joint efficiency, design loading, dilation, thermal stresses and design pressure. in process equipment design. [6]
- c) A storage tank is to store 25,000 kgs of benzene having density 800 kg/m^3 . Due to space limitations the maximum tank diameter is 2.4m. Estimate height of tank if liquid is to be filled upto 90% capacity of storage tank.[4]
- Q5)** Write short notes on any three. [18]
- a) Expansion joint used in process piping systems.
- b) Floating roof type storage tank.
- c) Various types of roofs for storage vessels.
- d) Nozzle reinforcement.

SECTION - II

- Q6)** a) A pressure vessel has inside diameter of 1400 mm and a plate of 5 mm. inside diameter of flange is 1412 mm. a gasket is provided over the flange face. Gasket factor is 2. and gasket seating stress is 120 kg/cm^2 . Inside diameter of gasket is 1415 mm. Pressure inside vessel is 2.5 kg/cm^2 . Permissible stress in bolts under atmospheric condition is 600 kg/cm^2 . Permissible stress in bolt under operating condition is 550 kg/cm^2 . Diameter of bolt is 20 mm. Calculate: i) Bolt load ii) Bolt area iii) Flange thickness. [10]
- b) Explain effect of wind load and seismic load on tall vessels. [6]
- Q7)** a) Explain various types of constructions used for high pressure vessels.[6]
- b) Give classification of filters and explain leaf filter or rotary drum filter.[8]
- c) What is an entrainment separator? [2]
- Q8)** a) Classify driers and explain anyone of them in detail. [8]
- b) Give application of different types of agitators. How the power requirement for agitator is calculated. ? [6]
- c) What is the difference between tray columns and packed columns? [2]

- Q9)** a) Explain design consideration for shell and tube heat consideration. [8]
b) What are centrifuges? Explain with sketch basket type centrifuge. [6]
c) What is a reboiler? [2]

Q10) Write short note on any three of following : [18]

- a) Inspection of pressure vessels.
- b) Theories of failure.
- c) Design of saddle support.
- d) Process flow diagrams.



Total No. of Questions : 10]

[Total No. of Pages : 3

P1622

[3665]-506

M.E. (Mechanical Engineering) (Design Engineering)

VEHICLE DYNAMICS

(2008 Course) (502212) (Elective - IV)

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 rule and non-programmable electronic pocket calculator is allowed.*
- 6) Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Derive an expression for steer angle δ_f required to negotiate turn with usual notations and explain the terms Neutral, under and over steering.[8]
b) Draw the graph of steering angle against speed of the vehicle and discuss its characteristics and explain the critical speeds. [8]
- Q2)** a) Emanate different forces and moments generated in steering system from the tire-road interface. State the formulae for these forces and moments. [8]
b) Derive the generalized equation of vehicle stability with usual notations.[8]
- Q3)** A vehicle has mass of 860 kg at the front axle and 705 kg at the rear axle. The wheel base is 2.56 m. the tires have the following cornering stiffness values: [16]

Load in N	Cornering Stiffness N/deg.
1000	300
2000	540
3000	760
4000	1000
5000	1140
6000	1335

P.T.O.

Determine the following cornering properties of the vehicle:

- a) Ackerman steering angle for 160 m and 50 m turning radius.
- b) Under steer gradient.
- c) Characteristic speed.
- d) Lateral acceleration gain.
- e) Yaw velocity gain at 90 kmph.
- f) Side slip angle for 250 m radius at the center of gravity, when speed of the vehicle is 90 kmph.
- g) Static margin.

Q4) Consider a vehicle as a mass of 1000 kg supported on a spring have a natural frequency of 1.5 Hz. The damping factor is 0.3. The vehicle moves over a speed breaker at speed of 20 km/hr. Speed breaker has a length 500 mm and is in shape of half sine curve of amplitude 100 mm. Find the response of the vehicle when it is on speed breaker and after just crossing the speed breaker. **[18]**

Q5) Write short notes on : **[16]**

- a) Human response to vibrations and its considerations in the design of suspensions.
- b) Road spectral density.
- c) Stability of the vehicle.
- d) Roll center.

SECTION - II

Q6) Consider a vehicle of mass 2000 kg with radius of gyration 1.75 m about its C. G., as a two degree freedom system with bounce and pitch as the coordinates. The stiffness of the front spring is 180 kN/m and that of the rear spring is 140 kN/m. The distance between the axes is 4 m and C.G. is located at 1.5 m from the front axis. Find the natural frequencies and mode shapes, if input is given at front wheels. Also find the frequency response of the system. **[18]**

Q7) Derive the differential equation for the motion of a vehicle considering lateral motion and yaw with steer angle as input. Hence find the condition for the directional stability and comment on the stability. [16]

Q8) Explain the skid steering of tracked vehicles considering centrifugal forces. Draw a free body diagram, when vehicle is skid steering. Hence derive the expression for the thrust developed at the track. [16]

Q9) a) Derive an equation of maximum tractive effort for vehicle on plane road. [6]

b) A vehicle weighs 35 kN and has wheel base 300 cm. The center of gravity is 1300 cm behind the front axle and 50 cm above ground level. The frontal area of the vehicle is 2.25 m² and aerodynamic drag coefficient is 0.45. The coefficient of rolling resistance is given by $f_r = 0.015 + 0.01 (V/100)^{2.5}$ where V is speed of the vehicle in km/hr. The rolling radius of tire is 40 cm. The coefficient of road adhesion is 0.8. Estimate the maximum possible speed of the vehicle on level ground and maximum tractive effort required. [10]

Q10) Write short notes : [16]

- a) Articulated steering of tracked vehicles.
- b) Handling of multi axle vehicle.
- c) Tire road friction.
- d) Analysis of sprocket torques and speeds.



P1623**[3665]-508**

M.E. (Mechanical) Mechatronics (Part - I)
APPLIED NUMERICAL METHODS AND COMPUTATIONAL
TECHNIQUES
(2008 Course) (502801)

*Time : 3 Hours]**[Max. Marks : 100**Instructions to the candidates:*

- 1) Answer any three questions from section I and any three 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, wherever necessary.
- 5) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

SECTION - I

Q1) a) Evaluate $\int_0^1 \frac{1}{1+x} dx$ correct to three decimal places using Romberg's method. **[10]**

b) Using Modified Euler's method, find approximate value of y at $x = 0.3$.
 Given $dy/dx = x + y$ and $x = 0, y = 1$. **[8]**

Q2) a) Use Thomas algorithm to obtain solution of tridiagonal matrix. **[10]**

$$\begin{bmatrix} 0.8 & -0.4 & 0.0 \\ -0.4 & 0.8 & -0.4 \\ 0.0 & -0.4 & 0.8 \end{bmatrix} \cdot \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 41 \\ 25 \\ 105 \end{bmatrix}$$

b) Given **[6]**

Weights	0.5555	0.8888	0.5555
	-0.7745	0.0	0.7745

Calculate the integral value $\int_3^8 (x^2 + x + 1) dx$ using Gauss Quadrature three point formulae.

Q3) a) For [12]

X_1	0	2	2.5	1	4	7
X_2	0	1	2	3	6	2
Y	5	10	9	0	3	27

Using Multiple Regression, fit $Y = a_0 + a_1X_1 + a_2X_2$

b) Write a short note on Shooting method algorithm used in solution of boundary value problems. [4]

Q4) a) For the values of x and y given in table, find cubic splines and evaluate y at $x = 1.5$ and dy/dx at $x = 3$. [8]

x	1	2	3	4
y	1	2	5	11

b) Calculate inverse of Matrix using LU decomposition. [8]

$$\begin{bmatrix} 3.0 & -0.1 & -0.2 \\ 0.1 & 7.0 & -0.3 \\ 0.3 & -0.2 & 10.0 \end{bmatrix}$$

Q5) Write short notes on (Any Two) [16]

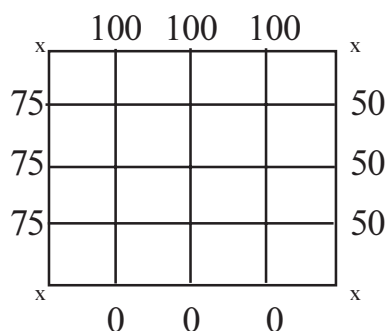
- Lagrange's Interpolation Polynomial.
- Gauss Quadrature for Double Integration.
- Given's Method.

SECTION - II

Q6) a) Integrate $y' = 4e^{0.8x} - 0.5y$ from $x = 0$ to $x = 2$, using $h = 2$ with initial conditions as $x = 0, y = 2$, using adaptive 4th order RK method. [10]

b) Using Classical 4th order RK method, integrate $y = -2x^3 + 12x^2 - 20x + 8.5$. The initial conditions are $y = 1$ at $x = 0$ and $h = 0.5$. [8]

Q7) Using Libmann's method obtain the temperatures of inside nodes. Compute three iterations with over relaxation of $\lambda = 1.5$ and tabulate the result. [16]



Q8) Solve the equation $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ subjected to $u(x,0) = \sin(\pi x)$ for $0 \leq x \leq 1$; $u(0,t) = u(1,t) = 0$, using Crank Nikolson method for two levels, $h = 1/3$ and $k = 1/36$. **[16]**

Q9) a) Use Euler method to calculate y at $x = 4$ with step size $h = 0.5$ and initial conditions as $y = 0$ at $x = 0$ for the differential equation. **[10]**

$$\frac{dy}{dx} = -2x^3 + 12x^2 - 20x + 8.5$$

b) Write short note on “Averages of $\pm 3\sigma$ ”. **[6]**

Q10) Write short notes on (Any Two) **[16]**

- a) Successive relaxation in solution of Elliptic Differential Equations.
- b) Weighted Residual Methods.
- c) Steps and their significance in Finite Element Method.



P1624**[3665]-509****M.E. (Mechanical) (Mechatronics)****MECHANICAL & ELECTRONICS MEASUREMENT
(2008 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 four important static characteristics of an instrument. [8]**

b) Elaborate various standards used in measurements. [8]

Q2) a) Compute the coefficient of correlation by Charles Spearman's method for following data : [10]

X	45	56	39	54	45	40	56	60	30	36
Y	40	36	30	44	36	32	45	42	20	36

b) A thermometer is calibrated between 145°C and 215°C. The specified accuracy is within $\pm 0.25\%$ of instrument span. Find maximum static error. [4]

c) Differentiate between Regression analysis and Correlation analysis. [4]

Q3) a) Explain with block diagram of working of logic analyzer. [8]

b) What is asynchronous timing mode and synchronous state mode? [8]

Q4) a) A Rota meter has been calibrated in liters per min. of water. It is to be used for metering Brine solution of specific gravity = 1.15. For this purpose the density of the float has been changed from 2000 kg/m³ to 2250 kg/m³ without altering shape and volume of the float. What correction factor to be introduced in the original scale in order to use the Rota meter for the brine solution. [8]**P.T.O.**

- b) For a Mcleod gauge, with a capillary of 1 mm diameter and effective bulb volume of 80 ccs, find the reading as indicated by mercury column for 10 Pascal pressure. [4]
- c) Explain with neat sketch the working the thermal conductivity gauge for measurement of ultra low pressure. [4]

Q5) Short notes (Any three) : [16]

- a) Calibration of temperature sensor.
- b) Hot wire anemometer.
- c) Vortex Flow meter.
- d) Resistance standard.

SECTION - II

- Q6)** a) Explain the infrared imaging system. [8]
- b) For a thermistor resistance change with temperature as indicated by the relation.

$$R_T = R_0 e^{\beta \left(\frac{1}{T} - \frac{1}{T_0} \right)}$$

Where T and T₀ are temperatures in K, R_T and R₀ are resistance in ohms at T and T₀ respectively. B is constant. For a certain thermometer B = 3450 K and resistance at 20°C, is known to be 1000 ± 2 Ω. Resistance is measured as 2500 ± 5 Ω. Calculate the temperature and maximum error in temperature measurement. [8]

- Q7)** a) Explain any one surface finish measuring instrument. [8]
- b) Explain characteristic of instrumentation amplifier. [8]

- Q8)** a) What is Impedance matching? [6]
- b) Explain working of binary weighted resistance D to A converter. [6]
- c) An analog voltage signal whose highest significant frequency is 1 Khertz, is to be digitally coded with resolution of 0.01% covering a voltage range of 0 to 10-volt. Determine - [6]
- i) Minimum No. of bits in the digital code.
 - ii) Analog value of LSB.
 - iii) RMS value of quantization error.

Q9) a) Explain AC and DC bridges in signal conditioning. **[8]**

b) Explain successive approximation method in ADC. **[8]**

Q10) Write Short notes on any THREE : **[16]**

a) Hall Sensor.

b) Types of Filters.

c) Stroboscope.

d) Effects of EMI.



P1627

[3665] - 514

M.E. (Mech.) (Mechatronics)

THEORY OF MACHINES & MECHANISMS

(2008 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) 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 do you understand by kinematic pair? With the help of neat sketches explain different type of kinematic pair. **[5]**
- b) Define Inversion of a Mechanism? Explain with the help of neat sketches inversions of four bar chain? Give their applications? **[5]**
- c) Write short notes on the following :- **[6]**
- i) Peaucellier's straight line mechanism.
 - ii) Robert's straight line mechanism.
- Q2)** a) In an I.C. engine mechanism, the stroke of the slider is 180 mm. and the obliquity ratio is 4.5. The crank rotates at 1000 rpm clockwise. Find (i) velocity of piston, (ii) Angular velocity of connecting rod. When the crank is 30° past the outer dead centre. **[6]**

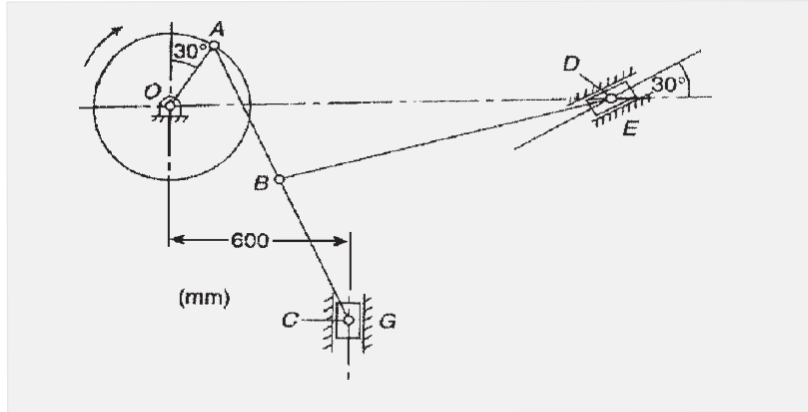
OR

- a) What are "Chase" Solutions of a loop closure equation? How to get such a solution when magnitudes of one vector and direction of another unknown. **[6]**

P.T.O.

- b) The Figure shows a mechanism in which $OA = 300$ mm, $AB = 600$ mm, $AC = BD = 1.2$ m. OD is horizontal for the given configuration. If OA rotates at 200 rpm in the clockwise direction, find
- The linear velocities of C and D , and.
 - The angular velocities of links AC and BD .

[10]



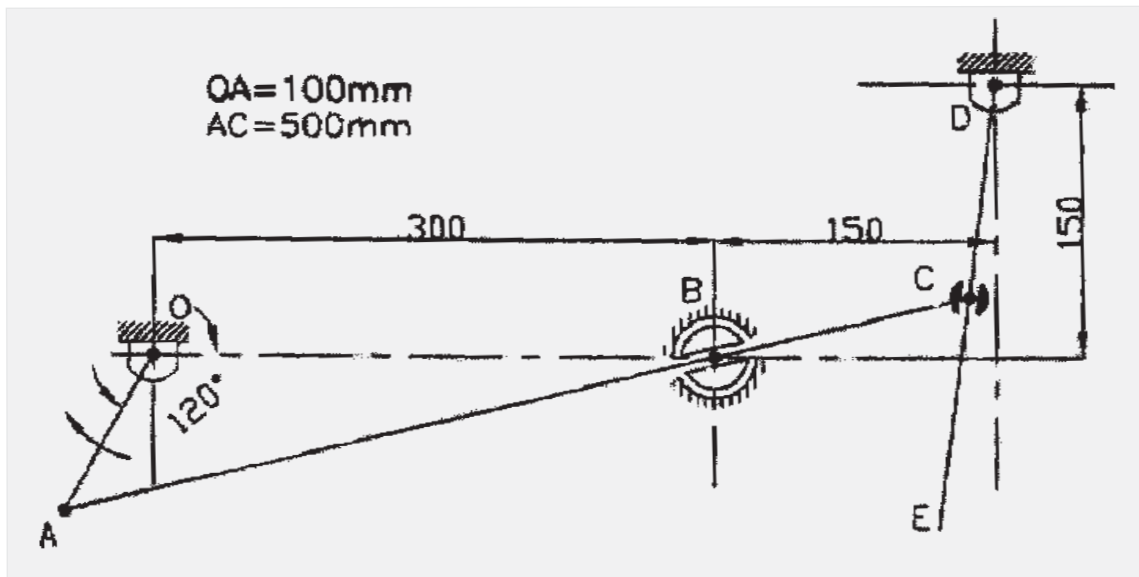
- Q3) a) The crank of reciprocating engine is 225 mm long, the connecting rod is 900 mm long and rpm is 250. Find the acceleration of the piston and the angular acceleration of connecting rod when the angle which the crank makes with i.d.c. is 40° .

[6]

OR

- 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 of 15 rad / sec. and the angular acceleration of 100 rad / sec². Using vector algebra method, determine the acceleration of the piston and the angular acceleration of the connecting rod when the crank is at 60° from inner dead centre.
- In the following figure a crank OA , 100 rpm as shown. Rod AC , 500 mm long slides in a swiveling pin at B . The end C slides on a swinging link DE . When the angle BOA is 120 degree, find the angular velocity and acceleration of link DE using relative velocity and acceleration method.

[12]



SECTION - II

- Q4) a)** Explain the following terms related to synthesis : [6]
- Body Guidance.
 - Function Generation.
- b) Design a four bar mechanism by using three precision points to generate $y = x^{1.5}$ for the range $1 \leq x \leq 4$. Assume $\theta_s = 30^\circ$, $\Delta \theta = 90^\circ$, $\Phi_s = 90^\circ$, $\Delta \Phi = 90^\circ$. Take length of fixed link AD as 55 mm. [12]
- Q5) a)** Define the following terms, (i) Longitudinal vibrations, (ii) Transverse vibrations, (iii) Torsional vibrations. [6]
- b) A cantilever shaft of 50 mm diameter and 350 mm long has a disc of mass 100 Kg at its free end. The young's modulus for the shaft material is 225 GN/m². Determine the frequency of longitudinal and transverse vibrations of the shaft. [10]

OR

- b) A steel shaft 1.5 m long is 95 mm in diameter for the first 0.6 m of its length, 60 mm in diameter for the next 0.5 m of the length and 50 mm in diameter for the remaining 0.4 m of its length. The shaft carries two flywheels at two ends, the first having a mass of 900 kg and 0.85 m radius of gyration located at the 95 mm diameter end and the second having a mass of 700 kg and 0.55m radius of gyration located at the other end. Determine the location of the node and the natural frequency of free torsional vibration of the system. The modulus of rigidity of shaft material may be taken as 85 GN/m². [10]

- Q6)** a) Write short notes on kinematic equivalent of cam-follower system. [4]
- b) A flat-faced mushroom follower is operated by a uniform rotating cam. The follower is raised through a distance of 45 mm in 120° rotation of the cam, remains at rest for the next 30° and is lowered during further 120° rotation of the cam. The raising of the follower takes place with Cycloidal motion and the lowering with uniform acceleration and deceleration. The least radius of the cam is 25 mm which rotates at 250 rpm.
- Draw the cam profile and determine the values of maximum velocity and maximum acceleration during lowering of the follower. [12]

OR

- b) Derive expressions for displacement, velocity and acceleration for a circular arc cam operating on a radial - translating roller follower : [12]
- i) When the contact is on the straight flank and
- ii) When the contact is on the circular nose



Total No. of Questions : 12]

[Total No. of Pages : 3

P1628

[3665]-538

M.E. (Electrical) (Control System)

ADVANCED DRIVES & CONTROL

(2008 Course) (503112) (Elective - IV)

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 additional data, if necessary.*

SECTION - I

- Q1)** a) Explain multiquadrant operation of the electric drive. [6]
b) Explain criteria for selection of drive components. [6]
c) Write note on the steady state stability criterion of the drive. [6]

OR

- Q2)** a) Explain in detail the thermal consideration and thermal model of the electric motor for heating and cooling. [9]
b) Write a note on the evaluation of the time as well as energy during the starting transient of the electric drive. State its importance. [9]

- Q3)** State various solid state controllers and method employed in the adjustable speed d.c. drive for range of speeds above normal. Explain the constant power operation of the drive. Also comment on the conditions to yield continuous conduction of armature current in each type of controller. Assume the drive is supplying fifty percent of the full load torque continuously. [16]

P.T.O.

OR

- Q4)** a) Draw a neat diagram of system model and derive the transfer function of the converter fed d.c. motor. [8]
- b) With reference to the waveforms of the armature current explain discontinuous conduction mode operation of a chopper fed d.c. motor. Explain the reasons of nonconducting state. Comment on the term 'Torque Pulsation'. [8]
- Q5)** Explain the effect of space harmonics present in the current on the performance of 3-phase induction motor. Why do these get generated? Explain the reason of preferring current source inverter to voltage source inverter to feed variable speed induction motor. [16]

OR

- Q6)** a) A 400V, 4pole, 50Hz, 3-ph, starconnected, cage rotor induction motor draws 1000A (fundamental) current at rated frequency against full load torque and runs at 2% slip (fundamental). Employing V/f control, in the constant torque region, the frequency of a voltage source inverter is adjusted to run the motor at 588 rpm with full load torque and 2% slip (fundamental), Determine [9]
- i) Output frequency of the inverter.
- ii) Magnitude of fundamental voltage and fundamental current drawn by motor.
- b) Write note on P.W.M. inverter. [7]

SECTION - II

- Q7)** a) Explain the static kramer control of drive using induction motor. [8]
- b) Write note on Dynamic d-q model of the induction motor. [8]

OR

- Q8)** a) Explain direct and indirect vector control of induction motor. [8]
- b) Write note on direct torque control of electric drive. [8]

Q9) With reference to control of synchronous-motor-drive, explain

- a) Dynamic d-q model. [8]
- b) Sinusoidal and trapezoidal back emf permanent magnet motor. [8]

OR

Q10) Explain in detail following, with reference to synchronous-motor-drive

- a) Trapezoidal SPM drive. [8]
- b) Sinusoidal SPM drive. [8]

Q11)a) In the closed loop control of the drive explain proportional and integral controller from following view-point. [9]

- i) Necessity.
- ii) Generation of signals.
- iii) Conditioning of signals for proper application.
- iv) Expected control action in the feed back loop.
- b) Explain the application of phase locked loop (PLL) in closed loop control of the electric drive. [9]

OR

Q12) Write a detail note on :

- a) Industrial application of P.I.D. controller. [9]
- b) Design procedure of current control in a closed loop control of the electric drive. [9]



P1629

[3665] - 544

M.E. (Electrical) (Power Systems)

**ARTIFICIAL INTELLIGENCE AND ITS APPLICATIONS
IN POWER SYSTEMS
(2008 Course) (503205)**

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.*

SECTION - I

- Q1)** a) With example, explain the concept of a fuzzy set. Also explain different operations of fuzzy set. [10]
- b) Explain with example, following numbers associated with a fuzzy set. [6]
- i) Height of a fuzzy set.
 - ii) Normal fuzzy set.
 - iii) Normalization of a fuzzy set.
- c) Explain following methods of associating crisp sets with a given fuzzy set. [9]
- i) Core of a fuzzy set.
 - ii) Support of a fuzzy set.
 - iii) Level set associated with a fuzzy set.
 - iv) α -cuts of a fuzzy set.
- Q2)** a) Explain following methods of generation of membership function. [9]
- i) Choice based on intuitive understanding.
 - ii) Generation of membership function based on subjective perception and based on inductive reasoning.
- b) Explain different operations of fuzzy relations. [8]
- c) Explain α -cuts of a fuzzy relation with example and 'max-min' composition of two fuzzy relations. [8]

P.T.O.

Q3) Explain 'Predicate Logic' (PL (2)) with reference to following points along with examples. [25]

- a) Syntax of PL (2).
- b) Symantics of PL (2).
- c) Semantic properties.
- d) Derivations.
- c) Resolution in PL (2).

SECTION - II

Q4) a) What is Artificial Neural Network? Explain following benefits of neural network. [10]

- i) Non - linearity.
 - ii) Input - Output mapping.
 - iii) Adaptivity.
 - iv) Fault tolerance nature.
- b) Giving analogy between 'biological neuron' and 'artificial neuron' explain McCulloch pitts nonlinear model of a neuron. [12]
- c) Construct an architecture graph of following fully connected feed forward network. It has 10 source nodes, 2 hidden layers, one with 4 neurons and other with 3 neurons and a single output neuron. [3]

Q5) a) What is learning of neural network. Explain following learning method.[17]

- i) Learning with a teacher.
 - ii) Learning without a teacher.
 - iii) Error-correction learning.
 - iv) Competitive learning.
- b) Explain how artificial neural network will be a useful tool for load forecasting and power synem protection. [8]

Q6) a) Explain 'Perceptron Learning Rule? Also explain the concept of learning rule and momentum coefficient. [8]

- b) Explain in detail with mathematical expressions, error back propagation algorithm. Also draw architecture of multilayer perceptron (MLP). [17]



P1630

[3665]-554

**M.E. (E & TC) Microwave / VLSI-Embedded Systems
(Electronics) (Digital Systems)**

**PRINCIPLES AND PRACTICES FOR IT MANAGEMENT
(2008 Course) (504182)**

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 role and importance of management in detail. [8]
b) What are business ethics and social responsibilities in management systems. [8]
- Q2)** a) Explain situations for revision of project plan and role of project manager. [8]
b) Explain theories of group formation. [8]
- Q3)** a) Explain application of IT in logistics and customer relationship. [8]
b) State the strategies for resolving destructive conflict. [8]
- Q4)** Write short notes on any three : [18]
a) Energy Management and Energy Audit.
b) Six sigma.
c) Knowledge management.
d) Application of IT in finance.

SECTION - II

- Q5)** a) State and explain various project quality standards. [8]
b) Explain organising a project team and team issues. [8]

P.T.O.

- Q6)** a) Explain the following terms in detail. [8]
- i) WBS
 - ii) CPI
 - iii) PND
 - iv) TCPI.
- b) State the modern approaches to management with reference to supply chain management. [8]
- Q7)** a) Explain application of IT in product design and development. [8]
- b) State in detail about 'preparing and implementing the project plan'. [8]
- Q8)** Write short notes on any three : [18]
- a) Stress management.
 - b) IPR and cyber laws.
 - c) Employee welfare.
 - d) Technology management.



P1631**[3665]-562**

M.E. (E & TC) (Microwave)
MICROWAVE INTEGRATED CIRCUITS
(2008 Course)

*Time : 3 Hours]**[Max. Marks : 100**Instructions to the candidates:*

- 1) Solve any Two questions from each section.
- 2) Figures to the right indicate full marks.
- 3) Assume suitable data whenever necessary.

SECTION - I

- Q1)** a) Explain any two lumped elements used in MIC with neat sketch. [10]
 b) Compare MIC with general low frequency circuits with respect to transmission line. [15]
- Q2)** a) Design a spiral (MIC) inductor having inner radius 0.52mm and outer radius 4.52mm. Calculate inductance and Q factor. Consider CF (correction factor) = 1.2. [10]
 b) Explain power divider topology. [15]
- Q3)** a) Design hybrid Lange coupler and calculate directivity, ZO_e , ZO_a and isolation if [15]

$$S = \begin{bmatrix} 4 & S_{12} & 0.8 & 0.2 \\ S_{21} & S_{22} & S_{23} & 0.8 \\ S_{31} & S_{32} & S_{33} & S_{34} \\ S_{41} & 0.8 & S_{43} & S_{44} \end{bmatrix}$$

- b) Explain MIC manufacturing flow. [10]

SECTION - II

- Q4)** a) What are the different types of multiplier circuits used at microwave frequencies? Derive the Manley-Rowe relation for reactive-Diode multiplier. [15]
 b) What are the advantages of PIN-Diode phase-shifter Vis-à-Vis ferrite phase shifter? Explain the working of any one type of PIN-Diode phase shifter. [10]

P.T.O.

- Q5)** a) An important figure of merit for a mixer is its conversion loss. Define it? [10]
b) Draw a circuit diagram of a Single-ended diode mixer, and using the small signal approximation obtain an expression for the total diode current in terms of RF and L.O.voltage. [15]
- Q6)** Write detail notes on (any two) : [25]
a) Matrix decomposition method for Linear-network synthesis.
b) Method of Harmonic-balance for non-linear network synthesis.
c) MIC test fixtures and probes.
d) Application of MIC in satellite communication system.
e) Future trends in MIC.



P1634

[3665]-614

M.E. (Production)

ADVANCE MACHINE TOOL DESIGN

(Elective - I) (Revised Course 2008) (511104)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Attempt one question from each unit of Section I and 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) Use of non-programmable electronic pocket calculator and statistical tables is allowed.*
- 6) Assume suitable data, if necessary.*

SECTION - I

UNIT - I

- Q1)** a) What do you understand by kinematic structures in machine tools? [6]
b) What are the distinctive features of machining and turning centers? Why are they so versatile? [6]
c) Illustrate with a neat sketch the kinematic structure for a broaching machine. [6]

OR

- Q2)** a) What is meant by high efficiency machining range? Explain in brief. [8]
b) Deduce the expression for power in milling machine and show diagrammatically the forces acting on milling cutter during machining. [10]

UNIT - II

- Q3)** a) Why is the stiffness of machine tools so important in machining operation? [8]
b) During the drilling operation on a radial drilling machine, analyze the different forces acting on the radial arm. Explain the procedure to design the radial arm. [8]

OR

- Q4)** a) Discuss the common requirements of spindle support. [6]
 b) Why it is essential to preload the bearings of spindle mountage? [4]
 c) Explain with sketches the methods of preloading a ball screw. [6]

UNIT - III

- Q5)** a) A nine speed gear box is to be designed for the minimum speed of 100 rpm and maximum speed of 1600 rpm. It is to be driven by an induction motor rotating at 1500 rpm. Draw best structural diagram, optimum ray diagram and gear box layout. [10]
 b) With the help of schematic diagram explain the working principle of any one type of electrical control system incorporated in machine tool. [6]

OR

- Q6)** a) What is meant by regenerative chatter? Explain it with reference to any one type of machine tool. [8]
 b) What do you understand by Hydraulic Power Pack in machine tool? Explain the factors used for selecting fluids for hydraulic system. [8]

SECTION - II

UNIT - IV

- Q7)** a) Explain with a block diagram the working principle of CNC machine. [6]
 b) What procedure is used by the operator to determine the tool length offsets? [6]
 c) What are the five basic types of tool changers? [6]

OR

- Q8)** a) How does a 180° rotation tool changer work? How does a pivot insertion tool changer work in CNC machine? [6]
 b) Explain the working principle of recirculating ball screws commonly used in CNC versions. What are its special advantages? [6]
 c) Would it be possible to design and build machining and turning centers without the use of computer controls? Explain. [6]

UNIT - V

- Q9)** a) Why is damping of machine tools important? How is it accomplished? [6]
 b) Write a note on dynamic characteristic of the cutting process. [6]
 c) Why is thermal expansion of machine tool components important? [4]

OR

- Q10)** a) What do you understand by stick-slip motion? Explain with a suitable example. [8]
- b) Describe the procedure followed in performing acceptance tests for machine tools. [8]

UNIT - VI

- Q11)** a) Explain the importance of aesthetics as a requirement in machine tool design with a suitable example. [8]
- b) Explain the concept of ergonomics as applied to different parts of machine tool. [8]

OR

- Q12)** a) Discuss the modern trends in design of machine tools. [8]
- b) Describe how CAD techniques can be applied in design of machine tool structures. [8]



P1635

[3665]-628

M.E. (Production)

INTELLECTUAL PROPERTY RIGHTS & PRODUCT DESIGN

(Revised Course 2008) (511112) (Elective - IV)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Attempt one question from each unit of Section - I and 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) Use of non-programmable electronic pocket calculator and statistical tables is allowed.*
- 6) Assume suitable data, if necessary.*

SECTION - I

Unit - I

- Q1)** a) What useful information can be obtained from the study of patent applications for the R&D and business development purposes? [6]
- b) What do you understand by the term 'assignment' with respect to trade marks? Discuss the issues related to refusal by the registrar to record the assignment. [6]
- c) Discuss the limitations and exceptions applicable to copyright protection. [6]

OR

- Q2)** a) How can one say that intellectual property is a dynamic area? [6]
- b) What are the various types and categories of signs which can serve as trademarks? Explain giving suitable examples. [6]
- c) Why and how is copyright different from patent rights? [6]

Unit - II

- Q3)** a) Enumerate the three kinds of fees payable at the receiving office with the PCT international application. [5]
- b) What are the basic criteria of patentability? [5]
- c) Discuss the issues related to enforcements of IPRs in developing countries. [6]

P.T.O.

OR

- Q4)** a) Discuss the main steps involved in the processing of PCT application during the international phase. [5]
- b) What are the challenges faced by the developing countries in enforcing IPRs? [5]
- c) Discuss the consequences of a disregards of IPRs in a country for its economy and the society in general. [6]

Unit - III

- Q5)** a) When did the Geographical Indications of Goods (Registration and Protection) Act, 1999, come in to force? Where in India is the Geographical Indication Registry located. [6]
- b) What is patent? Discuss the scope of subject matter for the grant of patent. [5]
- c) Show by flow diagram the progress of a patent application from the date of filing to the grant and sealing of patent. [5]

OR

- Q6)** a) Name the national and international bodies that are spreading IPR awareness programmes. [5]
- b) Why is it necessary to provide protection to databases under IPR laws? [6]
- c) What are the legal instruments for technology transfer? [5]

SECTION - II

Unit - IV

- Q7)** a) What is meant by the term 'Defendant' in a case of infringement? [6]
- b) Give the pros and cons of the various IPR instruments you may adopt to protect your IP asset, if the asset happens to be : [6]
- i) a biotechnological invention and
- ii) biotechnological data
- c) Explain briefly the current international developments in the protection of traditional knowledge. [6]

OR

- Q8)** a) Discuss the technological challenges to IP with reference to computer software industry . [6]
b) What subject matters are protectable under the industrial designs? [6]
c) How have the technological developments impacted on the protection of related rights? [6]

Unit - V

- Q9)** a) Outline the factors affecting product design. [6]
b) Classify the methodology and techniques in product design. [5]
c) Describe how the ergonomic factor plays an important role in product design. [5]

OR

- Q10)** a) Explain in brief the importance of product design in industry. [6]
b) State the principle requirements of good product design. [5]
c) List the important considerations affecting product design. [5]

Unit - VI

- Q11)** a) Discuss the extent to which advances in technology influence the design of graphic products. [5]
b) What properties material must possess that makes it suitable for packaging? Explain with suitable example. [5]
c) Discuss the implications of the increasing use of plastics in the production of automobile parts. [6]

OR

- Q12)** a) Discuss the factors to be considered when deciding upon the most appropriate manufacturing process for any engineering product of your choice. [6]
b) State different ways in which packaging can be made more environmentally friendly. [5]
c) Give different reasons why product should be packaged. [5]



P1636**[3665]-635**

M.E. (Computer Engineering)
INTERNET ROUTING DESIGN
(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) Assume suitable data, if necessary.

SECTION - I

- Q1)** a) Explain the IPv6 packet format. Which are the fields in the header of IPv4 are no longer maintained in the header of IPv6 packet. [8]
- b) Apply the Dijkstra-based widest path algorithm to the network topology shown in the figure 1 where each link is marked with an available bandwidth and node no. 1 is a starting node. [8]

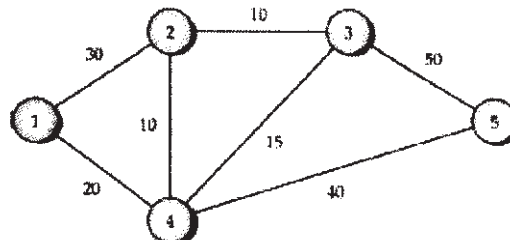


Figure 1. Network example for widest path algorithm

- Q2)** a) Explain k-shortest paths algorithm of routing. [8]
- b) Enlist the issues faced in a distance vector protocol that are addressed by a path vector protocol. [8]
- Q3)** a) Consider a fully-connected N-router OSPF network. Suppose one of the routers goes down. Estimate how many total link state messages would be generated before the network converges. [8]
- b) What are the sub-protocols of a link state protocol? List the differences between a distance vector protocol and a link state protocol. [8]

- Q4)** Write short note on any **THREE** : [18]
- Classful IP Addressing Scheme.
 - Path Vector Routing Protocol.
 - OSPF and IS-IS.
 - Router Architectures.

SECTION - II

- Q5)** a) Explain how the originating host 192.168.40.49 will send the packets to the destination host 192.168.40.76 under following scenario – [8]
- Both the hosts are under same subnet.
 - Both the hosts are under same network but not under same subnet.
- b) Which are the key elements of routers? Explain different types of routers. [8]
- Q6)** a) Construct a *HiCuts* decision tree for the rules shown in Table 6.1. [8]

TABLE 6.1 A two-field classifier

Rule	F1	F2
R1	0*	10*
R2	0*	01*
R3	0*	1*
R4	00*	1*
R5	00*	11*
R6	10*	1*
R7	11*	00*
R8	*	00*

- b) Explain why longest prefix match is important and define the longest prefix matching problem. [4]
- c) What is the main difference between a binary trie and multibit trie? [4]
- Q7)** a) Compare different 2-Dimensional Packet Classification Algorithms on the basis of Time and Space complexity. [8]
- b) How does bandwidth guarantee required by services affect the performance it receives in a heterogeneous bandwidth environment? [8]
- Q8)** Write short note on any **THREE** : [18]
- QOSPF.
 - Importance of Packet classification.
 - Traffic Engineering.
 - MPLS.



P1637**[3665]-643****M.E. (Computer Engineering)****NETWORK DESIGN MODELING AND ANALYSIS****(2008 Course) (510110)****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) The HR manager of a IT industry claims that among 400 employees 312 got a raise, 248 got increased pension benefits, 173 got both and 43 got neither. Explain why this claim should be questioned. **[8]**
- b) In how many ways two out of seven computer engineers be assigned to a new project? **[8]**
- Q2)** a) Explain relaxation algorithm in detail with an example. **[8]**
- b) The following table represents the cost of connecting each terminal to each concentrator. Each terminal has a weight of 1 and each concentrator has a capacity of 2 terminals. Assign these terminals to the concentrator using optimal terminal assignment algorithm. **[8]**

		Concentrator		
		G	H	I
Terminal	a	6	3	8
	b	2	9	4
	c	3	1	4
	d	2	5	9
	e	1	6	3
	f	2	7	9

- Q3)** a) What is the smallest number of lines which allow an offered load of 0.5 erlangs to suffer no worse than a 2 percent loss? [8]
- b) We are given three systems. All have 56 kbps lines. All have 50 percent utilization. All have average message length of 1400 bits. The first has exponentially distributed message length. The second has constant (1400 bits) message length. In the third, half of the messages are 400 bits long and other half are 2400 bits long. Compare waiting times of the three systems. [8]
- Q4)** Write short notes on (any three) : [18]
- a) M | G | I queue with vacations.
- b) Network components.
- c) PSN node.
- d) Applications of probability theory in network analysis.

SECTION - II

- Q5)** a) Discuss and derive equation for probability of loss in M|M|m|m system. [10]
- b) Let us consider a specific link configuration for a node. There are six half-duplex links operating at 9600 bps and six half duplex links operating at 4800 bps. The message size is 100 characters and each of the 12 links transmits 4 messages/sec. There is a 2 character link buffer for each link. What is the probability of overflow on a link buffer assuming it takes 100 μ s of the node processor to service a request. [6]
- Q6)** a) Explain Sharma's algorithm with an example. [8]
- b) Given the set of nodes and the distances between them, in terms of the lengths of the links, determine a spanning tree with minimum total length of the links using Kruskal's algorithm. [8]

Node	1	2	3	4	5	6
1	-	3	3	5	10	-
2	3	-	6	4	8	-
3	3	6	-	-	5	3
4	5	4	-	-	7	2
5	10	8	5	7	-	-
6	-	-	3	2	-	-

- Q7)** a) Explain duties and responsibilities of network administrator. [8]
b) Eight laboratories with 25 computers each are set up in an institute. Only 02 machines per laboratory are to be given access to internet. Suggest security mechanisms. [8]
- Q8)** Write short notes on (any three) : [18]
a) Network virtualization.
b) Spanning Tree Protocol.
c) Tools for network administration.
d) Probabilistic form of Little's Theorem.



P1639

[3665]-682

M.E. (Petroleum Engineering)

**NUMERICAL METHODS AND SIMULATION IN PETROLEUM
ENGINEERING**

(New 2008 Course) (512101)

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) For the following system of equations, find x, y, z using Gauss elimination, SOR, and Gauss Seidel method. $w = 1.1$; use your own starting value and do two iterations.

$$x + y + z = 10$$

$$2x + 3y + z = 18$$

$$x - y + z = 4$$

[25]

Q2) a) Solve the following system of equations by Newton Raphson method

$$x^2 y + \sin(xy) = 54$$

$$\sin(x^2 y) + xy = \cos y$$

b) Find the roots of the equation by Bisection method :

$$x^3 + 2x^2 + 3x - 4 = 0$$

[25]

Q3) Solve $y' = x^2 y - xy + 4$, $y(1) = 2$, using Euler, RK-5 and Adam Bashforth predictor corrector method. **[25]**

P.T.O.

SECTION - II

- Q4)** Given a 1D reservoir. Find the pressures in the interior of the reservoir, if the pressures are at 50 psi for one well and 3000 psi at the other well, both at each boundary. Length of the reservoir are 400 ft. Assume $\Delta x = 100$ ft. Solve by explicit, Cranknicolson and implicit method. Only set up the matrix $P_R = 3000$ psi. [25]
- Q5)** Derive the IMPES method for reservoir simulation. [25]
- Q6)** Write a detailed Essay on Reservoir Simulation. [25]



Total No. of Questions : 6]

[Total No. of Pages : 1

P1641

[3665]-696

M.E. (Petroleum Engineering)

ARTIFICIAL LIFT TECHNIQUES

(New 2008 Course) (512111) (Elective - IIIa)

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)** Explain in detail Workover Operations. **[25]**
- Q2)** Draw the IPR, Outflow Performance and Tubing in-take Curves and explain in detail. **[25]**
- Q3)** Explain in detail Gas Lift design. **[25]**

SECTION - II

- Q4)** Explain the design of an SRP. **[25]**
- Q5)** Explain Hydraulic fracturing. **[25]**
- Q6)** Explain Nodal analysis. **[25]**



Total No. of Questions : 6]

[Total No. of Pages : 1

P1642

[3665]-695

M.E. (Petroleum Engineering)

ADVANCED NATURAL GAS ENGINEERING AND TECHNOLOGY

(New 2008 Course) (512110)

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 and explain any two properties of Natural Gas. How do you compensate for the presence of impurities in them? **[25]**
- Q2)** Explain in detail the installation, operation and trouble shooting of pipelines. **[25]**
- Q3)** Explain in detail the steps involved in the design of a reciprocating compressor. Show the compressor cycle on a Mollier chart. **[25]**

SECTION - II

- Q4)** Define any EOS. How is it useful in Gas reservoirs? **[25]**
- Q5)** Draw a process flow diagram to show two methods how CO₂ is removed from a natural gas stream. **[25]**
- Q6)** Derive the equation used to calculate flow rate in an orifice meter. Explain all the constants. **[25]**



Total No. of Questions : 8]

[Total No. of Pages : 2

P1643

[3665]-720

M.E. (IT) (CSE)

HIGH PERFORMANCE COMPUTER NETWORK

(2008 Course) (Elective - IV) (514412 (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) Compare TCP/IP and ISO/OSI models for computer networks. [8]
b) Differentiate between circuit switching, message switching and packet switching. [8]
- Q2)** a) Explain the architecture of HPCN and discuss design issues related to it. [8]
b) Explain the architecture of Gigabit ethernet. [8]
- Q3)** a) What are ISDN interfaces, functions and services? [8]
b) Explain how congestion control is achieved in frame relay. [8]
- Q4)** Write short notes on (any three) : [18]
a) ATM service categories.
b) Compare frame relay and ATM.
c) S S 7.
d) QOS in HPCN.

SECTION - II

- Q5)** a) Explain different technologies used in DSL. [8]
b) Explain DMT used in ADSL technology. [8]

P.T.O.

- Q6)** a) Explain the SAN architecture. [8]
b) Draw and explain the fibre channel architecture. [8]
- Q7)** a) Discuss UMTS in detail. [8]
b) Explain CDMA technique in detail. [8]
- Q8)** Write short notes on (any three) : [18]
a) GSM architecture.
b) WLAN.
c) Mobile IP.
d) SONET Layered architecture.



Total No. of Questions : 8]

[Total No. of Pages : 2

P1644

[3665]- 721

M.E. (IT)

**SERVICE ORIENTED ARCHITECTURE
(Revised Course 2008) (Elective - IV) (Sem. - 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)** a) Explain the SOA concepts with tourism business which includes travels and hotel booking. **[10]**
b) State the principles of service orientation. **[6]**
- Q2)** a) Explain Enterprise Solution Assets (ESA). **[8]**
b) List the advantages and disadvantages of SOA. **[8]**
- Q3)** a) Explain Java Technology support for implementation of SOA. **[8]**
b) Explain top-down, bottom-up and agile strategy of SOA delivery. **[8]**
- Q4)** Write any three short notes : **[18]**
a) ESB - Enterprise Service Bus.
b) USDL.
c) UDDI and SOAP.
d) Service Design Guidelines.
e) Non-functional requirements of SOA.

SECTION - II

- Q5)** a) Consider a bicycle company which manufactures, distributes and sales bicycles across the nation. Design with SOA. **[10]**
b) What is the concept of service integration? **[6]**

P.T.O.

- Q6)** a) Explain service level agreement. [8]
b) Explain different places in SOA business solution where security is applied. [8]
- Q7)** a) Explain dot net support for SOA implementation. [8]
b) Explain importance of SOA governance. [8]
- Q8)** Write notes on any three : [18]
a) Impact of service changes.
b) Service interface design tools.
c) SOA delivery life cycle.
d) Mapping of business processes to technology.
e) Significance of quality assurance in SOA.



P1645

[3665]-764

M.E. (Instrumentation & Control)

**COMMUNICATION PROTOCOLS FOR INSTRUMENTATION
(2008 Course) (5061103)**

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) Keeping in view the advantages of HART communication protocol, elaborate with neat sketches, any one industry application in the following areas: **[16]**

- a) Inventory-management applications.
- b) Cost-saving applications.
- c) Remote-operation applications.
- d) Open-architecture applications.

Q2) The manufacturing/process industry can be viewed as a combination of several networks. How are the networks classified? **[2]**

Discuss the characteristics of the lower two networks. **[2]**

Suggest any three protocols/methods used at different levels in the industry. **[12]**

Q3) 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]**

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

- a) DeviceNet.
- b) ControlNet.
- c) Bluetooth.

SECTION - II

- Q5)** 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]
- Q6)** a) With neat sketch, explain the mapping of PROFIBUS and its variants (FMS, DP and PA) on the OSI/ISO model. [4]
b) PROFIBUS PA Network elements. [6]
c) Installation of ProfiBus DP nodes and PA nodes. [6]
- Q7)** Explain the following :
a) Link Active Scheduler (LAS) [4]
b) Device Description Files. [4]
c) Advantages of Fieldbus. [8]
- Q8)** Write short notes : [16]
a) ZigBee Protocol.
b) RS 485.



P1646

[3665]-541

**M.E. (Electrical) (Power Systems)
POWER SYSTEM MODELLING
(2008 Course) (503203)**

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) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary and state clearly the same.*
- 5) *Use of pocket electronic calculator is allowed.*

SECTION - I

- Q1)** a) Develop a mathematical model of a tap-changing transformer. [13]
b) Stating clearly the assumptions made, develop a simplified model for a steam turbine and governor system. [12]
- Q2)** a) What are the different types of loads encountered in Power System? How they are classified? Develop a model of 3-phase induction motor used in power system studies. [13]
b) A 60Hz, 138 kV, 3-phase, 225 km long transmission line has the following parameters :- $r = 0.169 \Omega/\text{km}$; $\ell = 2.093 \text{ mH/km}$; $c = 0.01427 \mu\text{F/km}$; and $g = 0$. Determine the circuit model of the line. [12]
- Q3)** Write short notes on the following :
a) Static var compensator model; [8]
b) Alternator excitation systems; and [8]
c) The need for modelling in Power Systems. [9]

SECTION - II

- Q4)** a) Derive the expressions for the self-inductance of phase winding 'A' and mutual inductance of phase winding 'A' with 'B' in terms of turns/phase, permeance of airgap along the 'd' and 'q' axes of a salient pole synchronous machine. State the assumptions made. [12]

- b) A 500 MVA, 13.2 kV, 0.85 p.f., 50 Hz, Y-connected, 2 pole alternator has the following data :

$$\begin{aligned}l_{aa} &= (3.22 + 0.046 \cos 2\theta) \text{ mH}; \\l_{ab} &= (-1.6 - 0.046 \cos(2\theta + \frac{\pi}{3})) \text{ mH}; \\l_{afd} &= 42 \cos \theta \text{ mH}; L_{ffd} = 550 \text{ mH}; \\R_a &= 3.8 \text{ m}\Omega; \text{ and } R_{fd} = 70 \text{ m}\Omega.\end{aligned}$$

Determine the p.u. values of L_d , L_q , L_{afd} and L_{fd} . [13]

- Q5)** a) Determine an expression for the electromagnetic torque developed in a salient-pole alternator in terms of the number of poles, i_d , i_q , ψ_d and ψ_q . [12]
- b) Write the equations for flux linkages of a salient pole machine in p.u. form. Obtain the equations for e_d , e_{fd} and e_{kd} and hence obtain the d -axis equivalent circuit of the machine. [13]

Q6) Write short notes on the following :

- a) Transmission line models; [8]
- b) Park's transformation; and [8]
- c) p.u. system for synchronous machine. [9]



P1647**[3665]-548**

M.E. (Electrical) (Power Systems)
HIGH VOLTAGE POWER TRANSMISSION
(2008 Course) (503210)

*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) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary and state clearly the same.*
- 5) *Use of pocket electronic calculator is allowed.*

SECTION - I

- Q1)** a) Draw a neat diagram showing the layout of a HVDC station, identifying the important components. Explain the function of each component. **[13]**
- b) A HVDC link has $X_{cr} = 58\Omega$, $R_{dc} = 3\Omega$ and $X_{ci} = 57\Omega$. The output power of the d.c. link is maintained at 500 MW with an a.c. line voltage of 330 kV and a p.f. 0.78. Calculate the necessary a.c. line voltage, current and p.f. at the rectifier terminals when operating with $\alpha = 15^\circ$. Assume that there is no loss at converter terminals. **[12]**
- Q2)** a) Explain the operation of a 12 pulse HVDC converter bringing out the following points :- **[12]**
- i) Transformer connections;
 - ii) Numbering the SCRs according to firing sequence;
 - iii) Waveforms of line current and output voltage of the converter;
 - iv) Harmonics in the line.
- b) The line voltage of a 3-phase bridge inverter is 160 kV when the extinction angle is 20° with an overlap angle of 20.5° . Calculate the d.c. voltage at the inverter terminals. Determine the necessary extinction angle to maintain the a.c. line voltage at 160 kV when the d.c. voltage drops to 175 kV assuming that the overlap angle remains unchanged. Take the commutation margin angle as 5° . **[13]**

Q3) Write short notes on any THREE of the following :

- a) D.C. circuits in HVDC transmission; [8]
- b) Protection of HVDC converters; [9]
- c) EHVAC vs. HVDC transmission; and [8]
- d) HVDC links. [8]

SECTION - II

Q4) a) A transmission line is 300 km. long and open at the far end. The attenuation of surge is 0.9 over one length of travel at velocity of light. The line is energised by a step input of 1000 kV. Draw the Bewley lattice diagram and calculate the final value of open end voltage. [12]

- b) Derive an expression for the effective shunt conductance of a EHV transmission line for a lightning surge. State the assumptions made. Use the expression derived to determine the effective conductance of a 400 kV line for a lightning surge given that shunt capacitance/km. of the line is 10nF. [13]

Q5) a) Explain the theory of travelling waves and standing waves as applied to EHV transmission lines. [13]

- b) Discuss the biological aspects of electric field. [12]

Q6) Write short notes on any THREE of the following :

- a) Methods of voltage control; [9]
- b) Protection of systems against surges; [8]
- c) Corona; and [8]
- d) Capacitance switching. [8]



Total No. of Questions : 8]

[Total No. of Pages : 2

P1649

[3665]-47

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

ADVANCED FLUID MECHANICS

(2002 Course)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Assume suitable data, if required.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of logarithmic tables, slide rule and electronic pocket calculator is allowed.*
- 4) *Answer any three questions from each section.*

SECTION - I

Q1) Consider the fully developed flow between two parallel plates, separated by a distance h , inclined at an angle θ to the horizontal. The bottom plate is stationary, while the top is moving with a speed U . Determine :

- a) The velocity profile. [10]
- b) Wall shear Stress. [3]
- c) Pressure Gradient which will produce zero wall shear stress. [4]

Q2) a) List any 2 assumptions of the boundary layer theory. [2]
b) Assuming a linear velocity profile within the boundary layer, determine the boundary layer thickness δ as a function of x . [10]
c) Derive the expression for the skin friction coefficient C_f for the same linear velocity profile. [5]

Q3) For compressible flows :

- a) Derive expressions for $\frac{T_0}{T}$ and $\frac{p_0}{p}$, where T_0 and p_0 are the stagnation temperature and pressure respectively. [4]
- b) Derive Bernoulli's equation for compressible flows. [12]

Q4) a) What are the first order Forward and Backward difference expressions for $\frac{\partial u}{\partial x}$? [2]

P.T.O.

- b) List the steps in solving $u_t + au_x = 0$ using the McCormack method, where 'a' is a constant. What is the stability criterion? [5]
- c) Apply the McCormack method to the continuity equation for two dimensional compressible flow. Show how the density is updated.[9]

SECTION - II

- Q5)** a) Derive the continuity equation in cartesian coordinates for two dimensional compressible flow. [15]
- b) Deduce the equation for 2 dimensional incompressible flow. [2]

- Q6)** a) Derive the expression for the substantial derivative $\frac{Du}{Dt}$. [8]
- b) Using the substantial derivative expression(or otherwise), derive the Euler (inviscid momentum) equation in the x direction. [8]

Q7) Let the velocity profile be given as :

$$u = x + y,$$

$$v = x - y$$

- a) Is this a possible case of incompressible flow. [3]
- b) If so, what is the stream function. [4]
- c) Is the flow irrotational. [3]
- d) If so, what is the velocity potential. [4]
- e) Compute the pressure difference between the points (2,1) and (0,0). Assume density = 1. [3]

Q8) A pipe has 300 mm diameter at the inlet. At the outlet, the diameter is 230mm. The flow rate is 0.28m³ per sec. of water. The pipe has a 90 degree bend in the horizontal plane. The pressures at the inlet and outlet are 25 kPa and 10.8 kPa respectively.

Find :

- a) Velocity at inlet and outlet. [4]
- b) Resultant Force on the pipe. [8]
- c) Frictional Loss (in kPa) [4]



P1651

[3665]-572

M.E. (E & T/C) (VLSI & Embedded Systems)

ANALOG AND DIGITAL CMOS IC DESIGN

(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) *Use of electronic pocket calculator is allowed.*
- 5) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Design CMOS current mirror for load current of $100\mu\text{A}$. Assume suitable data. Comment on the performance of the ckt. [8]
- b) How does MOSFET behave as pn diode? What are its applications? Give the expressions for its dc current & dynamic resistance. [8]
- Q2)** a) Differentiate at least three types of CMOS inverters w.r.t. gain, bandwidth, swing & R_{out} . [8]
- b) Give the detail mathematical analysis pertaining to ICMR, R_{out} , CMRR & dc bias of differential amplifier. [8]
- Q3)** a) What is micropower opamp? Brief the achievement techniques. What are its limitations? [8]
- b) Explore the sources & elimination techniques of hazards? [8]
- Q4)** Write short notes on any three : [18]
- a) Current & voltage references.
 - b) Current amplifiers.
 - c) Macro models of opamp.
 - d) High gain amplifiers.

SECTION - II

- Q5)** a) With the help of timing diagram explore the metastability issue what are solutions to it? [8]
b) Why are synchronous machines preferred? What are the merits of asynchronous machines? [8]
- Q6)** Draw FSM diagram & write VHDL code for synchronous overlapped 11001 mealy sequence detector. Also write test bench for it. [16]
- Q7)** a) Compute the total power dissipation & PDP for a logic having 10000 MOSFETs each having leakage of 1 pA. The total capacitive load is of 10pF & logic operates at 100M. What is percentage of static power dissipation? What is its scenario in current high density VLSI chips?[8]
b) What are the limitations of transmission gate? How to overcome them.[8]
- Q8)** Write short notes on any three : [18]
a) Domino logic.
b) Layout design rules.
c) CMOS parasitics.
d) Advance trends in VLSI.



P1652

[3665]-160

M.E. (Electrical Control Systems)

**MICROCONTROLLER & ITS APPLICATIONS IN CONTROL
SYSTEMS**

(2002 Course) (503107)

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 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 the internal RAM structure of 8051. [5]
b) Explain JUMP and CALL instructions of 8051. [5]
c) Explain rotate and swap operations of 8051. [5]
d) Explain Bit level logical operation provided in 8051. [5]
e) Write program in assembly language for 8051 to send 10 bytes of data from external RAM serially at a baud rate of 4800 at a clock frequency of 12 MHz. [5]
- Q2)** a) Explain the addressing modes of 8051. [5]
b) Explain the interrupt structure of 8051 with vector addresses. [5]
c) Explain the following instruction of 8051. [6]
i) CJNE @ R1, # data, rel
ii) AJMP add
iii) ORL C
iv) XRL A, # data
v) DA A
vi) MO VC,A, @ A + PC
d) Calculate the largest possible time delay for a timer in 8051, operating in model with a crystal frequency of 12 MHz. [4]
e) Write a program to add two 16 bit BCD numbers. [5]

- Q3)** a) Write short notes on assembler, simulator, emulator programmers and cross assemblers. [10]
b) How can we rotate satellite dish axis at 60° from the present angular position using 8051 and stepper motor? Design a suitable interface circuit and write appropriate codes for 8051. The motor step angle is 1.8° and current position is 0° . Draw flow chart. [15]

SECTION - II

- Q4)** a) Draw a block diagram to control temperature of an electric oven with 8051. Write assembly language program and draw flow chart. [10]
b) Explain the interfacing of 8 bit DAC to 8051. Draw flow and write a program to generate sinusoidal waveform. [15]
- Q5)** a) Write an assembly language program to receive and transmit data on RS232 serial communication with 8051. Draw flow chart. [15]
b) Compare 8051 and 8096 microcontroller. [5]
c) Give an application of PWM features of 8096. [5]
- Q6)** a) Explain the added features of 8096 over 8051. [5]
b) Explain evolution of 8051 microcontroller. [5]
c) Draw block diagram of 8096 and explain its important blocks. List out salient features of MCS-51 family. [15]



P1653

[3665] - 599
M.E. (Electronics)
EMBEDDED SYSTEMS

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)** List and explain characteristics of embedded systems with suitable example. What is design challenge in front of embedded system designers? **[10]**

Explain optimizing design metrics. Write short notes on :

- i) Time to market design metric.
 - ii) NRE & unit cost design metric.
 - iii) Performance design metric.
- b)** Write short notes on : **[8]**
- i) FPGA architecture.
 - ii) RISC v/s CISC architecture.

- Q2) a)** List the features of ARM processor. Draw and explain the ARM core. **[8]**
- b)** What are privileged and non privileged modes of operation in ARM processor. Explain. **[8]**

- Q3) a)** Explain Hardware and software architecture of embedded system. **[8]**
- b)** Write short notes on : **[8]**
- i) CAN Bus.
 - ii) MODBUS.

P.T.O.

- Q4)** a) With suitable diagram explain following protocols. [8]
i) Bluetooth ii) IrDA.
b) Explain following Hardware tools. [8]
i) In Circuit Emulator ii) Logic analyzer.

SECTION - II

- Q5)** a) What are the different features of μ COS-II? Explain the Porting of μ COS-II with different microcontrollers. [10]
b) Describe priority inheritance and priority inversion. [8]
- Q6)** a) What is shared data bug and state the characteristics of shared data bug? [8]
b) Explain following software architectures : [8]
i) Round Robin.
ii) Round Robin with interrupts.
iii) Function Queue Scheduling.
- Q7)** a) Explain with respect of RTOS. [10]
i) Scheduler.
ii) Inter task communication.
iii) Timer and events.
b) Explain the memory management functions of RTOS. [6]
- Q8)** a) How does a mailbox message differs from a queue message in uCOS? [8]
Can you message queue as counting semaphores?
b) Explain interrupt routines in an RTOS environment. [8]



P1655

[3665]-473

M.E. (Mechanical) (Heat Power)
NUMERICAL METHODS IN THERMAL & FLUID
ENGINEERING
(2008 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) Using 'LU Decomposition method' solve the following set of simultaneous equations. Do partial Pivoting. **[12]**

$$2x_1 + x_2 + x_3 - 2x_4 = -10$$

$$4x_1 + 2x_3 + x_4 = 8$$

$$3x_1 + 2x_2 + 2x_3 = 7$$

$$x_1 + 3x_2 + 2x_3 - x_4 = -5$$

- b)** With reference to solution of linear simultaneous equations explain: **[6]**
- i)** Partial Pivoting.
 - ii)** Ill conditioned system of equations.

Q2) a) How do we decide initial guess values for solving a polynomial equation using **[4]**

- i)** open end methods, and
- ii)** bracketing methods.

- b)** Mechanical engineers, as well as most other engineers, use thermodynamics extensively in their work. The following polynomial can be used to relate the zero pressure specific heat of dry air, C_p kJ/kg K, to temperature :

$$C_p = 0.99403 + 1.671 \times 10^{-4}T + 9.7215 \times 10^{-8}T^2 \\ - 9.5838 \times 10^{-11}T^3 + 1.952 \times 10^{-14}T^4$$

Determine the temperature that corresponds to a specific heat of 1.2 kJ/kg K.

[12]

P.T.O.

Q3) The following data was gathered to determine the relationship between pressure (P) and temperature (T) of a fixed volume of 1kg of Nitrogen. The volume (V) is 10m³. The ideal gas law is given by $PV = mRT$, where m is the mass and T is in kelvin.

T(°C)	-40	0	40	80	120	160
P(N/m ²)	6900	8100	9300	10500	11700	12900

- a) Fit a straight line to the data and thus determine R. Derive the formula you use. [12]
 b) Use the same to determine the pressure at 200°C. [4]

Q4) The following table gives pressure of steam at a given temperature. Compute the pressure for a temperature of 142°C and 185°C. Use Newton's divided difference method for 142°C temperature and Richardson's Gaunt technique for 185°C temperature. [16]

Temperature, °C	140	150	160	170	180
Pressure kg/cm ²	3.685	4.854	6.302	8.076	10.225

SECTION - II

- Q5)** a) A gas is expanded according to law $PV^{1.3} = \text{constant}$, from pressure of 10N/m². Assuming initial volume of gas 1 cubic meter and final volume 7 cubic meter, calculate work done using Simpson's 1/3rd rule divide volume in 6 equal intervals. Confirm your answer by solving the same problem using Gauss Quadrature 3 point formula. [12]
 b) Give physical significance of single, double and triple integration. [4]

Q6) a) Find all the eigen values and the corresponding eigen vectors of

$$A = \begin{bmatrix} 4 & 1 & -1 \\ 2 & 3 & -1 \\ -2 & 1 & 5 \end{bmatrix} \text{ taking } x_0^T = [1 \ 0 \ 0] \text{ by iteration method.} \quad [12]$$

- b) Explain Given's method. [4]

Q7) Use the Shooting method, solve the first boundary value problem

$$u'' = u + 1, 0 < x < 1$$

$$u(0) = 0, u(1) = e^{-1},$$

Assume $h = 0.25$

[18]

Q8) Solve the Poisson's equation

$$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = -10(x^2 + y^2 + 5)$$

in the domain $0 \leq x, y \leq 1$, subject to conditions,

$$u = 0 \text{ at } x = 0, x = 1$$

$$u = 0 \text{ at } y = 0$$

$$u = 1 \text{ at } y = 1 \text{ for } 0 < x < 1$$

Assume uniform mesh size with spacing $h = k = 1/3$. Calculate the value of u at the interior nodes. Derive the formula that you use.

[16]



P1656

[3665] - 630
M.E. (Computer)
APPLIED ALGORITHMS
(2008 Course)

*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) *Figures to the right indicate full marks.*
- 4) *Assume suitable data if necessary.*

SECTION - I

- Q1) a)** A given lot of chips contain 2% of defective chips. Each chip is tested before delivery. The tester itself is not totally reliable so that :
 $P(\text{"tester says chip is good"} \mid \text{"Chip is actually good"}) = 0.95$
 $P(\text{"tester says chip is defective"} \mid \text{"Chip is actually defective"}) = 0.94$
 If a tested device is indicated to be defective, what is the probability that it is actually defective? **[8]**
- b)** Derive the formula for determining the system reliability of non-series-parallel system shown in the fig Q1 (b). **[8]**

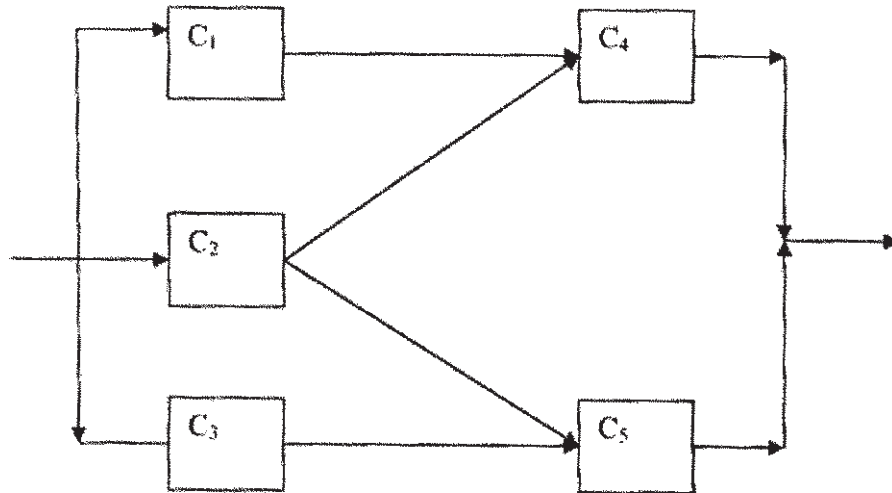


Fig Q1(b)

Q2) a) Consider the following code segment :

```
if B then
    repeat  $S_1$  until  $B_1$ 
else
    repeat  $S_2$  until  $B_2$ 
```

Assume that $P(B = \text{true}) = p$, $P(B_1 = \text{true}) = 3/5$, $P(B_2 = \text{true}) = 2/5$. Exactly one statement is common to statement groups S_1 and S_2 ; write ('good day'). After many repeated executions of the code segment, it has been estimated that the probability of printing exactly three 'good day' messages is $3/25$. Derive the value of p . **[8]**

b) Consider a moving head disk with the innermost cylinder of radius a and outermost cylinder of radius b . We assume that the number of cylinders is very large and the cylinders are very close to each other, so that we may assume a continuum of cylinders. Let the random X and Y respectively, denote the current and the desired position of the head. Further assume that X and Y are independent and uniformly distributed over the interval (a,b) . Therefore :

$$f_x(x) = f_y(y) = 1/(b-a), \quad a < x, y < b,$$
$$\text{and } f(x, y) = 1/(b-a)^2, \quad a < x, y < b,$$

Show that the expected seek distance is one third the maximum seek distance. **[10]**

Q3) a) Consider the algorithm for MAX-HEAPIFY used in heap sort algorithm:

```
MAX-HEAPIFY (A, i)
{
    l = LEFT (i);
    r = RIGHT (i);
    if (l <= heap size [A] and A[l] > A[i])
        then largest = l;
    else
        largest = i;
    if (r <= heap size [A] and A[r] > A[largest])
        then largest = r;
    if (largest = i) then
        exchange A [i] and A [largest];
        MAX-HEAPIFY (A, largest);
}
```

Determine the time complexity of this algorithm.

[8]

- b) Write a recursive binary search algorithm. Determine its time complexity. [8]

Q4) a) What is minimum spanning tree? Why we need it? What are the applications of minimum spanning trees? [8]

- b) Write short note on : Efficiency of algorithms. [8]

SECTION - II

Q5) a) Write an approximation algorithm for graph coloring. Clearly indicate any assumptions made. [8]

- b) Write an algorithm for breadth first search of an un-directed graph. With the help of an example show the functioning of this algorithm. [10]

Q6) a) Compare accounting method and potential method of amortized analysis. [6]

- b) Enlist the basic elements of dynamic programming. Briefly explain them. [6]

- c) Compare greedy method with dynamic programming method. [4]

Q7) a) Write an algorithm for pointer doubling problem. What is its time complexity? [8]

- b) State and briefly comment on Brent's theorem. [4]

- c) Define : i) Optimization problem ii) Instance of an optimization. [4]

Q8) Write short note on : [16]

- a) Huffman codes.

- b) Divide and conquer strategy.



P1662

[3665]-17

M.E. Civil (Const. & Management)
TQM AND MIS IN CONSTRUCTION
(2002 Course) (Elective)

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 and steam tables is allowed.*
- 6) Assume suitable data, if necessary.*

SECTION - I

- Q1)** Explain the importance of TQM in the construction industry with examples. Explain how TQM is to be implemented in a construction organisation. **[18]**
- Q2)** What is six sigma? What are its advantages? How six sigma tool helps in TQM? Explain with examples. **[16]**
- Q3)** What are the 4 types of costs of poor quality? Explain with examples. How hidden costs are determined? **[16]**
- Q4)** Explain in brief. **[16]**
- a) PDCA.
 - b) QIT.
 - c) Quality circles.
 - d) ISO 9001 : 2000 principles.

SECTION - II

- Q5)** With a flow diagram, explain the components and the sequence in which these components need to be linked up in any MIS. **[18]**

- Q6)** You are the Managing Director of a construction company doing global business in the infrastructure sector, in 4 different countries. Your headquarter is in India. Make suitable assumptions and list out the different types of information you need to process by creating a large data-base in order to form the MIS. This MIS should enable you to effectively control all the 4 business locations from your HQ. **[16]**
- Q7)** Explain the process of coding and decoding data in order to generate a MIS. Explain the process of importing and exporting data-files to and from a MIS. **[16]**
- Q8)** Explain in brief the following : **[16]**
- a) Web based project management.
 - b) MS Excel utilities.
 - c) GIS.
 - d) Hardware essential to create an MIS.



P1663

[3665]-122

**M.E. (E & TC) (Microwave)
ANTENNA AND RADIATING SYSTEMS
(Revised Course 2004) (504202)**

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

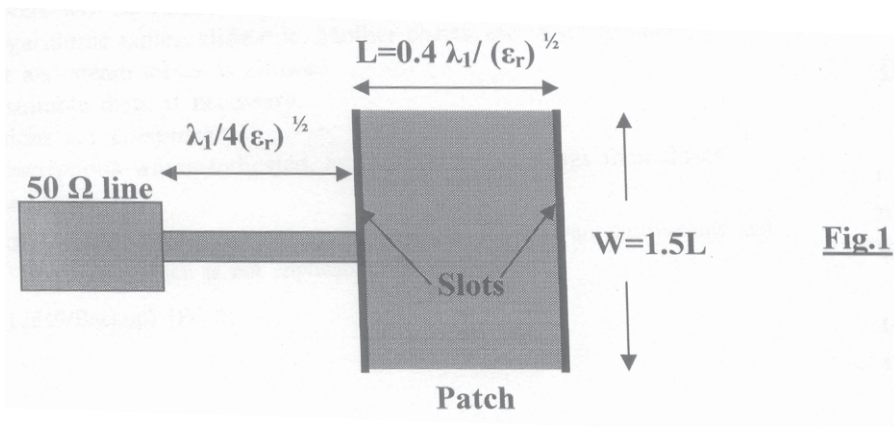
- Q1)** a) Define and explain following parameter of antenna : **[12]**
- i) Half Power Beam Width.
 - ii) Beam width between nulls.
 - iii) Directional pattern.
 - iv) Aperture efficiency.
- b) What is meant by 'Polarization'? Explain RHCP and LHCP with neat diagrams. **[8]**
- c) Find the half power beam width (HPBW) and first null beam width (FNBW) of the antenna, with has the field pattern of,
 $E(\theta) = \cos^2 \theta$ for $0^\circ \leq \theta \leq 90^\circ$ **[5]**
- Q2)** a) Draw and explain the practical measurement set-up required to plot the 'Radiation Pattern' of a receiving antenna. Explain how to find the beam width, f/b ratio from this pattern. **[12]**
- b) Draw and explain the block diagram of a typical 'Radio Communication Link' and derive the Friis transmission formula. **[8]**
- c) What is 'Near-Field' and 'Far-Field'? Compare them. **[5]**
- Q3)** a) Define and explain any two of the following with respect to antenna : **[12]**
- i) Duality Theorem.
 - ii) Planar Arrays.
 - iii) Parabolic Dish antennas.

P.T.O.

- b) Write brief notes on Electromagnetic Interference and Compatibility (EMI & C). [8]
- c) What is the required 'Aperture area' for an optimum circular horn antenna operating in the X-band at 10 GHz with 20 dBi gain? [5]

SECTION - II

- Q4)** a) Define and explain any two of the following briefly : [12]
- Pattern multiplication.
 - Feed methods in parabolic reflectors.
 - Smart Antenna.
- b) What is meant by 'broadband antenna'? Draw and explain different broadband antennas with neat diagram. [8]
- c) Find the radiation efficiency of a 1-m-diameter loop ($C = \pi m$) of diameter copper wire at 100MHz. [5]
- Q5)** a) A rectangular microstrip patch dimensions are given in Fig.1, which has a dielectric substrate with relative permittivity ' $\epsilon_r = 3.3$ ' and having a thickness of ' $t = \lambda_1 / 100$ '. Find the following :
- Impedance.
 - Bandwidth.
 - Directivity.
 - Length and impedance of $\lambda_1 / 4$ section of microstrip transmission line to match the patch to a 50Ω line.
 - Width of microstrip line.



- b) What are the 'design issues of antennas' to be considered, while they are to be used for 'satellite communication'? Explain. [8]
- c) Define the terms 'SWR' and 'Reflection Coefficient'. [5]

Q6) Write detailed notes on any four of the following :

[25]

- a) MMIC.
- b) Vector Network Analyzers.
- c) Antenna Parameters.
- d) Microwave Antennas.
- e) BALUN.
- f) EMI Analyzer.



Total No. of Questions : 8]

[Total No. of Pages : 2

P1664

[3665]-202

M.E. (Computer)

ADVANCED COMPUTER NETWORK

(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) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) What are the different issues of network design? Also, discuss the different tools for network design. [12]
b) Compare internal and external representation of network. [6]
- Q2)** a) Explain different stochastic processes in detail. [8]
b) With respect to the performance of a n/w. What is the relation between delay D, and utilization u? Use this relation, to establish a direct relationship between cost C and the delay D. [8]
- Q3)** a) Discuss in detail SCSI protocols and architecture. [8]
b) Discuss in detail VOIP system architecture. [8]
- Q4)** Write short notes on : [16]
a) PSTN Gateways.
b) Unified Algorithm.
c) Queuing models.

SECTION - II

- Q5)** a) Explain the Esau-William's algorithm. [8]
b) An FHSS system employs a total bandwidth of W_s 200 MHz and an individual channel bandwidth of 100 Hz. What is the minimum number of PN bits required for each frequency hop? [8]

P.T.O.

- Q6)** a) Explain any two loss-less compression techniques. [8]
b) With the help of a neat block diagram explain forward CDMA sync channel. [8]
- Q7)** a) Explain in detail the management of network storage architecture. [8]
b) What is pilot signal? Explain its use in detail? [8]
- Q8)** Write short note : [18]
a) RAID.
b) ARPA.
c) VOIP application.



P1667

[3665] - 409

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

TOTAL QUALITY MANAGEMENT IN CONSTRUCTION

(2008 Course) (Elective - II)

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 and steam tables is allowed.*
- 6) Assume suitable data, if necessary.*

SECTION - I

Q1) What is TQM? Why is it needed in the construction sector? What are the components of TQM programs? **[18]**

Q2) You are the Manager-Projects in your organisation. Your company executes construction of multi-storeyed buildings using precast and pre-fab technology. These buildings are used for residential as well as commercial use. Identify the various requirements of your internal customers and external customers. **[16]**

Q3) What is six sigma? How are the sigma levels decided? What training is given on six sigma? In which areas six sigma is applicable on construction projects? **[16]**

Q4) Assuming relevant data and using a suitable methodology, work out the cost of defects in the dry lean concrete (DLC) based on the following observations. **[16]**

P.T.O.

Sr No	% work in DLC defected
1	22
2	31
3	29
4	42
5	15
6	28
7	48
8	54
9	62
10	23

SECTION - II

- Q5)** Slab casting consists of shuttering, fixing reinforcement steel and concreting sub-activities. List out the various defects in each of these. Suggest preventive as well as remedial measures for these defects. Bench-mark the requirements for a good quality construction of the slab. Identify a 6 hours training program for improving the quality of slab construction. **[20]**
- Q6)** Explain with examples any 5 types of defects in quality. **[15]**
- Q7)** Explain with examples any 5 ISO 9001 : 2000 principles in brief. **[15]**
- Q8)** Explain the following :
- a) Concept diagrams of ISO. **[6]**
 - b) PRRT software. **[3]**
 - c) QFD. **[3]**
 - d) Motivation and quality. **[3]**



P1671

[3665]-765

**M.E. (Instrumentation & Control)
ANALYTICAL INSTRUMENTATION
(2008 Course) (5061104)**

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 importance of Chemical Analysis and Chemical Analytical instrumentation. **[10]**
b) What is difference between Classical and Instrumental methods of chemical analysis? How do you classify Instrumental methods? **[8]**
- Q2)** Explain with a block diagram working of a typical UV-VIS Spectrophotometer. Also explain working of a Monochromator and compare it with Filter. **[16]**
- Q3)** Explain Atomic Emission Spectrometry. Compare the Absorption spectra with Emission spectra. Also explain working of Plasma excitation source. What is role of Argon gas in Plasma excitation source. **[16]**
- Q4)** a) What is Auger Electron? Explain one Chemical Analytical method which is based on Auger electron detection. **[8]**
b) Explain with neat diagram working of Scintillation Counter. **[8]**

SECTION - II

- Q5)** Explain with neat diagram working of Atomic Absorption Spectrometer. Also explain working of hollow Cathode lamp. **[17]**

- Q6)** a) Explain working of HPLC with neat diagram. Also enlist various HPLC detectors and explain any one detector. [10]
b) What are the ideal characteristics of carrier gas in GC? Enlist various carrier gasses used in GC. [6]
- Q7)** Explain with neat diagram working of Fourier Transform IR spectrophotometer. What are the advantages of FTIR spectrophotometer over conventional IR Spectrophotometer? [16]
- Q8)** a) What is Chemical shift and Spin-Spin coupling in NMR? Explain with neat diagram working of NMR. [12]
b) Calculate slit width and band pass to obtain spectral bandwidth of 0.16 nm with linear reciprocal dispersion of 1.9 nm/mm. [5]



P1672

[3665]-5

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

**CONSTRUCTION MATERIALS AND MATERIALS MANAGEMENT
(2002 Course)**

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 and steam tables is allowed.*
- 6) Assume suitable data, if necessary.*

SECTION - I

- Q1)** Explain the requirements of a high performance concrete used for nuclear radiation shields. Detail out the experimental program used for baryte aggregates and comment on the inferences obtained. **[18]**
- Q2)** What is self compacting concrete? What are its advantages? Where is it used (any 4 applications)? Which tests are to be performed on SCC? **[16]**
- Q3)** From where is flyash generated? Which are its main types? Which properties of flyash make it a good construction material? What are its limitations?[16]
- Q4)** Explain in brief : **[16]**
- a) Silica fume concrete.
 - b) Smart materials.
 - c) FRP.
 - d) Underwater concreting.

SECTION - II

- Q5)** Explain materials management with a flow diagram and highlight the important objectives of it with examples. **[16]**
- Q6)** a) Explain ABC, FSN, VED, HML analysis with examples. Where are these used? **[8]**

P.T.O.

- b) Explain EOQ graphically. State its formula with meaning of each term in it. Discuss the modifications necessary to the EOQ. [8]

Q7) You are the materials manager of an internationally recognized construction company. On one of its projects, the company estimates a Marble Consumption of 10,000 sq.m annually. Estimated cost of Marble is Rs.1500 per sq.m, including taxes and transportation.

Estimated ordering cost is Rs.1000/- per order.

Estimated inventory carrying cost Rs.25% of average annual inventory.

Suppliers have offered the following discounts based on the bulk purchases.

5,000 sq.m and above	10%
4001 to 4999 sq.m	8%
3001 to 4000 sq.m	6%
2001 to 3000 sq.m	3%
1001 to 2000 sq.m	1%
≤ 1000 sq.m	no discount

Yearly consumption of Marble is as follows.

1. January	No requirement
2. February	No requirement
3. March	1500 sq.m.
4. April	3000 sq.m.
5. May	2000 sq.m.
6. June	1000 sq.m.
7. July	500 sq.m.
8. August	600 sq.m.
9. Sept.	300 sq.m.
10. Oct.	600 sq.m.
11. Nov.	500 sq.m.
12. Dec.	No requirement.

A study on wastages, pilferage and reduction in appearance and quality of marble shows that following wastage occurs.

Unused marble for one month or more - 1%

Unused marble for two months or more - 3%

Unused marble for four months or more - 4%

Unused marble for five months or more - 6%

Unused marble for six month or more - 8%

Cost of understocking of marble is 1% of the basic unit cost of marble.

- a) Determine EOQ after giving due weightage to discounts offered understocking and overstocking costs.
- b) Determine % increase in total cost after performing sensitivity analysis for the following data :
 - i) Actual cost of marble is Rs.1700/-
 - ii) Actual ordering cost is Rs.1200/-
 - iii) Actual marble consumption is 9900 sq.m.

Actual inventory carrying cost is 30%. [18]

- Q8)**
- a) What is lead time? What are the components of lead time? Why lead time is important in inventory management? [8]
 - b) Explain 2 bin system of inventory management graphically, with an example. How the important parameters necessary to operate the system are calculated? [8]



P1673

[3665] - 15

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

**INFRASTRUCTURE DEVELOPMENT AND
INTERNATIONAL CONTRACTING
(2002 Course) (Elective - II)**

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 and steam tables is allowed.*
- 6) Assume suitable data, if necessary.*

SECTION - I

Q1) Explain in brief the salient features of any 6 areas which constitute the basic infrastructure for any country. **[18]**

Q2) a) Explain in details the major initiatives launched by the central Government to overcome the problems of the power sector and make it vibrant, competitive and efficient. Also discuss about the R&D in the power sector, giving few examples. **[10]**

b) With statistical figures explain the aviation infrastructure in the country. **[6]**

Q3) a) What is PPP? Explain in brief a few mechanisms through which the PPP works. Highlight the success stories of PPP in the **[10]**

i) Telecom sector

ii) Road sector

iii) Railways

iv) Ports

b) Discuss the major concerns associated with the ports and the ports connectivity. Also explain a few measures to address these concerns. **[6]**

P.T.O.

- Q4) a)** Discuss the energy challenges w.r.t [10]
- i) coal depletion and pollution.
 - ii) rising oil imports.
 - iii) natural gas demands.
 - iv) in-efficient electric systems.
 - v) water shortages.
 - vi) limited nuclear energy.
- Make certain recommendations for handling these challenges.
- b) Discuss the pros and cons associated with Metro construction, giving examples. [6]

SECTION - II

- Q5) a)** Explain, how you would apply the TQM principles in international contracting with respect to. [8]
- i) Forming of the contract document
 - ii) Award of the contract
 - iii) Performance of the contract
 - iv) Contract closure
- b) You are the head of the contracts management department of a global company executing turnkey projects. Explain with suitable examples, how you would apply the 8, ISO 9001-2000 principles for improving the effectiveness of your department. Make suitable assumptions wherever necessary. [8]
- c) Differentiate between efficiency and effectiveness as expected by the ISO 9000: 2000. [2]
- Q6) a)** Discuss the various reasons, why ISO 9000 series did not become very popular in the United States construction industry. Make recommendations to overcome the same. [6]
- b) With respect to the Basrah Housing International project explain. [6]
- i) the objectives set related to bidding and the steps taken to achieve the objectives.
 - ii) the Indian Government's expectation from the Iraq authorities w.r.t. the negotiations carried out.
 - iii) Summary of the commercial aspects of the Contract agreement.
- c) With examples, discuss the basic problems that may arise in International contracting which do not exist in domestic contracts. [4]

- Q7)** a) List out the conditions which results in project delays in International Contracts. List them separately for : **[3+3+3]**
- i) Project Authorities.
 - ii) Contractor.
 - iii) Consulting Engineer to clients.
- b) Explain the structure & role of Dispute Resolving Board in international contracts. **[7]**
- Q8)** a) List out difficulties on a project site where neither contractor nor the owner (client) is responsible. How are these determined in terms of time and cost parameters? Explain. **[4+4]**
- b) Explain the various types of the FIDIC document and where they are used. **[8]**



P1675**[3665]-75****M.E. (Mechanical-Design)****ROBOTICS****(2002 Course) (Elective - I)****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 non-programmable electronic calculator is allowed.

SECTION - I

Q1) a) Explain the Automation types and role of Robot in automation for cost effectiveness. **[8]**

b) Explain with suitable diagram Jointed arm and SCARA Robot with their advantages, disadvantages and applications. **[8]**

Q2) a) Explain the terms : **[8]**

- i) Kinematic redundancy.
- ii) Redundant degree of freedom.

b) A planar RR Manipulator has first link of 100 mm length and second link of length 70 mm. State whether the manipulator can reach points P,Q,R separately where P is at (15, 15) Q is at (15, 70) and R is at (15, 170). **[8]**

Q3) a) Explain Denavit Hartenberg parameters for link transformation. **[8]**

b) Explain singularities of the mechanism in force domain. **[8]**

Q4) a) A robot has the link parameters are as shown in table. Determine the origin of the gripper w.r.t. base frame indicating all the intermediate steps. **[8]**

i	α_{i-1}	a_{i-1}	d_i	θ
1	0°	0	0	45°
2	0°	5	0	90°
3	90°	10	0	0°

b) Explain inverse and direct kinematics in robot system. **[8]**

P.T.O.

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

- a) Dynamic properties of Robots.
- b) Path Control methods in Robot system.
- c) D'Alembert's equation of motion.
- d) Robot applications.

SECTION - II

Q6) a) Explain the trajectory planning for joint space scheme with cubic polynomial fit. **[8]**

- b) A robot joint is required to reach 75° from 30° taking a total time of 3 seconds. Obtain the cubic polynomial fit and sketch the trajectory. **[8]**

Q7) a) What are the characteristics of sensors which are considered while their selection. **[8]**

- b) Explain thresholding and region growing in machine vision system. **[8]**

Q8) a) Explain control law partitioning. **[8]**

- b) Explain powered lead through robot programming method. **[8]**

Q9) a) What are the motion commands and interlocking commands in VAL II language? **[8]**

- b) Explain artificial intelligence in robot system. **[8]**

Q10) Explain any three from the following : **[18]**

- a) Jacobian in force domain.
- b) Robots in welding application.
- c) Obstacle avoidance in robot system.
- d) Tactile sensors used in robot system.



P1676

[3665]-104

**M.E. (E & T/C) Instrumentation
VLSI 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 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 to design CMOS ckt. for high speed? Design CMOS logic for $F = AB + CD + EFG + H$ and comment on speed. Assume suitable data. [8]
b) What is relationship among speed, area & power? How to design for low power? What are trade offs? [8]
- Q2)** a) Explore the mixed signal design issues in detail. [8]
b) How to overcome weak '0' & weak '1' problems? What are the limitations of transmission gate? [8]
- Q3)** Draw FSM diagram and write VHDL code for synchronous Mealy 110111 sequence detector. Justify the modeling style used. Write test bench for it. [16]
- Q4)** Write short notes on any three : [18]
a) Configuration & its need in VHDL.
b) Passive process.
c) Subprograms.
d) PDP.

SECTION - II

- Q5)** a) Write VHDL code for 1500 bit shift register. Write code for individual components too. [8]
b) What do you meant by synthesizable attribute? Mention any two with the hardware inferred. [8]

P.T.O.

- Q6)** a) Explore the synthesis, place & route processes in detail. [8]
b) List the tools being used in advanced chip design flow. [8]
- Q7)** a) With reference to structural model, explain module, package & library in brief. [8]
b) How to select the architectural modeling style? Explain with the help of case study. [8]
- Q8)** Write short notes on any three : [18]
a) Floor planning.
b) Delays involved in VHDL.
c) Noise margin w.r.t. technology scaling.
d) Clock skew.



P1677

[3665] - 130
M.E. (V L S I & Embedded)
FAULT TOLERANT SYSTEM DESIGN
(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) Assume suitable data, if necessary.*
- 4) All questions are compulsory.*

SECTION - I

- Q1)** a) Classify Fault Simulation Techniques and explain any one algorithm.[12]
b) Define the following terms : [6]
i) Controllability.
ii) Observability.
- Q2)** a) Explain the architecture of Parallel Scan-Based Test technique for testing of combinational circuit. [8]
b) Prove that in a combinational circuit if two faults dominate each other then they are functionally equivalent. [8]
- Q3)** Write short notes on : [16]
a) Primitive Cubes.
b) Delay Models.

SECTION - II

- Q4)** a) Construct a zoom table for evaluating AND and NOR gates with two inputs binary values. [8]
b) Construct a 8 - value logic table for the detection of dynamic Hazard.[8]

P.T.O.

- Q5)** a) Explain the following terms : [8]
- i) Fault propagation.
 - ii) Fault detection.
- b) Explain in detail the Path - oriented Decision making algorithm for fault detection. [8]

- Q6)** Write short notes on (Any two) : [18]
- a) Feedback Bridging Faults.
 - b) Fault Modelling.
 - c) Multiple Stuck Fault Model.



P1678

[3665]-134

**M.E. (E & T/C) VLSI & Embedded Systems
RFIC 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 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) What is RF modeling of MOSFET? Explain in detail. [8]
b) What are the effects of velocity saturation on device dynamic? Brief with the help of analytical expressions. [8]
- Q2)** a) “Zeros are called as bandwidth enhancers”. Justify the statement. [8]
b) What is need of neutralization in RF amplifiers? Explain the technique in case of source coupled RF amplifier. [8]
- Q3)** How to achieve EMC in chip design? Explore the cares to be taken at schematic, routing & packaging levels. Support by expressions. [16]
- Q4)** Write short notes on any three : [18]
a) Distributed amplifiers.
b) Dominant noise in RF amplifiers.
c) Cascaded amplifiers.
d) Power optimization.

SECTION - II

- Q5)** Design source coupled RF amplifier for voltage gain of 40 dB, bandwidth of 400 MHz, source resistance of 75Ω . Comment on R_{out} . Assume suitable data. [16]

- Q6)** a) What is power match versus noise match? What are the ways to resolve? [8]
b) Explore multiplier based mixer in detail. [8]
- Q7)** Design source degenerative type LNA for voltage gain of 80 dB, bandwidth of 100 MHz, supply voltage of 5V. How will you take care of power match? [16]
- Q8)** Write short notes on any three : [18]
a) Cross talk & solutions.
b) Square law mixers.
c) RF sensitive parasitics.
d) Impedance matching.



P1679

[3665] - 146

**M.E. (Electronics) (Digital System)
RECONFIGURABLE COMPUTING
(2002 Course)**

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) Use of electronic pocket calculator is allowed.*
- 4) Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Explore the evolution of general purpose computing architecture in VLSI technology. [8]
b) Explain the programmable, configurable & fixed function devices pertaining to performance parameters & examples. [8]
- Q2)** a) What are requirements from general purpose computing engine at chip level, board level & system level? What is prognosis for future? [8]
b) Draw the expected architecture of Reconfigurable Device (RD) in detail. [8]
- Q3)** a) Why is LUT based concept is appealing? What are the limitations of memories. [8]
b) What are regular & irregular computing tasks? Explore their effect on throughput. How will Reconfigurable Device (RD) behave to such tasks? [8]
- Q4)** Write short notes on (Any three) : [18]
a) Function & data density.
b) Switch box routing.
c) Interconnect schemes.
d) Research challenges in RC.

P.T.O.

SECTION - II

- Q5)** Explore with detail architectural primitives the block details of any one Reconfigurable Device (RD). **[16]**
- Q6)** a) What are the performance metrics in development of RD? Give the mathematical expressions in support. **[8]**
b) What is Rent's rule? What is its impact on architectural development?**[8]**
- Q7)** a) How are the parameters such as flexibility, efficiency, overheads, path width & contexts interlinked? **[8]**
b) What are global & local instruction distribution techniques? Which is best suitable for RD? **[8]**
- Q8)** Write short notes on (Any three) : **[18]**
- a) Partial Reconfiguration.
 - b) Context switching.
 - c) Fine grained parallelism.
 - d) Bisection bandwidth.



P1680**[3665]-164**

**M.E. (Electrical) Control System
NONLINEAR CONTROL SYSTEM
(2002 Revised Course)**

*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.
- 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) State and explain the different types of nonlinearities generally observed in physical control system. [8]
- b) Explain with neat sketches the peculiar characteristics which are unique to the nonlinear control systems. [9]
- c) Compare the nonlinear control system with the linear control system. [8]
- Q2)** a) Explain the method of plotting phase trajectories using Isocline method. [9]
- b) Classify various singular points for nonautonomous system and discuss their significance. [8]
- c) Consider the system described by $\frac{d^2x}{dt^2} + 0.2\frac{dx}{dt} - x = 0$ [8]

Evaluate trajectory for initial condition $\frac{dx}{dt} = 0$ $x = 1$.

- Q3)** a) Derive describing function for relay with dead zone. [8]
- b) In a unity feedback control system ON-Off relay is connected in cascade with forward path transfer function

$$G(S) = \frac{100}{S(S+1)(S+4)}$$

P.T.O.

Comment on the stability of the system and determine the frequency and limit cycle if it exist. [17]

SECTION - II

Q4) a) Explain [16]

- i) Popov method.
- ii) Circle criterion.

b) Explain describing function method for determining the stability of nonlinear control system. [9]

Q5) a) For linear time variant system $\frac{dx}{dt} = Ax$, derive expression $A^T P + PA = -Q$ where P & Q are square symmetric positive definite matrices. [10]

b) Explain the concept of positive and negative definiteness of a function. Give examples for each case. [8]

c) Check the sign definiteness of scalar function in quadratic for

$$V(x) = 2x_1^2 - x_1x_2 + 4x_2^2 + 2x_1x_2 + 5x_3^2 + 3x_2x_3. \quad [7]$$

Q6) a) Define and explain stability and asymptotic stability in the sense of Lyapunov. [8]

b) Explain the method of plotting phase plane trajectory using Delta method. [8]

c) What is adaptive control system? Discuss the design of nonlinear adaptive control system. [9]



P1682

[3665] - 173

M.E. (Electrical) (Power Systems)

POWER SYSTEMS PLANNING AND RELIABILITY

(Revised Course 2002)

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) Assume suitable data, if necessary.*

SECTION - I

Q1) In power systems planning how short term, medium term and long term planning are differentiated? What are the duties of planner in long term planning? **[25]**

Q2) Describe need for load forecasting and how it is done. What difficulties are faced by p-s planner in these methods and how he overcomes them? **[25]**

- Q3)** a) Describe steps to be taken in transmission system planning. **[15]**
b) How distribution system planning is carried out? Describe the procedure. **[10]**

SECTION - II

- Q4)** a) Differentiate between forced outage and scheduled outage. What are the reasons for forced outages in generating station. **[10]**
b) Describe a two state model. Prove that Mean Time To failure is reciprocal of failure rate. **[15]**

P.T.O.

Q5) a) What is Loss of Load Probability? How this concept is used in reliability of power system? **[10]**

b) A generating station has three units of 40 MW, 40 MW and 30 MW capacity. F.O.R. for each unit is 0.02. Prepare a capacity outage probability table for this system. **[15]**

Q6) Write notes on : **[25]**

- a) Bath tub curve.
- b) Markov process.
- c) Frequency duration approach.



Total No. of Questions : 10]

[Total No. of Pages : 3

P1683

[3665]-516

M.E. (Mechanical) Mechatronics - II

INDUSTRIAL AUTOMATION

(2008 Course) (502809)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Attempt 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.*
- 5) Use of scientific calculator is allowed.*

SECTION - I

Q1) Write short notes on (any two) : **[18]**

- a) Digital Function Blocks AND, OR and NOT used in function block diagrams of Discrete Controllers.
- b) Explain disadvantages of Automation with suitable illustrations.
- c) Explain the terms PLC and DCS.
- d) Types of switches used in PLC applications.

Q2) a) Explain Ring and Bus Topologies used in Networking. **[8]**

b) Explain logical ADD and SUB instructions in PLC programming. **[8]**

Q3) The system shown in Figure Q3 is used to drill a hole in an object move on a conveyor belt. Develop a PLC ladder program and explain the inputs and outputs used in programming. **[16]**

P.T.O.

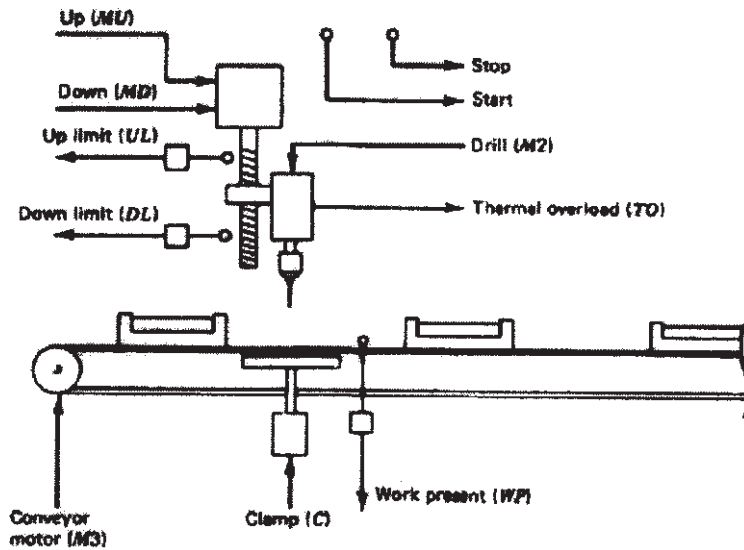


Figure Q 3

- Q4)** a) Explain Counters used in PLC with respect to types parameters with suitable example. [8]
- b) Explain why inputs are called sinking inputs and outputs are called sourcing outputs in PLC. [8]
- Q5)** a) Figure Q5 shows a tank, which is filled alternatively to level L and emptied to level E, when pushed ON. It continues to do so till OFF is pushed. Develop a ladder logic program with all i/o contacts shown in figure Q5. [12]

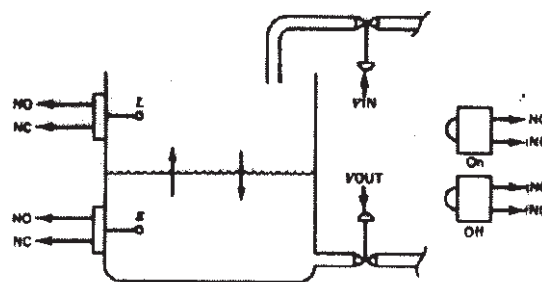


Figure Q 5

- b) Explain Examine ON and Examine OFF instructions used PLC programming. [4]

SECTION - II

Q6) Write short notes on (any three) : [18]

- a) Incremental and Absolute positioning in NC part programming.
- b) Position and velocity sensors used in CNC machines.
- c) Compare FMS with transfer lines.
- d) Criteria to define speed and feed in NC part programs.

Q7) a) Explain, with suitable block diagrams, the data flow diagram from program input to final turning in CNC machines with description of all the components involved in Simple Turning Operation in CNC lathe. [8]

b) Explain the term Distributed Numerical Control. [8]

Q8) a) Explain Helical, Parabolic and Cubic interpolation in brief. [6]

b) Write a NC part program for the profile shown in Figure Q8 (b). clearly mention all the assumptions made and use tab sequential format. [10]

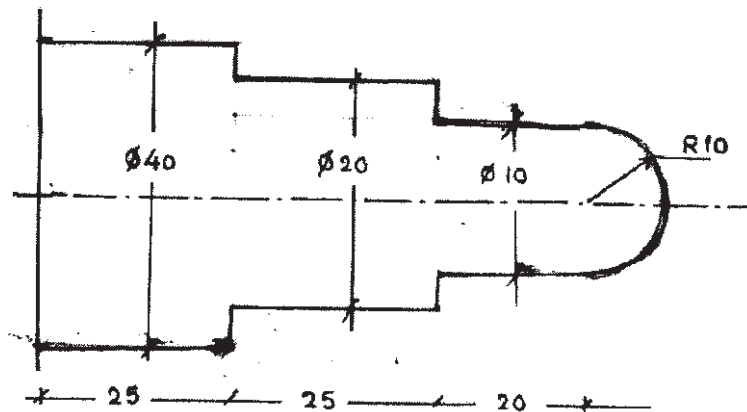


Figure Q 8 (b)

Q9) a) Enlist and explain in brief dimensional data functions used in NC part programming. [8]

b) Explain subprograms used in APT programming. [8]

Q10)a) Explain Tool Wear Offset used in NC programming. [8]

b) DCS in enterprise resource planning. [8]



Total No. of Questions : 10]

[Total No. of Pages : 2

P1684

[3665]-520

M.E. (Mechanical) (Mechatronics Part - II)

AUTOMOTIVE ELECTRONICS

(2008 Course) (5028011) (C)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Answer any three questions from section-I and any three questions from section-II. Answers to each section should be written in separate answer book.*
- 2) Figures to the right indicate full marks.*
- 3) Assume suitable data whenever necessary but mention it clearly.*
- 4) Use of scientific calculator is allowed.*

SECTION - I

Q1) Write short notes on (any two) : **[18]**

- a) Fuel injection system in Compression Ignition Engines.
- b) Anti Fog provisions in automobiles.
- c) Enlist various sensors used in Engine Measurements.

Q2) a) Describe Load Test of battery in Automobiles. **[8]**

- b) Discuss in brief Engine Cooling System and compare cooling by fan driven electrically and driven by crank shaft. **[8]**

Q3) a) Describe Electronic Ignition System and compare it with contact point Ignition System. **[8]**

- b) Explain in brief Active Suspension System. **[8]**

Q4) a) Explain various Heater control used in Automotive Heating System. **[8]**

- b) Enlist various safety devices used in automobile and their role in brief. **[8]**

Q5) a) Discuss role of electronics in automobile and its advantages over conventional methods in any two applications. **[8]**

- b) Compare digital speedometer and analog speedometers in automobiles. **[8]**

P.T.O.

SECTION - II

- Q6)** Write short notes on (any three) : **[18]**
- a) Anti Theft Alarm system in Automobiles.
 - b) Electronic Fuel Injection System.
 - c) Engine Control System block diagram for diesel cars.
 - d) Cam Sensors.
- Q7)** a) Development in Wiper system in Automobiles. **[8]**
b) Advantages of 8 bit microprocessors used in Automobiles. **[8]**
- Q8)** a) Compare distributor based and distributor less ignition control systems. **[8]**
b) Discuss in brief various sensors used in Automobile Anti Lock Braking System. **[8]**
- Q9)** a) Compare 8 bit microprocessors and 16 bit microprocessors in Luxury Cars. **[8]**
b) Sensors used in wheel alignment and balancing of wheels. **[8]**
- Q10)** a) Safety features in power windows. **[8]**
b) Over charging and deep discharge protections in automobile battery. **[8]**



P1686

[3665] - 578

M.E. (E & T/C) (VLSI & Embedded Systems)

RECONFIGURABLE COMPUTING

(2008 Course) (504185)

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) List the promises of Reconfigurable device to programmable DSPs. What are the constraints in development? [8]
- b) What are the architectural challenges in Reconfigurable devices? [8]
- Q2)** a) What is present scenario pertaining to area consumption & delay penalty by interconnect, configuration memory & LUTs in FPGAs? [8]
- b) Why is multiplier used as test function for different architectures? Compare the performance of different architectures w.r.t. multiply function density. [8]
- Q3)** a) For LUT & crossbar based FPGA, compute the area needed for crossbar if pitch of wire is 12λ , number of 4 - LUT is 1000. Assume suitable data. [8]
- b) What are the problems with simple networks? How to overcome them?[8]
- Q4)** Write short notes on any three : [18]
- a) Programmable & Configurable.
 - b) Static interconnects.
 - c) Functional density.
 - d) Instruction & data bandwidth.

P.T.O.

SECTION - II

- Q5)** a) Why is switch growth so enormous in case of interconnects in FPGAs? Draw the typical interconnect caricature & comment on the switch requirement. [8]
- b) Give mathematical model for Rent's rule based channel & wire growth. [8]
- Q6)** a) What are specific merits of multicontext FPGA? How does more saving of area possible? [8]
- b) In case of locally configured instructions, give the relationship between-
- i) Efficiency & frequency of instruction change.
 - ii) Efficiency & task critical path length. [8]
- Q7)** a) How does efficiency of Reconfigurable device depend on design w, architecture w, number of contexts & number of processing elements? [8]
- b) Explore the primitive architectural building blocks of any general purpose reconfigurable device. [8]
- Q8)** Write short notes on any three : [18]
- a) Dynamically programmable.
 - b) In system configurability.
 - c) Partitioning & placement.
 - d) Need of general purpose computing engine.

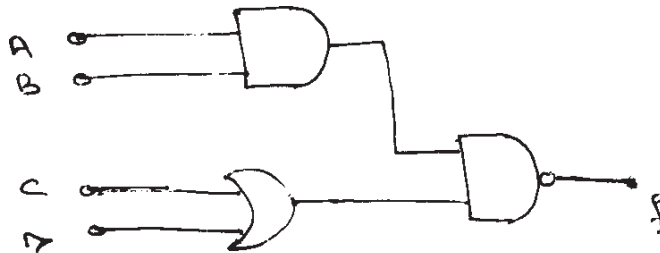


P1688**[3665]- 584****M.E. (VLSI & Embedded)****FAULT TOLERANT SYSTEM DESIGN****(2008 Course)****Time : 3 Hours]****[Max. Marks : 100****Instructions to the candidates:**

- 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) Assume suitable data, if necessary.

SECTION - I

- Q1)** a) Explain step by step procedure to construct a truth table for 3 input NAND gate using unknown logic value. [10]
- b) Construct a binary decision diagram for a given function : [8]
- i) $Y = A \bar{B} C + AC.$
 - ii) $Y = \bar{A} \bar{B} + AB.$
- Q2)** a) Classify in detail different fault models. Specify their advantages and disadvantages. [8]
- b) Explain the following terms w.r.t. fault modeling [8]
- i) Fault sampling.
 - ii) Critical path tracing.
- Q3)** a) Define primitive cubes and construct a primitive cube table for the ckt shown in Fig.1 [8]

Fig. 1**P.T.O.**

- b) Construct the primitive flow table for the following sequence. [10]

$x_1 x_2$: 00 01 11 10 11 10 00 10 11 01

The O/P is '1' if it follows the sequence 10 to 11 otherwise $z = 0$.

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

- a) Fault Insertion.
- b) Event driven V_s compiled simulation.

SECTION - II

- Q5)** a) Explain with example concurrent fault simulation technique. [6]

- b) Define the following terms : [12]

- i) Fault equivalence and fault dominance.
- ii) Fault coverage.
- iii) 6 - valued logic system.

- Q6)** a) What is boundary scan? Design a Boundary - scan cell circuitary for a Bi - directional I/O pin in the IEEE 1149.1 methodology. [8]

- b) Show that the existence of a static hazard is necessary condition for the creation of dynamic hazard. [8]

- Q7)** a) Explain structural model of RTL? Write on RTL model for a positive edge. Triggered D flip-flop. [8]

- b) Classify different delay models? Explain why the inertial delay of a gate cannot be greater than the smallest transport delay associated with the gate. [8]

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

- a) Self checking system.
- b) Ad - Hoc design for testability.
- c) g - v path sensitization algorithm.



[3665] - 596

**M.E. (Electronics) (Digital Systems)
MACHINE INTELLIGENCE
(504198) (2008 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) Assume suitable data, if necessary.*

SECTION - I

Q1) a) Discuss in detail the different soft computing constituents. With neuro-fuzzy as a backbone, describe the different characteristics of the soft computing. **[8]**

b) What are the different fundamental operations of fuzzy sets? Explain the decomposition principle based on the idea of the α -cuts. Suppose a fuzzy set A is defined by the discrete expression,

$$A = 0.2/1 + 0.5/2 + 0.7/3 + 1.0/4 + 0.8/5 + 0.4/6 + 0.2/7$$

Obtain weak α -cuts for $\alpha \in (0,1)$ from 0.1 to 1 with the step width of 0.1. Reconstruct the fuzzy set A using these α -cuts. **[10]**

Q2) a) Discuss in detail the concept of the extension principle. Analyze the process of extension principle using fuzzy sets for the following example.

$$3 \times \text{"about 4"} + 2 = \text{"about 12"} + 2 = \text{"about 14"} \quad \mathbf{[8]}$$

b) What are the different steps involved in the process of fuzzy reasoning? Discuss in detail the fuzzy reasoning for single rule with multiple antecedents. **[8]**

Q3) a) Describe the concept of composition of fuzzy relation. With suitable example explain Max-Min composition and Max-Product composition. **[8]**

b) What are different parameterized membership functions with single input? Describe how sigmoidal functions are used to synthesize a closed membership functions where, sigmoidal MF is given by,

P.T.O.

$$\text{Sig}(x;a,c) = 1/\{1 + \exp[-a(x-c)]\}$$

Where, a controls the slope at the crossover point $x = c$. [8]

- Q4)** a) Describe in detail the process of defuzzification. What are different defuzzification schemes used for obtaining crisp output. With suitable example, describe the Tsukamoto fuzzy model used in the reasoning procedure for two input two rule system. [8]
- b) What are the steps involved in the system identification? With suitable example, describe the least squares method used for the system identification. [8]

SECTION - II

- Q5)** a) What is Adaptive Networks and Describe its Architecture and Learning Procedures of Adaptive Networks and give with examples with respect to :
 • Single Linear node.
 • Perceptron Network.
 • Multilayer Perceptron. [8]
- b) Explain in details about Kohonen Self-Organizing Networks and represent with each steps of Iteration of 2 Inputs and 49 Outputs units. [8]
- Q6)** a) Classify various types of Layers supported in ANFIS Architecture in Adaptive Neuro-Fuzzy Interface System. [8]
- b) Explain the difference between the Radial Basis function Networks and Modular Networks give with each example. [8]
- Q7)** a) What is learning from Reinforcement? Explain the Jackpot Journey Problem and represent with Mathematical notation. [8]
- b) Draw the Circuit Diagram of Electrical Implementation of Continuous-Valued Hopfield Networks with circuit notations. [8]
- Q8)** Explain in brief about the following (ANY THREE) : [18]
- Adaptive Linear Element (ADALINE).
 - Principal Component Analysis (PCA).
 - Feedback Control System.
 - Using Genetic Algorithm in Game Playing.



P1694**[3665] - 684****M.E. (Petroleum)****HORIZONTAL MULTILATERAL AND INTELLIGENT WELLS****(New Course 2008) (512103)***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 for casing string and compute the body-yield strength for 20-in.-k-55 casing with a nominal wall thickness of 0.635 in and a nominal weight per foot of 133 lb/ft., during axial loading conditions. This pipe has minimum yield strength of 55,000 psi (k-55). **[8]**
- b)** Your company wants to complete a well at 12,000 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 and indicate the same using graphical procedure. 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
11,000	15.0	17.8
12,000	16.0	18.1

P.T.O.

Q2) It is desired to drill under the lake, using a build and hold trajectory. Horizontal departure to the target is 2,655 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. Explain any one in brief. [6]

Q4) Write short notes on : [16]

- a) Advantages of horizontal drilling technology.
- b) Multilateral well completion technique.
- c) Drilling bit design considerations.
- d) Underbalanced drilling operations.

SECTION - II

Q5) a) Explain in brief two criteria for optimizing bit hydraulics. [4]

- b) Define following fundamental properties of drilling fluid. [4]
 - i) Mud weight.
 - ii) Plastic viscosity.
 - iii) Yield point.
 - iv) Gel strength.

- c) From the data listed below, determine the following, [10]
- Height of cement in ft., in the annulus.
 - Amount in ft.³ of cement in the casing.
 - Depth in ft. of the top of the cement in the annulus.
 - No. of barrels of mud required to displace the cement.
 - No. of strokes to displace the cement.

Data:

Casing Setting depth = 3000 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.) = 0.316 bbl/stk

Cementing tool (no. of feet above shoe) = 100 ft.

Cementing program: Neat Cement = 500 sack

Slurry yield = 1.15 ft³/sack

Excess volume = 50%

Q6) Describe in detail one case study of multilateral or horizontal drilling technology or intelligent well system for an onshore or offshore field development program. Use the following points during the description of application. [16]

- Objectives.
- Reservoir aspects of drilling methodology.
- Drilling tools and technique.
- Drilling optimization methods.
- Mud selection, cement system, challenges involved and well completion in brief.

Q7) a) Determine which of the following bit gives the lowest drilling cost if the operating cost of the rig is \$400/hr., the trip time is 7 hours and connection time is 1 minute per connection. [4]

Bit	Bit Cost \$	Rotating Time (hours)	Connection Time (hours)	Mean Penetration Rate (ft./hr.)
A	800	14.8	0.1	13.8
B	4900	57.7	0.4	12.6
C	4500	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.
 - iii) Depth Vs trip time.
- c) Explain and calculate cycle speed and commercial speed of a drilling rig if rig move and rig building time is 20 days, total drilling days = 100 days and production testing days = 10 days. [6]

Q8) Write short notes on (any four) : [16]

- a) Logging while Drilling.
- b) Principles of the BHA.
- c) Drilling difficulties.
- d) Deflection tools.
- e) Economics of complex wells.



Total No. of Questions : 8]

[Total No. of Pages : 2

P1695

[3665]-665

M.E. (Chemical)

ADVANCED SEPARATION PROCESSES

(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) 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 radial migration & particle polarization in CFF. [8]
b) Explain the regimes in cross flow electrofiltration. [8]
c) Define cake & film resistance. [2]
- Q2)** a) Explain enriching & stripping in adsorptive bubble separation. [8]
b) Explain foam column theory & give the limiting equation. [8]
- Q3)** a) What is barrier efficiency, back pressure efficiency, mixing efficiency and cut correction in gaseous diffusion. [8]
b) What is the effect of co-adsorption? What are lead/trim operations? What are parallel trains in adsorption. [8]
- Q4)** a) What are stripping and heat limited process in temperature swing regeneration. [8]
b) Derive an expression for length of unused bed (LUB). [8]

P.T.O.

SECTION - II

- Q5)** a) Calculate the osmotic pressures of the following solutions : 4% NaCl solution (mol. wt. of NaCl = 58.45), 4% albumin (mol. wt. of albumin = 65000) and a suspension containing 28 g/l of a solid (where particle weight = 1ng) at a temp. of 25°C. [10]
- b) What is osmosis? Derive one equation for osmotic pressure. [8]
- Q6)** a) A component is to be removed from a solution containing 100 g/l of salt (by dialysis) in a counter-current dialyzer. Membrane area is 1000 cm² and the dialysis coefficient for salt $K_s = 0.0415$ cm/min when $Q_F = 200$ cm³/min. Flow rate of pure water used for diffusate $Q_D = 500$ cm³/min. If 90% of the salt is to be removed what area of membrane is required if the same flow rate of feed & water is used. [8]
- b) What are the design considerations in a dialyzer? Derive the relevant equations. [8]
- Q7)** a) Derive the flux equation in a pervaporation process. Explain each term. Explain why diffusivity is concentration dependent. [8]
- b) Describe the process of nanofiltration and ultra filtration and give relevant equation. [8]
- Q8)** a) What are the four steps in layer growth process? [8]
- b) Discuss gas separation in non-porous membranes. What are the features of non porous membranes. [8]



P1696

[3665]-574

M.E. (E & TC) (VLSI & Embedded Systems)

EMBEDDED SYSTEM DESIGN

(2008 Course)

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) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) What are the various design metrics used in the embedded system design? [12]
b) What are the characteristics of an embedded system? [6]
- Q2)** a) What is meant by the term design methodology? Why is a design methodology beneficial? [8]
b) What are the various programming technologies used for FPGA? [8]
- Q3)** a) What is meant by the term signal integrity? What are the reasons of ground bounce in Digital systems? How does limiting the slew rate of an output driver improve signal integrity? [8]
b) What are the roles of logic blocks and I/O blocks in an FPGA? [8]
- Q4)** a) What is the design philosophy used in RISC processor architecture?[8]
b) Draw and describe data flow model of ARM core. [8]

SECTION - II

- Q5)** a) Draw and describe the architecture of typical ARM-9 Processor/controller. [10]
b) Describe following ARM instructions. [6]
i) MOV.
ii) MOVN.
iii) LSL.

- Q6)** a) What advantages does serial transmission of data have over parallel transmission? What determines the order in which we transmit bits of data? [8]
- b) What is the role and purpose of floor-planning, placement, and routing in physical design? [8]
- Q7)** a) What is the need of optimization in the embedded system design? What are the various techniques used for optimization? [10]
- b) What are the advantages of boundary scan technique in an embedded system design? [6]
- Q8)** Write short notes on the following : [18]
- a) CAN Bus.
- b) IEEE-802.11 – Wireless LAN.
- c) Blue tooth.



P1705

[3665] - 23
M.E. (Civil) (Hydraulic Engineering)
CONCRETE, EARTH AND ROCKFILL DAMS
(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 slide rule and electronic pocket calculator is allowed.*
- 6) Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) How the earthquake forces are accounted for in the design of gravity dams? Explain the two approaches viz. pseudo-static and dynamic response, used in the analysis. [9]
- b) Write a note on concrete for gravity dams and the joints that are provided there in. [6]
- c) Distinguish between a low and high gravity dam. [3]
- Q2)** a) What are the various theories that are used in the design of arch dams? Explain the concept involved in all these theories. When these dams are preferred? [7]
- b) With the help of neat sketches explain the layouts of arch dam based on constant angle and constant radius. Bring out the major differences between the two. Obtain the value of the best central angle based on constant angle layout. [9]
- Q3)** Explain slip circle method of stability analysis of an earth dam. Explain how the critical circle is located. What is meant by sudden draw down? [16]
- Q4)** a) What is a rockfill dam? What are its principal components? Explain it with a neat sketch. [6]
- b) What are the various types of buttress dams? Explain them with neat sketches. State the conditions under which these dams can be used.[10]

P.T.O.

SECTION - II

- Q5)** a) Enumerate different types of spillways. State the conditions under which each of them can be used. [5]
- b) Explain in what way the stability analysis of an ogee spillway differs from that of a non-overflow gravity dam. [4]
- c) Obtain the crest profile of an ogee spillway based on USWES method for a discharge of 2000 cumecs over a length of 50 m, with the maximum water level above the bed is not to exceed 50 m. Take the down stream slope of the spillway as 0.75 H : 1 V. [8]
- Q6)** a) Explain how the inter-relationship between jump-height curve and tail-water-rating curve decides the choice of energy dissipating device below spillways. [8]
- b) List the various methods of energy dissipation below spillways. [4]
- c) What are the different types of crest gates? Explain with the help of a neat sketch, the components and working of a taintor gate. [4]
- Q7)** a) What do you understand by construction pore pressure in earth dams, and how are they estimated? [4]
- b) Explain the various measures taken to control seepage through the foundations of earth dams with the help of neat sketches. [7]
- c) Draw a typical flownet for an earth dam with a horizontal filter at the down stream end, with reservoir full condition. [5]
- Q8)** a) Explain how the principal and shear stresses are determined in a gravity dam. [4]
- b) Explain the necessity and locations for providing galleries and shafts in gravity dams. [3]
- c) What is the necessity of dam instrumentation? Write a brief note on it. [6]
- d) Write a note on the foundation treatment for a gravity dam, in brief, giving the reasons there of. [4]



P1706

[3665]-50

**M.E. (Mech.-Heat Power)
ADVANCED THERMODYNAMICS
(2002 Course) (Old)**

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 :- **[8]**
i) Availability of closed & Open system.
ii) Irreversibility & Exergy.
- b) Explain the Vander Wall's equation of state for real gases. Obtain this equation in reduced form. **[8]**
- Q2)** a) Define Helmholtz & Gibb's function. **[4]**
b) Distinguish between first law efficiency & second law efficiency. **[4]**
c) Air is compressed in a piston-cylinder device from 1.2 bar, 15°C to 2.4 bar, 100°C. Neglecting the heat interaction and changes in K.E. & P.E. and assuming that the system exchanges heat only with infinite atmosphere at a pressure of one atmosphere and 20°C, determine the actual work and the minimum work required per kg. of air for the compression process. **[8]**
- Q3)** a) Define and explain the Amagat's law of additive volumes. **[4]**
b) 2 kg. of Oxygen and 7 kg. of Nitrogen are mixed. The mixture is at 4 bar and 300 K.
Determine :- **[12]**
i) Mole fraction of components.
ii) Partial pressure of each component.
iii) Gas constant & molar mass.
iv) Volume & density of mixture.

P.T.O.

- Q4)** Write short notes on (any three) :- **[18]**
- a) Generalised compressibility charts.
 - b) Maxwell Relations.
 - c) PVT Surface for water.
 - d) Joule Thompson coefficient & Inversion curve.

SECTION - II

- Q5)** a) From fundamentals, derive T.ds equations & show that $C_p = C_v$ at absolute zero temperature. **[10]**
- b) Write a note on fugacity and activity. **[6]**
- Q6)** a) One kg. of Ethane, C_2H_6 , is burned with 90% of theoretical air required for complete combustion. Assuming complete combustion of hydrogen in the fuel, determine the percentage of product constituents on mass as well as volume basis. **[10]**
- b) What is adiabatic flame temperature? Explain. **[6]**
- Q7)** a) Define and explain term enthalpy of formation. **[4]**
- b) Explain :- **[6]**
- i) Kay's rule.
 - ii) Dalton's law of partial pressure.
- c) Explain degree of reaction and its limiting values. When does a chemical reach equilibrium? **[6]**
- Q8)** Write short notes on (any three) :- **[18]**
- a) Bose-Einstein statistics.
 - b) Third-law of thermodynamics.
 - c) Fermi-Dirac approach.
 - d) Entropy deviation.



Total No. of Questions : 8]

[Total No. of Pages : 3

P1707

[3665]-52

**M.E. (Mech.) (Heat Power)
ADVANCED HEAT TRANSFER
(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) 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 down and briefly discuss all the possible types of boundary conditions encountered in heat conduction problems. **[8]**
- b) A 3mm dia. Stainless steel wire ($K = 20 \text{ W/mK}$, and resistivity, $\rho = 10 \times 10^{-8} \Omega\text{m}$, 100 m long has a voltage of 100 Volts impressed on it. The outer surface of the wire is maintained at 100°C . Calculate the centre temperature of the wire. **[8]**
- Q2)** a) Explain : **[6]**
- i) Fin Effectiveness.
- ii) Fin Efficiency.
- b) A thermometer well of 10mm OD and 8mm ID is of material with thermal conductivity of 25 W/mK is exposed to gases at 2°C and the temperature of the wall in which well is fixed, is 12°C . If an error of not more than 0.6°C is to be involved, determine length of the well. Take $h = 50 \text{ W/m}^2\text{K}$. **[10]**

P.T.O.

- Q3)** a) What is Reynolds Analogy? Explain. [6]
- b) For the flow over flat plate assuming laminar boundary layer, sketch the velocity and thermal boundary layer for : [6]
- i) $Pr = 1.0$
- ii) $Pr \ll 1$
- iii) $Pr \gg 1$
- c) Explain the salient features and steps used in Blasius method. [4]
- Q4)** Write short notes on any three : [18]
- a) Heisler and Grober charts.
- b) Crank - Nicholson scheme.
- c) Differential and Integral analysis of boundary layer flow.
- d) Implicit and Explicit methods.

SECTION - II

- Q5)** a) Discuss the problem of Natural Convection from a heated vertical plate. Draw the temperature and velocity distribution at a section and the boundary layers formed. Explain the steps involved in the Integral Solution procedure and obtain the final correlation. [12]
- b) A square plate $0.4\text{m} \times 0.4\text{m}$ maintained at 400K is suspended vertically in atmosphere at 27°C . Determine the heat transfer coefficient and rate of heat transfer from the plate using the correlation

$$Nu_L = 0.518 (Gr_L Pr)^{1/4}.$$

Given the properties air $\nu = 20.75 \times 10^{-6} \text{ m}^2/\text{s}$, $Pr = 0.697$ and $k = 0.03 \text{ W/m-K}$ [6]

- Q6)** Explain any four of the following : [16]
- a) Ablative heat transfer.
- b) Transpiration cooling.
- c) Pool Boiling curve.
- d) Dropwise condensation and promoters.
- e) Heat pipes-construction and applications.
- f) Fluidized bed combustion.

Q7) Explain the following laws of thermal Radiation : **[16]**

- a) Planck's Law.
- b) Stefan - Boltzmann Law.
- c) Kirchoff's Law.
- d) Rayleigh-Jean's Law.
- e) Lambert's Law.
- f) Wien's Law.

Q8) a) What do you understand by radiation shields? Explain its applications. Using radiation network method, show that N number of shields reduce the heat transfer rate by a factor of $(N + 1)$. **[10]**

- b) Write notes on (any two) : **[6]**
- i) Radiation from gases and vapours.
 - ii) Hotel's cross string method.
 - iii) View factor.



P1708

[3665]-55

M.E. (Mechanical) (Heat Power)

ADVANCED REFRIGERATION & CRYOGENICS

(Revised Course 2002)

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 effect of condensing temperature, suction temperature, suction superheat and liquid sub-cooling on compressor performance. **[10]**
- b) What is meant by secondary refrigerants? Explain eutectic point & typical applications for the same. **[6]**
- Q2)** A multi-evaporator, pressure regulating valve and single compressor vapour compression refrigeration system working with ammonia. The refrigeration capacity of high temperature evaporator operating at -6.7°C is 5 TR, while it is 10 TR for the low temperature evaporator operating at -34.4°C . The condenser pressure is 10.8 bar. Assuming saturated conditions at the exit of evaporator and condenser, ammonia vapour to behave as an ideal gas with gas constant of 0.4882 kJ/kg K and isentropic index of 1.29 and isentropic compression. **[16]**
- a) Find the required power input to compressor in kW.
 - b) Find the required power input in kW if instead of using a single compressor and pressure regulating valve, individual compressors are used for the low and high temperature evaporators.
 - c) Draw schematic diagram and P-h chart for (a) and (b).
 - d) Comment on results with reference to power input, maximum compressor discharge temperature & volumetric efficiency for (a) & (b).

Use the following data for ammonia :

T, °C	P _{sat} , (kPa)	h _f , (kJ/kg)	h _g , (kJ/kg)
-34.4	95.98	44.0	1417
-6.7	331.8	169.1	1455
27.7	1080.0	330.4	1485

- Q3)** a) Explain design & selection criteria for condensers. [6]
 b) Explain meaning of Superheat Horn with the help of neat sketch. [6]
 c) Explain Actual Vapour Compression Cycle with the help of neat sketch. [6]

- Q4)** Write short notes on : [16]
 a) Multistage Thermoelectric refrigeration.
 b) Magnetic cooling.
 c) Pulse tube refrigeration system.
 d) Refrigerant piping design.

SECTION - II

- Q5)** a) Discuss the important applications of vapour absorption refrigeration system. Derive expression for COP of an ideal vapour absorption refrigeration system. [10]
 b) The following data is given for Vapour absorption refrigeration system. Find the maximum value of COP of the system. [6]
 i) Heat addition in generation is at 90°C.
 ii) Heat rejection is at 30°C.
 iii) Refrigeration takes place at -5°C.

- Q6)** Explain the working principle and applications of following refrigeration system :- [18]

- a) Vortex Tube.
 b) Thermo-electric.
 c) Steam Jet.

Draw the schematic diagrams.

- Q7)** Write short notes on (any four) : **[16]**
- a) Gas Separation and Purification.
 - b) Superconducting bearings.
 - c) Adiabatic demagnetization.
 - d) Cryogenic Insulations.
 - e) Cryosurgery system.
- Q8)** a) Explain the Claude system with schematic layout and T-S diagram. Develop expression for liquid yield. **[8]**
- b) Discuss thermodynamics involved in the following processes producing low temperature :- **[8]**
- i) Expansion through a J-T valve.
 - ii) Adiabatic expansion through an expansion engine.



P1709

[3665]-476

M.E. (Mechanical) (Heat Power)

**PERFORMANCE ASSESSMENT OF MECHANICAL EQUIPMENT
(2008 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 book.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Figures to the right indicate full marks.*
- 5) Use of logarithmic tables, slide rule, steam tables, Mollier charts, electronic pocket calculator is allowed.*
- 6) Assume suitable data.*

SECTION - I

Q1) a) Explain different energy losses in boilers? **[8]**

b) Explain the energy conservation opportunities in boilers? **[8]**

Q2) a) Explain different boiler performance terms? **[9]**

b) The following observations were recorded during a boiler trial

Mass of feed water and its temperature = 640kg/hr. and 50 degree C

Steam pressure = 10 bar,

Fuel used = 55kg/hr.

H.C.V. of fuel = 44100 kJ/kg,

Temperature of gases = 300 degree C

Boiler room temperature = 30 degree C.

For finding the dryness fraction of steam, the steam is passed through the throttling calorimeter and the following observations were noted.

Temperature of steam = 120 degree C, pressure of steam = 5 cm of Hg above atmosphere.

Barometer reading = 762 mm of Hg.

Heating surface of the boiler = 18.6 meter square.

C_{pg} (for gases) = 1.1 kJ/kg-K, C_{pg} (super heated steam) = 2.1 kJ/kg-K

The composition of oil used by mass, C = 85%, H₂ = 13%, and remaining is ash.

The flue gas analysis by volume done by using orsat apparatus is given as CO₂ = 12.5%, O₂ = 4.5% and N₂ = 83%

P.T.O.

Find :

- (i) Equivalent evaporative per kg of fuel and per meter square of heating surface area/hr.
- (ii) Efficiency of the boiler.
- (iii) Also draw the heat balance sheet on one kg of fuel basis.

Take steam partial pressure in exhaust gases = 0.07 bar. [9]

- Q3)** a) What are the different types of fuel used in furnaces, and briefly describe fuel economy measures adopted in furnaces? [8]
- b) Explain the procedure of constructing daily waste heat source and load diagram for furnace. [8]
- Q4)** a) Explain the Cogeneration used in textile industries. [8]
- b) What are the basic Cogeneration systems used? [8]

SECTION - II

- Q5)** a) Explain the different sources of pump noise and explain in detail liquid noise source. [8]
- b) A centrifugal fan has the following data : [10]

Impeller dia. = 0.6 m, Impeller speed = 1475 r.p.m.

This fan gives the following test results

Vol. in m ³ / sec	Fan static pressure in mm of water	Fan static efficiency
0.2	145	50
0.3	137	68
0.4	127	77
0.5	112	77
0.6	87	68

The duty requirement of 0.6 m³ / sec at 175 mm static water column are to be meet, the following alternatives are available :

- (i) One 0.6 m diameter fan.
- (ii) Two 0.6 m diameter fan in series.
- (iii) Two 0.6 m diameter fan in parallel.

Determine the fan speed and total pressure required in each case. Which alternative is most desirable?

- Q6)** a) What are the various methods employed to derive centrifugal blowers? State their merits? How is the impeller mounted in each case? [8]
b) Explain energy conservation opportunities in fans and blowers? [8]
- Q7)** a) Illustrate in detail factors affecting the performance of compressed air system? [8]
b) What is slip factor? What is its effect on the flow and pressure ratio in the stage? [8]
- Q8)** a) Explain the role of energy technology in energy conservation, and its effect in modern times. [8]
b) Describe energy conservation using heat pipes in details? [8]



P1710

[3665] - 477

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

REFRIGERATION TECHNOLOGY

(2008 Course) (Elective - I) (502104 - B)

Time : 3 Hours]

[Max. Marks:100

Instructions to the candidates:

- 1) Q. No.1 & Q. No. 6 are compulsory.*
- 2) Solve any one question from Q. No 2 & Q. No. 3.*
- 3) Solve any one question from Q. No 4 & Q. No. 5.*
- 4) Solve any one question from Q. No 7 & Q. No. 8.*
- 5) Solve any one question from Q. No 9 & Q. No. 10.*
- 6) Use of refrigerant property tables, thermodynamic charts, psychrometric charts, calculator, and log table is allowed.*
- 7) Assume suitable data, cases, conditions, etc. with supportive justifications, if required.*
- 8) Use dark graphite pencil, ball point pen to mark the cycles, etc. on the thermodynamic charts.*

SECTION - I

- Q1)** a) Discuss the need of multi-pressure refrigeration system in context of conservation of energy. **[5]**
- b) Write classification for vapour absorption systems and explain working of anyone of it with neat sketch. **[10]**

Q2) Design the ammonia refrigeration plant to meet the following requirements. **[25]**

- 1) Brine solution for blast chilling of fish: flow rate 15 liter per second with supply temperature (-) 15°C and return temperature (-) 12°C.
- 2) Chilled water for frozen meat storage: flow rate 4 liter per second with supply temperature (+) 2°C and return temperature (+) 4°C.

The owner of the plant has requested to make an energy efficient design of the plant. The food consultant is very cautious about temperature level and requested to treat it under critical application category. The following details are available for the design of the plant.

P.T.O.

- 1) The plant is located near Pune city. Refer following weather conditions for Pune city.

Station Design	Cooling DBT/MCWBT					
	0.4%		1.00%		2.00%	
	DBT	MCWBT	DBT	MCWBT	DBT	MCWBT
	°C	°C	°C	°C	°C	°C
Pune	38.4	20.5	37.4	20.4	36.3	20.6

- 2) The potable, clean water is available in ample quantity throughout the year on the site.
- 3) Compressor parameters: displacement = 200 CC, speed = 1800 rpm, isentropic efficiency = 85%, volumetric efficiency = 74%

Draw the schematic layout of the proposed refrigeration plant with its P-h chart. Discuss the selection of components: condenser, evaporator, compressors, flash chambers, etc. Summarize the design for cycle COP, an individual evaporator's refrigeration duty, actual heat rejection in condenser, actual total power consumption of the compressors.

OR

Q3) Design the R22 refrigeration system for the pharmaceutical plant. **[25]**

1. Capsule packaging chamber: conditioned air at DBT 20°C, RH 40% and flow rate 225 CMM. Chief pharmacist has suggested use of 100% fresh air.
2. Chilled water: supply temperature (+) 2°C and return temperature (+) 6°C, mass flow rate: 1.2 kg/s

The plant is located in hot dry area of Nagpur city. The good quality water is not available for the condenser in the ample quantity. Develop the plant layout considering energy efficiency as an objective. Consider following details as input for the calculation .

- 1 Compressor: isentropic efficiency 84%, volumetric efficiency 76%
- 2 Compressors are available with displacement capacities: 220 CC, 275 CC and 350 CC.
- 3 Electric drive (motor) for compressor: Variable speed = minimum 800 rpm to maximum 2400 rpm

Draw P-h chart for the proposed plant. Justify the selection of the components and operating parameters for the refrigeration plant. Summarize the design for

- Theoretical & actual COP,
- Actual and specific heat rejection in the condenser,
- Actual total power consumption and number of compressors required in each stage, and
- Actual refrigeration capacity of each evaporator.

Assume following weather data for the Nagpur city.

Month	Jan	Feb	Mar	April	May	June
DBT, °C	30.8	34.0	40.4	42.0	44.0	42.4
WBT, °C	26.5	27.6	32.2	33.9	35.3	34.3
Month	July	August	Sept	Oct	Nov	Dec
DBT, °C	37.8	33.2	37.4	35.4	35.6	31.4
WBT, °C	36.2	31.3	34.3	32.6	34.3	28.3

Q4) The refrigeration plant cycle layout is as follows :

[10]

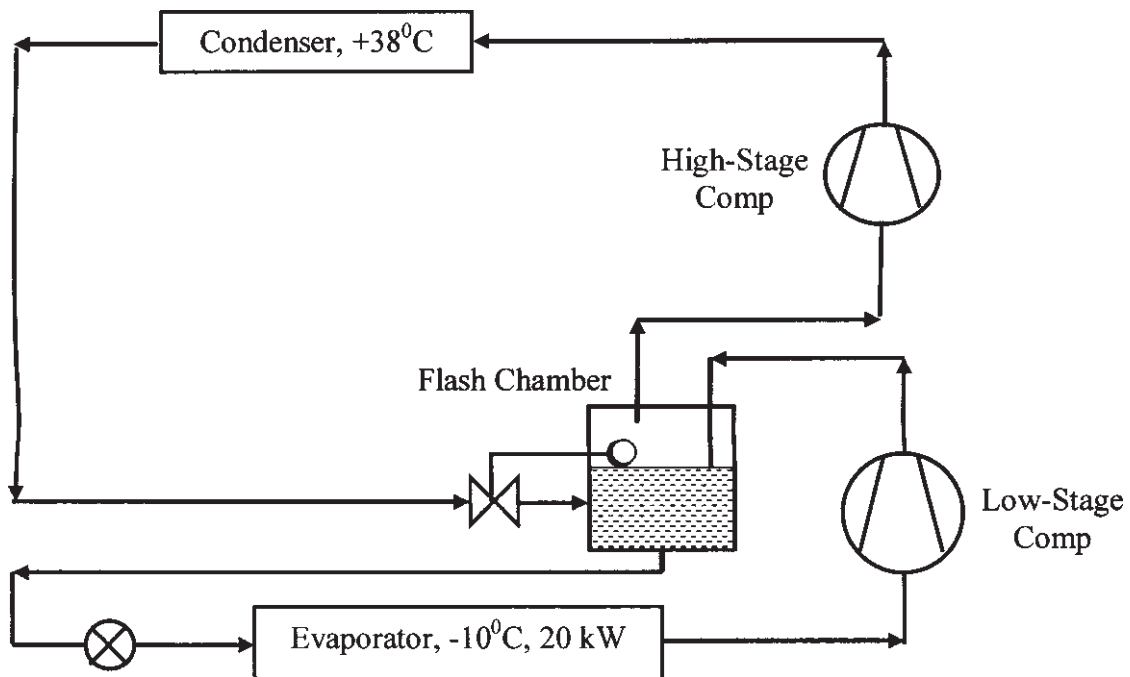


Fig. No.:01

Calculate

- Theoretical cycle COP.
- Mass flow rate of refrigerant through evaporator.
- Intermediate pressure of flash chamber.
- Specific heat rejection capacity of the condenser.
- Theoretical isentropic power consumption of both the compressors.

Sketch the cycle on the P-h diagram.

OR

Q5) Evaluate the performance of the following cascade refrigeration system shown in Fig. No.02 for the parameters. [10]

- a) Theoretical cycle COP.
- b) Heat rejection in high side cycle condenser.
- c) Actual refrigeration capacity of evaporator of high side cycle.

Assume following data for the calculations.

- i) Refrigerant R22 in high pressure side cycle.
- ii) Refrigerant R 717 in low pressure side cycle.
- iii) Isentropic efficiency of the compressors: 87%.
- iv) Volumetric efficiency of the compressors: 69%.

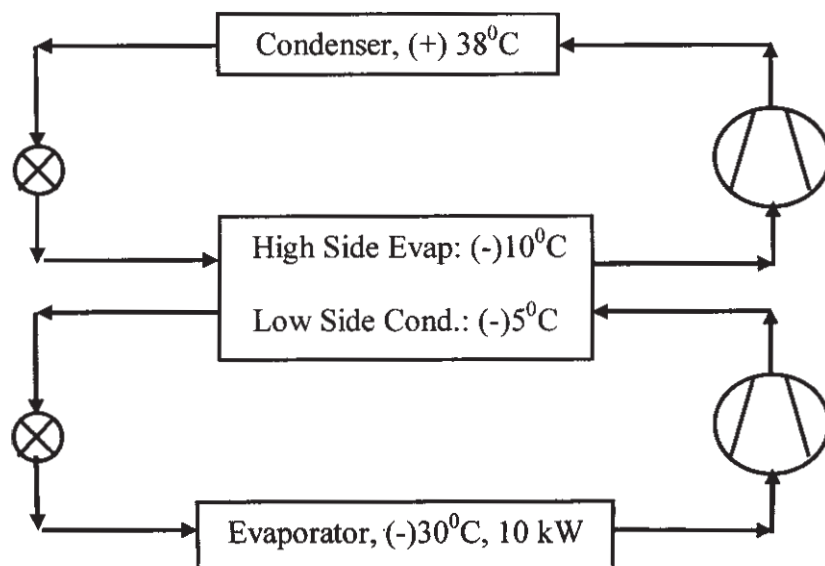


Fig. No.: 02

SECTION - II

- Q6)** a) Write classification for the cooling tower and discuss anyone of its type with neat sketch. [8]
- b) Explain: Use of an evaporative condenser in refrigeration system achieves maximum coefficient of performance (COP) as again use of air cooled condenser. In support of this discussion, draw P-h chart &/or psychrometric chart. [7]

Q7) The owner of M/s Kool Ice-cream Plant, Pune has decided to setup another ice-cream plant to meet growing demand of ice-cream. As per the calculations of the refrigeration consultant, the plant is required to operate two evaporators at following conditions **[25]**

- Evaporator # 01: Temperature (-)18°C and 75 kW
- Evaporator # 02: Temperature (-) 25°C and 50 kW

The weather conditions for Pune location are as follows

Month	Jan	Feb	Mar	April	May	June
DBT, °C	27.0	31.1	34.3	38.7	39.2	36.6
WBT, °C	23.0	25.6	31.3	34.6	35.7	33.6
Month	July	August	Sept	Oct	Nov	Dec
DBT, °C	31.1	28.7	24.3	21.2	20.3	24.4
WBT, °C	29.5	24.4	21.2	18.9	17.6	18.7

Compressor isentropic efficiency 80% & volumetric efficiency 74%. Select the compressors of any following displacement capacities: 200, 250, 300, 350 CC.

Assume variable speed motor: minimum 750 rpm to maximum 2500 rpm.

The visit of refrigeration consultant to the site and discussions with plant owner has revealed that the location of the plant has very good source of potable water. Since, the plant is going to work round the year, the operating cost of the plant is major objective set by owner. Write the plant design for the following operating parameters

- a) Actual COP and theoretical-isentropic COP.
- b) Actual heat rejection in the condenser.
- c) Actual power consumption of the compressor/s.
- d) Number of low pressure and high pressure compressors are required.

Draw actual plant layout and the corresponding P-h and T -s chart.

OR

Q8) Design the multi-temperature warehouse for storage of fruits and dairy products. The total cooling capacity and temperature conditions are as follows. **[25]**

- 1) Chamber # 01: capacity 100 kW, storage ambient (-) 2°C
- 2) Chamber # 02: capacity 60 kW, storage ambient (-) 18°C

The following data is available for the calculations

- 1) Compressor: isentropic efficiency 84%, volumetric efficiency 71 % for all the low stage and high stage compressors.

- 2) Compressors are available in displacement capacities: 150, 200, 250, 300 & 350 cc.
- 3) Variable speed motors available in speed range 750 to 2400 rpm.
- 4) Motor efficiency 97%, transmission efficiency 96%.
- 5) The weather data of the site of the plant as follows.

Month	Jan	Feb	Mar	April	May	June
DBT, °C	33.6	35.7	42.5	37.7	39.8	35.0
WBT, °C	31.0	32.0	39.8	34.6	35.6	31.5
Month	July	August	Sept	Oct	Nov	Dec
DBT, °C	33.6	31.8	33.0	35.9	34.8	33.0
WBT, °C	30.3	29.6	29.6	32.0	32.0	29.0

Write the justification for selection of refrigerant, evaporator and overall arrangement of plant. Evaluate the actual power consumption of the plant with air cooled condenser and evaporative condenser and recommend appropriate type of condenser. Draw the P-h chart for selected plant layout.

Calculate theoretical COP for the recommended plant layout.

Q9) Calculate actual COP for the following refrigeration plant shown in Fig No. 3 [10]

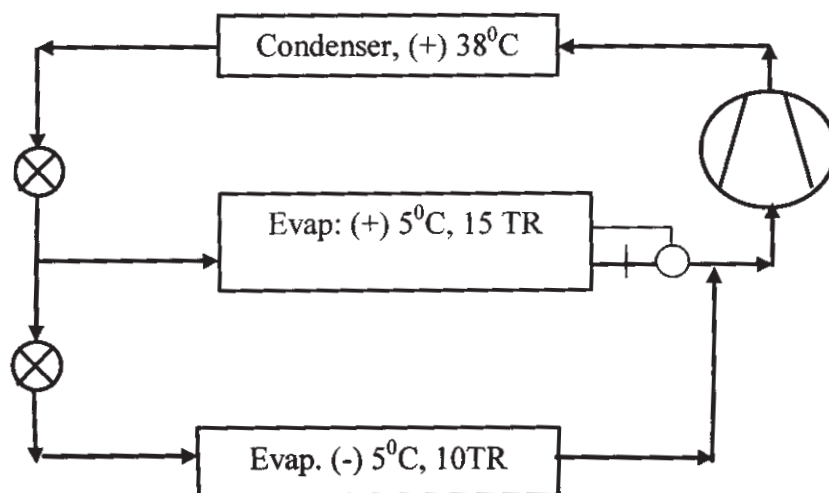


Fig. No.: 3

Assume : compressor isentropic efficiency 82% and volumetric efficiency 74%.

OR

Q10) Calculate actual COP for the pumped circulation refrigeration system of Fig. No. 4. [10]

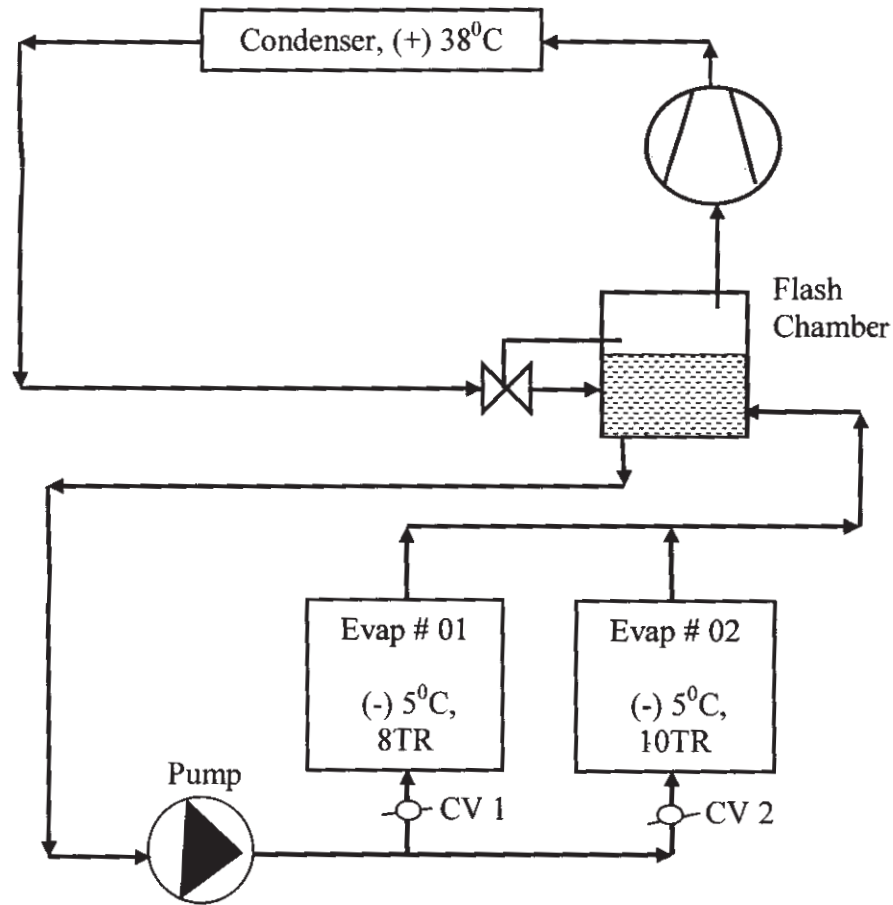


Fig. No. 04

Assume :

- Compressor isentropic efficiency 86% and volumetric efficiency 73 %.
- Pump circulation ratio : 2.5.



P1711**[3665]-487****M.E. (Mechanical) Heat Power
CRYOGENIC ENGINEERING****(2008 Course) (Elective - III) (502111) (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) Draw a schematic diagram of Heylandt cycle. Explain its operation using T-s diagram. Develop expressions for yield, work and efficiency. **[10]**
- b) Explain, briefly the variation of thermal properties of solids in cryogenic range of temperature. **[6]**
- Q2)** a) Develop an expression for work requirement per unit mass for an ideal liquefaction system. **[8]**
- b) Determine the ideal work requirement for liquefaction of helium beginning at 1 atm. and 300 K. Also determine the heat rejected in the ideal isothermal compressor in KJ/kg. **[8]**

Properties of Helium			
Pressure (atm)	Temperature (K)	Enthalpy (KJ/kg)	Entropy (KJ/kg.K)
1.00	4.224 (Sat. Liq)	9.711	3.454
	4.224 (Sat. Vap.)	30.13	8.287
1.00	300	1573.0	31.41

- Q3)** a) Explain the working of Gifford McMahon Cryorefrigerator with neat diagram. **[8]**
- b) Explain in detail, what is meant by J-T effect and Inversion Curve. **[8]**

Q4) Write short notes on (any Three) : **[18]**

- a) Magnetic Cooling.
- b) Vacuum shielded vessels.
- c) Collins Heat Exchanger.
- d) Stirling Cycle Refrigerator.

SECTION - II

Q5) a) What is the necessity of cryogenic liquid storage? What do you understand by high performance and low performance vessels? Discuss design considerations of inner and outer vessels. **[8]**

- b) Discuss **[8]**
 - i) Cryogenic fluid Storage vessel piping arrangements.
 - ii) Methods of draining the vessels.

Q6) Discuss the problems and scope of cryogenic instrumentation. Explain with neat sketches the instruments used for cryogenic measurements of **[16]**

- a) Strain.
- b) Flow.
- c) Liquid level.
- d) Temperature.

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. **[4]**

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

- a) Helium Dilution Refrigeration.
- b) Cryogenic engineering applications in transport.
- c) Cryogenic applications in medicine and biology.



Total No. of Questions : 8]

[Total No. of Pages : 2

P1712

[3665]- 636

M.E. (Computer)

MOBILE COMPUTING

(2008 Course) (D) (510104) (Theory)

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) Assume suitable data, if necessary.*

SECTION - I

Q1) State what are the functions of the following categories of equipment in a GSM system. **[16]**

- a) Base Station System.
- b) Base Transceiver Station.
- c) Star, Chain, and Multihop configurations of BTS's into a common remote BSC.

Q2) a) Find the spectral efficiency in bps/Hz of the GSM system assuming a channel spacing of 200 kHz and a channel data rate of 280 kbps. What will be the spectral efficiency if the bandwidth is increased by 50%? Why is Gaussian base band filter used in the GSM raw data?

- b) State the particulars of mobile which are kept in the VLR database. **[16]**

Q3) State the key features of Bluetooth protocol. Show the system architecture of Bluetooth. Narrate the functions of PICONET communication. What are the host controller interfaces used in Bluetooth? **[16]**

Q4) a) Narrate the distinction between the following service areas :
GSM, PLMN, MSC, LA and CELLS.

- b) Why do mobile units require two IDs viz. MS-ISDN and IMSI?
- c) State the logical channels in GSM?

[18]

P.T.O.

SECTION - II

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

- a) Access Router.
- b) Mobile Adhoc Network.
- c) Mobile IP.

Q6) a) State why it is necessary to perform location updates for an MS in the GSM system?
b) How does an MS become aware of its change of location?
c) With the help of a suitable diagram explain the message sequences required to be generated in order to complete the GSM location update procedure.

[16]

Q7) a) Draw a diagram showing the expanse of frame, multiframe, superframe and hyperframe for a GSM network. Show the links expanding one unit of a bigger frame into constituent parts of the next superframe in the hierarchy of frames.
b) State what are the following types of logical control channels intended for :
i) BCCH
ii) CCCH and
iii) DCCH

[16]

Q8) Explain the functions of the following :

[16]

- a) AUC database.
- b) PICO net.
- c) MAC management in IEEE 802.11 Wireless LAN.



P1713

[3665]-647

M.E. (Computer)

**ADVANCED INTERNET PROGRAMMING
(2008 Course) (Elective - III) (510111 (D)) (Theory)**

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) With reference to the basic structure of a servlet, what are the two servlet classes out of which one class is extended by the servlet. All servlets override at least one method wherein custom functionality is implemented. Which is the method which is automatically called by the server in response to a client request?

b) Construct a skeleton for common servlet.

[16]

Q2) Write suitable code skeleton to

[16]

- a) Access LDAP server using JND from Java.
- b) Populate LDAP with suitable data. Highlight important classes, interfaces, constructors, methods and packages.

Q3) a) State the sequence of steps that one needs to go through to create a bean.

b) What is meant by manifest file?

c) How is a ready bean packed in a jar file?

d) Describe a suitable IDE for bean development.

[18]

Q4) Describe working of a certificate based authentication system used for protecting e-Commerce transactions between browsers and websites. **[16]**

P.T.O.

SECTION - II

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

- a) Portlets.
- b) Internationalization and localization.
- c) Struts.

Q6) a) State the difference between a Remote Procedure Call (RPC) and a Remote Method Invocation (RMI).

- b) With reference to RMI discuss the following issues :
- i) Marshalling and unmarshalling.
 - ii) Parameter passing.
 - iii) Stubs and skeletons.
 - iv) RMI registry and how it manages RMI references.

[16]

Q7) Elucidate the following items : **[16]**

- a) Example of an application server.
- b) Ways of accessing JSP files.
- c) SOAP.

Q8) Draw and explain the schematic diagram showing layout of the following: **[16]**

- a) Architecture of public access points.
- b) Firewall screened internet connection.
- c) Processing layout using encrypted credit cards.



P1720

[3665] - 81
M.E. (Mech) (DE)
ANALYSIS AND SYNTHESIS OF MECHANISMS
(Old 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, and electronic pocket calculator is allowed.*
- 6) Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Write a note on symmetrical coupler curves. [6]
b) Synthesize a slider-crank mechanism so that the slider displacement is proportional to the crank rotation. The initial and final values of the crank and slider displacements are : $\phi_s = 30^\circ$, $\phi_f = 120^\circ$, $S_s = 60$ mm, $S_f = 100$ mm. Use three accuracy points with Uniform spacing. [10]
- Q2)** a) State and prove Robert-Chebyshev theorem. [8]
b) Write notes on any two : [10]
i) Hartmann Construction.
ii) Cubic of stationary curvature.
iii) Computer Aided Design of Mechanisms.
- Q3)** a) Discuss the concept of structural error and its relation with the spacing of accuracy points.
For the function $y = x^2 + \sqrt{x}$, in the range $0 \leq x \leq 1$, find out 3 accuracy points with Chebyshev spacing. [8]
b) Explain the procedure for 4-accuracy point synthesis of a slider - crank function generator, by treating the 1st accuracy position of the slider as a design variable. [8]

P.T.O.

- Q4) a)** For a moving link, two points A and B, and their centers of curvature A' and B' are given. Explain with a sketch the Bobillier construction to draw the inflection circle. Also show that the construction satisfies the Euler-Savary equation. [8]
- b)** Derive the Frudenstein's equation for a 4-bar mechanism and discuss its uses in synthesis. [8]

SECTION - II

- Q5)** Synthesize a 4-bar function generator to coordinate 3 displacements of the input and output links as given below.

input : $\phi_{12} = 40^\circ$, $\phi_{23} = 30^\circ$, $\phi_{34} = 40^\circ$;

output : $\Psi_{12} = 70^\circ$, $\Psi_{23} = 60^\circ$, $\Psi_{34} = 80^\circ$.

All displacements are clockwise. Draw the synthesized mechanism in the various positions. [18]

- Q6) a)** What is a dyad and how is it relevant in the synthesis of a 4-bar? Explain. Find the correlation between the number of prescribed positions of the end-point of the dyad and the number of solutions for the dyad, and then present it in a tabular form for the case of function Generation. [10]
- b)** Write a note on 'Branch and Order Defects'. [6]
- Q7) a)** Briefly explain the matrix method of displacement analysis of spatial mechanisms. [8]
- b)** A slider-crank with crank length of 30 mm and connecting rod length 80 mm, offset = 0, has its crank making 45° with the line of stroke of the slider. A force of 1000 N acts on the slider, towards the crank shaft. Find the torque required on the crank shaft so that the mechanism is in static equilibrium. [8]
- Q8) a)** Explain the complex vector approach to the synthesis of a 4-bar for specified velocities and accelerations of its moving links. [8]
- b)** Write notes on any two : [8]
- i) Pole Triangle.
 - ii) Mechanical Error.
 - iii) Number Synthesis.



Total No. of Questions : 6]

[Total No. of Pages : 2

P1721

[3665]-177

M.E. (Electrical) (Power System)

POWER SYSTEM DYNAMICS

(2002 Course) (503207)

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.*

SECTION - I

- Q1)** a) Discuss two machine series reactance system using Clark diagram. [12]
b) Explain classical model used for system of one machine against infinite bus. [13]
- Q2)** a) Explain elementary mathematical model of overall power system. [12]
b) Describe classical multimachine model and its drawback. [13]
- Q3)** a) Discuss effect of inertia, effect of governor action, effect of saliency, saturation and short circuit ratio on steady state power limits. [18]
b) Discuss precalculated swing curves and their used for large disturbances in power system. [7]

SECTION - II

- Q4)** a) Discuss Runge-Kutta method of solution of transient stability problem of power system. [15]
b) Discuss effect of excitation on generator power limits. [10]
- Q5)** a) Explain voltage stability with HVDC links. [12]
b) Discuss the relation between voltage stability and rotor angle stability. [13]

P.T.O.

Q6) Write short notes on :

- a) Islanding in power system. [8]
- b) Power system voltage collapse. [8]
- c) Methods of improving power system stability. [9]



P1722

[3665] - 221
M.E. (Petroleum)
WELL CONTROL
(Revised Course 2002)

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 in brief different causes and symptoms of a kick? **[4]**
- b)** A 6,000 ft T.V.D well observed a kick after closing the surface BOP. Well data available in API field units is as follows : **[10]**
Current drilling mud = 11.4 ppg
Casing shoe data size = 13-3/8" TVD 4800 ft, Hole data size 12-1/4" TVD 6400ft.
Drill pipe 5" , Capacity 0.0176 bbls/ft
Drill collar 8" × 3", 530ft long capacity 0.0087 bbls/ft
Capacities
 Drill collars in open hole 0.0836 bbls/ft
 Drill pipe in open hole 0.1215 bbls/ft
 Drill pipe in casing 0.1353 bbls/ft
 Mud pump output 0.119 bbls/stroke
 Slow circulation rate 440 psi at 30 spm
 SIDP pressure = 340 psi, SICP = 410 psi, pit gain = 12 bbls
Calculate,
 i) Initial circulating pressure.
 ii) Kill mud weight.
 iii) Final circulating pressure.
 iv) Prepare step down plan on graph paper for driller's method.
- c)** Explain in brief slow circulation pressure (SCR) **[4]**

P.T.O.

- Q2) a)** You have two flanges, API 6bx & 6B indicate the type of gasket that matches the flanges : **[4]**
- Type R octagonal.
 - Type R oval.
 - Type RX.
 - Type BX.
- b) Explain pressure testing of blind / shear ram with neat sketch. **[8]**
- c) Using following information & answer each question, **[4]**
- Accumulator bottle capacity = 10 Gallons
 No. of bottles = 15
 Max operating pressure = 3000 psi, min operating pressure = 1200 psi
 Precharge pressure = 1000 psi, Electric pump discharge vol = 5gpm
- During bop function test the pressure on the accumulator on the bottle bank drops from 3000 to 1800 psi. How many gallons of fluid did that function use.
 - If electric pump was switched off during that operation how long would it take to recharge the bottle bank switch on.
- Q3) a)** Make 3D insitu stress tensor. Write the procedure to find the values of 3D stresses. **[8]**
- b) Find normal stress & shear stress on a fracture plane making an angle 30° . If two principle stresses are 20 psi & 10 psi. Use Mohr's circle & equations. **[8]**
- Q4) a)** A well is closed in on a 30 bbl gas kick, while drilling 8.5" at 11000 ft (TVD) with 5" drill pipe and 750 ft of 6.5" drill collars.
 Annular capacities,
 5" drill pipe in 8.5" hole = 0.0495 bbl/ft , 6.5" drill collar in 8.5" hole = 0.0292 bbl / ft mud weight 12.3 ppg , SIDPP 350 psi, Gas gradient 0.115. What will be sicp? **[3]**
- b) While pulling out driller forgot to fill the hole & 40 stands of drill pipes were pulled out dry. What will be the reduction in bottom hole pressure? Calculate with the following data well depth 9200 ft (TVD), casing shoe depth 5240 ft (TVD), mud weight 13.8 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. **[3]**
- c) Write short note on : **[10]**
- Leak of test.
 - Wait & weight method.

SECTION - II

Q5) Using driller's method calculate, **[18]**

- a) Pressure at 2000 ft.
- b) Pressure at casing seat when the top of the gas bubble reach at that point.
- c) Annulus pressure when gas bubble reaches the surface.
- d) Height of gas bubble at surface.
- e) Pressure at the casing seat when gas bubble reaches the surface.
- f) Total pit volume increase with the influx at the surface.

Given data :

Well depth = 10000 ft, hole size = 7-7/8", drill pipe size = 4.5" , 8-5/8"
surface casing = 2000ft casing ID = 8.017", fracture gradient = 0.76 psi/
ft, fracture pressure = 1520 psi,

mud weight = 9.6ppg.

mud gradient = 0.50 psi/ft.

A kick is taken with the drill string on bottom.

SIDPP = 200 psi ,SICP = 300psi, pit level increase = 10 bbls., kill mud
weight = 10 ppg.

Normal circulation 6 bpm at 30 spm, kill rate = 3 bpm at 30 spm.

Circulating pressure at kill rate = 510 psi.

Pump capacity= 0.1 bbl/ stks , capacity of drill pipe (inside) = 0.0142
bbl/ft.

Capacity of drill pipe casing annulus = 0.0428 bbl/ft, drill pipe hole
annulus = 0.0406 bbl/ft.

Initial displacement pressure = 700 psi at 30 spm , shut in bottom hole
pressure = 5200 psi.

Temp bottom = 620° R, $Z_b = 1.007$, MASP = 520 psi, Temp. at 2000 ft
= 540° R, $Z_{2000} = 0.811$

Temp surface = 520° R, $Z_s = 0.875$, $P_f = 24$ psi, $h_b = 246$ ft , annular area
= 32.80 inch².

$$P_x = \frac{B}{2} + (B^2/2 + P_b e_m Z_x T_x h_b A_b / Z_b T_b A_x)^{1/2}$$

$$B = P_b - e_m (D - X) - P_f A_b / A_x.$$

- Q6)** a) Well control problem in oil base mud with hydrocarbon phase diagram. [8]
 b) Write short note on : [8]
 i) Relief well.
 ii) Underground blow out.
- Q7)** a) Discuss advantages and disadvantages of concurrent method of well control. [8]
 b) What is snubbing? Describe with suitable fig. snubbing stack & snubbing operation. [8]
- Q8)** a) Discuss well completion operation of abnormal pressure zones. [8]
 b) What is momentum kill? Show that momentum $M = (eq)^2 Z_1 T_1 R/s.g Ma$
 $P_i g_c A.$ [8]



P1724

[3665]- 517

M.E. (Mechanical) (Mechatronics)

DRIVES AND ACTUATORS

(2008)

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) Explain any four types of thyristors. **[16]**

Q2) a) The maximum junction temperature of a transistor is $T_j = 150^\circ\text{C}$ and the ambient temperature is $T_A = 25^\circ\text{C}$. If the thermal impedance are $R_{JC} = 0.4^\circ\text{C/W}$, $R_{CS} = 0.1^\circ\text{C/W}$ and $R_{SA} = 0.5^\circ\text{C/W}$.

Calculate :

- i) Maximum power dissipation.
- ii) Case temperature. **[8]**

b) Explain advantages and disadvantages of single phase full-converter-fed dc motor drives. **[8]**

Q3) a) What is the principle of three phase semiconverter fed dc motor drive? **[8]**

b) Explain the principle of closed locked loop control of dc drives. **[8]**

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

- a) Characteristics of DC motor.
- b) Thyristor turn on methods.
- c) Thyristor turn off methods.

SECTION - II

Q5) a) What is a synchronous motor? What are different types of synchronous motor? Explain any two type of synchronous motor. **[10]**

b) What is the starting torque of synchronous motors? **[6]**

Q6) a) What is vector control with respect to induction motor? Explain basic principle of vector control. **[8]**

P.T.O.

- b) Differentiate between electromechanical and electric actuator. [8]
- Q7)** a) What are pneumatic actuators? Explain any two types of pneumatic actuators. [8]
- b) Explain the selection criteria for valve actuator. [8]
- Q8)** Write short notes on : [18]
- a) Indirect vector control.
- b) Piston Actuators.
- c) Miniature control valves.



P1725**[3665]-586**

M.E. (E & TC, VLSI & Embedded System)
ADVANCED DIGITAL SYSTEM DESIGN
(2008 Course) (Elective - III) (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) Draw the detail Architecture of RISC & compare it with SISC in detail. [8]
 b) Draw address & data path architecture of CPU indication names of various blocks. Which unit of CPU sequences the data path operation? How are they implemented? [10]
- Q2)** a) Find the suitable state assignment for FSM defined by the flow table (Table : I). Derive the next state & O/P expression for the FSM using this state assignment. [8]

Table (I)

Present State	Next State				O/P
	$W_2 W_1 = 00$	01	10	11	Z
A →	(A)	B	C	–	0
B →	D	(B)	–	G	0
C →	F	–	C	G	0
D →	(D)	E	C	–	1
E →	A	(E)	–	G	0
F →	F	E	C	–	0
G →	–	B	C	G	1

- b) Find Hazard Free minimum cost implementation of the function. [8]
 $f(x_1, \dots, x_4) = \pi m(0, 2, 3, 7, 10, 15) + D(2, 3, 5, 13)$

P.T.O.

- Q3)** a) Draw $2^m \times n$ array of SRAM cells & explain operation in detail. [8]
 b) For two unsigned n -bit binary numbers A & B, design a circuit that produces ' n ' bit O/P; - 'Q' be the quotient & R be remainder. [8]
- Q4)** Write note on : [16]
 a) ASM & its Applications.
 b) Fault-Free analysis.
 c) ATM Packet decoder.
 d) Scan path techniques.

SECTION - II

- Q5)** a) Explain how the BIST scheme is implemented for sequential circuits. Draw the necessary block diagram. [8]
 b) Design algorithm of divider of two binary numbers. Also write VHDL code for same. [8]
- Q6)** a) Draw & explain the interfacing diagram of 480 bus with microprocessor. [8]
 b) Develop a pseudo code for bit counting circuit & draw its ASM chart. [8]
- Q7)** a) What is floating point arithmetic operation. Explain by example. [8]
 b) Apply the partitioning procedure to reduce the state table (Flow diagram) (Shown in Table - II). [10]

Table - II

Present State	Next State					O/P
	$W_1 W_2$	00	01	10	11	Z
A		(A)	B	C	–	0
B		F	(B)	–	H	0
C		F	–	(C)	H	0
D		D	G	C	H	1
E		A	E	–	H	0
F		(F)	E	C	–	0
G		D	G	–	H	0
H		–	G	C	H	1

- Q8)** Explain the following : [16]
 a) Random Test.
 b) 486 bus model.
 c) Clock skews.
 d) IEEE floating point structure.

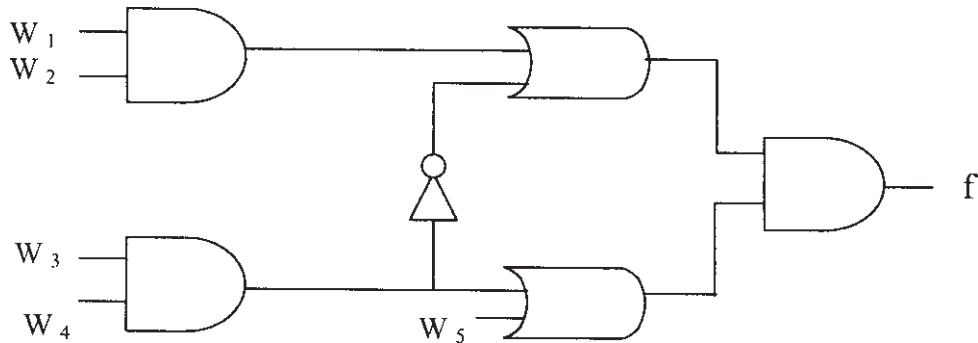
P1726**[3665]-594****M.E. (Electronics) DS****ADVANCED DIGITAL SYSTEM DESIGN****(2008 Course) (Elective - I)****Time : 3 Hours]****[Max. Marks : 100****Instructions to the candidates:**

- 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) Assume suitable data, if necessary.

SECTION - I

- Q1)** a) Design and implement 4-bit circuit to check internal capability for generation of tests & for compression of the result. [8]
 b) What are the types of Hazards? Explain in details with its significance. [8]

- Q2)** a) Sensitize each path in given circuit to obtain a complete test set that comprises a minimum number of tests. [8]



- b) Write an algorithm and VHDL code for 4-bit register with synchronous clear. [8]
- Q3)** a) Find a hazard free minimum cost POS implementation of the function $F(x_1, \dots, x_4) = \Pi M(0, 2, 3, 7, 10) + d(5, 13, 15)$ [8]
 b) Design an original circuit that exhibits dynamic hazards. [8]

P.T.O.

Q4) Write note :

[18]

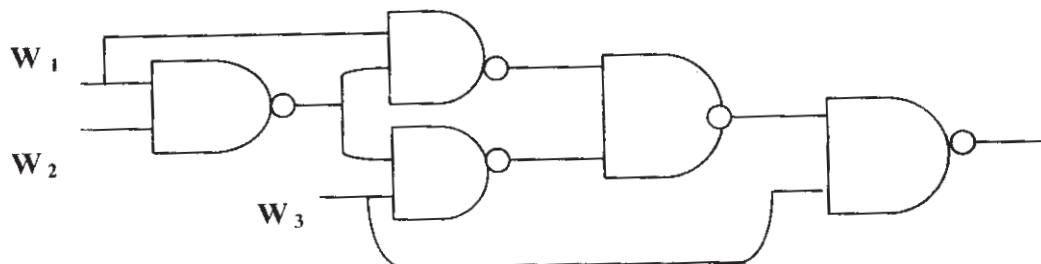
- a) Formal model for sequential circuit.
- b) Design for Testability.
- c) Why RISC is faster than CISC.

SECTION - II

- Q5)** a) Design a circuit that finds the \log_2 of an operand that is stored in an n-bit register. Show all steps in the design process & state any assumption made. Also give its VHDL code that describes complete circuit. [8]
- b) What are the major steps to design ATM packet generator explain in details. [8]

- Q6)** a) Design a digital circuit to implement Arithmetic mean with help of ASM chart and data path circuit. [8]
- b) Draw register model of 486 processor. Discuss the significance of Barrel shifter and MAC unit. [8]

- Q7)** a) Are all single stuck-at-0 & stuck-at-1 faults in this circuit detectable? Justify. [8]



- b) What is the significance of compressor circuit? Explain the use of compressor circuit with proper diagram. [8]

Q8) Write short notes :

[18]

- a) Fault free analysis.
- b) Flip flop timing parameters.
- c) Switch Debouncing.



Total No. of Questions : 10]

[Total No. of Pages : 2

P1729

[3665]-706

M.E. (IT)

REAL-TIME AND EMBEDDED SYSTEMS

(2008 Course) (Elective - I)

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 diagram 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 typical characteristics of Embedded system? Discuss in brief. [8]
b) Explain embedded system design process with stages and what are the support tools required for the embedded system design process? [8]
- Q2)** a) Write the features of the I2C bus, explain the design benefits with I2C bus. [8]
b) Explain the message based feature of CAN bus communication architecture. [8]
- Q3)** a) Describe the common architectural features of SHARC processor. [8]
b) Explain the clock synchronization and how clock synchronization is used as handshake in I2C bus with suitable clock diagram. [8]
- Q4)** a) List various Exception vectors of the ARM processor as per the priority. Explain the exception handling process in the ARM processor. [10]
b) Explain the instruction stage pipeline of the ARM processor with example. [8]

P.T.O.

- Q5)** Write short note on any four : **[16]**
- a) Hard and Soft real time systems.
 - b) Release time. Vs Dead line.
 - c) THUMB mode of ARM processor.
 - d) Standard Data frame of CAN bus.
 - e) Myrinet bus.

SECTION - II

- Q6)** a) Give the classification of the scheduling algorithms, compare and contrast static vs. dynamic algorithms with examples. **[8]**
b) Draw state diagram for making and receiving calls on telephone PBX system and explain in brief. **[8]**
- Q7)** a) A cyclic scheduler is to be designed for the following tasks. Find utilization and hyper period and give possible schedule for the same. **[8]**
T1(4, 1), T2(5, 1.8), T3(20, 1), T4(20, 2)
b) What are assumptions for priority driven scheduling of periodic tasks.**[8]**
- Q8)** a) Explain the waterfall model of software development. **[6]**
b) What is CRC card methodology? Discuss the steps necessary for analyzing the system for using this methodology. **[12]**
- Q9)** a) Explain the following terms in brief : **[8]**
i) Valid schedule.
ii) Schedulable set of jobs.
iii) Tardiness.
iv) Lateness.
b) What are advantages and disadvantages of cyclic scheduler? **[8]**
- Q10)** Write short notes on any four : **[16]**
- a) Hardware/Software design methodology.
 - b) Concurrent engineering.
 - c) Optimal scheduling.
 - d) Notations for representing the periodic task.
 - e) Aperiodic or sporadic task.



P1730

[3665] - 766

M.E. (Instrumentation & Control)

INDUSTRIAL AUTOMATION

(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.*

SECTION - I

Q1) Explain in brief different types of Sequencer? Develop Sequential Function chart for car washing machine. **[18]**

The conditions of machine are as follows: -

- a) Initially car is not on platform.
- b) There should be four operations in washing
 - i) Use water to wash
 - ii) Use the Soap
 - iii) Use hot wax
 - iv) Hot air blower to dry the car
- c) Exit the car from platform.

Q2) Describe the internal PLC operations for analog ADD operation. An analog signal of 0-10 volts comes in through a converter to an input module. The signal is to be scaled to 1/5 of its value by the CPU and then sent out through an O/P module. The O/P is also to be sent to a BCD O/P display. Develop data flow diagram & PLC program. **[16]**

Q3) Discuss the different communication Protocols used to interfacing DCS with the following: - **[16]**

- a) Supervisory computers.
- b) PLCs.
- c) HART transmitters.
- d) Field bus devices.

P.T.O.

Q4) Prepare the User Requirement Specification for Rotary Kiln Automation. Also list objectives of Kiln control. [16]

Q5) Write notes on: [16]

- a) GAMP.
- b) OPC.

SECTION - II

Q6) What is SPC? Explain in brief Tools of SPC and discuss application of SPC for process control. [16]

Q7) a) Explain with suitable diagram 'predictive control'. State its shortcomings. [8]

b) Draw process flow diagram & SFC for constantly stirred tank heater. Also give I/O listing for the same. [10]

- i) Fill the tank to Intermediate level A from Pump A.
- ii) Fill the tank from intermediate level A to maximum level B from pump B.
- iii) Heat & Stir for 5 Minutes.
- iv) Open Drain valve until empty switch engages.

Q8) With neat Sketch explain different blocks of Fuzzy controller. Explain role of ANN to enhance performance of a process. [16]

Q9) Explain the functions of the following units in DCS. [16]

- a) Database Management System.
- b) Security and user access Management.

Q10) You have to make a complete integration of assembly line in a car-manufacturing unit. Suggest an automation strategy for it. Justify your answer. [16]



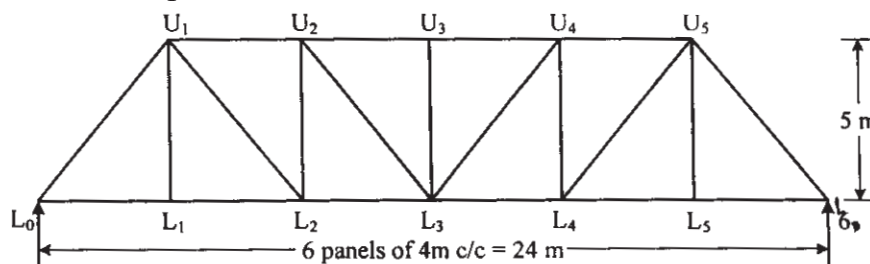
P1731**[3665]-459****M.E. (Civil-Structure)****STRUCTURAL DESIGN OF STEEL BRIDGES****(2008 Course)****Time : 4 Hours]****[Max. Marks : 100****Instructions to the candidates:**

- 1) Attempt any two questions from section I and 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 should be drawn wherever necessary.
- 5) If necessary, assume suitable data and indicate clearly.
- 6) Use of nonprogrammable electronic pocket calculator, IS 800 and steel table is allowed.

SECTION - I

- Q1)** a) Explain the different factor for the selection of type of bridges. [8]
 b) Explain in brief different methods of erection of bridges. [8]
 c) Explain in brief type of loads and forces for the design of railway steel bridges. [9]

- Q2)** A through type railway truss girder bridge consists of two Pratt trusses as shown in Fig.1. The bridge supports an equivalent uniformly distributed live load of 150 kN/m. The dead load transmitted to each truss inclusive of self weight is 15 kN/m. Design the members U_2U_3 , U_3L_3 , U_2L_3 and L_2L_3 . Assume the impact factor to be 40%. [25]

**Fig. 1**

- Q3)** A deck type plate girder railway bridge is provided for a single broad gauge track. The effective span of main girder is 20 m. The self weight of stock rails and check rails are 0.6 and 0.4 kN/m respectively. The self weight of fasteners may be assumed as 0.2 kN/m. The sleepers are provided at a spacing of 450 mm c/c and are 2.8 m × 0.25 m × 0.25 m. The unit weight of sleepers materials may be assumed as 7.5 kN/m³. Design cross section for plate girder, stiffeners and draw the design sketches for the bridge structures. The EUDL for B M is 1964 kN, for S F is 2168 kN and impact factor is 0.458. [25]

P.T.O.

SECTION - II

- Q4)** The effective span of a deck type plate girder two lane highway bridge is 30m. The reinforced concrete slab is 250mm thick inclusive of the wearing coat. The foot paths are provided on either side of the carriage way. Design the maximum section of plate girder, if the bridge is to carry IRC class A loading as shown in Fig.2. [25]

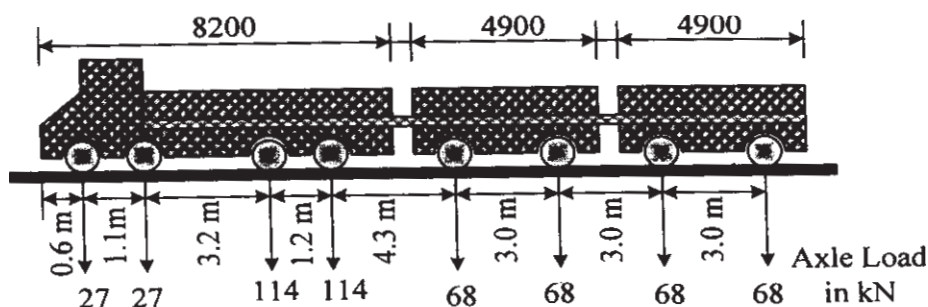


Fig. 2 IRC Class A Loadings

- Q5)** The effective span of through type truss girder highway two lane bridge is 40m. The reinforced concrete slab is 250mm thick inclusive of the wearing coat. The foot paths are provided on either side of the carriage way. The spacing between centre to centre of truss girder is 12m. The highway bridge is to carry IRC A standard loading. Suggest a suitable truss for the bridge. Determine the forces in central top chord, bottom chord, vertical and diagonal members of the central panel. [25]
- Q6)** a) Design a rocker bearing for a 32m span truss girder railway bridge with the following data.
- The reaction due to dead load, live load and impact load is 1500 kN. The vertical reaction due to overturning effect of wind at each end of the girder is 120 kN. The lateral load due to wind effect at each bearing is 60 kN. The tractive force and braking force are 981 kN and 686 kN respectively. [18]
- b) Explain different type of bearing and its function for steel bridges. [7]

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P1732

[3665]-478

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

**ENERGY CONSERVATION AND MANAGEMENT
(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) Use of electronic pocket calculators and steam tables are allowed.*
- 6) Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Explain in details the duties of Energy Manager and Energy Auditor as defined in the Energy Conservation Act 2001. **[8]**
- b) What are the priorities of energy generation from different energy sources for India in next decade? **[8]**
- Q2)** a) What are the measurements required for conducting the Energy Audit? For conducting the Energy Audit of Power Plant what instruments do you recommends. **[8]**
- b) Explain the relation between Energy Management and Energy Audit. **[8]**
- Q3)** a) A plant uses 6 tones/day of coal to generate steam. The calorific value of coal is 4500 Kcal/kg. the cost of coal is Rs. 1500/tone. The plant substitutes coal with rice husk as a boiler, which has calorific value of 2800 Kcal/kg and costs Rs. 650/tone. Calculate the annual saving at 280 days of operation, assume that the boiler efficiency decreases from 82% on coal to 78% on rice husk. **[8]**
- b) What are the losses considered in direct and indirect method? Categories these losses in order to there values. **[8]**

- Q4)** Write a short note on (any three) : **[18]**
- a) Energy audit of Steam Power Plant.
 - b) Green energy.
 - c) Energy Wheel.
 - d) Energy Regulatory authority and its function.

SECTION - II

- Q5)** Explain any Three of the following : **[18]**
- a) The Electricity Act 2003.
 - b) Need for Electrical Load management and step by step approach for maximum demand control.
 - c) Energy Efficient Motors.
 - d) Electrical Motor Speed Control Systems.
- Q6)** a) Discuss the different types lamps used in practice. Give information on luminous efficacy, colour rendering index, Typical applications and life of lamps. **[12]**
- b) List some good practices in lighting. **[4]**
- Q7)** a) List the applications of Centrifugal pumps. What do you understand by pump characteristic curve and system curve? Locate the operating point. Discuss the potential opportunities for energy savings in pumping system. **[8]**
- b) Explain the difference between Fans, Blowers and compressors. Draw neat sketches of different types of centrifugal and axial fans. State and explain fan laws. **[8]**
- Q8)** Write notes on (any four) : **[16]**
- a) Heat wheels.
 - b) Heat pumps and their applications.
 - c) Energy saving measures in Refrigeration.
 - d) Types and classification of furnaces.
 - e) Cogeneration cycles.



P1733

[3665] - 489

**M.E. (Mechanical /Heat Power)
HEAT EXCHANGER SYSTEM DESIGN AND
PERFORMANCE**

(2008 Course) (Elective - IV) (502112) (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, Mollier charts, electronic pocket calculator is allowed.*
- 6) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) What are the different kinds of spiral Heat exchangers? What are their limitations? **[6]**
- b) In a 1-2 TEMA E shell-and-tube exchanger, water enters the shell at 21°C at a rate of 1.4 kg/s. Engine oil flows through the tubes at a rate of 1.0 kg/s. The inlet and outlet temperatures of the oil are 150°C and 90°C, respectively. Determine the surface area of the exchanger by both the MTD and ϵ -NTU methods if $U = 225 \text{ W/m}^2\text{.K}$. The specific heats of water and oil are 4.19 and 1.67 J/g.K respectively. **[10]**
- Q2)** a) Explain what is meant by heat exchanger sizing and rating. **[6]**
- b) Name the specific heat exchanger construction type that may be used in each of the following applications & Discuss **[10]**
- i) Milk pasteurizing.
 - ii) Power condenser.
 - iii) Automotive Radiator.
 - iv) Marine oil cooler.
 - v) Air cooled condenser.

P.T.O.

Q3) A rotary regenerator, with a rotational speed of 10 rpm, is used to recover energy from a gas stream at 250°C flowing at 10 kg/s. This heat is transferred to the air stream at 10°C, also flowing at 10 kg/s. The wheel depth is 0.22 m and diameter 1.6 m, so that its face area is approximately 1.8 m². The mass of the matrix is 150 kg with a surface-to-volume ratio of 3000 m²/m³, and the mean specific heat of the matrix material is 0.8 kJ/kg K. The heat transfer coefficient for both fluid streams is 30 W/m².K. The mean isobaric specific heat of the gas is 1.15 kJ/kg.K and that of air is 1.005 kJ/kg.K. The flow split gas: air = 50%: 50%. For a counterflow arrangement, calculate the following values: [18]

- a) The regenerator effectiveness,
- b) The rate of heat recovery and the outlet temperatures of air and gas,
- c) The rate of heat recovery and the outlet temperatures of air and gas if the rotational speed of the wheel is increased to 20 rpm.
- d) The rate of heat recovery and the outlet temperatures of air and gas if the rotational speed of the wheel is reduced to 5 rpm.

Q4) a) What are the various correction factors (J-factors) considered in Bell Delaware method? [6]

- b) Explain in detail design methodology for HE with the help of flow chart [10]

SECTION - II

Q5) a) In a shell-and-tube feedwater heater, cold water at 15°C flowing at the rate of 180 kg/h is preheated to 90°C by flue gases from 150°C flowing at the rate of 900 kg/h. The water flows inside the copper tubes ($d_i = 25$ mm, $d_o = 32$ mm) having thermal conductivity $k_w = 381$ W/m.K. The heat transfer coefficients on gas and water sides are 120 and 1200 W/m².K, respectively. The fouling factor on the water side is 0.002 m²K/W. Determine the flue gas outlet temperature, the overall heat transfer coefficient based on the outside tube diameter, and the true mean temperature difference for heat transfer. Consider specific heats C_p for flue gases and water as 1.05 and 4.19 J/g K respectively and the total tube outside surface area as 5m². There are no fins inside or outside the tubes, and there is no fouling on the gas side. [12]

- b) Explain advantages and limitations of PFHE. [6]

- Q6)** a) In an oil-to-water heat exchanger, the oil enters the exchanger at 100°C with a heat capacity rate of 3700 W/K . Water is available at 15°C and 0.6 kg/s . Determine the exit temperatures in a 1–2 TEMA(E) shell-and-tube exchanger by the MTD method for $U = 500 \text{ W/m}^2\cdot\text{K}$ and surface area of 10 m^2 . Consider $C_p = 1.88$ and $4.19 \text{ J/g}\cdot\text{K}$ for oil and water, respectively. Assume oil outlet temperature as 63°C . [8]
- b) Explain the various streams of flows in the shell side of STHE. Draw neat sketches if necessary. [8]
- Q7)** a) List various standards and codes adopted for design of heat exchanger. Explain the importance and necessity of use of such standards and codes. [8]
- b) In an oil-to-water heat exchanger, the oil enters the exchanger at 100°C with a heat capacity rate of 3700 W/K . Water is available at 15°C and 0.6 kg/s . Determine the exit temperatures in (a) counterflow, and (b) parallelflow arrangements for $U = 500 \text{ W/m}^2\cdot\text{K}$ and surface area of 10 m^2 . Consider $C_p = 1.88$ and $4.19 \text{ J/g}\cdot\text{K}$ for oil and water, respectively. If the ratio of convection thermal resistances of oil to water is 1:2, and the wall and fouling resistances are negligible, calculate the wall temperature at each end of the counterflow and parallelflow exchangers. [8]
- Q8)** Explain which heat exchanger is suitable for following applications with reasoning- [16]
- Low viscosity liquid and steam.
 - High viscosity fluids.
 - Fouling liquids.
 - Slurries- suspensions-pulps.
 - Heat sensitive liquids.
 - Cryogenic applications.
 - Vapor condensation.
 - Vapor/gas partial condensation.



P1734

[3665]-502

M.E. (Mechanical) (Design Engineering)
ANALYSIS AND SYNTHESIS OF MECHANISMS
(2008 Course) (502210)

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 and steam tables is allowed.
- 6) Assume suitable data, if necessary.
- 7) Solve Graphical problems on drawing sheets.

SECTION - I

Q1) a) Rewrite following sentences, state whether they are True or False and Justify your answer. [5]

- i) Spring cannot be called as a kinematic link.
- ii) A rigid link of triangular shape is called as ternary link.
- iii) Offset slider crank mechanism is a quick return mechanism.
- iv) Crank rocker mechanism is an inversion of 'Grashoffian Linkage'.
- v) Number of degrees of freedom of a kinematic chain can not be negative.

b) Figure 1 shows a possible mechanism in which link 2 is driving link and link 4 is driven one. Draw equivalent linkage and hence find out degrees of freedom for the mechanism using Grubler's criterion. [6]

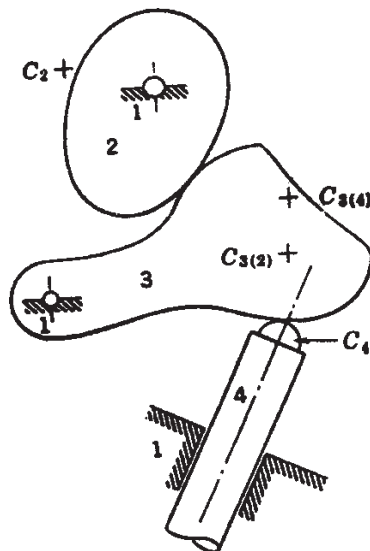


Fig. 1, Q. 1(b)

P.T.O.

- c) Figure 2 shows schematic of a mechanism. Redraw the sketch on answer sheet, find out degrees of freedom for the mechanism using Grubler's criterion. [5]

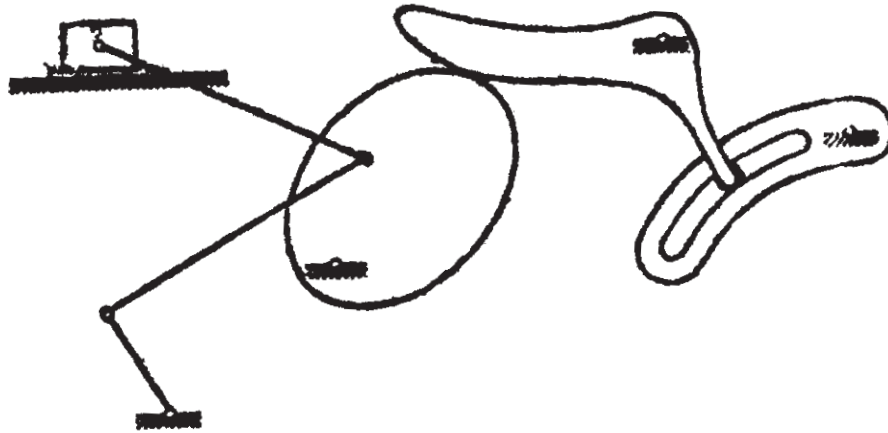


Fig. 2, Q. 1(c)

- Q2) Figure 3 shows a rod of length L suspended freely and rotating anticlockwise at Ω rad/s (uniform). A disc of radius ' r ' is pivoted to the end of the rod and is rotating anticlockwise at ω rad/s (uniform). 'A' is the point on the periphery of the disc. Derive the equation for finding out instantaneous linear velocity and acceleration of point 'A'. [8]

Using the equations derived above, find out instantaneous linear velocity and acceleration of point A if $\Omega = 5$ rad/s, $L = 200$ mm, $\omega = 20$ rad/s, $r = 50$ mm, $\theta = 270^\circ$ and $\phi = 45^\circ$. [2]

Verify the results using polygon method. [6]

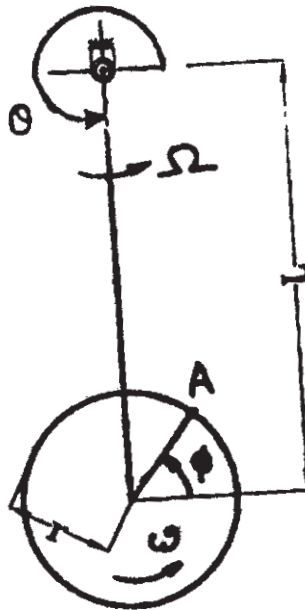


Fig 3, Q. 2

- Q3)** a) Write a short note on : Elastic Linkage Model. [8]
 b) Explain how mechanisms can be analyzed using the matrix method. [8]
- Q4)** a) Plot space centrode for connecting rod of a slider crank mechanism with 40mm long crank and obliquity ratio 3. [10]
 b) Identify 'Body centrode' and 'Space centrode' in case of a circle that is tracing epicycloid and hypocycloid. Comment on the result. [6]
- Q5)** a) Prove that the radius of curvature of a cycloid at any point is twice the length of normal drawn from that point to the base line. [10]
 b) What is the significance of Ball's Point. What is its use? [8]

SECTION - II

- Q6)** a) Figure 4 shows three positions of link AB. Its length is 80mm. It is to be moved through the successive positions A_1B_1 , A_2B_2 and A_3B_3 with co-ordinates as shown. Position A_3B_3 is horizontal and point A_3 is 80mm vertically above B_2 . Graphically synthesize a four bar mechanism with link AB as its coupler. Find out the co-ordinates of the ground pivots in the same reference frame. Also find lengths of input and output links. Draw the mechanism in its second position. [8]

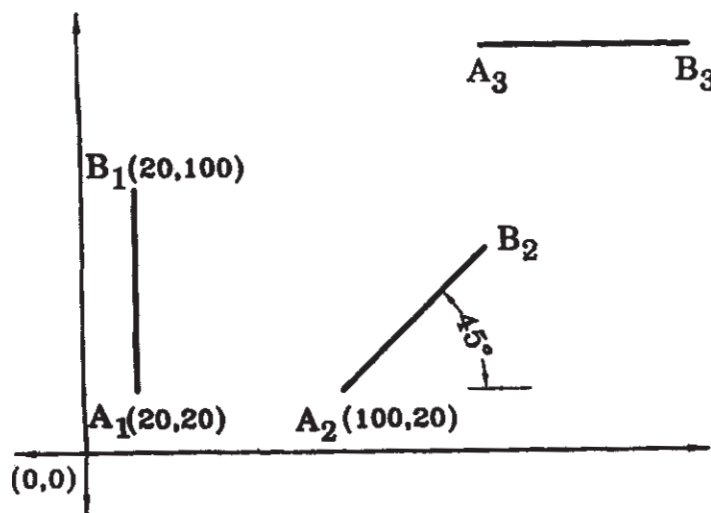


Fig 4, Q 6 (a)

- b) What is double point on coupler curve? What is difference between cusp and crunode? Where are cusps and crunodes seen in the standard curves? [8]

- Q7)** A four revolute mechanism is to be synthesized by using three precision points, to generate the function $y = 2x^2 - x$, for the range $1 \leq x \leq 4$. Assuming 30° starting position and 120° finishing position for input link and 70° starting position and 160° finishing position for output link, find out values of x , y , θ (input angles) and ϕ (output angles) corresponding to the three precision points with chebychev spacing. (Use graphical method for obtaining the precision points and round off the precision points to nearest single decimal).

[6]

If the grounded link is horizontal and its length is 100mm, synthesize the mechanism using analytical method based on Freudenstein's Equation.

Assume crank length as 40mm. Find other link lengths.

[10]

- Q8)** a) If link 1, Link 2, Link 3 and Link 4 are Input, Coupler, Output and Ground links respectively and if at a particular instant $\omega_1, \omega_2, \omega_3, 0$ and $\alpha_1, \alpha_2, \alpha_3, 0$ are their instantaneous angular velocities and instantaneous angular accelerations respectively, explain how to find out link lengths to satisfy given conditions using Complex Number Method.

Hence find link lengths if $\omega_1 = 3^\circ/\text{s}$, $\omega_2 = 2^\circ/\text{s}$, $\omega_3 = 0^\circ/\text{s}$, $\omega_4 = 0$ and $\alpha_1 = 0$, $\alpha_2 = 8/3^\circ/\text{s}^2$, $\alpha_3 = 8^\circ/\text{s}^2$, $\alpha_4 = 0$.

[10]

- b) Distinguish between Path Generation and Motion Generation.

[6]

- Q9)** a) Figure 5 shows a four bar mechanism. Redraw the mechanism on the drawing sheet to the scale and draw its cognate mechanisms in the same figure to get coupler curve of point 'P'.

[12]

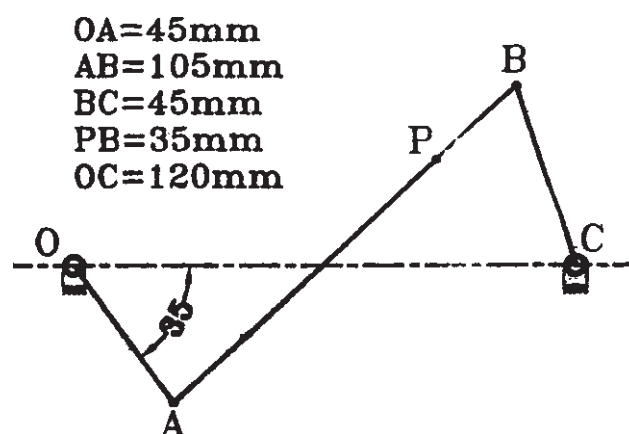


Fig. 5, Q. 9 (a)

- b) What is Branch Defect and Order Defect?

[4]

Q10) Write short notes on (any three) :

[18]

- a) Dyad Method.
- b) Opposite Pole Quadrilateral.
- c) Bermester Points.
- d) Errors in Mechanisms.
- e) Type Number and Dimensional Synthesis.



P1735

[3665] - 537

M.E. (Electrical) (Control Systems)

INTELLIGENT CONTROL

(2008 Course) (Elective - IV)

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) Figures to the right indicate full marks.*
- 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)** a) What is the various activation function? Explain them schematically. [8]
b) What are the network topologies? [8]

OR

- Q2)** a) What are the paradigms of neural network learning? [8]
b) Explain single layer neural network with one output and two inputs. [8]

- Q3)** a) State learning rate. [2]
b) Explain perceptron convergence theorem. [6]
c) What happens when cyclic data is introduced to feed forward network?[8]

OR

- Q4)** a) Explain the delta rule used to adjust the weights of Adaline network. [8]
b) "Single layer perceptron can not represent exclusive - OR" Justify this statement with proper example. [8]

- Q5)** a) Describe the learning vector quantisation method. [6]
b) What is kohanen network? Explain. [6]
c) Explain normalized Hebbian rule. [6]

P.T.O.

OR

- Q6)** a) Describe adaptive resonance theory. [6]
b) Explain ART 1 neural network. [6]
c) Describe the normalization of ART 1. [6]

SECTION - II

- Q7)** a) What are the different fuzzy sets? Define them. [8]
b) What are the operations on fuzzy sets? Explain with example. [6]
c) Given :

$$A = \{a, b, c, 1, 2\}$$

$$B = \{1, 2, 3, b, c\}$$

Find i) $A \cup B$ ii) $A \cap B$. [4]

OR

- Q8)** a) Given :

$$A = \{(x_1, 0.1), (x_2, 0.5), (x_3, 0.3)\}$$

$$B = \{(y_1, 0.3), (y_2, 0.4)\}$$

be the two fuzzy sets on the universes of discourse $X = \{x_1, x_2, x_3\}$ and $Y = \{y_1, y_2\}$ resp. Find the cartesian product of A and B. [7]

- b) Let A be the fuzzy set defined by

$$A = \frac{0.5}{x_1} + \frac{0.4}{x_2} + \frac{0.7}{x_3} + \frac{0.8}{x_4} + \frac{1}{x_5} \text{ List all } \alpha \text{ - cuts.} [5]$$

- c) What are the fuzzy relations? Explain them. [6]

- Q9)** a) What is defuzzification? [4]
b) When should you not to use fuzzy logic? [4]
c) Explain fuzzy logic controller using example of basic feedback control system. [8]

OR

- Q10)** a) What are the various defuzzification methods? Explain them. [8]
b) What is the effectivity of fuzzy logic control systems. [8]

Q11) Explain in detail fuzzy logic model for Air conditioner controller. **[16]**

OR

Q12) Explain with example, the application of self supervised learning to control and process monitoring. **[16]**



Total No. of Questions : 8]

[Total No. of Pages : 3

P1737

[3665]-440

**M.E. (Civil-Hyd.)
DAM ENGINEERING
(2008 Course) (501304)**

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) What are the various forces acting on a Gravity Dam. Discuss about each of them in brief. [6]
- b) A vertical gravity dam retains water up to a depth of 120 metres on the upstream side and the inclined surface retains water up to a height of 12 metres in the downstream side. The dam has a total base width of 55 metres. Determine the total uplift pressure without any drainage gallery. [6]
- c) The magnitude of principal stress in an elementary profile of a gravity dam works out to be 3500 kN/m^2 . If this dam is to be constructed with the material of specific gravity of 2.4 and if the coefficient of uplift is 0.8 find the height of the dam. [6]
- Q2)** a) A zoned type earthen dam of height of 40 m is proposed at a location where hard rock is available at 6m depth below the river bed. [8]
- i) Draw a sketch of the cross section showing all the dimensions of different components.
- ii) Show at least four components and state the function of each of them.

P.T.O.

- b) What do you mean by Critical Slip Circle? Can you obtain the Critical Slip Circle for an earthen dam by manual calculation? [4]
- c) Explain the procedure of drawing a phreatic line in case of an earthen dam with central core of impervious material. [4]
- Q3)** a) What is Ogee spillway? What are the other types of spillways? Write in brief about the design criteria of an ogee spillway with all the required formulae. [8]
- b) What are the design principal and method of construction of a Rockfill Dam? [8]
- Q4)** a) Discuss in detail about the design criteria of 'Buttress Dam'. [8]
- b) A vertical gravity dam retains water up to a depth of 110 metres on the upstream side and the inclined surface retains water up to a height of 11 metres in the downstream side. The dam has a total base width of 60 metres. Determine the total uplift pressure when the centre line of the drainage gallery is at a distance of 10 metres from the upstream face. [8]

SECTION - II

- Q5)** a) A gravity dam is located in the seismic zone number five. The height of the dam is 60 metres and the top width is 8 metre. The upstream face is vertical and the downstream face has a slope of 0.9 (H) : 1.0(V) from the top. A free board of 2.5 metres is provided. Specific weight of the dam material is 24 kN/m³ and the basic seismic coefficient for zone five is taken as 0.08. Calculate the earthquake forces per unit length of the dam and its moment at the base. [9]
- b) An overflow spillway has the following data : [9]
- i) Discharge per running metre length of spillway is 12 m³/s/m.
 - ii) The upstream face is vertical.
 - iii) The downstream face has a slope of 0.80(H) : 1.0(V).
 - iv) The RL of the river bed is 100 metre.
 - v) The RL of the maximum water level is 145 metres.
 - vi) The spillway is an ungated one

Determine the

- 1) Crest level of the spillway.
- 2) Shape of u/s and d/s portion of the crest of spillway as per USWES recommendations.
- 3) Sketch the profile.
- 4) The depth of water in the tail channel of spillway so that the hydraulic jump type apron, can be used as an energy dissipater.

Q6) a) Prove that the best central angle for an arch dam is $133^{\circ}34'$. Give all the mathematical details with all the steps. [8]

b) Discuss various modes of failures of earthen dam in detail along with required sketches. [8]

Q7) a) Draw the neat sketch of a rock toe. [8]

b) State any four types of energy dissipation devices below spillway. Explain the suitability of each of them. [8]

Q8) Write short notes (any four) [16]

- a) Silt Pressure on Gravity Dam.
- b) Response Spectrum Method.
- c) Drainage Blanket.
- d) Trail Load Theory for Arch Dam.
- e) Siphon Spillway.
- f) Automatic Gate for spillway.



P1738

[3665] - 705

M.E. (Information Technology (CSE (IT))

SOFTWARE ARCHITECTURE

(Theory) (Revised Course 2008) (514404) (Elective - 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) Write in brief on ALL of following : **[18]**

- a) Documenting Design patterns.
- b) Software design.
- c) Definition of software architecture.
- d) Execution view.
- e) Object relational databases.
- f) Message brokers.

Q2) Explain the following concepts with examples : **[16]**

- a) Business Archetype pattern : Party.
- b) UML profile for archetype.
- c) Wrapper façade pattern.
- d) Enterprise service bus.

Q3) a) Write short Notes on component-connectors view type. **[6]**

b) Draw a neat diagram for hardware configuration of IS2000, explain it. **[6]**

c) What do you understand by application interface level EAI. **[4]**

Q4) a) Write short Notes on Broker pattern. **[6]**

b) What do you understand by terms: idioms, architectural patterns. **[6]**

c) Write in brief on Adaptor pattern. **[4]**

P.T.O.

SECTION - II

Q5) In brief state the concept/term; illustrate with good examples for the following concepts. **[16]**

- a) Service oriented architecture.
- b) HTTP protocol.
- c) Software modules.
- d) XML and XML DOM.

Q6) Write short Notes on any three : **[18]**

- a) Object databases versus relational databases.
- b) JDBC and JDBC drivers.
- c) Three layers: presentation, domain logic, data source.
- d) Performance of systems (Nonfunctional requirement) with examples.

Q7) What do you understand by the following concepts : **[16]**

- a) Distributed computing.
- b) Features of Object orientation.
- c) Reliability of software systems.
- d) AJAX.

Q8) Write in brief on ALL of the following : **[16]**

- a) What are the benefits of Web services.
- b) In context of distributed computing what are the advantages of middleware like J2EE.
- c) What are software components and how do they encourage reuse/modifiability.
- d) Software architecture is important. Justify the Comment.



P1739**[3665]-577****M.E. (E & TC) (VLSI & Embedded Systems)****MACHINE INTELLIGENCE****(2008 Course) (Elective - I) (504184)****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.

SECTION - I

- Q1)** a) Describe the term Membership Functions (MF) formulation. Discuss in detail with suitable example MFS in one and two dimensions. [8]
- b) What is soft computing? Describe the different soft computing characteristics. [8]

- Q2)** a) Discuss in detail Max-Product and Max-Min composition operations in connection with fuzzy relations. Suppose X, Y, Z are three different sets such as, $X = [X_1, X_2, X_3]$, $Y = [Y_1, Y_2, Y_3]$ & $Z = [Z_1, Z_2, Z_3]$. Let R_1 represents fuzzy relation between X & Y and R_2 a fuzzy relation of closeness between Y & Z. Assume that, R_1 & R_2 can be expressed as the following relation matrices.

$$R_1 = \begin{bmatrix} 0.9 & 0.5 & 0.7 \\ 0.2 & 0.9 & 0.4 \\ 0.7 & 0.2 & 0.6 \end{bmatrix} \quad R_2 = \begin{bmatrix} 1 & 0.5 & 0.3 \\ 0.9 & 0.7 & 0.6 \\ 0.2 & 0.8 & 0.7 \end{bmatrix}$$

Obtain the degree of relevance between $x_2 (\in X)$ and $Z_3 (\in Z)$ by using Max-Min and Max-Product composition methods. [10]

- b) What is fuzzy reasoning? Discuss in detail the fuzzy reasoning for multiple rules with multiple antecedents. [8]
- Q3)** a) What is extension principle? Analyse the process of extension principle using fuzzy sets for the following principle.
 $3 \times \text{"about 4"} + 2 = \text{"about 12"} + 2 = \text{"about 14"}.$ [8]
- b) Draw and explain the block diagram of the fuzzy inference system. [8]

- Q4)** a) What do you mean by derivative based optimization? Explain in detail the method of steepest descent. [8]
- b) What are the steps involved in the system identification? Draw and explain the block diagram for parameter identification. [8]

SECTION - II

- Q5)** a) What is ADALINE networks? Describe in detail the backpropagation learning rule for a multilayer perceptron. [8]
- b) What are the applications of Kohonen self organising networks? Mention the different steps involved in training of Kohonen self organising network. [8]
- Q6)** a) What do you mean by principal component analysis? Compare between principal component analysis and regression analysis. [8]
- b) Describe in detail the Learning Vector Quantization (LVQ) method used for adaptive data classification based on training data with desired class information. [8]
- Q7)** a) Explain the concept of Adaptive Network based Fuzzy Inference System (ANFIS). Discuss the ANFIS architecture for the sugeno fuzzy model. [8]
- b) What are different data clustering algorithms? Explain K-means clustering algorithm in detail. [8]
- Q8)** Write short notes on (any 3) [18]
- a) Radial basis function neural network.
 - b) Dynamic programming.
 - c) Continuous and binary Hopfield network.
 - d) Reinforcement learning.



P1743

[3665]-639

M.E. (Computer)

**WEB SERVICES AND SERVICE ORIENTED ARCHITECTURE
(2008 Course) (Theory)**

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) How does advertisement and discovery of web services work? [4]
b) Explain the messaging with SOAP protocol. [4]
c) What do you understand by service composition. [4]
d) Discuss briefly Bottom up strategy to SOA delivery/building SOA. [4]
- Q2)** a) Compare the design approaches of service orientation and object orientation (Hint: in terms of interface granularity, coupling, statefulness, scope). [8]
b) Explain with examples of your own: Task centric business services. [4]
c) What standards constitute web services. [4]
- Q3)** Discuss following concepts with examples. [16]
a) The WS BPEL process definition structure.
b) Motivation and objectives of SOA governance.
c) Loose coupling and its advantages.
d) Business gains from SOA.
- Q4)** Answer any THREE : [18]
a) Enterprise Service Bus is an intelligent, distributed, transactional and messaging layer, connecting applications, diverse data in an enterprise. Explain ESB and its above characteristics.

- b) Write short notes on WS-Reliable messaging.
- c) What are the typical issues faced in : Service deployment, Service testing.
- d) Draw a neat diagram for IBM on demand operating environment.
- e) Explain the concept in detail 'Enterprise solution assets'.

SECTION - II

- Q5)** a) In context of web based client server architectures (distributed internet architecture) explain the given concepts : Browser as a client, Web server tier, Application tier, Data tier. **[8]**
- b) What do you understand by terms. **[8]**
- i) Components and Interfaces.
 - ii) Statelessness and statefulness of components/services.
- Q6)** In brief explain **[16]**
- a) Web service wrappers for Legacy applications.
 - b) XML and its importance.
 - c) What is RSS and what are its applications.
 - d) Encryption and its importance to SOA.
- Q7)** Illustrate the following concepts with examples of your own : **[16]**
- a) Service level agreement and quality of service.
 - b) Applications of BLOGS.
 - c) Single sign on for security.
 - d) Transactions and ACID properties.
- Q8)** Write short notes on ANY THREE : **[18]**
- a) Heterogeneity, Interoperability and Integration of applications.
 - b) Web 2.0.
 - c) SOA and technical Need for SOA.
 - d) AJAX concepts, applications.
 - e) Javascript.



P1744

[3665]-209

**M.E. (Computer)
APPLIED ALGORITHMS
(1997 Old Course)**

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) What is time complexity of an algorithm? How do we represent it using Big-Oh(O) notation? Write any algorithm to solve same problem in different ways so that they have different time complexities. **[12]**
- b) 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. **[4]**
- Q2)** a) Write a program for Binary search using divide and conquer strategy, Analyze the algorithm for time and space complexity requirement for the same algorithm for different cases. **[8]**
- b) Discuss the Merge sort algorithm for the following data set to sort in ascending order, in which data set do you think that merge sort is not advisable to use **[8]**
- i) 12, 12, 12, 12, 12
 - ii) 20, 15, 14, 11, 10
 - iii) 10, 1, 12, 15, 7
- Q3)** a) Solve the following problem of job sequencing with deadline using Greedy approach. Find out feasible and optimal solution.
Let $N = 4$, $(p_1, p_2, p_3, p_4) = (100, 10, 15, 27)$ and
 $(d_1, d_2, d_3, d_4) = (2, 1, 2, 1)$ **[8]**
- b) Analyze an single source shortest path algorithm with time and space complexity using greedy approach. **[8]**

- Q4)** a) 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]
- b) Analyze an algorithm of minimum spanning tree using greedy approach and find out its time and space complexity, compare this complexities with other algorithm for minimum spanning tree. [10]

SECTION - II

- Q5)** a) Consider the following instance of Knap sack problem : $n = 6$,
 $(p_1, p_2, p_3, p_4, p_5, p_6) = (w_1, w_2, w_3, w_4, w_5, w_6) = (100, 50, 20, 10, 7, 3)$
 and $M = 165$. [12]
 Solve the problem using Dynamic programming approach.
- b) What is principle of optimality? Which algorithmic strategy use this principle? Explain with suitable example. [6]
- Q6)** a) Solve the sum of subset problem using backtracking algorithmic strategy for the following data. [8]
 $N = 4$ (w_1, w_2, w_3, w_4) = (11, 13, 24, 7) and $M = 31$
- b) Discuss and analyze the problem of finding Hamiltonian cycle using backtracking. [8]
- Q7)** a) Show that both P and NP are closed under the operation union, intersection, concatenation and kleen closure (*). [10]
- b) Show that an infinite recursively enumerable set has an infinite recursive subset. [6]
- Q8)** a) 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? [8]
- b) Explain the branch and bound algorithmic strategy for solving the problem, take an example of traveling salesman problem using branch and bound. [8]



P1745

[3665] - 490

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

COMPUTATIONAL FLUID DYNAMICS

(2008 Course) (Elective - IV) (502112 - B)

Time : 3 Hours]

[Max. Marks:100

Instructions to the candidates:

Answer 3 Questions from each Section.

SECTION - I

Q1) Consider a square control volume ABCD of length 1. **[16]**

- a) Apply mass balance to the control volume.
- b) Apply momentum balance. The forces can be taken as pressure and shear stresses. The shear stresses need not be given as a function of viscosity and velocity gradient.

The values at the mid-point of sides (AB, BC etc.) can be taken as the average value for that side. Note : The control volume is not infinitesimal.

Q2) Consider the case of developing flow in a channel. Show how pressure is updated / calculated using the SIMPLE method. **[17]**

Q3) For quasi one-dimensional flow in a converging-diverging nozzle, write the mass and momentum equations. Show how density is updated. **[16]**

Q4) Consider Navier-Stokes equations for compressible flow. Present the numerical algorithm for the solution. **[17]**

SECTION - II

Q5) Consider the continuity equation for compressible flow. Show how density is updated using MacCormack scheme. What is the stability condition. **[17]**

P.T.O.

Q6) Consider the equation $u_t = au_x$.

Show how the solution is obtained using the Lax-Wendroff method. Show the numerical diffusion (artificial viscosity) term. Derive the condition for stability. [16]

Q7) Consider 2 dimensional transient conduction in a unit square. Apply Alternate-direction method and give the algorithm for the solution. [17]

Q8) For one-dimensional transient conduction :

a) Write the explicit scheme. Derive the expression for stability. [8]

b) Express the implicit formulation. What is the stability condition? [8]



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[3665] - 587

M.E. (E & TC - VLSI)

EMBEDDED AUTOMOTIVE SYSTEMS

(2008 Course) (504195)

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 security and warming system in automotive systems. **[10]**
b) Which are the components for Electronic engine management systems? Explain briefly. **[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) Current trends in automobile system.
ii) Vehicle motion control.
b) Which different types of fuel injection systems? Explain. **[8]**
- Q4)** a) Write short note on any two sensors : **[8]**
i) Exhaust temperature sensors.
ii) Flow sensors.
iii) Vehicle speed sensors.
b) Which are the rating and efficiency of battery? What are the various tests on batteries and how charging is done? **[8]**

P.T.O.

SECTION - II

- Q5)** a) Describe briefly solid state ignition system techniques. [8]
b) How fuel metering is done? Which are the different techniques? [8]
- Q6)** a) Briefly explain the technique of Integrated engine control and exhaust emission control technique. [8]
b) How artificial intelligence plays role in modern automobiles? [8]
- Q7)** a) Explain Electronic management of chassis systems. [8]
b) Draw a schematic arrangement for atypical CAN network containing a master and number of slaves. How multiprocessor communication is possible? [8]
- Q8)** a) Explain the different Dashboard instruments and their use. [10]
b) Describe the details of head light and side light, Horn, wiper system and traffic indicator. [8]



Total No. of Questions : 6]

[Total No. of Pages : 2

P1747

[3665]-42

M.E. (Civil-Structures)
HIGH RISE STRUCTURES
(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 answer books.*
- 3) Neat diagram must be drawn wherever necessary.*
- 4) Figures to the right indicate full marks.*
- 5) Assume suitable data, if necessary and clearly state them.*
- 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) Design a RC chimney for the following data : **[25]**

Height = 80m

External diameter = 6.00m

Wall thickness = 300 mm at top(linearly varying)

Safe bearing capacity of soil = 350 kN/m².

Q2) a) Evaluate the maximum sag of the conductor due to temperature variation in the design of transmission line tower. **[13]**

b) Describe the evaluation of following loads in the analysis of transmission tower under the normal and broken conditions. **[12]**

- i) Vertical load.
- ii) Lateral load.
- iii) Longitudinal load.
- iv) Transverse load.

Q3) A 56 m high steel tower is to be erected for transmission line for single circuit three phase 50 cycle per second. Suggest the suitable geometry and determine the various forces acting on tower under normal operating condition. **[25]**

P.T.O.

SECTION - II

- Q4)** a) Give the qualitative comparison of 2-D and 3-D analysis of tall building. [10]
b) Describe the seismic behavior of various bracing system used in multistory buildings. [15]
- Q5)** a) Compare the overall structural performance of shear walls, coupled shear and bracing in tall building with the earthquake excitations.[10]
b) Describe the drag and shielding effect due to wind in the design of building. [15]
- Q6)** A self supporting steel stack is 80 m high and its diameter at top is 3.5 m. Design the plates for the stack, base plate and anchor bolts. The stack is located in the industrial zone where intensity of wind pressure up to 30 m is 1.5 kN/m². Use IS : 6533 and IS : 875. [25]



[3665] - 613
M.E. (Production)
SUPPLY CHAIN MANAGEMENT
(2008 Course) (511104) (Elective - 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)** Develop the supply chain models for the Agricultural Enterprises. Give detail explanations of each aspect; also include the necessary mathematical expressions. **[18]**
- Q2)** a) Derive the expression for the capacitated plant location model for network design in supply chain. **[12]**
b) Explain binomial representation of uncertainty. **[4]**
- Q3)** a) How can the full set of four drivers to be used to create strategic fit for a PC manufacturer targeting time sensitive customers? **[4]**
b) What is ERP? Mention the advantages & disadvantages of using best-of-breed solution and single integrator solution. **[6]**
c) Discuss how the three supply chain macro processes interface in order to be successful. **[6]**
- Q4)** a) Compare the performance characteristics of: direct shipping Network & I -Transit Merge Network. **[4]**
b) “Speed Logistics” , a third party logistics firm provides warehousing and other logistics services. The general manager of “Speed Logistics is facing a decision regarding the amount of space to lease for the upcoming three year period. He has forecasts that “Speed Logistics will need to handle a demand of 100,000 units for each of the three years. Past data suggest that “Speed Logistics has required 1000 sq. ft of warehouse space for every 1,000 units of demand. “Speed Logistics” receives revenue of Rs. 1.22 for each unit of demand. The general manager must decide whether

P.T.O.

to sign a three -year lease or obtain warehousing space ‘on the spot’ market’ every year. The three-year lease will cost Re. 1.00 per sq. ft. per year and the ‘on the spot’ market’ rate is expected to be Rs. 1.20 per sq. ft. per year for each of the three years. The only cost “Speed Logistics faces is the cost for the warehouse and discount rate $=k=0.1$.

Whether the general manager of “Speed Logistics” should lease the space or obtain from the spot market every year? [12]

SECTION - II

- Q5) a)** DO sells vitaherb, a popular vitamin diet supplement. Demand for vitaherb is 10,000 bottles per month. The manufacturer currently charges \$3 for each bottle and DO incurs a holding cost of 20 percent. The manufacturer has offered a discount of \$0.15 for all bottles purchased by retailers over the coming month. Evaluate the number of bottles of vitaherb that DO should order given the promotion. Determine the forward buy that will occur. It is assumed that the discount will only offered once, the order quantity without discount is a multiple of order quantity with discount and DO takes no action to influence customer demand. [12]
- b) Explain the different types of Probabilistic models used in Inventory Management. [6]
- Q6) a)** For determining appropriate level of safety inventory explain *how to measure*: [12]
- i) Demand & supply Uncertainty.
- ii) Desired level of product availability.
- b) Scope of Emerging Distributed Co-Operative Tel-Manufacturing Over internet. [4]
- Q7) a)** Explain in detail Savings Matrix Method for routing and scheduling in transportation. [12]
- b) Explain with relevant example: Revenue impact of E- business on the book Industry. [4]
- Q8)** Explain why Dell Computers Systems Ltd became the market leader since last three years among their Competitors? Justify your answer with quantified statements with specific reference to supply chain Management principle and concepts. [16]



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[3665] - 611

M.E.

ADVANCE MECHATRONICS

(Elective - I) (511104)

Time : 3 Hours]

[Max. Marks:100

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Draw Diagrams wherever necessary.*
- 3) *Answers to the two sections should be written in separate answer sheets.*
- 4) *Assume suitable data, wherever necessary.*

SECTION - I

Q1) a) Compare and contrast the control system for the domestic central heating system involving a bimetallic thermostat and that involving a microprocessor? **[12]**

b) State the steps that might be present in the sequential control of a dishwasher. **[4]**

OR

a) Identify various mechatronic elements that might be present in the control system involving microprocessor controlled wrist watch? **[8]**

b) Explain following terms with respect to closed loop system. **[8]**

- i) Comparison element.
- ii) Control Element.
- iii) Process Element.
- iv) Measurement Element.

Q2) a) Explain what do you understand by following mechatronic data of strain gauge pressure transducer. **[10]**

Ranges: 70 to 1000 kPa, 2000 to 70000 kPa

Supply Voltage: 10 V dc or ac rms

Full range output: 40 mV

Non-linearity and hysteresis: ± 0.5 % full range output

Temperature range: -54°C to +120°C when operating

Thermal zero shift: 0.030 % full range output /°C

P.T.O.

- b) A pressure sensor consisting of a diaphragm with strain gauges bonded to its surface has the following information in its specification. [6]
Ranges: 0 to 1400 kPa, 0 to 35000 kPa
Non-linearity error: $\pm 0.15\%$ full range
Hysteresis error: $\pm 0.05\%$ of full range

OR

- a) Suggest a sensor that could be used as part of system to control the thickness of rolled sheet by monitoring its thickness of rolled sheet by monitoring its thickness as it emerges from rollers. The sheet metal is in continuous motion and the measurement needs to be made quickly to enable corrective action to be made quickly. The measurement system has to supply an electrical signal. Explain the logical steps involved in the process and justify suggested sensor in mechatronic way. [10]
- b) A copper-constantan thermocouple is to be used to measure temperatures between 0 to 200°C. The e.m.f at 0°C is 0 mV, at 100°C it is 4.277 mV and at 200°C it is 9.286 mV. What will be the non-linearity error at 100°C as a percentage of the full range output if a linear relationship is assumed between e.m.f and temperature over the full range? [6]

Q3) Explain following for microprocessor [18]

- a) Accumulator
- b) Status
- c) Memory Address
- d) Program counter registers

OR

- a) How does a microcontroller differ from microprocessor? Draw a block diagram of basic microcontroller and explain the function of each subsystem? [12]
- b) What input is required to reset an Intel 8051 microcontroller? [4]
- c) A microprocessor uses eight address lines for accessing memory. What is the maximum number of memory locations that can be addressed? [2]

SECTION - II

Q4) Explain following w.r.t. process control systems : [16]

- a) Characteristics functions.
- b) Input/Output arrangements.
- c) Addressing techniques.
- d) Memory systems.

OR

- a) Simplify following Boolean equations : [8]
- i) $Q = A.C + A.C.D + C.D.$
- ii) $Q = A.B.C + C.D. + C.D.E.$
- b) Use De Morgan's laws to show that a NOR gate with inverted inputs is equivalent to an AND Gate. [8]

- Q5)** a) Devise a system, using a PLC which can be used to control the movement of a piston in a cylinder using a 4/2 solenoid operated pilot valve. The piston is to move in one direction when a proximity sensor at one end of the stroke closes contacts and in the other direction when a proximity sensor at the other end of the stroke indicates its arrival. [10]
- b) Explain the criteria for selection of PLC for a particular task. [6]

OR

- a) Explain how a PLC can be used to handle an Analogue input. [6]
- b) Devise a PLC system that could be used with a conveyor belt which is used to move an item to a work station. The presence of the item at the work station is detected by means of breaking a contact activated by a beam of light to the photosensor. There it stops for 100 s for an operation to be carried out before moving on and off the conveyor. The motor for the belt is started by a normally open start switch and stopped by a normally closed switch. [10]

- Q6)** Design a coin counter that includes an electromechanical device to accept a handful of mixed denominations of Indian rupee coins that will align and present the coins in serial order to a sensor array capable of acquiring data to determine its individual and group values of coin. The system should be useful for Indian Railways for platform ticket transaction machine. [18]

OR

Design a mechatronic system for car park barriers which is having facility to lift and lower based on number of cars existing in the parking. [18]



Total No. of Questions : 8]

[Total No. of Pages : 2

P1751

[3665]-602

M.E. (Electronics) (Digital System Design)
DIGITAL SYSTEM DESIGN USING PLD'S
(2008 Course) (Elective - III)

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) What are the types of PLD, explain evolution in PLD's, comment on technology. [10]
b) What is selection criteria of CPLD and FPGA? [8]
- Q2)** a) Draw and explain about architecture of FPGA in detail. [8]
b) List out the detail features of Xc 4000 FPGA family. [8]
- Q3)** a) Differentiate the CPLD and FPGA. [8]
b) What are the types of CPLD devices available in the market, give the short features of each. [8]
- Q4)** a) Discuss about the Coll Runner - II CPLD family, list its feature. Give the specific application of the device in short. [10]
b) Give the feature of Xc 9500 CPLD. [6]

SECTION - II

- Q5)** a) Write VHDL code to drive the stepper motor, give the proper interfacing diagram. [10]
b) Discuss about the spartan - 3 FPGA. [6]
- Q6)** a) What are the different FPGA programming techniques? Discuss any one in brief. [8]
b) List the feature of 5200 FPGA family. [8]

P.T.O.

Q7) a) Write VHDL code for 3 floor lift controller give the proper interfacing diagram using CPLD. [10]

b) Comment on area and power optimization of CPLD and FPGA. [6]

Q8) Write note on : [18]

a) Advanced tools in VLSI.

b) Comparison of selection of microcontroller versus CPLD, FPGA chips.

c) Selection of DSP processors.



Total No. of Questions : 8]

[Total No. of Pages : 2

P1752

[3665]-123

M.E. (Electronics / E&TC)

MICROELECTRONICS

(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) Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Draw schematic of CMOS inverter and explain voltage transfer characteristic in detail. [8]
- b) What are the different causes of power dissipation in CMOS, discuss in detail? [8]
- Q2)** a) What is Domino Logic? Explain operation of Domino AND gate in detail, comment on inverter at the O/P of Domino gate. [10]
- b) What is transistor sizing? Derive the relationship between the widths of n & p banks of MOSFETs. [8]
- Q3)** a) Write VHDL code for divide by 5 synchronous counter. [8]
- b) Explain about stuck-open & stuck-short faults. [8]
- Q4)** a) Design a Moore machine synchronous to detect overlapped 1011 sequence. [8]
- b) Explain & draw about the boundary scan, JTAG & their standards. [8]

P.T.O.

SECTION - II

- Q5)** a) Write low power mode of CPLD and embedded array block in FLEX 10K FPGA. [8]
b) Draw and explain about the architecture of FPGA in detail. [8]
- Q6)** a) Write VHDL code for 4bit shift register for SISD & SIPO operations use behavioral modeling. [8]
b) What do you mean by non-synthesizable statements? Why it is being used in VHDL? Give examples. [8]
- Q7)** a) Draw state diagram & VHDL code for lift controller. [8]
b) Describe about the transmission gates explain draw OR gate using transmission gates. [8]
- Q8)** Write notes on : [18]
a) Test Bench, their types and usage.
b) Design for testability.
c) Analogue VLSI.



P1753**[3665] - 534****M.E. (Electrical) (Control System)****ROBUST CONTROL****(2008 Course) (Sem. - II) (503111 (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) *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) If X is a vector space and a real valued function $\|x\|$ is defined on X . Which are the properties to be satisfied by $\|x\|$ so that it can be said to be a norm on X . [8]
- b) Define : [8]
- i) Semidefinite / Definite Matrix.
 - ii) Vector norm.
 - iii) Matrix norm.
 - iv) Positive Definite Matrix.

OR

- Q2)** a) For the Linear Time Invariant System, Define : [8]
- i) Controllability.
 - ii) Stability.
 - iii) Observability.
 - iv) Stabilizability.
- b) For the system [8]

$$A = \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}, B = \begin{bmatrix} 1 \\ 1 \end{bmatrix}, C = \begin{bmatrix} 0 & 1 \end{bmatrix}$$

check the observability.

P.T.O.

- Q3) a)** If $\|A\| < 1$, show that
 $(I - A)^{-1} = I + A + A^2 + \dots$ [6]
- b)** Prove that Riccati Equation
 $A^*X + XA - XBB^*X + C^*C = 0$
 has unique positive semidefinite stabilizable solution assuming (A, B) stabilizable and (C, A) detectable. [10]

OR

- Q4) a)** Compute 2-Norm and ∞ -norm for the system given by

$$G(s) = \left[\begin{array}{cc|c} -1 & -2 & 1 \\ 1 & 0 & 0 \\ \hline 2 & 3 & 0 \end{array} \right]. \quad [8]$$

- b)** Define H_2 and H_∞ spaced and state the norms induced on them. [8]
- Q5) a)** Explain well posedness and internal stability of the system. State the conditions for internal stability for plant 'P' & controller 'K'. Prove any two conditions. [10]
- b)** Write a note on feedback structure mentioning the necessity of it. [8]

OR

- Q6) a)** Explain the steps involved in computing RL_∞ norm. [8]
- b)** Evaluate the internal stability for the system

$$P = \left[\begin{array}{cc} \frac{1}{(s-1)} & 0 \\ 0 & \frac{1}{(s+1)} \end{array} \right] \text{ and } K = \left[\begin{array}{cc} \frac{(1-s)}{(1+s)} & -1 \\ 0 & -1 \end{array} \right]. \quad [10]$$

SECTION - II

- Q7) a)** State Algebraic Riccati Equation associated with the Hamiltonian matrix H. [6]
- b)** Find out the eigenvalues and eigenvectors for

$$A = \begin{bmatrix} 1 & 3 & 4 \\ 1 & 4 & 3 \\ 1 & 2 & 1 \end{bmatrix} \quad [10]$$

OR

- Q8)** a) Write down the conditions for output feedback stabilizability in context with Luenberger observer. [8]
 b) Explain in brief : [8]
 i) Model Uncertainty.
 ii) Robust Performance.

- Q9)** a) Write a note on Linear Fractional Transformation. Also state the condition for well defined LFT. [8]
 b) State and prove Small Gain Theorem for internal stability. [8]

OR

- Q10)** a) For the system

$$P = \begin{bmatrix} \frac{1}{s-1} & 0 \\ 0 & \frac{1}{s+1} \end{bmatrix} \text{ and } K = \begin{bmatrix} (1-s) & -1 \\ 0 & -1 \end{bmatrix}$$

check the internal stability. [8]

- b) Define & Explain :
 i) Nominal and Robust stability.
 ii) Nominal and Robust Performance. [8]

- Q11)** a) State and explain Bode's Gain and Phase Relation. [8]
 b) Explain feedback control interpretation for coprime factorization of a transfer matrix. Consider the plant P having state space representation as

$$\begin{aligned} \dot{x} &= Ax + Bu \\ y &= Cx + Du \end{aligned} \quad [10]$$

OR

- Q12)** a) Enlist the assumptions made for the realization of the transfer matrix G(s) of the form

$$G(s) = \left[\begin{array}{c|cc} A & B_1 & B_2 \\ \hline C_1 & 0 & D_{12} \\ C_2 & D_{21} & 0 \end{array} \right]. \quad [8]$$

- b) Diagonalize the following matrix. [10]

$$A = \begin{bmatrix} 1 & 7 & 8 \\ 1 & 5 & 4 \\ 2 & 7 & 9 \end{bmatrix}.$$



P1755

[3665] - 227

M.E. (Petroleum)

OFFSHORE TECHNOLOGY

(Revised 2002 Course) (512108)

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) List out the various challenges in deepwater drilling program. Explain drilling difficulties or hole problems for the same in brief. **[10]**

b) Classify different types of offshore structures and discuss the merits and demerits of fixed and floating structures in brief. **[8]**

Q2) Write short notes on : **[16]**

- a) Mooring system design.
- b) Environmental forces acting on a vessel.
- c) Repeat formation testing.
- d) Sub-sea well completion.

Q3) a) Describe any one type of mathematical model to optimize the wind and wave forces during offshore drilling. State and express the assumptions, equations and limitations of this model. **[12]**

b) Draw the schematic sketch and indicate various types of forces acting on a floating drilling vessel. **[4]**

Q4) a) Draw the schematic sketch and explain in detail the, 'dynamic positioning system'. **[10]**

b) Draw the schematic sketches of different types of, 'spread mooring pattern', used in conventional station keeping. **[6]**

P.T.O.

SECTION - II

- Q5)** a) Write important factors that you will consider during design of drilling fluid programme, 'to combat and control the possible problems associated with drilling in deep water'. Explain any one in detail. [10]
b) What is a Subsea Tree? Write the different types of Subsea tree used in offshore. Draw the neat schematic sketch and describe any one type of Subsea tree. [8]
- Q6)** a) Write the various modes available for storage and transportation of oil and gas at offshore. Discuss in brief the design considerations for storage system for natural gas. [12]
b) Write a note on, 'diving equipment'. [4]
- Q7)** a) Explain oil and gas separation facility with a process flow diagram (GGS.) [8]
b) Write short note on : [8]
i) Remote operated vehicles (ROV).
ii) Safety during diving.
- Q8)** a) List the various methods of production testing before completion of a well. Describe in detail drill stem testing method. [10]
b) Explain 'ballast control and stability for a floating drilling vessel' in brief. [6]



Total No. of Questions : 8]

[Total No. of Pages : 2

P1756

[3665]-443

M.E. (Civil) (Hydraulic Engineering)
HYDROINFORMATICS AND SIMULATIONS
(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 book.*
- 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) Define Hydroinformatics. What are the techniques used in Hydroinformatics? Explain role of Data mining and numerical modeling in Hydroinformatics. **[16]**

Q2) What is decision support system. Discuss design of decision support system for flood protection including various components. **[16]**

Q3) Discuss various methods of simulations. Discuss possible simulation model for predicting inflow to a reservoir. **[16]**

Q4) Write short notes on (any two) : **[18]**

- a) Any practical simulation model.
- b) Role of internet in water resources engineering.
- c) Any practical Hydroinformatics tool.

P.T.O.

SECTION - II

- Q5)** What are Artificial Neural Networks. Explain in detail standard back propagation algorithm. Compare back propagation algorithm and cascade correlation algorithm. **[16]**
- Q6)** Discuss the flow chart of Genetic Algorithm. Explain mutation, crossover and reproduction. **[16]**
- Q7)** a) Discuss merits and demerits of ANN. **[8]**
b) Discuss Fitness function, population, individuals, fitness value in connection with the Genetic Algorithm. **[8]**
- Q8)** Write short notes on (any two) : **[18]**
a) Conjugate Gradient algorithm.
b) Applications of ANN in rainfall-runoff modeling.
c) Stopping criteria in GA.



P1759

[3665]-507

M.E. Mechanical (Design Engineering)
INDUSTRIAL TRIBOLOGY
(2008 Revised Course) (502212-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) *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) State and discuss various factors affecting wear. [6]
b) Derive the expression for co-efficient of friction using theory proposed by Broden & Tabor and compare it with expression obtained by modified adhesion theory. [12]
- Q2)** Derive Reynolds equation for hydrodynamic action with assumption. [16]
- Q3)** a) Explain rolling friction & rolling resistance. [8]
b) Explain short & long bearing theory in journal bearing. [8]
- Q4)** Explain the mechanism of adhesive wear. Derive equation for the law of adhesive wear as proposed by Archad. [16]
Explain Rowe's modification of Archad equation. [16]

SECTION - II

- Q5)** What is squeeze film lubrication. A circular plate of radius 'r' is approaching an oily plane surface with velocity 'V' at the instant the film thickness is h_1 . Derive an expression for the time 't' taken to reduce the film thickness from h_1 to h_2 . The viscosity of lubricant is μ . [16]

- Q6)** Assuming generalised Reynold's equation, derive Reynold's equation for aerodynamic bearings in dimensionless form. Explain various terms in the equation. State the advantages & limitations of air lubricated bearings. Give their application. **[16]**
- Q7)** Derive Ertel-Grubin equation in case of elasto hydrodynamic lubrication. Discuss the shortcomings of the above equation. **[16]**
- Q8)** Write short notes on (ANY THREE) : **[18]**
- a) Petroff's equation.
 - b) Mechanism of tyre-road interaction.
 - c) Foil bearings.
 - d) Piston-Fin lubrication.



P1760

[3665] - 530

M.E. (Electrical Engineering) (Control System)

SCADA SYSTEMS & APPLICATIONS

(2008 New Course) (Elective - I) (503105)

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) Assume suitable data, if necessary.*

SECTION - I

Q1) What is SCADA system? Explain the block diagram of SCADA system in details. **[25]**

Q2) Explain following components with respect to SCADA system : **[25]**

- | | |
|------------------------------|------------------------------|
| a) Monolithic SCADA Systems. | b) Distributed SCADA system. |
| c) Modbus RTU. | d) UCA / IEC 61850. |

Q3) a) Draw block diagram of PLC and explain each blocks in details. Also give specifications of any one industrial PLC. **[15]**

b) Compare PLC and SCADA system in details. **[10]**

SECTION - II

Q4) Explain the implementation methods of SCADA industrial communication technologies. **[25]**

- | | |
|-------------------------------|------------------------|
| a) Wired and wireless method. | b) Fiber optic method. |
|-------------------------------|------------------------|

Q5) Explain automatic substation control & its configuration by using SCADA system. **[25]**

Q6) Explain application of SCADA system in Energy management system in details. **[25]**



P1762

[3665]-579

M.E. (E & TC/Electronics) (VLSI and Embedded Systems) (Digital System)

MEMORY TECHNOLOGIES

(2008 Course) (Elective - 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) Compare and contrast ECL and BiCMOS Bipolar SRAM technologies. [6]
b) Explain the following application specific SRAMs. [6]
i) Line Buffers.
ii) CAM.
c) What is SOI (Silicon On Insulator) technology. Draw and explain cross section of thin film SOI CMOS inverter. [6]
- Q2)** a) Enlist the advantages and disadvantages of trench capacitor based cells? Hence compare SPT and TTC trench capacitors. [8]
b) Explain the various stages of soft error creation by an alpha particle hit in a DRAM. [8]
- Q3)** a) What are stacked gate EPROM and split gate EPROM? Explain FAMOS device with help of energy band diagram. [8]
b) What is Floating-Gate Tunneling Oxide (FLOTOX) technology? Compare it with Silicon-Oxide-Nitride-Oxide (SONOS) memories. [8]
- Q4)** a) Explain read, program and write operation of a Flash Memory Cells. Refer ETOX (EPROM tunnel oxide). [8]
b) What is RAM pseudo random testing? Describe a typical Markov chain representation for the same. [8]

- Q5)** a) Explain the usage of Single Stuck Fault model (SSF) for memory testing. Support your answer with a suitable example. [8]
b) What is IDDQ Fault modeling? [8]

SECTION - II

- Q6)** a) Discuss dielectric related failures and semiconductor-dielectric interface failures in Semiconductor memories with reference to general reliability issues. [8]
b) Compare reliability of DRAM capacitor for trench capacitor and stacked capacitor. [8]
- Q7)** a) Discuss total dose effects. Hence detail the process of charge generation near SiO₂/Si interface. [8]
b) What is SEU (Single Event Upset) hardening? [10]
- Q8)** a) Explain operation of FRAM cell and compare FRAM and EEPROM. [8]
b) What are magneto-resistive random access memories? Do they differ from analog memories? How? [8]
- Q9)** a) Enlist and compare the commonly used packages for surface mount technology. [8]
b) What are memory cards? Explain Flash memory card. [8]
- Q10)** a) Discuss different issues related to radiation hardening process. [8]
b) What is single electron memory? [8]



Total No. of Questions : 10]

[Total No. of Pages : 2

P1763

[3665]-618

M.E. (Production Engineering)
ENGINEERING ECONOMICS AND ACCOUNTING
(2008 Course) (511105)

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)** Differentiate between Micro Economics and Macro Economic. Explain the use of these two sciences. [16]
- Q2)** a) "Demand curve slopes upwards from left to right". Do you agree? Justify. [8]
b) "Law of demand has no exceptions". Do you agree? Justify. [8]
- Q3)** a) Explain the important techniques for Demand Forecasting. Discuss in brief any two of these. [8]
b) What do you mean by Elasticity of Demand? How is it found out? [8]
- Q4)** Explain any four of the following terms : [16]
a) Pure Competition.
b) Perfect Competition.
c) Monopoly.
d) Oligopoly.
e) Equilibrium.
f) Fixed Cost.
- Q5)** a) Enumerate any six pricing philosophies. Give brief discussion on any two of these. [9]
b) How does pricing decisions differ in private enterprises and public enterprises? [9]

SECTION - II

- Q6)** a) Explain the technique of Cost Benefit Analysis, with suitable example. [8]
b) What is meant by cost? Does it differ from price? Justify. [8]

P.T.O.

- Q7)** a) How does Absorption Costing differ from Marginal Costing? [8]
 b) Explain the need for providing depreciation. Discuss any two methods for calculating depreciation amount mentioning their advantages. [8]

- Q8)** ABC Ltd. manufactures a single product NEXT. The following figures relate to the NEXT for a one year period. [18]

Activity Level	50%	100%
Sales and Production [Units]	400	800
	Rs. Lakhs	Rs. Lakhs
Sales	8.0	16.0
Production Cost		
Variable	3.2	6.4
Fixed	1.6	1.6
Selling and Distribution Costs		
Variable	1.6	3.2
Fixed	2.4	2.4

The normal level of activity for the year is 800 units. Fixed costs are incurred evenly throughout the year and actual costs are the same as budgeted. There were no stocks on NEXT at the beginning of the year. In the first quarter 220 units were produced and 160 units were sold. You are required to find out the following :

- a) What would be the fixed production costs absorbed by NEXT if absorption costing is used?
 b) What would be the under/over recovery of the overheads during the period?
 c) What would be the profit under the absorption costing or Marginal Costing?
- Q9)** a) Explain the technique of Break Even Analysis. What are the assumptions in this analysis? To what extent these can be valid? [8]
 b) Discuss in brief any two techniques used for evaluating business proposals, highlighting the benefits and limitations of these techniques. [8]
- Q10)** Write short notes on any four of the following : [16]
- Contents of a Project Report.
 - Forecasting of business changes.
 - Cost classification.
 - Resource allocation by Government.
 - Scope of Managerial Economics.



Total No. of Questions : 8]

[Total No. of Pages : 3

P1765

[3665]-64

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

IC ENGINES - II

(Compression Ignition Engines)

(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) Discuss briefly the design performance data of CI engines. [6]
b) What is meant by mean piston speed? Explain its importance. [4]
c) Determine the ideal efficiency of the diesel engine having a cylinder with bore 250mm, stroke 375 mm and a clearance volume of 1500 cc, with fuel cut-off occurring at 5% of the stroke. Assume $\gamma = 1.4$ for air. [4]
d) How do exhaust temperature and mean effective pressure affect the engine performance? Explain. [4]
- Q2)** a) Explain clearly the reasons for looking for alternate fuels for CI engines. [4]
b) Comment on Retrofitted Bio-Diesel engine. [6]
c) Can alcohol be used for CI engines? Explain any two methods. [6]
- Q3)** a) Enlist the salient features and with the help of schematic diagram. Explain the working of Common-Rail Fuel Injection System. [6]
b) What is the purpose of a fuel injector? Mention the various parts of a injector assembly by drawing a scale. [6]

P.T.O.

- c) A four cylinder, four stroke diesel engine develops 100 kW at 3500 rpm. Its brake specific fuel consumption is 180 gm per kWh. Calculate the quantity of fuel to be injected per cycle per cylinder. Specific gravity of the fuel may be taken as 0.88. [4]

- Q4)** a) Explain the combustion stages in a CI engine with the help of P - θ diagram. [8]
 b) Define Squish, Swirl, directional movement and turbulence. Explain their importance in the design of CI engine combustion chambers. [8]

SECTION - II

- Q5)** a) Discuss the effect of speed on the following parameters of CI engines.
 i) Mechanical and Brake thermal efficiency.
 ii) BMEP and BSFC.
 iii) Brake torque of engine. [8]
 b) In a test of a single cylinder, four stroke oil engine the following results were obtained. [10]

Cylinder Diameter	=	20 cm
Stroke	=	40 cm
Mean effective pressure	=	6 bar
Torque	=	407 Nm
Speed	=	250 rpm
Oil Consumption	=	4 kg/h
Cooling water flow rate	=	4.5 kg/min
Calorific value of fuel	=	43 MJ/kg
Air used per kg of fuel	=	30 kg
Rise in cooling water temperature	=	45°C
Final temperature of exhaust gases	=	420°C
Room temperature	=	20°C
Mean specific heat of exhaust gas	=	1 kJ/kgK
Specific heat of water	=	4.18 J/kgK

Find the i_p , b_p and Draw up a heat balance sheet for the test in KJ/h.

- Q6)** a) A four stroke diesel engine working at sea level (pressure : 1 bar and Temp. = 17°C) develops a brake power of 280 kW with a volumetric efficiency of 80% at sea level conditions. The engine works at an air-fuel ratio of 18:1, with a specific fuel consumption of 0.240 kg/kWh. The engine runs at 1800 rpm, Determine the engine capacity and the bmep.

This engine is taken to an altitude of 3 km where ambient temperature and pressure are -23°C and 0.715 bar. A mechanically coupled supercharger is fitted to the engine which consumes 12% of the total power developed by the engine. The temperature of air leaving the supercharger is 37°C. Determine the degree of supercharging required to maintain the same brake power of sea level. Also calculate the isentropic efficiency of the compressor. Assume air-fuel ratio, thermal efficiency and volumetric efficiency remain the same for naturally aspirated and supercharged engine. [10]

- b) Make the thermodynamic analysis of a Turbocharged CI engine cycle. [6]

- Q7)** a) Explain the instruments for measuring the following invisible emission.

- i) Oxides of nitrogen.
- ii) Carbon monoxide.
- iii) Unburned hydrocarbons.

Write their approximate values. [6]

- b) What are the causes of particulates generation? How are they controlled? [6]

- c) Explain with sketch working of hartridge smoke meter. [4]

- Q8)** Write short notes on (any three) : [16]

- a) CNG engine.
- b) Heat Release Programme.
- c) Modern methods of measuring Temperature and pressure.
- d) CI engine fuel rating.



Total No. of Questions : 6]

[Total No. of Pages : 4

P1143

[3666] - 203

F.Y.M.C.A. (Under Engineering)

OPERATIONS RESEARCH

(2008 New Course) (510911)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answers to the two sections should be written in separate answer books.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of electronic pocket calculator is allowed.*
- 4) *Assume suitable data, if necessary.*
- 5) *All questions are compulsory.*

SECTION - I

- Q1)** a) A company produces two types of hats. The company can produce a total of 350 hats a day. The market limits daily sales of the first and second types to 150 and 200 hats respectively. Assume that the profit per hat is Rs. 8 for type one and Rs. 5 for type two. Formulate the LPP to maximize the profit and solve it by graphical method. [8]
- b) What is feasible solution and optimal solution? Discuss the properties of LP model. [4]

OR

- a) Solve the following LPP by the Simplex method :
Minimize : $Z = X_1 - 3X_2 + 2X_3$
Subject to
 $3X_1 - X_2 + 2X_3 \leq 7$
 $-2X_1 + 4X_2 \leq 12$
 $-4X_1 + 3X_2 + 8X_3 \leq 10$
 $X_1, X_2, X_3 \geq 0$ [10]
- b) List the four special cases that arise in the use of simplex method. [2]

- Q2)** a) Consider the transportation problem shown in table below : [9]

		Market					
Plant		1	2	3	4	5	Supply
	1	10	2	16	14	10	300
	2	6	18	12	13	16	500
	3	8	4	14	12	10	825
	4	14	22	20	8	18	375
	Demand	350	400	250	150	400	

P.T.O.

Find the basic feasible solution using each of the following methods and compare their total costs.

- i) Northwest corner method.
 - ii) Least cost cell method.
 - iii) Vogel's approximation method.
- b) What is balanced transportation problem? [2]

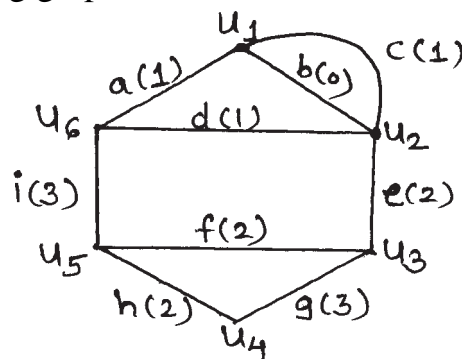
OR

- a) Solve the following assignment problem minimum cost.

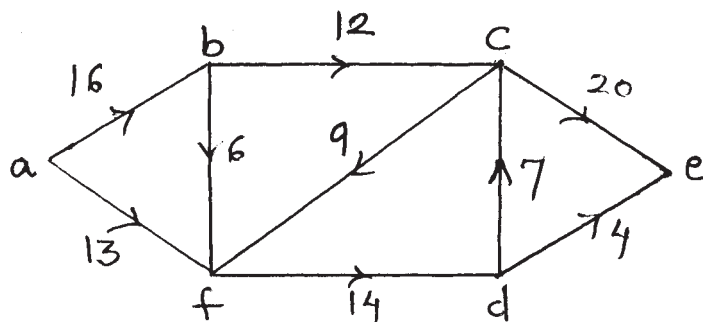
	I	II	III	IV	V
A	11	17	8	16	20
B	9	7	12	6	15
C	13	16	15	12	16
D	21	24	17	28	26
E	14	10	12	11	15

- b) What is an Assignment model? Give one application. [5]
 c) What is degeneracy in Transportation problem? [3]

- Q3) a) Using Kruskal's algorithm find the minimum weighted spanning tree in the following graph G. [6]



- b) Capacity of each edge is given. Determine the maximal flow from 'a' to 'e' in the given network. What is the value of maximum flow? [6]



OR

- a) A small project is composed of activities whose time estimates are listed in the table below : activities are identified by their beginning (i) and ending (j) node numbers. [7]

- i) Draw the project network.
ii) Find the expected duration and variance for each activity. What is the expected project length?

Activity i - j	Estimated duration (weeks)		
	Optimistic	Most Likely	Pessimistic
1 - 2	1	1	7
1 - 3	1	4	7
1 - 4	2	2	8
2 - 5	1	1	1
3 - 5	2	5	14
4 - 6	2	5	8
5 - 6	3	6	15

- b) Compare PERT and CPM. [5]

SECTION - II

- Q4)** a) Use branch and bound technique to solve the following integer programming problem :

$$\text{Maximize } z = 7x_1 + 9x_2$$

Subject to

$$-x_1 + 3x_2 \leq 6$$

$$7x_1 + x_2 \leq 35$$

$$x_1 \geq 0, x_2 \leq 7$$

x_1, x_2 integers.

[6]

- b) Explain with example :

i) Exponential smoothing.

ii) Regression.

[6]

OR

- a) Consider the following two time series :

Period	1	2	3	4	5	6	7	8	9	10
Set A	10	12	9	10	11	20	19	23	20	21
Set B	15	13	15	16	16	14	16	15	17	16

- i) Compute 3 & 5 period moving average for time series A & B and find the respective forecasts for the eleventh period.

- ii) Which one of the above averaging period prove the most accurate forecasts for each time series. [6]

- Q5) a)** The research department of Hindustan lever has recommended the marketing department to launch the shampoo of three different types. The marketing manager has to decide one of the types of shampoo to be launched under the following estimated pay-offs for various levels of sales. [8]

What will be the marketing manager's decision?

- OR

Which strategy should the concern executive choose on the basis of :

- Q6)** a) What is Simulation Experiment? Discuss the factors affecting simulation. [7]
b) Explain in brief Generation of Random numbers. [4]

OR

-

Total No. of Questions : 12]

[Total No. of Pages : 2

P1145

[3666] - 304

Second Year M.C.A. (Engineering)

COMPUTER COMMUNICATIONS AND NETWORKS

(2008 Course) (610904) (Sem. - I)

Time : 3 Hours]

[Max. Marks : 70

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, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 6) Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) List the different guided media and explain briefly any two of them. [4]
b) Compare the Infrared and Radio transmission. [4]
c) What is multiplexing? Explain CDM in brief. [4]

OR

- Q2)** a) Compare peer to peer networks and client-server networks. [4]
b) What is 802.11? Explain Wireless LAN in brief. [4]
c) Give reasons why OSI model failed to take off? [4]

- Q3)** a) What is Framing? Explain different methods of framing. [8]
b) List flow control algorithms used in Data link layer? Explain Go Back N protocol. [4]

OR

- Q4)** a) Draw HDLC frame structure. Write functions of each field. [4]
b) Draw PPP frame structure. Write functions of each field. [4]
c) List different types bridges? Explain Remote Bridge. [4]

- Q5)** a) Explain briefly CSMA/CD by taking four nodes as A1, A2, A3 and A4 and also explain Bit Map protocol briefly. [6]
b) Explain Wavelength Division Multiple Access (WDMA). [5]

OR

P.T.O.

- Q6)** a) Explain exposed and Hidden station problem in Wireless LAN? Also explain how these problem can be avoided. [6]
b) Explain Bluetooth architecture. Draw the Bluetooth protocol stack diagram. [5]

SECTION - II

- Q7)** a) What are choke packets? Explain. [5]
b) Explain the Hierarchical routing. [6]

OR

- Q8)** a) What is Congestion? Explain any one congestion control technique. [6]
b) Explain the techniques for achieving good quality of service. [5]

- Q9)** a) Explain connection establishment and connection termination with respect to the transport Layer. [6]
b) Explain Token Bucket algorithm briefly. [6]

OR

- Q10)** a) What is Socket? What are Socket primitives? What will be the socket address of machine having IP address = 192.168.99.99 in case of web server (http) and FTP server installed on the same machine. [6]
b) Explain the RTP and RTCP with example. [6]

- Q11)** a) What is the difference between IMAP and POP3 protocols? Explain when and where they are used? [6]
b) What is FTP? When and where it is used? Why does it require 2 ports? Explain at least 5 user commands used in FTP. [6]

OR

- Q12)** a) Explain how DNS service works. [6]
b) Explain BOOTP and DHCP in brief. [6]



F.Y.M.C.A. (Under Engineering Faculty)

PROBABILITY AND STATISTICS

(2008 Course) (510904)

Time : 3 Hours]

[Max. Marks : 70

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 probability table, electronic pocket calculator is allowed.*
- 5) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) A husband and wife appear in an interview for two vacancies for the same post. The probability of husband's selection is $1/7$ and that of wife's selection is $1/5$. What is the probability that :
- i) At least one of them is selected.
 - ii) Both of them are selected.
 - iii) Only one of them is selected. [6]
- b) A certain firm has plants A, B and C producing 35%, 15% and 50% respectively of the total output. The probabilities of non-defective product from these plants are 0.75, 0.95 and 0.85 respectively. An item is selected from the total output of these plants and found to be defective. What is the probability that it is produced by plant C? [6]

OR

- a) Box A contains 2000 components of which 5% are defective, box B contains 500 components of which 40% are defective and box C and D contains 1000 components each with 10% defective components. A box is selected at random and a component is drawn from it, find the probability that :
- i) It is defective.
 - ii) If the component is defective, it is from box B. [6]
- b) The students in a class are selected at random, one after the other for an examination. Find the probability that the boys and girls in the class alternate, if
- i) The class consist of 4 boys and 3 girls.
 - ii) 3 boys and 3 girls. [6]

Q2) a) A product is manufactured by company for which it has 3 machines M_1 , M_2 and M_3 . M_1 produces 50%, M_2 produces 30% and M_3 produces 20% of the total product. Past experience shows M_1 produces 4% defectives, M_2 produces 5% defectives and M_3 produces 6% defectives. At the end of day from the total production 1 unit of production is selected at random and is found to be defective. What is the probability that machine M_1 has produced it? [6]

b) Verify whether the function $P(x)$ defined by

$$P(x) = \frac{1}{2^x}, x = 0, 1, 2, 3, \dots$$

is p.m.f. of a discrete random variable X . [6]

OR

a) A continuous random variable has probability density function :

$$f(x) = \begin{cases} k(2x - x^2), & 0 < x < 2 \\ 0, & \text{otherwise} \end{cases}$$

Find k and $P(x > 1)$. [6]

b) A random variable X has m.g.f. $M(t) = \frac{3}{3-t}$ find the standard deviation of X . [6]

Q3) a) The life time of a certain type of battery have mean 300 hours and standard deviation 35 hours. Assuming that the distribution of life time is normal find :

- Probability of batteries having life time between 225 and 335 hours.
- The life time in hours above which we will find the best 20% of the batteries.

Z	0.84	1.28	2.14
Area from $z = 0$	0.30	0.3997	0.4884

[6]

b) Let (X, Y) be a discrete bivariate random variable with following p.m.f.

Y	0	1	2	3
X				
0	k	3k	2k	4k
1	2k	6k	4k	8k
2	3k	9k	6k	12k

Find k and marginal probability mass function for X and Y . [5]

OR

- a) A joint p.d.f. of bivariate joint random variables X and Y is given by :

$$f(x, y) = \begin{cases} k(6 - x - y), & \text{for } 0 < x < 2, 2 < y < 4 \\ 0, & \text{otherwise} \end{cases}$$

Find k and $P(x < 1, y < 3)$. [6]

- b) For a uniform distribution of a random variable X defined on $[a, b]$. Show that

$$E(X) = \frac{a+b}{2} \text{ and } \text{Var}(X) = \frac{(b-a)^2}{12}. \quad [5]$$

SECTION - II

- Q4)** a) Explain the following terms :

- i) Null hypothesis and research hypothesis.
- ii) Type I and type II errors.
- iii) Test statistics. [6]

- b) Let s^2 be a sample variance of a random sample of size n from the distribution of X. Prove that :

$$S^2 = \frac{\sum_{i=1}^n X_i^2 - \left(\sum_{i=1}^n X_i \right)^2}{n(n-1)} \quad [6]$$

OR

- a) Explain the terms :

- i) Sampling with and without replacement.
- ii) Random sample and sample statistic.
- iii) Sample mean and sample variance. [6]

- b) What is point estimator and point estimate? What properties of estimator make it a good estimator? [6]

- Q5)** a) A random sample of size n is selected from a normal distribution with mean μ and variance σ^2 . Prove that the sample mean \bar{X} is normally distributed with mean μ and variance σ^2/n . [6]

- b) Show that a random sample of size 100, drawn with replacement, the standard error of sample proportion can not exceed 0.05. [6]

OR

- a) Explain significance testing? How does it differ from hypothesis testing? [6]
- b) Define : [6]
 - i) Confidence interval for difference and sum.
 - ii) Confidence interval for variance.
 - iii) Maximum likelihood estimate.

- Q6)** a) The mean lifetime of a sample of 100 fluorescent light bulbs produced by a company is computed to be 1570 with standard deviation of 120 hours. If μ is the mean life time of all the bulbs produced by the company, test the hypothesis $\mu = 1600$ hours against alternate hypothesis $\mu \neq 1600$ hours using a level of significance of 0.01. [6]
- b) Observations on a random variable X are recorded as 306, 295, 300, 350, 290, 310, 315, 301, 308. Find : [5]
- i) Sample mean.
 - ii) Sample median.
 - iii) Sample range.

OR

- a) A random sample of size 5 is drawn from a binomial distribution with parameter $n = 20$ and p is unknown. Estimate the value of p for a data given by 18, 17, 15, 19, 20 using method of moment. [6]
- b) Prove that sample mean is an unbiased estimator of population mean.[5]



Total No. of Questions : 12]

[Total No. of Pages : 2

P1198

[3666] - 305

Second Year M.C.A. (Engineering)

PRINCIPLES OF MULTIMEDIA

(2008 Course) (610905)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q1 or Q2; Q3 or Q4; Q5 or Q6 from Section-I and Q7 or Q8; Q9 or Q10; Q11 or Q12 from 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) *Use of electronic pocket calculator is allowed.*
- 6) *Assume suitable data if necessary.*

SECTION - I

- Q1)** a) Explain the features of GTK+. [4]
b) Explain what do you mean by multimedia document architecture? Also explain what is MHEG & SGML. [8]

OR

- Q2)** a) State & explain the goals and objectives of the multimedia system? [6]
b) Explain with suitable examples Multimedia building blocks. [6]

- Q3)** Explain JPEG-DCT encoder & decoder in detail. [12]

OR

- Q4)** a) Define lossy lossless, intraframe & interframe image compression? Explain Shannon-Fano algorithm with the help of suitable example. [6]
b) Explain BMP file format in detail. [6]

- Q5)** a) Explain the fundamental characteristics of the audio? [5]
b) Explain WAV file format. [6]

OR

- Q6)** a) Explain what do you mean by MIDI? Explain use of MIDI in multimedia applications. [6]
b) Distinguish between Omni-directional, Bi-directional, Uni-directional microphones. [5]

P.T.O.

SECTION - II

- Q7)** a) Explain LZW Compression / Decompression technique using suitable example. [8]
b) Explain the features of H.261. [4]

OR

- Q8)** a) What do you mean by digital video? Explain the features of EDTV in detail. [8]
b) Explain in brief the major characteristics of DVD-Video. [4]

- Q9)** a) Explain four class specifiers available in VRML 2.0. [5]
b) Explain perambulation, synthetic experience and realization in Virtual reality. [7]

OR

- Q10)** a) Explain different forms of virtual reality. [5]
b) Explain the role of Charge Coupled Devices used in VR applications. [7]

- Q11)** a) What are the different methods used to create animation? Explain any one of them. [7]
b) Write short note on 3D-Animation. [4]

OR

- Q12)** a) Explain the role of shockwave format in web based animation. [7]
b) Explain about key frames & tweening in animation. [4]



Total No. of Questions : 8]

[Total No. of Pages : 2

P1412

[3665] - 18

M.E. (Civil - Hydraulic)

COMPUTATIONAL METHODS IN HYDRAULIC ENGG.

(2003 Syllabus)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Answer any 3 questions from each section.*
- 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.*
- 8) Your answers will be valued as a whole.*

SECTION - I

- Q1)** a) Write about the importance of Finite Difference Methods in the Computational Methods in Hydraulic Engineering. What is the basis of FDM? Discuss about the basics of Finite Difference Method from the view point of Taylor's series. How you can get the first derivative from the view point of Taylor's series. Can you change the equal interval of Taylor's series to unequal interval? Justify your statement with valid logic. **[9]**
- b) What is the basis of Relaxation Method? When a fluid passage becomes gradually narrow then the streamlines come closer. Why does it happen? What is the equation of stream line? Why stream line is an imaginary line? Do you think that Method of Relaxation is the most convenient method for drawing the flow net for any Hydraulic Structure? Show the Application of Relaxation Method in a case; when flow is taking place within a partially penetrating well? **[9]**
- Q2)** a) What do you mean by Boundary value problem? State two examples. **[8]**
- b) What do you mean by grid analysis in case of Finite Difference Method? In any grid if one or more than one arm is having partial length due to end conditions then weighted formula is used and correction factors are used? Discuss in detail about the correction factor λ . **[8]**

P.T.O.

- Q3)** a) Describe about Polar Diagram along with a neat sketch and discuss in detail about 'Stall Point'. [8]
 b) In case of flow around a cylinder there are various kinds of flow patterns. Discuss about any two kind of flow patterns and discuss about the 'Stagnation Point' and significance of Stagnation Point. [8]
- Q4)** a) Write in detail about Markov Chain. [8]
 b) What do you mean by Regression? What are its application in the subject of Computation Methods in Hydraulic Engineering? State two examples along with their mathematical significances. [8]

SECTION - II

- Q5)** a) Write in detail about significance of different planes in Schwartz-Christoffel Transformation. What is the application of this transformation in Hydraulics? [9]
 b) What do you mean by Classical Hydrodynamics? How you can correlate the term 'Conformal Mapping' with the subject of Classical Hydrodynamics? Do you think that the subject of Classical Hydrodynamics deals only with inviscid flow? Justify your answer. [9]
- Q6)** a) How the method of Finite Difference is applied to the cases of steady flow? Can there be unsteady non-uniform flow? If not; then why is it so? From the view point of Partial Differential Equation how do you represent a case of Unsteady Non-uniform flow? [8]
 b) Write in detail about 'Chi Square Test'. How do you correlate 'Null Hypothesis' and 'Chi Square test'? [8]
- Q7)** a) Prove the Cauchy-Reimann Equation and show that the first order partial derivatives of the stream function w.r.t. 'x' and 'y' give the components of velocities in 'x' and 'y' direction with negative sign. [8]
 b) The Stream function ' ψ ' is expressed as $\psi = x^2 - y^2$. Find the velocity potential function and the component of velocities in 'x' and 'y' direction. If applicable find the Velocity Potential Function. [8]
- Q8)** Write Short Notes (Any Four): [16]
 a) Separation due to sudden enlargement.
 b) Trailing Edge of an aerofoil.
 c) Oseen's Correction.
 d) Flow around a sphere.
 e) Accuracy of Finite Difference Method.



Total No. of Questions : 8]

[Total No. of Pages : 3

P1413

[3665] - 22

**M.E. (Civil - Hydraulic Engg.)
IRRIGATION AND DRAINAGE
(Old Course) (501310)**

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Answer any 3 questions from each section.*
- 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) Your answers will be valued as a whole.*
- 7) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 8) Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Discuss in detail about 'Root Zone Soil Water' along with the diagram. What do you mean by Permanent Wilting Point? What is 'Field Capacity'? What do you mean by Hygroscopic Water? What do you mean by 'Readily Available Moisture'? What is the meaning of 'Capillary Water'? [9]
- b) Discuss in detail about the 'Soil Moisture Relationship' along with the diagram, where occupation of spaces by air, water and soil particles are clearly shown. Discuss in detail about pore spaces. What do you mean by 'Soil Moisture Fraction'? [9]
- Q2)** a) Find the frequency of irrigation of water for proper growth of the crop, considering the following data.
- i) F.C. of soil = 28%.
 - ii) P.W. = 10%.
 - iii) Specific Gravity of Soil = 1.42.
 - iv) Depth of root zone = 1180 mm.
 - v) Daily consumptive use of water = 20 mm.
- Readily available moisture is 82% of the available moisture. [8]
- b) Write in detail about the application of Drip Irrigation in the western zone of India. What are the advantages and disadvantages of Drip Irrigation? [8]

P.T.O.

- Q3)** a) What do you mean by Lift Irrigation? What are the schemes of Lift Irrigation? What are the various design considerations involved in the distribution system of a Lift Irrigation Scheme? [8]
 b) Derive the equation along with sketch from which we know the required spacing between the tile drains. [8]
- Q4)** a) Determine the spacing of the tile drain from the data given below : [8]
 i) Annual rainfall = 100 cm.
 ii) Drainage coefficient = 1% to be drained in 24 hours.
 iii) Depth of impervious layer from the surface = 10 m.
 iv) Depth of highest position of the water table below the land surface = 1.5 m.
 v) Depth of drain below land surface = 2.0 m.
 Permeability of the soil = 6×10^{-6} m/s.
 b) Write about the design considerations involved in intake well in case of Lift Irrigation. [8]

SECTION - II

- Q5)** a) Write in detail about various drainage systems. [6]
 b) Write in short about various methods of assessment of canal revenue. [6]
 c) What do you mean by Soil Erosion? Can we control it? If yes, then what are the methods to control Soil Erosion? [6]
- Q6)** a) What do you mean by 'Evaporation'? What are the various empirical formulae which are used to measure the amount of evaporation? Write in detail about any two of them along with all the terms and their significances and units. Do you think evaporation is an algebraic function of atmospheric pressure? [8]
 b) The following data were obtained in determining the soil moisture content at successive depths in the root zone prior to applying irrigation water :

Depth of Sampling	Weight of moist soil sample	Weight of oven dried soil sample
0 - 25 cm	1.35 N	1.27 N
25 - 50 cm	1.36 N	1.26 N
50 - 75 cm	1.23 N	1.15 N
75 - 100 cm	1.11 N	1.02 N

The bulk specific gravity of the soil in the root zone is 1.5. The available moisture holding capacity of the soil is 17.8 cm/m depth of soil.

Determine :

- i) The moisture content at different root zones.

- ii) The moisture content in the entire root zone prior to irrigation.
- iii) Depth of water to be applied to bring the moisture content to the field capacity. [8]

Q7) a) What do you mean by 'Non-Modular Outlets' for canals. Discuss in detail with required sketches. [8]

b) What is 'Warabandi'? Describe it with a neat sketch. Write about Management of Warabandi System. [8]

Q8) a) What is 'Sprinkle Irrigation'? What are the advantages and disadvantages of 'Sprinkle Irrigation'? What are the different kinds of sprinklers? Write about the design concept of any one of them. [8]

b) Write short note on (any two) : [8]

- i) Salinity in soil.
- ii) Design consideration in Jackwell.
- iii) Culturable Command Area.
- iv) Evapotranspiration.



Total No. of Questions : 6]

[Total No. of Pages : 2

P1415

[3665] - 32

M.E. (Civil - Structures)

EARTHQUAKE RESISTANT DESIGN OF BUILDINGS

(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) 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.

Note : Use of IS1893 (Part - I) 2002 is permitted.

SECTION - I

- Q1)** a) Describe code based methods of seismic analysis. [8]
b) Describe briefly the direct and indirect effects of an earthquake. [8]
c) Write notes on [9]
i) Strong Ground Motion.
ii) Body waves and surface waves.
- Q2)** a) Describe using diagrams how the irregularities of mass, stiffness, strength are not desirable in a building located in earthquake prone area. [15]
b) Discuss various approaches to deal with the problems of non-structures. Which approach you recommend for a flexural structure. [10]
- Q3)** A simple one storey building has shear walls as shown in figure 3.1. The shear walls are of M25 grade concrete and 200 mm thick. The storey height is 4 m. Design shear force on building is 300 kN in either directions. Compute design lateral forces in Y - direction. [25]

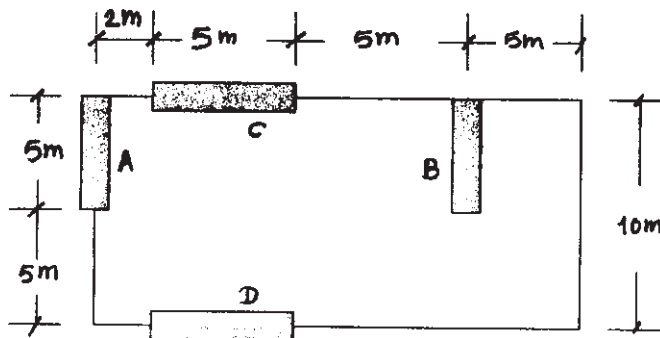


Figure 3.1

P.T.O.

SECTION - II

Q4) Determine the frequency and design seismic coefficients for an ordinary masonry shear wall in a primary health centre in zone III. Given following Roof Load - 20 KN/m, Height of wall - 3.5 m, Width of wall - 0.3 m, Unit weight of wall = 20 KN/m³. Assume hard rocky soil. [25]

Q5) a) What is the necessity of ductile detailing? What are the variables affecting ductility? [10]

b) What is Seismic Evaluation? Classify different retrofitting techniques. Explain conventional techniques of retrofitting for RC buildings. [15]

Q6) The plan of a three storey RCC Hospital building is shown in figure 6.1 and located in zone IV. It is proposed to build it with special moment resistant frame and on medium stiff soil. Assuming D.L. = 10 KN/m², L.L. = 3 KN/m², determine seismic loads on structure. The storey height of each floor is 3m. [25]

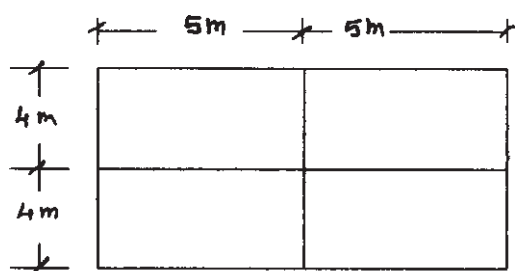


Figure 6.1



Total No. of Questions : 6]

[Total No. of Pages : 2

P1416

[3665] - 35

M.E. (Civil) (Structures)

**REINFORCED CONCRETE AND PRESTRESSED CONCRETE
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 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 slab for a hall of size 5.5 m x 5.5 m c/c fixed at all supports using yield line theory. Use M20 Fe415 take Live load = 4 kN/m² & floor finish load = 1.2 kN/m². Draw reinforcement details. **[10]**
- b)** Design a grid slab for a floor of hall 10.5 m x 13.5 m c/c having square grid of 1.5 m. Use M20 Fe500 take Live load = 4.5 kN/m² & floor finish load = 1 kN/m². Apply the required check & draw reinforcement details. **[15]**
- Q2)** Design a bell type RCC shear wall for length 3.6 m, thickness 230 mm for the following: Axial forces of 1600 kN & 300 kN due to dead & live load & due to seismic load respectively. Bending moment of 550 kNm & 3600 kNm due to dead & live load & due to seismic load respectively. Use M20 Fe500, Draw reinforcement details. **[25]**
- Q3)** Design a Intze type ESR for 3.5 lakh liters with staging height 15 m 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 the reinf. details. **[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 = 14 m, width of support = 400 mm, spacing of beams 3 m c/c, RCC slab thickness 120 mm, live load on slab 1.5 kN/m^2 , water proofing load on slab = 1.5 kN/m^2 , concrete grade M45 HT steel is Multi-strand cables with $f_y = 1900 \text{ N/mm}^2$, stressed up to 75% of ' f_y ' 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 losses of prestress. **[10]**

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. **[15]**

Q6) a) Design post tensioned prestressed concrete slab for a floor of shopping mall for the following

Isolated clear spans of $7.5 \times 7.5 \text{ m}$ width of supporting beam on all sides 300 mm, live load on slab 4.5 kN/m^2 , floor finish load on slab = 1.2 kN/m^2 , concrete grade M50 HT steel is cables of cross sectional area 120 mm^2 with $f_y = 1700 \text{ N/mm}^2$ stressed up to 70% of f_y .

Design must include check fiber stresses in concrete and deflection design of end block. Draw sketches showing cable. **[18]**

b) Explain in detail with proper sketches, manufacturing process of prestressed concrete pipes. **[7]**



Total No. of Questions : 6]

[Total No. of Pages : 2

P1417

[3665] - 36

M.E. (Civil Structures)

ADVANCED DESIGN OF STEEL STRUCTURE

(2002 Course) (501508)

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 black figures should be drawn wherever necessary.*
- 4) Your answers will be valued as a whole.*
- 5) Use of non programmable calculator, I.S. 800, 875, 801, 1915, 1161, hand book of steel sections is allowed.*

SECTION - I

- Q1)** a) Write a detailed note on lateral load resisting systems in multistoried building frames. [8]
- b) Draw the diagrammatic sketch of a through type railway truss girder bridge showing arrangement of various structural elements. [7]
- c) Explain with schematic arrangement the bridge bearing adopted for railway bridge. [10]
- Q2)** a) List the I.S. provisions to account for workable / movement space to be left for pedestrians; at flyover / bridge site; while erecting scaffolding. [6]
- b) Explain the safety measures to be considered while designing formwork as recommended by I.S. [6]
- c) Two thin tubular sections have same wall thickness and circumference. One section is circular with internal radius 'a' while other is a square section. Neglecting the stress concentration, find ratio of shear stresses for
- i) Equal twisting moments in two cases.
 - ii) Equal angle of twist. [8]
- d) Write a note on design consideration for tubular sections. [5]
- Q3)** a) Write a note on behaviour of compression elements of light gauge steel. [8]

P.T.O.

- b) Explain light gauge steel structural members with reference to manufacturing process, types of sections & their advantages. [8]
- c) A channel section of 100 mm x 75 mm x 1.5 mm thickness with 12 mm lip is to be used as concentrically loaded column of 3.1 m effective length. Find the allowable load using $f_y = 235 \text{ MPa}$. [9]

SECTION - II

Q4) A pratt truss girder through type bridge is provided for single broad gauge track. The effective span of bridge is 45 m. The cross girders are spaced 5m. apart. The stringers are spaced 2 m between centrelines. 0.6 kN/m stock rails & 0.4 kN/m check rails are provided. Steepers are spaced 0.45 m centre to centre. Main girders are provided at spacing of 7 m between their centre lines. Design central top chord member, bottom chord, vertical & diagonal member of central panel. Use standard main line loading. Assume spacing of sleepers & its type. Draw neat sketch showing design details. [25]

- Q5)** a) List the types of bridge bearings & explain its characteristics, static behaviour. [8]
- b) A beam SC 250 @ 85.56 kg/m is to be connected to column ISWB 350 @ 56.9 kg/m. The connection carries 80 kNm moment and 100 kN. Shear force due to dead load and live loads. It also carries 60 kNm moment & 25 kN shear force due to lateral load effect.
- Design the welded connection & Draw the details of design. [17]

- Q6)** a) A propped cantilever ABC of length 3m; has fully plastic moment of resistance $2 M_p$ for the length of 2 m from fixed end and M_p for remaining 1 m length. A single concentrated load W acts at the dist 2 m from fixed support. Using both statical & kinematical methods determine collapse load. [15]
- b) State and explain upper bound lower bound and uniguness theorems of plastic analysis. [10]



Total No. of Questions : 6]

[Total No. of Pages : 2

P1419

[3665] - 40

M.E. (Civil) (Structures)

NON LINEAR ANALYSIS OF STRUCTURE

(2002 Course) (Elective - 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 two separate answer books.**
- 3) Use of non programmable calculator & stability coefficient tables is permitted.**
- 4) Assume suitable data, if necessary.**

SECTION - I

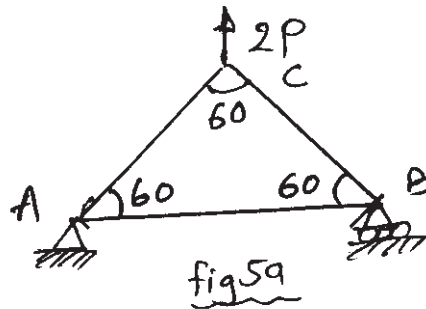
- Q1) a)** Explain Moment - curvature Nonlinearity for a cantilever beam with concentrated load P at its tip. Write the governing equations and method to obtain deflection. **[13]**
- b)** Derive the relation to find maximum deflection in a beam with hinged ends. Use shape function $W(x) = \sum A_m \sin M \pi x/a$. **[12]**
- Q2) a)** Write the strain energies due to stretching, bending and kinetic energy of an orthotropic plate. Use Hamilton's principle and stress function approach to derive governing equations. **[15]**
- b)** Derive the simplified nonlinear governing equation using Berger approximation for plates with immovable boundaries. **[10]**
- Q3) a)** Using Ramberg - Osgood stress-strain relation show non linear behaviour of orthotropic plate. **[12]**
- b)** Obtain actual collapse mechanism for a cantilever beam with a point load at free end. **[13]**

SECTION - II

- Q4) a)** Derive the nonlinear matrix with usual notation for plane frame member. **[18]**
- b)** Develop stiffness matrix for a beam hinged at both ends. **[7]**

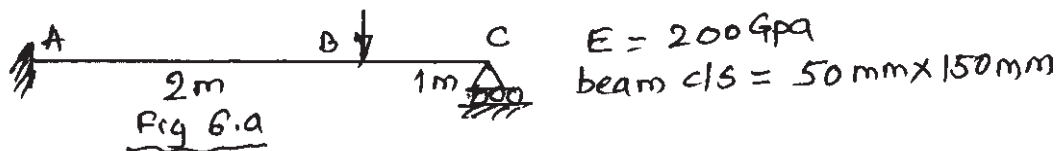
P.T.O.

- Q5) a) A rigidly jointed frame is as shown in fig 5.a. Calculate joint reactions. All the members have same cross-sectional properties. [15]

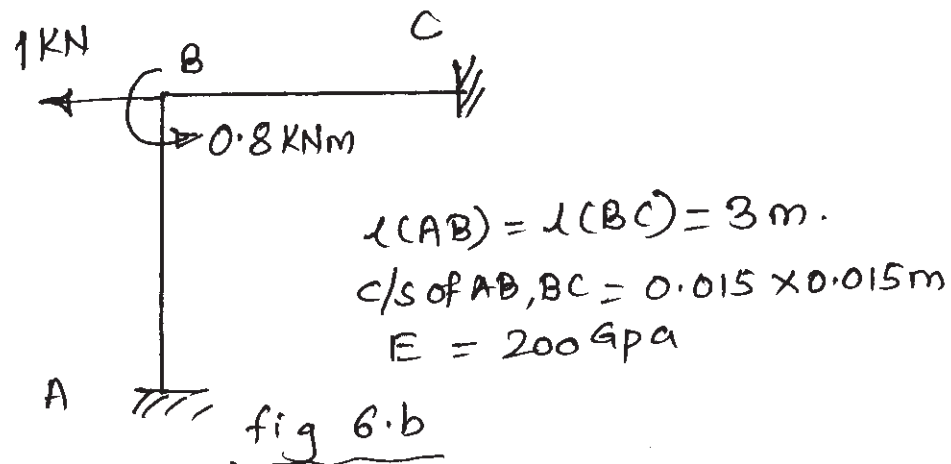


- b) Write steps involved in elastic-plastic analysis of frame. [10]

- Q6) a) Perform elastoplastic analysis of the cantilever beam as shown in fig. 6.a.



- b) Develop stiffness matrix for non-linear analysis of plane frame as shown in fig. 6.b.



[25]



Total No. of Questions : 8]

[Total No. of Pages : 2

P1421

[3665] - 67

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

GAS TURBINES

(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) Explain the simple Gas Turbine cycle with help of a schematic, P-V and T-S diagrams. List the assumptions made. Derive expression for efficiency of the cycle. Explain the heat exchange cycle and derive expression for its efficiency. Draw the performance curves of the two cycles. **[18]**

- Q2)** a) Discuss the effect of operating variables on Thermal efficiency of a Gas Turbine plant. **[8]**
- b) The following data is given for Gas Turbine plant : **[8]**
- i) Pressure ratio = 6.
 - ii) Air inlet temperature = 15°C.
 - iii) The air is heated first in a heat exchanger and then in combustion chamber upto 750°C.
 - iv) The air is then expanded in two stages such that the expansion work is maximum.
 - v) The air is reheated to 750°C after the first stage.

Determine the cycle Thermal efficiency, work ratio and net shaft work per kg of air.

Q3) Discuss the working of a centrifugal compressor with the help of schematic diagram pressure and velocity distribution in a radial passage and h - s representation of flow through a centrifugal compressor. Draw the velocity Δs and derive expression for Euler's work. **[16]**

P.T.O.

- Q4)** Write notes on (any four) : **[16]**
- a) Slip factor and its effect on work input.
 - b) Dimensionless parameters of centrifugal compressors.
 - c) Surging in centrifugal compressors.
 - d) Losses in axial compressor stage.
 - e) Stalling of a stage of an axial flow compressor.

SECTION - II

- Q5)** a) Discuss the combustion theory applied to Gas turbine combustor. Explain the factors affecting combustion chamber design and performance. **[9]**
- b) Explain any three of the following : **[9]**
- i) Combustion intensity and combustion efficiency.
 - ii) Typical combustion chamber.
 - iii) Flame tube cooling.
 - iv) Fuel Injection equipment.
- Q6)** Explain the different forces acting on the Gas Turbine blades. What are the factors to be considered in the selection of blade materials? What blade materials are used? Discuss the blade manufacturing and blade fixing techniques. **[16]**
- Q7)** a) What do you understand by the term ‘matching of components’? Define a match point and explain the details of component match. **[8]**
- b) Discuss the problem of blade cooling. Explain the methods with sketches and heat transfer problem involved. **[8]**
- Q8)** Write notes on (any four) : **[16]**
- a) Applications of Gas Turbines.
 - b) Fuels for Gas Turbine.
 - c) Combined cycle power plant.
 - d) Emission standards.
 - e) Ram Jet engine.



Total No. of Questions : 10]

[Total No. of Pages : 3

P1422

[3665] - 70

M.E. (Mech. Design Engg.)
MACHINE STRESS ANALYSIS
(Old & Revised 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) Figures to the right indicate full marks.*
- 4) Use of electronic pocket calculator is allowed.*
- 5) Assume suitable data, if necessary.*

SECTION - I

Q1) Derive an equilibrium equation using cartesian co-ordinate system. State the significance of compatibility conditions. **[16]**

Q2) a) State and explain : **[6]**

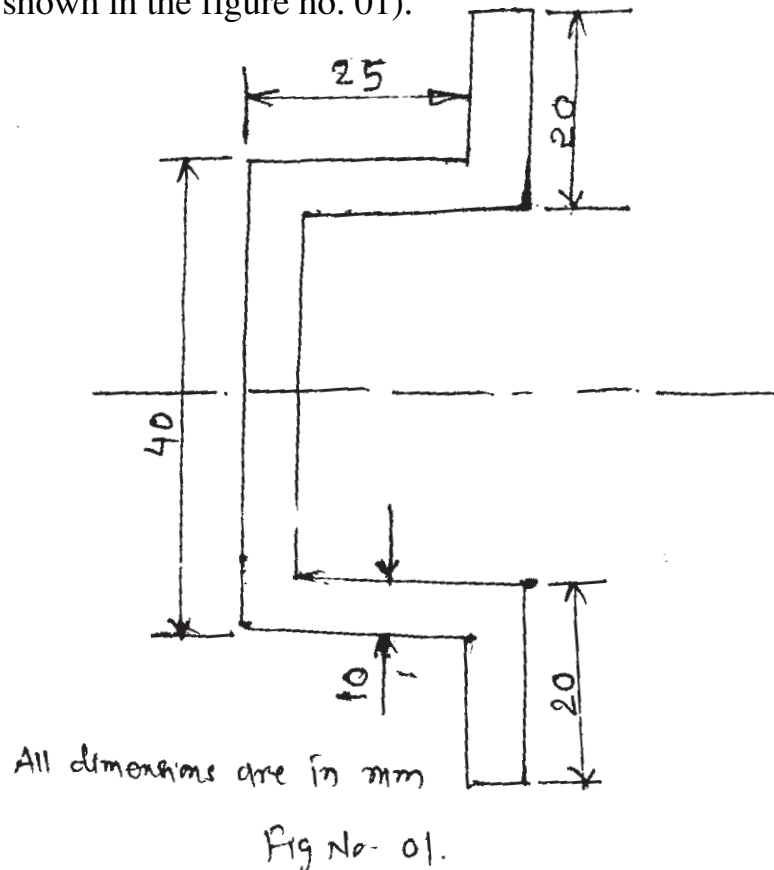
- i) Theorem of virtual work.
- ii) Theorem of least work.

b) A simply supported beam AB of length 'L' carries a concentrated load 'W' at a distance 'a' from end 'A' and 'b' from end 'B'. Deduce expressions for the strain energy of beam and the deflection under the load. Also deduce the equation when the load is at the mid-span. (Use Castiglino's theorem). **[10]**

Q3) a) Explain the importance of bending axis and shear centre for thin sectioned member. **[4]**

P.T.O.

- b) Locate the shear centre for symmetrical section about horizontal axis.
(as shown in the figure no. 01). [12]



- Q4)** a) List and explain in brief the method for evaluating torsional stresses?[4]
 b) Give a procedure to analyse a thin rectangular member subjected to torque 'T'. [4]
 c) A circular tube of radius 'r' and thickness of wall 't' of length 'l' are subjected to twist. Obtain an equation for shear stress and angle of twist. [8]
- Q5)** Write short notes on : [18]
 a) Plain stress and plain strain.
 b) Saint Venant's principle.
 c) Stresses in beams subjected to unsymmetrical bending.

SECTION - II

- Q6)** Derive from fundamentals the expression for contact stresses between two rotary rollers, with axis parallel and under compressed loads. State the assumptions made in deriving the above equation. [16]

- Q7)** a) Find the shape factor for: [8]
 i) Triangular cross-section beam.
 ii) Circular cross-section beam.
- b) Define the following terms & explain : [6]
 i) Plastic hinge.
 ii) Collapse load.
 iii) Load factor.
- c) State the assumptions made in the theory of plastic bending. [2]
- Q8)** a) How is change in resistance of a strain gauge wire related to its extension? Explain. [4]
- b) A three element rectangular rosette strain gauge is mounted on a steel specimen for a particular state of loading of the structure, the strain gauge readings are $r_A = 200 \mu$, $r_B = 900 \mu$, $r_C = 1000 \mu$. Determine the values and orientations of the principle stresses. (Take $E = 200 \text{ GPa}$ and $\nu = 0.285$). [12]
- Q9)** a) A disc of uniform thickness and of 600 mm diameter rotates at 1800 rpm. Find the maximum stress developed in the disc. If a hole of 100 mm diameter is made at the centre of the disc. Find the maximum value of radial and Hoop's stresses. Assume density of the material of disc = 7700 kg/m^3 and $\nu = 0.3$. [10]
- b) Explain the procedure to analyse a wire wound thick cylinder? What are the assumptions made? [6]
- Q10)** Write short notes on : [18]
 a) Brittle coating method.
 b) Analysis of stresses in compound cylinder.
 c) Spring back effect.



P1423**[3665] - 76****M.E. (Mechanical) (Design Engg.)****RELIABILITY ENGINEERING****(2002 Course) (Elective - II) (502208)****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 non-programmable electronic calculators is allowed.
- 6) Assume suitable data, if necessary.

SECTION - I

- Q1) a)** Define Reliability. Calculate the reliability for the system shown in Fig.1. The numbers in each block shows the reliability of individual component. [8]

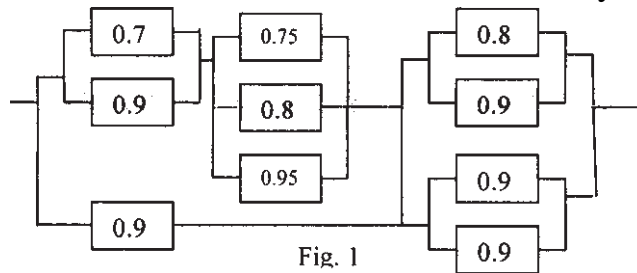


Fig. 1

- b) Explain Hazard Rate & Failure Rate. Draw Hazard Rate curve against life, showing various regions. [8]
- Q2) a)** What is Bayes' rule? In an engineering manufacture plant, 70% of the crankshafts are ground by machinist R and 30% by machinist S. It is known from past experience that the crankshafts ground by machinists R and S contain 3 percent and 4 percent defective units respectively. If a randomly selected crankshaft is found to be defective, find the probability that it was ground by the machinist R. [8]
- b) What is meant by Redundancy in a system? Classify redundancy with suitable example. [8]
- Q3) a)** Explain normal and Weibull distributions stating their significance. [8]
- b) Derive the expression for reliability and failure rate for a mechanical component whose time to failure is given by Weibull distribution. For a mechanical component following Weibull distribution with $\beta = 3$, $\eta = 3000$ and $l = 1500$, find the reliability of the component and the failure rate for an operating time of 2500 hours. [8]

P.T.O.

Q4) a) The repair times t_i for a mainframe computer system are observed to be 1.3, 1.5, 1.7, 1.8, 2.2, 2.6, 3.0, 3.1, 3.3 and 3.9 hours. Assuming lognormal distribution for the repair times determine the following :

- i) Maintainability of the system for an allowed down time of 5 hours.
- ii) Downtime required to achieve a maintainability of 0.99.

The value from standard normal tables are $\phi(2.0911)=0.9817$ and $\phi(2.327)=0.99$. [10]

b) Define Availability and Maintainability. Explain various types of Availability. [6]

Q5) Write short note on following (Any three) : [18]

- a) Chebyshev inequality.
- b) Center line theorem.
- c) Quality and Reliability.
- d) MTBF and MTTR.
- e) Event Tree Analysis.

SECTION - II

Q6) a) What is procedure for constructing FMECA table? Explain it with suitable example. [8]

b) A Logic gate diagram for FMEA study has been shown in Fig.2. The basic failure modes of A, B and C have failure rates 0.001, 0.05 and 0.002 per hour resp. Find out the failure rate of T_0 . Assume mission time of 100 hrs. [8]

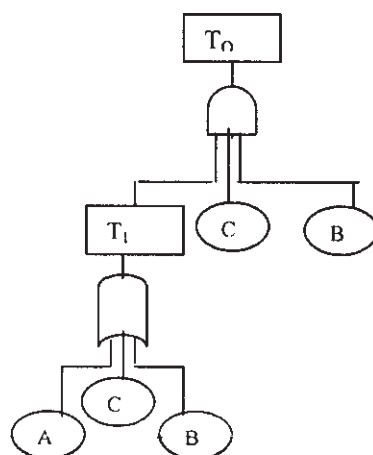


Fig. 2

- Q7)** 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 0.001 failures/hour. Compute reliability of the aircraft for 20-hour flying mission. [8]
- b) The following data refer to predicted reliability of seven 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	7
Predicted reliability	0.994	0.998	0.990	0.996	0.990	0.980	0.96

- Q8)** a) Explain in brief the accelerated life tests conducted at various stages in reliability evaluation. [6]
- b) In a short sample “accelerated life testing” of a system, based on Weibull distribution the following data is recorded. [10]

Failure No.	MTTF (Hrs)
1	20
2	15
3	21
4	26
5	35
6	38
7	30

Plot the variation of reliability against time using

- Mean ranking and
- Median Ranking Method.

- Q9)** a) Explain load-strength interaction in reliability based design. [8]
- b) What Marin factors are considered in fatigue design of machine components? [8]

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

- Cut sets and Tie sets.
- Failure Mode Effect and Criticality Analysis.
- Safety margin and Reliability Index.
- Reliability evaluation using conditional Probability.
- AGREE method of reliability allocation.



Total No. of Questions : 8]

[Total No. of Pages : 2

P1427

[3665] - 143

M.E. (Electronics) (Digital Systems) (Part - I)

IMAGE PROCESSING AND PATTERN RECOGNITION

(2002 Revised Course) (Elective - I)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Figures to the right indicate full marks.*
- 2) Draw diagrams wherever required.*
- 3) Use suitable data if required.*
- 4) Solve any three questions from each section.*
- 5) Use of scientific calculator is allowed.*

SECTION - I

- Q1)** a) Explain how a brightness histogram is calculated? Explain run length coding with the help of suitable example. [8]
b) Draw a gray scale transformation function that will stretch the contrast. Explain the transformation of bit-plane slicing. [9]
- Q2)** a) Explain the process of convolution of image with a filter mask. Draw two different filter masks for smoothing the image. [8]
b) Explain Laplacian of Gaussian filter. Explain why edge detection is done using zero crossing. [8]
- Q3)** a) Explain chain coding for boundary representation using 4 and 8 neighbour code. [8]
b) Explain polynomial representation for boundary representation. [8]
- Q4)** a) Explain optimal global and adaptive thresholding. Explain how threshold is selected using pdfs. [8]
b) Explain edge based segmentation. Explain boundary tracing as dynamic programming. [9]

SECTION - II

- Q5)** a) Explain how will you calculate fourier transforms of boundaries. How a boundary can be represented using segment sequences? [9]
b) Explain heuristic search for boarder detection. Explain match based segmentation. [8]

P.T.O.

- Q6)** a) Explain cluster analysis for pattern recognition. [8]
b) Explain the use of fuzzy systems for object recognition. [8]
- Q7)** a) Explain point distribution models for image understanding. [8]
b) Explain use of hidden Markov models for image understanding. [8]
- Q8)** a) Explain any one image restoration method in detail. [8]
b) Explain syntactic way of image recognition. Explain what is image recognition. [9]



Total No. of Questions : 8]

[Total No. of Pages : 2

P1428

[3665] - 149

**M.E. (Electronics) Computer
EMBEDDED SYSTEM AND SOFTWARE
(2002 Revised 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) Figures to the right indicate full marks.**
- 4) Use of scientific calculator is allowed.**
- 5) Assume suitable data, if required.**

SECTION - I

- Q1)** a) Explain various addressing modes in 8051 with examples. [8]
b) Assuming crystal frequency to be 12 MHz, find out the count to be loaded in timer 1 mode 1 to generate a square wave of 50 Hz. [8]
- Q2)** a) Explain the interrupt structure in 8051. [9]
b) Explain various timer modes in 8051. [8]
- Q3)** a) What is a real time system? Explain the features of RTOS. [8]
b) Compare RISC and CISC architectures. [8]
- Q4)** a) Describe essential components of any embedded system. Draw and explain software architecture used in embedded system. [9]
b) How will you save memory space while development of embedded system software. [8]

SECTION - II

- Q5)** a) List different features of ARM processor. Describe the memory structure of ARM processor. [8]
b) Compare FPGA and CPLD. [8]

P.T.O.

- Q6)** a) Describe the features of AVR microcontroller. Draw and explain the register file structure in it. [9]
b) Explain I2C bus protocol. Compare it with SPI bus protocol. [8]
- Q7)** a) Explain any one example of an embedded system with its features and specifications. Draw the block diagram. [9]
b) Describe a blue tooth system with its specifications. [8]
- Q8)** a) Describe exception priorities in ARM processor. [8]
b) Describe features of V_x works. [8]



Total No. of Questions : 6]

[Total No. of Pages : 2

P1429

[3665] - 160 - A

M.E. (Electrical - Power Systems)

MICROCONTROLLER & APPLICATIONS IN POWER SYSTEMS

(2003 Revised Course) (503201)

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 sections should be written in separate books.*
- 4) Neat diagrams must be drawn wherever necessary.*
- 5) Figures to the right indicate full marks.*
- 6) All questions carry equal marks.*

SECTION - I

- Q1)** a) Explain the block diagram of 8051 with neat sketch. [10]
b) Explain the port structure of 8051 microcontroller. [10]
c) Explain idle and power down modes of 8051 microcontroller. [5]
- Q2)** a) Explain various modes of serial data transmission / reception in 8051 microcontroller. Explain the SFR's used for the same. [10]
b) Explain the following instructions of 8051 microcontroller. [10]
i) MOVX @ DPTR, A
ii) DJNZ add, add
iii) SUBB A, @ R_i
iv) SWAP
v) ROTATE
c) Write a program to implement an even counter in 8051 microcontroller. [5]
- Q3)** a) Explain salient features of members of MCS-51 family. [10]
b) How do you decide the edge and level triggered configuration of external interrupts INT0 and INT1? If two requests of interrupt are received simultaneously how these are handled in MCS-51? [5]
c) It is required to generate baud rate of 2 - K K in mode 3 of 8051 serial port. Calculate the required count for timers, settings in various SFR's and write an initialization program to transmit and receive the same data byte given again and again. [10]

P.T.O.

SECTION - II

- Q4)** a) What are the functions of assembler and simulator? [5]
b) What is RS232 standards? Explain the serial interfacing of 8051 with PC. Draw block diagram. [10]
c) Explain with example the instructions that affects flag bits. [10]
- Q5)** a) Draw system block diagram of MCS-8051 for speed measurement. Draw flow chart and write the program for measuring the speed. [15]
b) Draw the detail block diagram and write program to rotate stepper motor. [1.8° full step, 200 steps per revolution]. [10]
- Q6)** a) What are salient features of MCS - 96 family of microcontroller? Explain the added feature of 8096 over 8051 microcontroller. [10]
b) Explain the functions of on-chip EPROM, ADC and PWM features of MCS-96 microcontroller? [15]



Total No. of Questions : 6]

[Total No. of Pages : 2

P1432

[3665] - 174

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.*

SECTION - I

- Q1)** a) With reference to optimization problem, explain following terms :
i) Design vector.
ii) Design constraints.
iii) Objective function. **[13]**
b) State the criteria on which classification of optimization problem is done.
Explain any two in details. **[12]**
- Q2)** a) Explain multivariable optimization with inequality constraints. **[12]**
b) Explain Steepest Descent method. Draw its flowchart. **[8]**
c) State Kuhn Tucker conditions. **[5]**
- Q3)** a) Explain random walk method for unconstrained minimization along with its flow chart. **[13]**
b) Explain unrestricted search elimination method with a limited step size. **[12]**

SECTION - II

- Q4)** a) Explain the Newton Raphson method of load flow analysis (Rectangular form). **[13]**
b) Explain the fast decoupled load flow method along with its flow chart. **[12]**

P.T.O.

Q5) Explain the formulation of problem for A.C. - D.C. load flow explaining :

- a) D.C. system model.
- b) Converter variables.
- c) Derivation of equations.
- d) Inverter operation.
- e) Flow chart.

[25]

Q6) a) Write a note on three phase load flow analysis.

[13]

- b) From the theory of symmetrical components derive the sequence impedance matrix in terms of self and mutual impedances.

[12]



Total No. of Questions : 8]

[Total No. of Pages : 2

P1435

[3665] - 189

M.E. (Production)

C.I.M. AND ADVANCE MANUFACTURING PROCESSES

(2002 Course) (511108)

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) Figures to the right indicate full marks.**
- 4) Assume suitable data, if necessary.**

SECTION - I

- Q1)** a) Explain role of computer in process planning with suitable example. [8]
b) Explain necessary information required for preparation of data file for a component. [8]
- Q2)** a) Explain the use of computer in testing. [6]
b) What is FMS? Explain different modules in FMS. [10]
- Q3)** a) Explain the any two MRPII modules in manufacturing area. [8]
b) What is DNC? Explain its hard ware and soft ware component. [8]
- Q4)** Write short notes on : [18]
a) AGV.
b) Local area network.
c) ERP.

SECTION - II

- Q5)** a) Explain the effect of feed rate, electrolyte flow velocity and voltage on dimensional inaccuracy in case of electro-chemical process. [8]
b) State the input and operating parameters of EBM. How is 'Heat Affected Zone' reduced? [8]
- Q6)** a) Explain the effect of frequency, amplitude and grit size of MRR in USM. [8]
b) Explain different arrangement of tool magazine and tool positioning in ATC. [8]

P.T.O.

- Q7)** a) Explain steriolithography process along with process parameters. [8]
b) Explain the concept of high speed manufacturing. What are necessary requirement of machine tool for the same. [8]

- Q8)** Write short note on : [18]
a) Agile manufacturing.
b) Rapid tooling.
c) Parameters affecting on MRR in AJM.



Total No. of Questions : 6]

[Total No. of Pages : 2

P1444

[3665] - 234

**M.E. (Instrumentation) Process & Biomedical
MICRO CONTROLLER APPLICATION IN INSTRUMENTATION
(2002 Course) (506108)**

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 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) Design a digital stop watch with LED display using 8051 controller, which will display minutes and seconds. Explain flowchart and comment on selection of crystal oscillator. **[25]**

Q2) Design a portable tachometer with following specifications. Develop flowchart and circuit schematic diagram.

- Range : 2000 rpm
- Least count : 1 rpm
- Power source : 9V battery
- Display : LCD
- Sensor type : optical pick-up which out puts 1 pulse/revolution
- Sensor signal output : 9V pulse. **[25]**

Q3) Write short notes on : **[25]**

- a) Alphanumeric Liquid Crystal Display.
- b) Stepper motor driver.

P.T.O.

SECTION - II

Q4) Explain 'Byte write' and 'Random read' modes for Inter Integrated Communication (IIC) based EEPROM. **[25]**

Q5) Explain how a voltage to frequency converter can be interfaced to 8051 microcontroller. Elaborate with an application. **[25]**

Q6) Write short notes on : **[25]**

- a) Matrix keyboard interface.
- b) RS232 serial interface.



Total No. of Questions : 12]

[Total No. of Pages : 3

P1532

[3665] - 526

M.E. (Electrical) (Control System)
AUTOMATION & ROBOTICS
(2008 Course) (Elective - 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.**

SECTION - I

- Q1) a)** Discuss articulated Robot and Cartesian robot for the following points.
i) Co-ordinate system.
ii) Work Envelop (Draw fig.).
iii) Advantages and Disadvantages.
iv) Applications. **[10]**
b) Explain the concept of Degrees of freedom with neat sketch. **[6]**

OR

- Q2) a)** What are the advantages and disadvantages of CNC machines over robots. **[7]**
b) Give the historical development of robot during 1930 to 1970. **[3]**
c) Give BRA definition of Robot. Also state laws of Robotics as stated by Issac Asimov. **[6]**

- Q3) Compare between** **[18]**
a) PTP and CP Robot.
b) Servo controlled and non servo controlled Robot.
c) Hydraulic and Pneumatic Robot.

OR

- Q4) a)** Explain in brief different types of joints with neat sketch. **[6]**
b) Explain concept of Yaw, Pitch and Roll. **[6]**
c) Explain different selection criteria of PMDC motor starting with Gear-Reduction ratio G. **[6]**

P.T.O.

Q5) State and explain any four methods of robot programming in detail. [16]

OR

- Q6)** a) Explain the industrial application of the robots in
- Part sorting and
 - Spray painting w.r.t.
 - Types of robot configuration. [6]
 - Selection of drive. [4]
 - Methods of control. [6]
- b) Explain the concept of on line and off line programming. [4]
- c) What do you mean by Robot library for an existing computer language? [6]

SECTION - II

- Q7)** a) Explain Lagrangian analysis for deriving dynamic equation of motion. [8]
- b) Let a point $P = (0.5 \ -0.5 \ 1)^T$ is rotated along x, y, z axis simultaneously by an angle $30^\circ, 45^\circ, 60^\circ$ respectively. Find the co-ordinates of final point P after rotation. [10]

OR

- Q8)** a) Explain the concept of translational transformation and rotational transformation. [8]
- b) What is meant by homogeneous co-ordinate systems for manipulator? [4]
- c) Two points $a = (4, 3, 2)^T$ and $b = (6, 2, 4)^T$ are to be translated a distance +5 units along x axis and -3 units along the z axis. Using the appropriate homogeneous transformation matrix, determine the new points a_{xyz} and b_{xyz} . [6]
- Q9)** a) Draw a neat diagram showing D - H parameters and derive the expression for the D - H matrix which relates two consecutive co-ordinate frames. [8]
- b) In 3R Robotic arm, the shoulder joint is arranged on the axis of a rotary base and the axis of rotation of shoulder and Elbow joints are parallel to each other. The DH parameter table for the arm is given below. [8]

Link	a	α	d	θ
1	0	90	0	θ_1
2	a_2	0	0	θ_2
3	a_3	0	0	θ_3

Draw the diagram showing the link co-ordinate system.

OR

- Q10)** a) Which are the four important parameters of Denavit - Hartenberg notation to describe how a frame (i) relates to a previous frame (i - 1)? Give the technical definition of each parameter. [12]
b) 'The inverse kinematic problem is more practical than the forward kinematic problem' - Justify the statement. [4]
- Q11)** a) Explain Joint Position Control (JPC) with the help of neat block diagram. [9]
b) Explain linear control schemes for robot. [7]

OR

- Q12)** Explain in brief
- a) PD and PID control. [5]
b) Resolved Motion Rate Control (RMRC). [5]
c) Torque and Force control of Robotic manipulator. [6]



Total No. of Questions : 8]

[Total No. of Pages : 2

P1561

[3665] - 637

M.E. (Computer Engineering)
INFORMATION AND NETWORK SECURITY
(2008 Course) (510105)

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) What are the principles of data security architecture? Explain in brief. [6]
b) Enlist and discuss steps necessary for creating information security policy. [8]
c) What is the need of one way hash function? [4]
- Q2)** a) What are the principles of public key cryptography? Explain RSA public key encryption algorithm. [8]
b) Explain authentication protocol based on symmetric and asymmetric cryptosystem. [8]
- Q3)** a) What is meant by bastion host? Describe the screened-subnet firewall system with a Demilitarized zone (DMZ). Explain its significant features. [8]
b) Explain HMAC algorithm. [8]
- Q4)** Write short notes on (any three) : [16]
a) DES.
b) Security Mechanisms.
c) ARP hazards.
d) Security aspects of biometric devices.

P.T.O.

SECTION - II

- Q5)** a) Explain cryptographic algorithms used in S/MIME. [7]
b) What is secure binding of multimedia streams? [6]
c) Explain, what is session key management with suitable example. [5]
- Q6)** a) Explain in brief what do you understand by key localization in SNMP. [8]
b) What are some weaknesses of a packet-filtering router? [8]
- Q7)** a) Explain Diffie-Hellman key exchange algorithm. [8]
b) What are the requirements for the use of a public-key certificate scheme? [8]
- Q8)** Write short notes on (any three) : [16]
a) Shared secret data authentication.
b) DNS certificates.
c) Secure RSVP.
d) PKI components.



Total No. of Questions : 8]

[Total No. of Pages : 2

P1587

[3665] - 749

M.E. (Environmental Engg.)

AIR AND NOISE POLLUTION CONTROL

(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.*

SECTION - I

Q1) Discuss about the sampling and monitoring techniques of Air pollution. Give the effects of Air pollution. **[16]**

Q2) Explain about the following : **[18]**

- a) Dispersion model.
- b) Air pollution Laws & Regulations.

Q3) Explain the principle, working and design of the following : **[16]**

- a) Electrostatic precipitators.
- b) Scrubbers.

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

- a) Incineration and design of Incinerator.
- b) Collection Efficiency for Air pollution.

SECTION - II

Q5) Give the characteristics, sources and the effects of Noise pollution. Comment on Action plan in India to control the Noise pollution. **[16]**

Q6) What is Adsorption? What are the types of adsorption? Discuss the design of adsorption and explain all the Adsorption Isotherms. **[18]**

P.T.O.

Q7) Before the installation of ESP, the stack gas of power plant contains 6.0 gm particulate / m³ of gas. The gas flowrate is 350 m³/min and new precipitator can remove 2500 kg/day.

- a) What is the emission rate of particulate before and after pollution control in kg/day.
- b) What is the efficiency of ESP?

[16]

Q8) Discuss the Air pollution status in India and the role of government and action plan to control Industrial and vehicular emissions. **[16]**



P1593**[3665] - 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 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

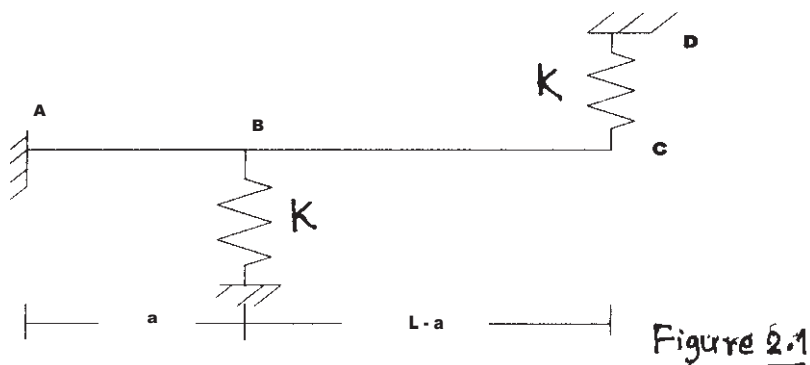
Q1) a) Derive the formula for dampening ratio using logarithmic decrement principle. **[10]**

b) A weightless steel cantilever beam of 0.70 m long has cross section 50 mm deep and 20 mm wide. It supports a load of 1000 N at free end. Determine the natural frequency of vibrations. Derive the formula used. **[15]**

Q2) a) Define and explain **[10]**

- i) Degree of freedom.
- ii) Natural Frequency & Period of oscillations.
- iii) Under damped system.
- iv) Periodic Load.

b) Find the natural frequency of the system shown in figure 2.1. **[15]**



Q3) a) For SDOF system defined by $5 \frac{d^2 y}{dx^2} + 3 \frac{dy}{dx} + 12x = 10 \sin \omega t$. Determine

- i) Natural Frequency.
- ii) Damping Factor.
- iii) Damped Frequency.
- iv) Critical Damping.
- v) Amplitude of Resonance.
- vi) Maximum Frequency.
- vii) Magnification Factor.
- viii) Logarithmic Decrement.
- ix) Phase Angle.

[10]

b) Write notes on any five :

[15]

- i) Non linear analysis by Linear Acceleration Method.
- ii) Types of Base Isolation.
- iii) Damping and its estimation.
- iv) Structural Response to Ground Motion.
- v) Response Analysis using Half Cycle Sine Pulse Force.
- vi) Frequency Response Curves.

SECTION - II

Q4) Determine the natural frequency and plot all mode shapes for the structure shown in Figure 4.1. Also find modal mass participation factors in all the modes.

[25]

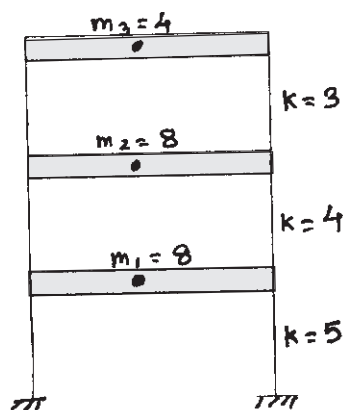
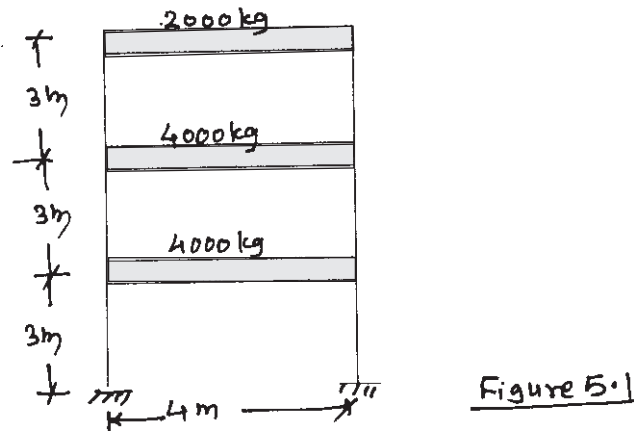


Figure 4.1

- Q5)** a) Write a note on Tuned Mass Dampers. [7]
- b) Determine the natural frequency and plot all mode shapes for the shear building shown in Figure 5.1. Assume EI for each column $4.8 \times 10^6 \text{ N/m}^2$. [12]



- c) Write a short note on Non-Linear Seismic Analysis. [6]
- Q6)** a) Explain Finite Element Approach for solution of boundary value problems of continuous system. [10]
- b) Find deflection and bending moment at centre of simply supported beam subjected to u.d.l. of 'w' N/m throughout the span. Use Rayleigh's approach assuming suitable shape function. [15]



Total No. of Questions : 6]

[Total No. of Pages : 2

P1600

[3665] - 133

M.E. (VLSI & Embedded System)

ASIC DESIGN AND MODELLING

(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) *Assume suitable data, if necessary.*
- 4) *All questions are compulsory.*

SECTION - I

- Q1)** a) Explain the Behavioral Modeling Techniques used in VHDL. Write a VHDL code for a Half Adder using Structural Architecture. [8]
- b) Explain with block diagram the steps involved in post layout synthesis.[8]
- Q2)** a) Explain with Schematic diagram the architecture of Semi-Custom ASIC. [8]
- b) Write the expressions for the various Power dissipation to be considered for the Clock planning in ASIC. [8]
- Q3)** Write short notes on - [18]
- a) Parasitic Extraction.
 - b) Delays in Modeling.
 - c) Stick diagram.

SECTION - II

- Q4)** a) Classify fault Model. Find the Test Set for the Circuit Shown in Fig.1. to find the maximum fault coverage. [8]

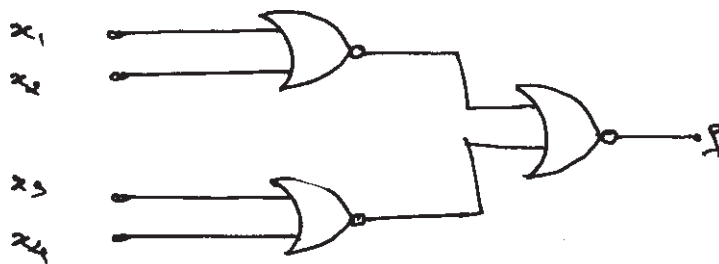


Fig.1

P.T.O.

- b) Explain how the wire-load tables are used to measure delays in floor planning? [8]
- Q5)** a) Explain the architecture of Built In Logic Block Observer for testing of Sequential circuits. [9]
- b) Explain the following terms : [9]
- i) Fault Coverage.
 - ii) Controllability.
 - iii) Observability.
- Q6)** Write short notes on (Any two) : [16]
- a) Design Rule Checks.
 - b) Global routing.
 - c) PAR verification.



Total No. of Questions : 6]

[Total No. of Pages : 2

P1602

[3665] - 176

M.E. (Electrical) (Power System)
HIGH VOLTAGE POWER TRANSMISSION
(Revised 2002 Course) (503204)

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 whenever necessary.*
- 4) Figures to the right indicate full marks.*

SECTION - I

- Q1)** a) What are the mechanisms by which lightning strokes develop and induce overvoltages on overhead power lines? [12]
b) Explain the different aspects of insulation design and insulation co-ordination adopted for EHV system. [13]
- Q2)** a) What are the causes for switching overvoltages? How are they controlled in power systems? [15]
b) What are the causes for power frequency overvoltages in EHV AC transmission systems? [10]
- Q3)** Write short notes on -
a) Sub-synchronous resonance in series capacitor compensated lines. [9]
b) Static reactive compensation systems. [9]
c) Voltage control using synchronous condenser. [7]

SECTION - II

- Q4)** a) Discuss complete characteristics of 3-phase bridge rectifier. [12]
b) Explain operation of 3-phase bridge converter with overlap greater than 60 degree and less than 120 degree. [13]

P.T.O.

- Q5)** a) For HVDC transmission system discuss power reversal mechanism.[13]
b) With reference to protection of HVDC transmission system discuss
i) DC reactors.
ii) Circuit breakers and
iii) Overvoltage protection.

[12]

- Q6)** Write short notes on - [25]
a) Advantages and problems of ground return in HVDC transmission system.
b) Harmonics and their control in HVDC system.
c) Reactive power control in HVDC system.



Total No. of Questions : 8]

[Total No. of Pages : 3

P1605

[3665] - 193

M.E. (Production)

PRECISION ENGINEERING

(2002 Revised Course) (Elective - 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) Use of non-programmable electronic pocket calculator and statistical tables is allowed.*
- 6) Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Illustrate with a suitable example the purpose of performing the selective assembly. [8]
- b) Hole $40^{+0.027}$ mm is assembled with shaft $40^{+0.035}_{+0.018}$ mm using selective assembly after dividing the tolerance zones into three groups. Find out the tolerance of the fit without and with selective assembly. [8]
- Q2)** a) Explain the essential differences between surface metrology and other forms of dimensional metrology. [8]
- b) Explain in brief with suitable example the role of amplification in measurement. [8]
- Q3)** a) State the reason why power amplification makes a radical departure from mechanical instruments. [8]
- b) Describe with a suitable example the concept of form factor and bearing area curves in relation to surface roughness. [8]
- Q4)** Write short notes on (any three) : [18]
- a) Laser interferometers.
 - b) Tool Maker's Microscope.
 - c) Universal dividing head.
 - d) Co-ordinate Measurement Machine (CMM).

P.T.O.

SECTION - II

- Q5)** a) Describe in detail what is meant by automated inspection. Why is it becoming an important part of manufacturing engineering? [8]
- b) Enumerate your thoughts on the merits and limitations of analog vs. digital measuring equipment. Give specific examples. [8]

- Q6)** a) State the principles which govern the design of limit gauges giving examples of such gauges to check :
- i) Length.
 - ii) Diameter.
 - iii) Depth.
 - iv) Distance between an internal and an external face. [8]
- b) Discuss the rational subgroup concept. What part does it play in control chart analysis? [8]

- Q7)** a) Describe in brief : [8]
- i) Total Quality Control.
 - ii) Just in Time (JIT).
- b) The viscosity of a polymer is measured hourly. Measurements for the last-20 hours are shown as follows :

Test	Viscosity	Test	Viscosity
1	2838	11	3174
2	2785	12	3102
3	3058	13	2762
4	3064	14	2975
5	2996	15	2719
6	2882	16	2861
7	2878	17	2797
8	2920	18	3078
9	3050	19	2964
10	2870	20	2805

- i) Does viscosity follow a normal distribution?
- ii) Set up a control chart on viscosity and a moving range chart. Does the process exhibit statistical control?
- iii) Estimate the process mean and standard deviation. [10]

- Q8)** a) A company uses the following acceptance sampling procedure. A sample equal to 10% of the lot is taken. If 2% or less of the items in the sample are defective, the lot is accepted; otherwise, it is rejected. If submitted lots vary in size from 5000 to 10,000 units, what can you say about the protection by this plan? If 0.05 is the desired LTPD, does this scheme offer reasonable protection to the consumer? [8]
- b) Discuss in brief the importance of acceptance tests for machine tools and its influence in precision manufacturing. [8]



Total No. of Questions : 8]

[Total No. of Pages : 2

P1610

[3665] - 405

M.E. (Civil Construction and Management)

DISASTER MANAGEMENT

(2008 Course) (Elective - I)

Time : 4 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Answer any three questions from each section.*
- 2) Question No. 1 and 5 are compulsory. Out of the remaining attempt any two questions from Section I and two 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) Differentiate between Ecosystem Based Disaster Management and Community Based Disaster Management. [8]
- b) Discuss the relation between Development and Disasters with example of Mumbai city. [6]
- c) List out various types of disasters commonly affecting India. State the location of frequent occurrence. [4]
- Q2)** a) Write a note on Tsunami of 2004. [6]
- b) Which type of disasters can be predicted in advance? Discuss the features of early warning systems. [6]
- c) Explain the term vulnerability with suitable examples. [4]
- Q3)** a) State the disasters that are related to population growth. Explain any one of them in detail. [6]
- b) What do you mean by global pandemic? Discuss in brief various global pandemic that have significant impact on human civilization recently. Give examples of global pandemic. [5]
- c) Which type of natural disasters can be mitigated so as to have minimum loss to life and property? Discuss mitigation measures for any one of these disasters. [5]

P.T.O.

- Q4)** a) Discuss the reasons for the recent floods in Karnataka and Andhra Pradesh. Is the cause essentially due to natural factors or human errors? [5]
- b) Is rapid depletion of ground water a type of disaster? To which category this belong? What are the reasons for this problem? [5]
- c) Carry out the cause - effect analysis for following disasters : [6]
- i) Loss of glaciers.
 - ii) Unseasonal and extreme precipitation.
 - iii) Forest Fires.

SECTION - II

- Q5)** a) What is gender? Why does gender matter in disaster response? Discuss the norms for sanitation interventions in emergency response based on gender. [6]
- b) What do you mean by Chlorination? State its types? State how to make 1% chlorine solution? [6]
- c) Write a detailed note on Sphere Standards. [6]
- Q6)** a) In a relief camp what are the options available for supply of clean and potable water supply. What are the criteria for clean and potable water supply. [6]
- b) How do diseases from human faeces get transmitted? What are the barrier measures that you will adopt to prevent the transmission of these diseases? [4]
- c) What are the different methods of testing turbid water? Explain in details each method. [6]
- Q7)** a) What the source selection criteria in disaster relief camps vis-à-vis water supply? [6]
- b) With the help of neat labeled sketch discuss various latrine options. State the applications of these options. [6]
- c) Explain any one procedure for disinfecting water at Point of Use (PoU). How will you measure the effectiveness of disinfection process? [4]
- Q8)** Write short notes on : [16]
- a) Facilitators, their role in emergency response and their training needs.
 - b) Tanker record book.
 - c) Water tank cleaning procedures.
 - d) Health risks related to improper solid waste management.



Total No. of Questions : 6]

[Total No. of Pages : 2

P1648

[3665] - 462

M.E. (Civil / Structures)

THEORY OF PLATES AND SHELLS

(2008 Course) (Semester - II) (501408)

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) Differentiate between thin and thick plate bending under lateral loads. Give explanation of the various assumptions made in small deflection theory. [8]
- b) State the 4th order differential equation for a thin plate. Find expressions for moments, shears using various boundary conditions. [5]
- c) Obtain the expression for strain energy stored in the small element of a thin plate subjected to bending and twisting moments. Describe the procedure to obtain the deflected surface of the plate under a given loading by Raleigh-Ritz approach. [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_0 . Derive the expression for the deflected surface using Navier's method. [19]
- b) State the advantages of Levy's method over Navier's method. State the constants of Levy's method. [6]
- Q3)** A circular plate of radius 'a' is having fixed edges. Find the maximum values of radial and tangential moments for the following loading conditions :
- a) Central load P.
 - b) Central circular patch load over a area of radius $a/4$ with intensity p_0 per unit area.
 - c) Axisymmetric triangular load with zero intensity at the centre and p_0 per unit area at the edges. [25]

P.T.O.

SECTION - II

- Q4)** Derive the equation of equilibrium of shell of revolutions with axisymmetric loading. Apply the same to determine the membrane forces in a R.C.C hemispherical dome of radius of 8 m and thickness 120 mm supported on its lower edge by roller supports all along the periphery. Plot the variation of internal forces along any meridian. Consider self weight only. Is there any bending effect to be considered near the lower edge? Comment on your answer. [25]
- Q5)** a) Derive the equations of equilibrium for a small element of a cylindrical shell. Show the stress resultants on this element for general loading. [14]
b) Explain in brief different theories of bending in cylindrical shells. [6]
c) With neat sketches classify shell surfaces based on Gaussian curvature. [5]
- Q6)** a) Describe the principles of Lundgren's beam theory for thin shells. Discuss the advantages and limitations of the theory. [8]
b) Using Lundgren's beam theory, analyze a semicircular cylindrical shell of 3 m radius and simply supported over a span of 10 m. The shell is subjected to a uniformly distributed load of intensity of 1.8 kN/m^2 . This intensity is inclusive of the self weight. Calculate the maximum compressive stress at the crown in the mid-span section and compare the value with the value obtain by membrane theory. Comment on the results by both theories. [17]



Total No. of Questions : 8]

[Total No. of Pages : 2

P1650

[3665] - 127 - A

**M.E. (E & T/C.) VLSI & Embedded Systems
ANALOG AND DIGITAL CMOS IC DESIGN**

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) Calculate W/L for MOSFET to offer dynamic resistance of 10 k Ω . Assume suitable data. [8]
b) With the help of necessary schematic explain current sink & source with Rout offered. [8]
- Q2)** Design CMOS differential amplifier for CMRR = 40dB. The dissipation should not exceed 2.5 mW at supply of 2.5V. [16]
- Q3)** a) What is design technique for low noise opamp? Brief with the help of necessary expressions. [8]
b) What is meant by buffered opamp? Explore with schematic. [8]
- Q4)** Write short notes on any three : [18]
a) Cascode amplifier.
b) Current mirrors.
c) Bandgap reference.
d) Micro power opamp.

SECTION - II

- Q5)** Draw FSM diagram & write VHDL code for 001101 Moor sequence detector. Also write test bench for it. [16]

P.T.O.

- Q6)** a) Explore CMOS parasitics in detail. How do they affect performance? [8]
b) What is need of NORA logic? With suitable schematic explore the typical logic function. [8]
- Q7)** a) What are the advance trends in high speed VLSI? [8]
b) For CMOS logic derive the expressions for total power dissipation & PDP. [8]
- Q8)** Write short notes on any three : [18]
a) Merits & demerits of transmission gate.
b) Technology scaling & its effects.
c) Hazards & mitigation techniques.
d) Low power design.



Time : 3 Hours]

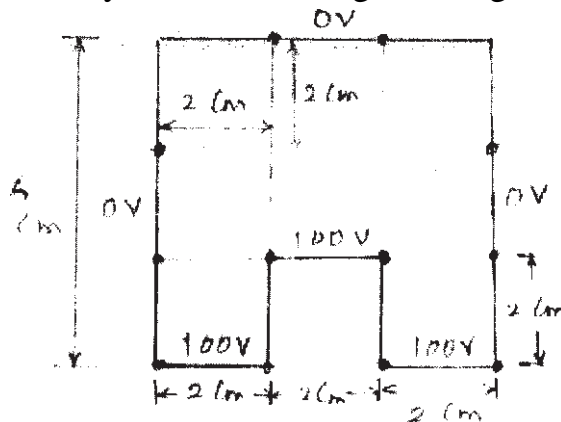
[Max. Marks : 100

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) Using method of moments, derive expression for field distribution using integral form of potential equation. [15]
 b) Write note on 'Yee's FD Algorithm'. [10]
- Q2)** a) Write coefficient matrix A to determine the potential distribution in the geometry shown in the figure using finite difference method. [15]



- b) Compare the strengths and weaknesses of method of moments and FDTD. [10]
- Q3)** a) Derive the expression for Green's function G corresponding to PDE, for free space. [10]
 b) Define following terms related to antenna [15]
- i) Antenna efficiency.
 - ii) Beam width.
 - iii) Directivity.
 - iv) Radiation resistance.
 - v) Gain.

SECTION - II

- Q4)** a) The radiation intensity of an antenna is given by $U(\theta, \phi) = \cos^4 \theta \sin^2 \phi$ for $0 \leq \theta \leq \pi/2$ and $0 \leq \phi \leq 2\pi$ (in upper half space). It is zero in the lower half space. Find
- i) Exact directivity.
 - ii) Elevation plane half power - beam width (in degrees). [15]
- b) Explain construction and working of helical antenna. Derive expression for axial ratio and circumference. [10]
- Q5)** a) Derive expression for effective length, resonant frequency, effective width, conductance and input impedance of microstrip antenna. [15]
- b) A microstrip antenna with overall dimensions of $L = 0.906$ cm, $W = 1.186$ cm, substrate with height $h = 0.1588$ cm and dielectric constant $\epsilon_r = 2.2$, is operating at 10 GHz. Find
- i) The input impedance.
 - ii) The position of the feed point where input impedance is 50Ω . [10]
- Q6)** a) Derive expressions 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 $3 \times 10^{-3}\lambda$ 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]

[Total No. of Pages : 2

P1657

[3665] - 139

M.E. (Electronics - Digital System)
ADVANCED DIGITAL SYSTEM 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 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) Design a sequential circuit that computes the product of two four bit numbers. [10]
b) Describe the design issues of RISC & CISC. [6]
- Q2)** a) What is clock skew? What are the possible problems caused by clock skew? What is the remedy? [6]
b) Design a sequence generator in which output Y is '1' only if input sequence of 1001 occurs at consecutive clock pulses, otherwise Y = '0'. [10]
- Q3)** a) Design a sequential circuit to compute the mean of K numbers. Draw the ASM chart and data path circuit. [10]
b) Find a Hazard free minimum cost implementation of the function
$$f(x_1, \dots, x_4) = \sum m(0, 4, 11, 13, 15) + D(2, 3, 5, 10). \quad [8]$$
- Q4)** Write short notes on : [16]
a) System integrity.
b) H-Tree clock distribution network.
c) Switch debouncing.
d) Signature Analyser.

P.T.O.

SECTION - II

- Q5)** a) What is the BIST scheme? Explain how it is implemented for sequential circuit. Draw necessary block diagram. [8]
b) What will happen for a finite transmission line, if it is not terminated in Z_0 ? [8]
- Q6)** a) Explain the following terms in context to a large digital system design :
i) Reliability estimation.
ii) Reliability function.
iii) Failure rate.
iv) Bathtub curve.
v) MTBF. [10]
b) How will you define reliability in a system with 'n' components having different individual failure rate? [6]
- Q7)** a) What are the approaches to network design? Explain formal optimization techniques. [8]
b) With the help of diagram explain the structure of a network design tool. [8]
- Q8)** Write short notes on (any three) : [18]
a) Boundary scan.
b) IEEE 486 bus.
c) Scan path technique.
d) PRBSG.



Total No. of Questions : 8]

[Total No. of Pages : 3

P1658

[3665] - 269

M.E. (Chem.)

ADVANCED MOMENTUM & 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) *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) Defined different types of non-Newtonian fluids, with appropriate mathematical expressions and examples. **[4]**
- b) Derive the equation of continuity and show that for incompressible fluid : $\nabla \cdot \mathbf{V} = 0$. **[4]**
- c) Derive an expression for mass flow rate of a polymer fluid, described by the power law model. The fluid is flowing through a long circular tube of radius R and length L. Consider laminar flow. **[10]**
- Q2)** a) Explain construction and working of capillary tube viscometer. **[6]**
- b) Show that the expression for mass flowrate (W) of a Bingham fluid through a slit is given by :

$$W = \frac{2}{3} \frac{(p_0 - p_L) W B^3 \rho}{\mu_0 L} \left[1 - \frac{3}{2} \left(\frac{\tau_0 L}{(p_0 - p_L) B} \right) + \frac{1}{2} \left(\frac{\tau_0 L}{(p_0 - p_L) B} \right)^3 \right]$$

What happens when yield stress goes to zero. **[12]**

- Q3)** a) Derive dimensionless form of equations of change what is its significance? **[6]**
- b) Obtain Bernoulli equation from Navier-Stokes equation. **[4]**

P.T.O.

- c) Show that generalised Reynolds number for laminar flow through circular tube of any time independent fluid is

$$N_{Re, gen} = \frac{\delta V^{2-n'} D^{n'}}{k' 8^{n'-1}}. \quad [6]$$

- Q4)** a) A cylindrical rod of diameter kR moves axially with a velocity V along the axis of a cylindrical cavity of radius R . Assume that the fluid in cavity moves only due to the rod motion. Show that the velocity distribution in the narrow annular region is given by

$$\frac{V_z}{V_0} = \frac{\ln(r^\theta / R)}{\ln k} \quad [10]$$

- b) For scale-up rule exponent n , show the following for turbulent agitation
- When $n = 2/3$, the power per unit volume is constant in scale-up. [3]
 - When $n = 1$, tip speed is constant in scale-up. [3]

SECTION - II

- Q5)** a) A cylindrical tank, capable of holding $Q \text{ m}^3$ of liquid is equipped with an agitator having sufficient power to keep the liquid contents at uniform temperature. Heat is transferred to the contents by means of a coil arranged in such a way that the area available for heat transfer is proportional to the quantity of liquid in the tank. This heating coil consists of 10 turns. Water at T_w K is fed to this tank at a rate of $W \text{ kg/min}$, starting with no water in tank at time $t = 0$. Steam at T_s K flows through the heating coil and the overall heat transfer coefficient is $U \text{ kcal/h.m}^2 \text{ K}$. Show that the temperature T_b of water in tank is given by

$$\frac{T_b - T_w}{T_s - T_w} = 1 - \frac{1 - \exp(-UA / WC_p)}{UA / WC_p} \quad [12]$$

Assume common notations.

- b) Apply the statement of conservation of energy to the fluid in the macroscopic flow system and show the steady state macroscopic energy balance is given by

$$\Delta \left[H + \frac{1}{2} \frac{V^3}{V} + gh \right] = Q + W \quad [4]$$

State the assumptions. [2]

- Q6)** a) Derive an expression for thermal boundary layer thickness (δ_T) for the flow of power law liquid over a flat plate, in laminar condition. [10]
 b) A slab occupying a space between $y = -b$ to $+b$, is initially at a temperature T_0 . At time $t = 0$, the surface temperature is suddenly raised to T_1 and maintained there. Find the time dependent temperature profile $T(y, t)$. [8]

- Q7)** a) What is heat transfer augmentation? Explain active and passive methods of heat transfer augmentation. [8]
 b) The equation of change for temperature is given by

$$\rho C_p \frac{DT}{Dt} = -(\nabla \cdot \bar{q}) - (\bar{\tau} : \nabla \bar{V}) - \left(\frac{\delta \ln \rho}{\delta \ln T} \right)_p \frac{DP}{Dt}$$

Where \bar{V} , \bar{q} , $\bar{\tau}$ are fluid velocity vector, heat flux vector and viscous momentum flux tensor respectively.

Use Fourier's Law with constant k , omit viscous dissipation term and show that

- i) for ideal gas

$$\rho C_p \frac{DT}{Dt} = k \nabla^2 T + \frac{DP}{Dt}$$

- ii) for fluid flowing in constant pressure system

$$\rho C_p \frac{DT}{Dt} = k \nabla^2 T$$

- iii) for fluid with constant density

$$\rho C_p \frac{DT}{Dt} = k \nabla^2 T$$

- iv) for stationary solid

$$\rho C_p \frac{DT}{Dt} = k \nabla^2 T \quad [8]$$

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

- Euler equation.
- Stress tensor properties.
- Equation of mechanical energy.
- Heat transfer in liquid metals.
- Dimensionless numbers in liquid mixing.



M.E. (Electrical) (Control Systems)
MULTIVARIABLE AND OPTIMAL CONTROL SYSTEMS
(2008 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 and electronic pocket calculator is allowed.
- 6) Assume suitable data, if necessary.

SECTION - I

Q1) a) Explain with neat block diagram the structure of a typical multivariable control system. [6]

b) A multivariable control system is represented in state space form :

$$\dot{x}(t) = Ax(t) + Bu(t)$$

$$y(t) = Cx(t) + Eu(t)$$

Where,

$$A = \begin{bmatrix} 0 & 1 & 0 \\ 3 & 2 & 0 \\ 1 & 1 & 1 \end{bmatrix}; \quad B = \begin{bmatrix} 0 & 0 \\ 1 & 2 \\ 0 & 1 \end{bmatrix}; \quad C = \begin{bmatrix} 1 & 2 & 0 \\ 0 & 0 & 1 \end{bmatrix}; \quad E = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

Obtain the transfer matrix form of the system.

[10]

OR

Q2) a) What are the advantages of representing the multivariable control system into state space form. [4]

b) The overall transfer matrix of a multivariable control system is given by

$$T(s) = \begin{bmatrix} \frac{s+1}{s^2} & \frac{s+2}{s^2+1} \\ \frac{2}{s} & \frac{2s+3}{s^2+1} \end{bmatrix}$$

Find :

- i) The state space representation of the system.
- ii) The characteristic polynomial of the system.

[12]

P.T.O.

- Q3)** a) Explain the concept of controllability of multivariable control system and discuss any one method of testing the controllability. [6]
 b) Investigate the state controllability of the multivariable control system represented by the following state space model : [10]

$$\dot{x}(t) = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 2 \end{bmatrix} x(t) + \begin{bmatrix} 2 & 2 \\ 1 & 1 \\ 0 & 0 \end{bmatrix} u(t)$$

$$c(t) = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix} x(t).$$

OR

- Q4)** a) State and explain the concept of observability of the multivariable control system and discuss any one method of testing the observability of the control system. [6]
 b) Determine the observability of the multivariable control system given by : [10]

$$\dot{x}(t) = \begin{bmatrix} 0 & 1 & 0 \\ -1 & -2 & 1 \\ 0 & 0 & 3 \end{bmatrix} x(t) + \begin{bmatrix} 0 & 0 \\ 1 & 0 \\ 0 & 1 \end{bmatrix} u(t)$$

$$c(t) = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix} x(t).$$

- Q5)** a) Discuss in detail the pole allocation using Linear state variable feedback in multivariable control system. Draw appropriate block diagram showing LSVF. [9]
 b) What is an observer? Explain with neat block diagram the nature of the state estimation problem using an observer. [9]

OR

- Q6)** a) Explain the concepts of stability and reproducibility of multivariable control system. [6]
 b) Discuss any one classical method which can be extended to analysis of multivariable control system. [6]
 c) Explain decoupling or non-interactive control for multivariable system. [6]

SECTION - II

- Q7)** a) State and explain the Linear State Regulator problem and show that for an infinite - time state regulator problem, the performance index is,

$$J = \frac{1}{2} \int_0^{\infty} (X^T Q X + U^T R U) dt \text{ with usual notation.} \quad [8]$$

- b) Discuss any one of the following methods for the numerical solution of matrix Riccati Equation : [8]
- i) Direct Integration.
 - ii) Negative Exponential method.
 - iii) Iterative method.

OR

- Q8)** a) Discuss the factors to be considered in the formulation of an optimal control problem using quadratic performance criterion. [6]
- b) Given a linear system represented by the state equation :

$$\dot{X}(t) = \begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix} X(t) + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u(t)$$

Assuming the linear control law

$$u = -KX = -k_1 x_1 - k_2 x_2$$

determine the constants k_1 and k_2 so that the following quadratic performance index is minimized,

$$J = \frac{1}{2} \int_0^{\infty} (X^T Q X + U^T R U) dt$$

Assume,

$$Q = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}; R = 1. \quad [10]$$

- Q9)** a) Enumerate the merits and demerits of optimal control. [6]
- b) Define Hamiltonian. Derive the state, co-state and control equations. How will you solve the optimal control problem using these equations? [10]

OR

- Q10)** a) State the Pontryagin's minimum principle. Discuss step by step procedure of solving optimal control problem using Pontryagin's minimum principle. [10]
- b) Discuss briefly the relation between the Pontryagin's minimum principle and Dynamic programming. [6]

- Q11)**a) Discuss the Bang-bang control strategy and state the advantages of Bang-bang controller. [8]
- b) Draw the block diagram showing the structure of feedback minimum-time optimal control system and outline the procedure of solving minimum-time optimal control problem. [10]

OR

- Q12)**a) State and derive the Hamilton - Jacobi equation. [9]
- b) Use the minimum principle to show that it is necessary to use a Bang-bang controller to drive the system,

$$\dot{X}(t) = \begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix} X(t) + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u(t)$$

from the initial state $x_1 = 1, x_2 = 1$ to a zero final state ($x_1 = x_2 = 0$) if the input variable is constrained.

Find such a control, if $-1 \leq u \leq 2$. [9]



Total No. of Questions : 6]

[Total No. of Pages : 2

P1674

[3665] - 34

M.E. (Civil / Structures)

PLATES & SHELLS

(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) 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) State classification of plate theories. Explain each classification with neat sketch & example. **[8]**
- b) Derive from first principles moment curvature relations in case of thin plate bending. **[12]**
- c) Write assumptions in thin plate bending theory. **[5]**
- Q2)** a) A square plate of side 'a' is simply supported on all its edges. It is subjected to sinusoidal load $q(x, y) = q_0 \sin \frac{\pi x}{a} \cdot \sin \frac{\pi y}{a}$, where 'q₀' is the intensity of loading at centre find maximum displacement 'w' & value of corner forces required to hold it down. Draw variation of reaction on any one edge of the plate. **[20]**
- b) State different boundary conditions of rectangular plate & write necessary conditions stating equations in 'w' or its derivatives. **[5]**
- Q3)** A circular plate is subjected to udl 'q' over its surface. Edge is clamped. Obtain from the first principles equation for 'w' in terms of 'r'. Hence obtain values of bending moments at centre & at the edge of plate. Radius of plate is 'a'. **[25]**

P.T.O.

SECTION - II

- Q4)** a) Distinguish between plate bending & shell bending. [5]
b) Derive from first principles membrane forces developed in cylindrical shell under dead load & live load.
Show by diagram variation of N_x , N_θ & $N_{x\theta}$. [20]
- Q5)** a) Draw various shell surfaces of revolution. [5]
b) A spherical dome is subjected to uniformly distributed load ' q ' per unit area of shell surface prove that no tensile forces are developed in the portion of shell from $\phi = 0$ to $\phi = 51^\circ - 51'$, where ϕ is semiangle between axis of revolution & normal to shell surface. [20]
- Q6)** a) Explain Lundgren's beam theory of cylindrical shell. [10]
b) A conical shell of base radius ' r ' and semiangle ' α ' is loaded by force ' p ' at apex. Determine circumferential & meridional forces at base. [15]



Total No. of Questions : 6]

[Total No. of Pages : 1

P1681

[3665] - 172

M.E. (Electrical) (Power Systems)

POWER SYSTEMS MODELLING

(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) Assume suitable data, if necessary.*

SECTION - I

Q1) Describe the need for modelling of a power system. Which components of power system are represented by models? Describe the function of each such component. **[25]**

Q2) What is Park's transformation? How it is used in obtaining flux linkage model of a synchronous machine? **[25]**

Q3) a) Describe speed-voltage terms in the equations of a synchronous machine. Draw corresponding circuits. **[10]**

b) Derive the voltage equations of a synchronous machine in odq - FDQ axes and make comments on them. **[15]**

SECTION - II

Q4) Describe a modern excitation system used for a synchronous generator with the help of block diagrams. Describe the function of each block. **[25]**

Q5) Develop and explain simple models used for : **[25]**

- a) Boiler.
- b) Turbine.
- c) Governor.

Q6) Write notes on : **[25]**

- a) Load modelling.
- b) Transformer modelling.



M.E. (Electrical) (Control System)
PROCESS CONTROL MANAGEMENT
(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 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 Leadership, Motivation, Group dynamics and teams in process Control Management in details. [15]
b) Write short note on : [10]
i) Conflict management.
ii) Stress management.
- Q2)** a) Draw & explain block diagram of process control system. [10]
b) What is Mathematical modelling of the system? Develop a mathematical model of Heat transfer process shown in figure 1. Also find Time constant of the system. [15]

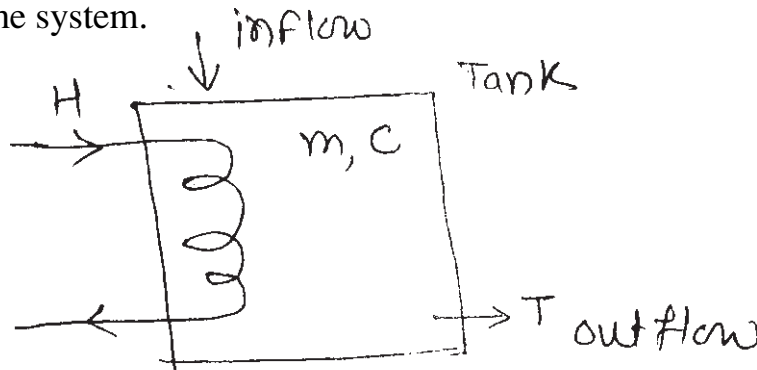


Figure ① Heat transfer process

Given :

H_t = Heat transfer.

H_o = Overall heat transfer coeff.

m = Tank mass.

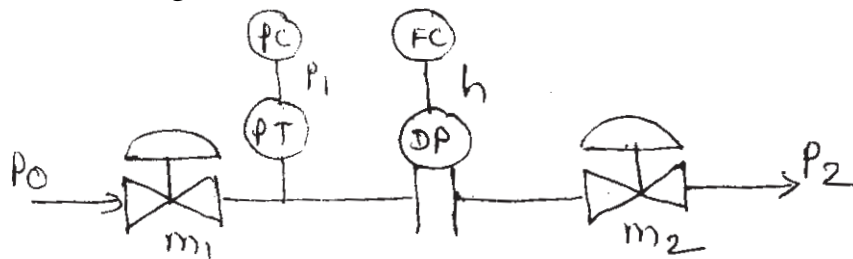
C = Specific heat of material.

T_d = Temperature difference between heat donor & reciever.

- Q3) a)** Explain Zeigler - Nichols closed loop method for tuning in details. Also explain what is Reset windup problem. [10]
- b)** Compare P, PI and PID control actions with their advantages, disadvantages, applications and expressions in details. [15]

SECTION - II

- Q4) a)** Explain block diagram of digital control system with advantages and disadvantages.
Also explain effect of digital control on stability of the system. [15]
- b)** Explain & derive the expression for discrete PID controller in details. [10]
- Q5) a)** Draw block diagram of cascade control system. Develop cascade control system for Continuous Stirred Tank Reactor (CSTR) and explain. [12]
- b)** Explain feed forward control system with neat block diagram. Develop a feed forward control system for Heat Exchanger. [13]
- Q6) a)** Define RGA (Relative Gain Array) for process. Give properties of RGA. Also explain what do you mean by decoupling of two control loops. [10]
- b)** Find RGA (Relative Gain Array) of the pressure flow process shown in figure 2. Use simplified equations for differential pressure h and controlled pressure p_1 . Both valves affect flow and pressure. But not necessarily to the same degree. [15]



m_1, m_2 are control valves

Figure 2 pressure flow process



Total No. of Questions : 8]

[Total No. of Pages : 2

P1691

[3665] - 664

M.E. (Chemical) I

**MANAGEMENT OF RESEARCH AND DEVELOPMENT IN
CHEMICAL INDUSTRIES**

(2008 Course) (509102)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Answer any three questions from each section.*
- 2) Your answers will be valued as a whole.*

SECTION - I

Q1) What is the relation between R & D growth and G.D.P. growth of a country? Explain with respect to growth in research in fertilizer sector. **[17]**

Q2) Discuss various methods of getting back money (from the market) spent as investment in research. Prepare a balance sheet on the investments on and profits earned from R & D project. **[17]**

Q3) Mass transfer engineering technologies (for example distillation, extraction, membrane filtration etc.) have improved markedly over last few decades. From highly inefficient technologies they have reached a stage where these technologies can be considered as competent technologies. Explain the component of research in this sector. **[17]**

Q4) Write notes (any 3) : **[16]**

- a) Skilled Manpower in R & D.
- b) Research in Ancillary Chemical Industry.
- c) 'Fruitful' Research.
- d) Creative Thinking.

SECTION - II

Q5) What is the status of research & development in Indian Chemical Industry? Explain in details the Role of International (like Nobel Prize) and National prizes in revitalizing R & D. **[17]**

P.T.O.

Q6) Explain the importance of PERT & CPM techniques in R & D management?
Take a case study. [17]

Q7) Fermentation technology in chemical industry has shown significant improvement in the last few decades? Give chronological survey of research in that sub branch and its role in improving standard of life of society. [17]

Q8) Write notes (any 3) : [16]

- a) Interdisciplinary Research.
- b) Controlling Expenses in R & D.
- c) Natural Rate of Growth of Economy.
- d) Role of Research in Ozone Hole Recuperation.



Total No. of Questions : 8]

[Total No. of Pages : 2

P1692

[3665] - 197

M.E. (Computer)

ADVANCED DATABASE MANAGEMENT SYSTEMS

(2002 Revised Course) (Theory)

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) Explain with examples following concepts : [16]

- a) OLAP.
- b) Transaction ACID properties.
- c) Primary and foreign Keys in databases.
- d) SQL data types.

Q2) In the context of databases give the following : [16]

- a) An example of a data warehouse Fact table.
- b) An example of database application in banking domain.
- c) An example of SQL aggregate function query.
- d) An example nonserialisable schedule situation.

Q3) Explain in brief : [16]

- a) Distributed deadlock.
- b) Database replication.
- c) Commit and rollback.
- d) Relational model.

Q4) Write short notes on any three : [18]

- a) Data fragmentation in distributed databases.
- b) Parallel databases.
- c) Transaction system processes with a diagram.
- d) Normalization of databases.

P.T.O.

SECTION - II

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

- a) Search engines and unstructured data.
- b) ORACLE as a database product.
- c) PL/SQL.
- d) Example Applications of databases for educational institutes.

Q6) With your own examples explain following concepts : **[16]**

- a) Prediction, classification in context of data mining.
- b) Object oriented databases.
- c) Database Tuning and administration.
- d) Locks.

Q7) What is the growing importance of Internet for business with example ecommerce applications where databases are important. Give any one example of an ecommerce application in detail giving need, advantages. State how databases are useful in internet world with example of the ecommerce application you have described. Discuss how XML could be relevant for internet databases. **[16]**

Q8) Explain the CONCEPT, its features and give example applications for following with relevant diagrams if required to illustrate the concept/application

- a) Two tier Client server systems in databases.
- b) SQL commands.
- c) Database encryption and security.
- d) Spatial databases.

[16]



Total No. of Questions : 8]

[Total No. of Pages : 2

P1699

[3665] - 271

M.E. (Chemical)

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) How is the effect of centrifugal field considered? Explain both the approaches. [8]
b) What are surface properties? Derive the equation of any one of them. [8]
c) Define Internal Energy. [2]
- Q2)** a) How many types of systems have been defined? Explain any one in detail. [8]
b) State the three types of disorders & describe any two. [8]
- Q3)** a) What are I & II order transitions? [8]
b) What are the various reasons for non-ideality in a liquid-liquid system? [8]
- Q4)** a) Explain in the detail how barometric formula is derived? [8]
b) Explain the first two steps in the glucose cycle. [8]

SECTION - II

- Q5)** a) Explain & derive Boltzmann distribution law. [8]
b) Define ensemble, degeneracy, occupation number. [6]
c) What is an open system? [4]

P.T.O.

- Q6)** a) Explain the application of I law to an open system. [10]
b) What is chemical affinity? Derive an equation for it. [6]
- Q7)** a) Explain any one method for finding the activity of an electrolyte. [8]
b) Explain the Debey - Huckle Theory. [8]
- Q8)** Write short notes :- [16]
a) Reaction coordinate.
b) Exergonic & Endergonic Processes.
c) Accessibility.
d) Limiting law.



Total No. of Questions : 8]

[Total No. of Pages : 2

P1700

[3665] - 199

**M.E. (Computer)
MOBILE COMPUTING
(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) 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) Draw schematic diagram of the GSM network and show the location of following components in it. **[16]**

- a) MSC/VLR.
- b) HLR.
- c) AUC.
- d) EIR.
- e) GMSC.
- f) BSC.
- g) BTS.
- h) MS and
- i) OSS.

Q2) Describe the basic procedures in the formation of a call including : **[18]**

- a) Connection request.
- b) Paging procedure.
- c) Identification procedure.
- d) Authentication procedure.

Q3) a) Narrate the detailed functions of a SIM card.
b) What are the functions of the ECHO cancellor?
c) State the functions of an SMS gateway.

[16]

P.T.O.

- Q4)** a) “GSM system uses both FDMA d TDMA techniques” Explain the above statement with suitable illustration.
b) Explain how the GSM system is secured against fraudulent use.
- [16]**

SECTION - II

- Q5)** a) With respect to modulation define the spectral efficiency of the GSM system.
b) Show that the relative spectral efficiency of system X with respect to system Y decreases according to increase in the square root of C/I (carrier to channel interference). Show how the spectral efficiency is related to the channel bandwidth Bx.
- [16]**
- Q6)** Describe the WiFi PCI adapter setup in Linux Operating System. **[16]**
- Q7)** Write short notes on the following : **[16]**
- a) State the reason for the use of frequency hopping in GSM system.
b) Describe an appropriate frequency hopping algorithm.
- Q8)** Write short notes on the following : **[18]**
- a) WAP protocol stack.
b) Nokia Internet Tool Kit.
c) Android.



Total No. of Questions : 10]

[Total No. of Pages : 2

P1701

[3665] - 163

M.E. (Electrical) (Control Systems)

INTELLIGENT CONTROL

(Revised Course 2003)

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) What are basic components of artificial neural network? [9]
b) What are the paradigms of neural network learning? [9]
- Q2)** a) Explain single layer neural network with one output and two inputs. [8]
b) Explain Adaline neural network. [8]
- Q3)** a) What is back propagation algorithm? Explain. [8]
b) What are the applications of back propagation algorithm? [8]
- Q4)** a) What are the problems resulted while storing too many patterns using associative memory? How these problems can be solved? [8]
b) Describe the learning vector quantisation method. [8]
- Q5)** a) Explain ART 1 neural network. [8]
b) Explain reinforcement learning scheme. [8]

SECTION - II

- Q6)** a) Describe dynamic programming to find a sequence of a control actions. [8]
b) Explain the application of ART for machining applications. [8]

P.T.O.

- Q7)** a) What is the ancient philosophy of fuzzy logic? [8]
b) What are the various applications of fuzzy logic? [8]
- Q8)** a) What are the characteristic of fuzzy logic? [8]
b) What are the operations on fuzzy sets? Explain with examples. [8]
- Q9)** a) What are the fuzzy relations? Explain them. [8]
b) What are the fuzzy implications? Explain with examples. [8]
- Q10)** a) Explain the theory of approximate reasoning. [9]
b) What are the translation rules? Explain them with examples. [9]



M.E. (E & TC) (Microwave)
COMMUNICATION NETWORKS
(2002 Course)

Time : 3 Hours]

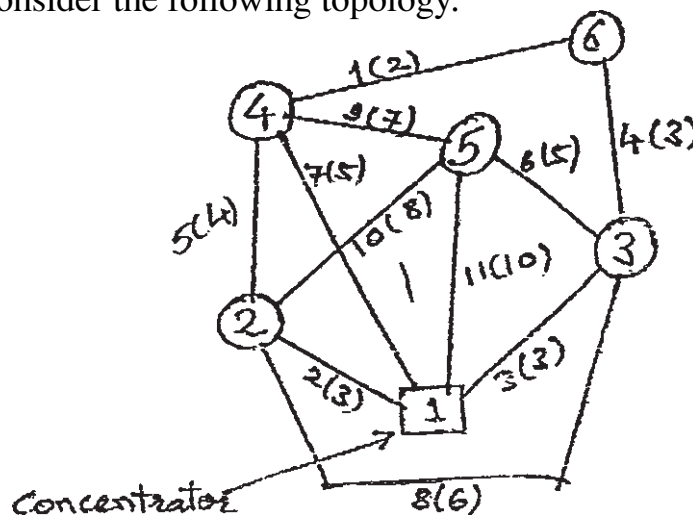
[Max. Marks : 100

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 and electronic calculator is allowed.
- 6) Assume suitable data, if necessary.

SECTION - I

- Q1)** a) List and explain six main goals of Routing algorithm. [9]
 b) Consider the following topology. [9]



Links are labelled with indices.

Link lengths are in paranthesis.

- i) Apply the Kruskal Algorithm to find a minimum spanning tree.
 - ii) Apply Esau - Williams Algorithm. What is the difference between the two algorithms mentioned above.
- Q2)** a) At a switching center, messages arrive at the rate of 120/h. The message length is distributed exponentially, with a mean length of 144 characters. The speed of the link serving the switching centre is 8 characters/s. Find the mean message waiting time and the link utilization. [8]
 b) Explain M/M/1 Queue. [8]

P.T.O.

- Q3)** a) Consider a statistical multiplexer that has a transmission line with a speed of $R = 64$ kbps. Suppose that the average packet length is $E(L) = 1000$ bytes = 8000 bits and that the average arrival rate is four packets/second. Compare the average packet delay for constant-length packets to exponentially distributed packets. [8]
- b) A multipoint line serves 200 stations. The probability that a given station has a message is .01. What is the probability that no station has a message? [8]
- Q4)** a) Describe socket structure and explain TCP/IP socket programming. [8]
- b) What are the advantages and disadvantages of Adaptive Routing and Explicit Routing. [8]

SECTION - II

- Q5)** a) Suppose traffic with intensity 2 Erlangs is offered to 3 lines. What is the probability of loss predicted by the Erlang-B, Erlang-C and Poisson Formulas? [8]
- b) An experiment was conducted on a 2400 bps line to observe its transmission error rate. The experiment was run for 8 hours, and the number of errors observed at the end of each hour was 12, 6, 7, 3, 15, 10, 18 and 5.
What is the mean error rate of the link? What is its standard deviation? [8]
- Q6)** a) Differentiate between centralised and distributed approaches for network design. [8]
- b) Using the RSA public key cryptosystem, with $a = 1$, $b = 2$ etc : [8]
If $p = 3$ and $q = 11$, list five legal values for d .
The public key $K_p = 33, 3$
Generate secret key $K_s = ?$
A message is encrypted using $K_p = 33, 3$. Which resulted in cyphertext of 01, 03, 28, 17.
Decrypt it and obtain the plaintext.
- Q7)** a) Discuss the essential features of VOIP. [8]
- b) What are the features of IPV6? What is the maximum number of fragments that can result from one IPV6 datagram that contains only a base header? If it contains a base header plus a TCP header? [8]

- Q8)** a) A datagram subnet allows IMPs to drop packets as per their need. The probability of an IMP discarding a packet is p . There is a link between a source host to a source IMP which is connected to the destination IMP and then onto the destination host. If either of the IMPs discards a packet, the source host eventually times out and tries again. If both the host IMP and IMP-IMP lines are counted as hops what is the mean number of
- i) Hops a packet makes per transmission?
 - ii) Transmission a packet makes?
 - iii) Hops required per received packet? **[9]**
- b) There are two Lan Bridges, both connected to a pair of 802.4 networks. The first bridge is faced with 1000 numbers of 512-byte packets per second that must be forwarded. The second is faced with 200 numbers 4096 byte packets per second. State which bridge will need the faster CPU. Discuss your answer. **[9]**



Total No. of Questions : 8]

[Total No. of Pages : 2

P1719

[3665] - 71

M.E. (Mech.) (D.E.)

ANALYSIS AND SYNTHESIS OF MECHANISMS

(2002 Revised 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 and electronic pocket calculator is allowed.*
- 6) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) The link lengths of a 4-bar linkage A_0ABB_0 are : $A_0B_0 = 40$ mm, $A_0A = 20$ mm, $AB = BB_0 = 25$ mm. The output link B_0B is in-line with the frame A_0B_0 . Construct the inflection circle using the E-S equation. You may treat the given position of the mechanism as a limiting case of the nearby positions. [12]
- b) Write a note on 'Structural Error and spacing of Accuracy points'. [6]
- Q2)** a) Explain the algebraic 4-Accuracy point synthesis of slider-crank, which treats the first accuracy position of the slider as a design variable. [8]
- b) Explain the 3-Accuracy point synthesis of a 4-bar function generator starting from the standard form equation of dyad. Also briefly discuss the case with 4 accuracy points. [8]
- Q3)** a) A function $y = x + \sqrt{x}$ is to be generated using a 4-bar in the range $0 \leq x \leq 1$. Three accuracy points with uniform spacing are to be used. The total rotations of the input and output links are to be 60° and 90° respectively. Synthesize a 4-bar for this purpose using a graphical method, and draw it in one position. [10]
- b) Discuss the principles underlying the method of normal acceleration. [6]

P.T.O.

Q4) 4 desired positions of a link are as follows : Point A on the link occupies 4 successive positions with coordinates (0, 0), (4, 0), (10, 0) and (20, 0) while the link successively undergoes rotations of 30° , 30° and 45° , all in the clockwise sense.

Synthesize a 4-bar for this purpose and draw it in ONE position. [16]

SECTION - II

Q5) a) State and prove the Robert-Chebyshev theorem. [8]

b) Derive expressions for the link lengths of a 4-bar mechanism which would satisfy prescribed values of angular velocities and accelerations of its moving links. [8]

Q6) Write notes on any three : [18]

- a) Cubic of stationary curvature.
- b) Hartmann construction.
- c) Mechanisms with high degree of complexity.
- d) Dyad and standard form equation.

Q7) a) Explain symmetry of coupler curves and the related mathematical condition. [8]

b) Three positions of the input link of a 4-bar (ϕ) are to be coordinated with three positions of the output link (ψ) as given below.

$$\phi_1 = 0^\circ, \phi_2 = 45^\circ, \phi_3 = 90^\circ;$$

$$\psi_1 = 45^\circ, \psi_2 = 0^\circ, \psi_3 = -45^\circ.$$

Synthesize such a 4-bar using the Frudenstein's equation and draw it in the first position. [8]

Q8) a) Explain the velocity analysis of a typical ternary link of a complex mechanism by the Auxiliary point method. Clearly state the quantities that must be known. [8]

b) Explain with a neat sketch the D-H parameters for a pair of links of a spatial mechanism. [8]



Total No. of Questions : 8]

[Total No. of Pages : 2

P1764

[3665] - 701

M.E. (Petroleum)

ADVANCED OFFSHORE TECHNOLOGY

(2008 Course) (Elective - III) (Sem. - II) (512111)

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) State and describe the mathematical expression to calculate wave and current forces acting on a floating offshore vessel. [9]
b) Explain mooring system? Draw the sketches and discuss in detail mooring sequence and mooring system for, 'Tension Leg Platform'. [9]
- Q2)** a) Draw the typical chart graph for drill stem testing operation, for three flowing and shut-in pressure readings. Indicate all the points in it. [4]
b) Define the following : [2]
i) Centre of gravity.
ii) Metacenter.
c) Draw the schematic sketch of a typical BOP Control System. [5]
d) Describe the, 'Lower Marine Riser Package' in brief. [5]
- Q3)** Write the floating system options for deepwater projects? Explain the construction, installation, mooring spreads and risers for these structures. [16]
- Q4)** Write short notes on : [16]
a) riser tensioning system.
b) rig hydraulic objectives in deep water drilling.
c) cementation problems in deep water drilling.
d) dynamic positioning system.

P.T.O.

SECTION - II

- Q5)** a) Describe the general well design considerations for deep drilling program. Draw the sketches or graphs and explain the well design factors with their equations. [9]
- b) Write the various means available for the transportation of oil and gas. What is the basis to select an offshore transportation system? Draw the sketch and explain in brief the, 'buoys and tankers system' for transportation. [9]
- Q6)** a) Explain rig motions and vessel offset measurement. Write the permissible values in different operating conditions, for these two. [8]
- b) What are the primary functions of a riser tensioner system and drill string motion compensator? Draw the schematic sketch of any one. [8]
- Q7)** a) Describe in detail any one type of Floating-offshore platform. State and explain the design considerations for various structural members of this platform. Draw the free-body diagram, graph along with mathematical expressions if any. [12]
- b) Explain in brief, 'diving equipment'. [4]
- Q8)** Write short notes on : [16]
- a) API types and properties of oil well cement.
 - b) Primary well control.
 - c) Offshore production system.
 - d) Offshore storage of oil and gas.



Total No. of Questions : 6]

[Total No. of Pages : 2

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M.E. (Civil Structures)
OPTIMIZATION TECHNIQUES
(2008 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) *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) State and explain the various methods available for solving a multivariable optimization problem with equality constraints. **[8]**

b) Formulate an optimization problem for minimum weight and minimum cost to design a rectangular reinforced concrete column section with a constraint on buckling criteria. **[9]**

c) Find the maxima and minima of the function
 $f(x) = 4x^3 - 18x^2 + 27x - 7$. **[8]**

Q2) a) State and explain decomposition principle. **[6]**

b) Maximize $F = x_1 + 2x_2 + x_3$
Subject to

$$2x_1 + x_2 - x_3 \leq 2$$

$$-2x_1 + x_2 - 5x_3 \geq -6$$

$$4x_1 + x_2 + x_3 \leq 6$$

$$x_i \geq 0, i = 1, 2, 3$$

Using Big-M technique. **[10]**

c) Maximize $F = 15x_1 + 6x_2 + 9x_3 + 2x_4$
Subject to

$$10x_1 + 5x_2 + 25x_3 + 3x_4 \leq 50$$

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

$$7x_1 + x_4 \leq 35$$

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

Using revised simplex method. **[9]**

P.T.O.

- Q3)** a) What is difference between elimination and interpolation methods? List various elimination methods and interpolation methods. [6]
- b) Find the value of x in the interval $(0, 1)$ which minimizes the function $f = x(x - 1.5)$ to within ± 0.05 by Fibonacci method. [9]
- c) Minimize the function $f = x_1 - x_2 + 2x_1^2 + 2x_1x_2 + x_2^2$ starting from the point $X_1 = \{0, 0\}$ along the direction $S = \{-1, 0\}$ using the quadratic interpolation method with an initial step length of 0.1. [10]

SECTION - II

- Q4)** a) What is the difference between random jumping and random walk methods? [5]
- b) Minimize $f = 2x_1^2 + x_2^2$ from the starting point $(1, 2)$ using the univariate method (two iterations only). [10]
- c) Formulate an optimization problem for minimum weight and minimum cost to design a steel beam with a constraint on deflection criteria. [10]

- Q5)** a) Complete one iteration of the reduced gradient technique for the following NLP problem

$$\begin{aligned} &\text{Minimize } x_1^2 + 2x_2^2 \\ &\text{Subject to } x_1^2 + x_2^2 = 5 \end{aligned}$$

$$\text{Use a starting feasible solution } X_0 = \begin{Bmatrix} 1.0 \\ -2.0 \end{Bmatrix}$$

Initial $\alpha = 0.25$, and all termination factors equal to 0.01. [13]

- b) Minimize $f(x) = 10 + x^2 - 8x$
 Subject to $x \geq 6$
 Use the penalty function method with the following penalty terms to find the constrained minimum point of the above problem.
- i) Bracket operator penalty term with the following values of R : 0.01, 0.1, 1.0, 10.0, 100.0 and ∞ .
- ii) Inverse penalty term with following values of R : 1000.0, 100.0, 10.0, 1.0, 0.1 and 0.01. [12]

- Q6)** a) Illustrate the working principles of Genetic Algorithms with an example of unconstrained optimization problem. [13]
- b) What is a neural network? How is a neuron modeled in neural network based models? [12]

