

Total No. of Questions : 8]

[Total No. of Pages :2

P 1534

[4065] - 148

M.E. (Electronics) (Digital Systems/Computer)

COMPUTER NETWORKS

(2002 Course) (504304)

Time : 3 Hours]

[Max Marks : 100

Instructions to 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) Describe different approaches to network design and explain the structure of network design tool. [9]
- Q2)** a) Explain M/M/2 system and derive necessary equations. [8]
b) In an M/M/1 Queuing system, 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) What is the average time T, in the system?
ii) What is Q, the average number of messages in the queue?
iii) What is the probability that there are 2 messages in the system?
iv) What is N, the average number of messages in the system?
- Q3)** a) Explain Address Resolution Protocol (ARP) and Reverse Address Resolution Protocol (RARP). [8]
b) Compare different routing procedures with their applications. [8]
- Q4)** a) Describe how layers in the ISO Reference model corresponds to layers in the TCP/IP reference model. [8]
b) Explain the Flow deviation algorithm for routing. [8]

P.T.O.

SECTION-II

- Q5)** 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 center is 8 characters/s. Find the mean message waiting time and the link utilization. [8]
- b) Draw ATM reference model and explain functions of its different layers. [8]
- Q6)** a) Explain the sequences of socket procedures that the client & server call. [8]
- b) What are the network performance parameters? How they can be estimated? [8]
- Q7)** a) Describe IPv6 and highlight important features of it. [8]
- b) List design goals for a firewall. Also list four techniques used by firewalls to control access and enforce a security policy. [8]
- Q8)** Write short notes (Any Three): [18]
- a) VoIP
 - b) IEEE 802.11
 - c) SNMP
 - d) Bluetooth



Total No. of Questions : 8]

[Total No. of Pages : 5

P1508

[4065]-220

M.E. (Petroleum Engg.)

RESERVOIR CHARACTERIZATION AND MANAGEMENT

(2002 Course)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

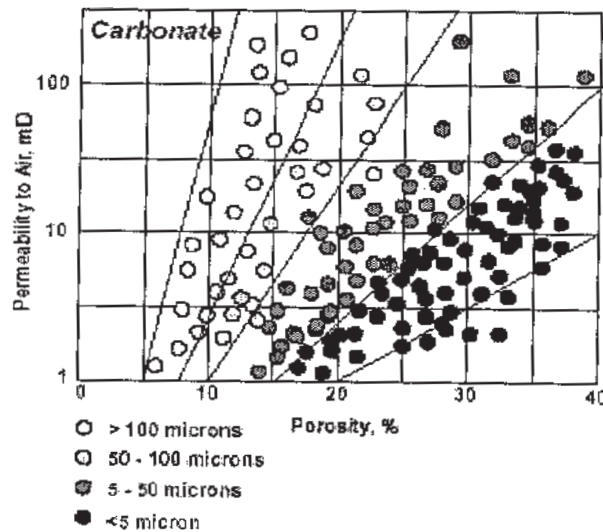
- 1) Answers to the two sections should be written in separate answer books.*
- 2) Attempt any two questions each from section I and from Section II.*
- 3) Assume additional data, if required.*
- 4) Use of graph paper is allowed.*

SECTION - I

- Q1)** a) What is reservoir compartmentalization? How does sealing capacity of faults affect behaviour of flow units in a compartmentalized reservoir? How is it recognized using seismic and well data? **[15]**
- b) What is deterministic, random and stochastic or mixed reservoir? Explain with the help of neat sketches a multilayered reservoir that shows discrete/ sharp changes and gradual changes in a sand-shale sequence. **[10]**

OR

- Q2)** a) Give a broad classification of reservoir heterogeneity as interpreted on different scales. How is it recognized using well test data? **[15]**
- b) Figure given below shows porosity permeability ($k-\phi$) cross plot along with grain size variation for 150 samples representative of a carbonate reservoir. **[10]**



P.T.O.

Answer the following:

- i) What is the relationship between coarsening of grain size and porosity- permeability values.
- ii) What is the probability that $k > 5$.
- iii) What is the probability that $\phi > 10 \%$.
- iv) What is the probability that $k < 5$ and $\phi > 10 \%$.

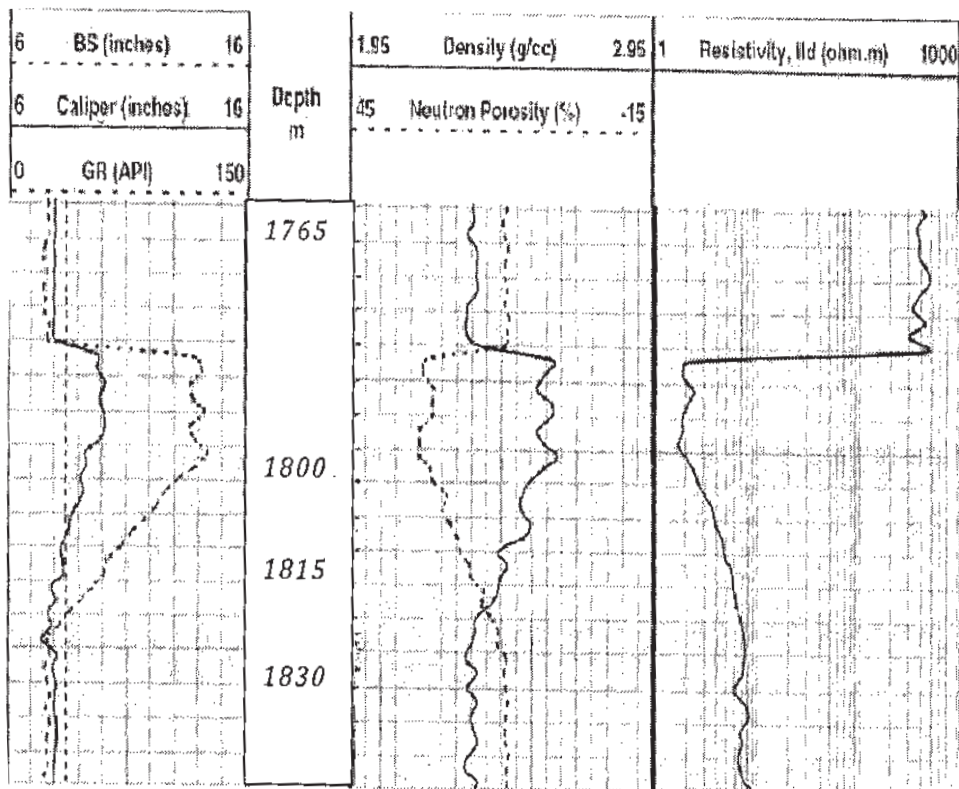
Q3) a) Write notes on any two of the following: [16]

- i) Natural drive mechanisms in reservoirs.
- ii) Estimation of porosity / lithology from well logs.
- iii) Fractured reservoirs.
- iv) Interwell permeability mapping.

b) How is hydrocarbon show interpreted by understanding relationship between water saturation, relative permeability, pore throat size distribution and height above water column? [9]

OR

Q4) a) You are provided with a part of log suite (depth 1765 m to 1840 m) from a reservoir succession penetrated by a well. [15]



- i) Identify the lithology by specifying important depths.
 - ii) Calculate the mud cake thickness at 1830 m and 1800 m.
 - iii) Calculate the shale volume (V_{sh}) at 1800 m from Gamma ray and also from density / neutron separation.
 - iv) Given that at 1830 m, the Archie 'm' equals 1.86 and porosity 18.9 % , calculate the resistivity of water occupying the pores in the rock.
- b) Illustrate with the help of a representative diagram standard rock porosity model for shaly sandstone. Why is it necessary to use different tools and measurement techniques to understand different portions of pore system?[10]

SECTION - II

- Q5)** a) Table 1 is a spreadsheet for permeability variograms taken from 72 wells for horizontal and vertical directions. In the calculation of horizontal variograms traverses were taken along NE-SW and NW-SE directions. [20]

Table 1: Experimental Variogram readings for Q.5.A.

Horizontal Variogram (m)	NE -SW Horizontal Variogram	NW-SE Horizontal Variogram	Vertical Distance (m)	Vertical Variogram
500	5.90	7.00	0.04	1.88
1000	6.36	8.44	0.08	3.00
1500	6.79	9.80	0.12	5.11
2000	7.20	11.02	0.16	6.20
2500	7.62	12.82	0.20	6.81
3000	8.80	13.56	0.24	7.70
3500	9.62	13.96	0.28	7.90
4000	9.97	13.78	0.32	8.25
4500	9.86	13.58	0.36	8.29
5000	9.84	13.50	0.40	8.63
5500	7.52	13.05	0.44	8.72
6000	9.42	17.12	0.48	8.39
6500	6.39	12.48	0.52	8.48
7000	9.69	18.61	0.56	8.98

Plot separate graphs for horizontal (NW-SE, NE-SW) and vertical directions.

Based on your analysis of the experimental variograms, answer the following questions with proper justifications.

- i) Are the variograms isotropic?
- ii) What is the probable sill and range for the horizontal variograms (NW-SE, NE-SW) and vertical variogram?
- iii) Do any of variograms show nugget effect, cyclicity, and positive or negative correlation?
- iv) If an ellipse is derived from the variograms for NE-SW and NW-SE directions then which is the major and minor axis of the ellipse? What does this ellipse indicates?
- v) What statistical correlation is derived from questions b and c in terms of permeability variations in different directions in different wells?

b) Write a note on Horizontal wells in reservoir assessment. [5]

OR

Q6) a) Explain in brief the stepwise approach to performing reservoir management. [15]

b) Write notes on **any two** of the following: [10]

- i) Use of transient tests in reservoir management.
- ii) Assessment of reservoir compartmentalization using fluid data.
- iii) Mapping of abnormal pressure.

Q7) a) A plot of annual production against time for an asset indicates that production will continue for 17 more years before reaching an economic limit of 1,750 bbl / year. The line of extrapolation passes through 15,000 bbl for the last year of available data. However production data shows that the actual production for that year was 14,300 bbl and that some downtime had been experienced.

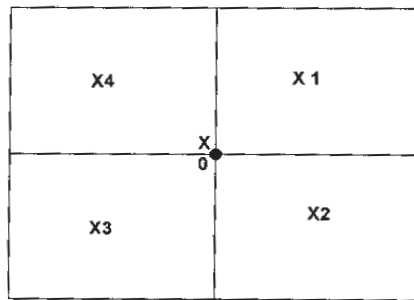
Calculate the recovery (current reserves), which can be expected over the next 17 years before the production reaches the economic limit of 1,750 bbl /year assuming a. [h = 0 and b.] h = 0.5

If current mean selling price for crude oil is \$ 22 / bbl throughout the remaining life of the reservoir then what would be the value of the reservoir. [15]

b) Explain with the help of a neat sketch, how a Kriging estimate is calculated?[10]

OR

- Q8)** a) What is a Petroleum Fiscal System? Write in brief about production sharing contract. **[15]**
- b) Assume that, in the plane, we want to estimate the value of the parameter z at location X_0 . The information available to us is the value of z in the four neighboring locations X_1, X_2, X_3 and X_4 as given in the figure below. Calculate the value of z at location X_0 using Kriging linear estimate approach. **[10]**



Total No. of Questions : 6]

[Total No. of Pages :2

P 1536

[4065] - 221

M.E. (Petroleum Engineering)

ENVIRONMENT MANAGEMENT TECHNOLOGY & SAFETY PROCEDURES

(2002 Course)

Time : 3 Hours]

[Max Marks : 100

Instructions to candidates :

- 1) Answers to the two sections should be written in separate answer books.*
- 2) Solve any two questions each from Section-I and Section-II.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Assume suitable data, if necessary.*

SECTION-I

- Q1)** a) What are the sources of 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) Explain different issues involved in and methods used for decommissioning of onshore as well as offshore wells and structures. **[10]**
- Q2)** a) What is CO₂ sequestration? Explain the role of petroleum industry in CO₂ sequestration. **[15]**
- b) What are environmental air quality monitoring parameters? Explain the equipment used for the purpose. **[10]**
- Q3)** Attempt any two of the following: **[25]**
- a) Draw a figure to show stratification of the atmosphere based on temperature / density relationship. Show major regions of the atmosphere on your diagram. Give characteristics of each zone.
 - b) Summarize the sources of Indoor Air quality contaminants.
 - c) List and explain potential contaminants from sampling device and well castings.
 - d) The Air Quality Index [AQI] was introduced for general public to understand the outdoor air quality. Show the relationship between AQI and Health Effects.

P.T.O.

SECTION-II

- Q4)** Discuss the protocol for field investigation of a contaminated site, assuming the contaminations due to spilled Petroleum products. Support your discussion by considering the following: **[25]**
- a) Levels of protection,
 - b) Work zone control, and
 - c) Knowledge of safety procedures.
- Q5)**
- a) Describe the processes involved in purifying natural gas before its commercial sale. **[15]**
 - b) Write a note on environmental problems associated with the production of oil and gas at onshore and offshore sites. **[10]**
- Q6)** Write short notes on the following: **[25]**
- a) Nature of environmental audit in petroleum industry,
 - b) Pollution due to drilling of oil wells,
 - c) Decommissioning of offshore structures,
 - d) Well abandonment procedure, and
 - e) Methods to control offshore spills.

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Total No. of Questions : 06]

[Total No. of Pages : 2

P1462

[4065]-32

M.E. (Civil) (Structures)

EARTHQUAKE RESISTANT DESIGN OF STRUCTURE

(2002 Course) (501507)

Time : 4 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Answer any two questions from each section.*
- 2) Answers to the two sections must be written in separate 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.*
- 7) Use of IS 1893-2002 (Part-1) is permitted.*

SECTION - I

- Q1)** a) What are the causes and types of earthquake? [7]
- b) What are the different major plates? Explain the Plate Tectonic Theory in details? [8]
- c) Describe the approaches used to measure the size of an earthquake?[10]
- Q2)** a) Explain in brief some of the earthquakes occurred in India? What lessons are learnt from them? [7]
- b) What are the criteria or demands of seismic resistant design of structures? Explain the code based methods of seismic design of an earthquake?[8]
- c) What is “Seismo-resistant Building Architecture?” Explain the major aspects involved to avoid adverse effects of architectural design on seismo-resistant building constructions? [10]

P.T.O.

- Q3)** A plan of five storey SMRF building for T.V. Centre is as shown in **figure 3.1**. The Dead Load including self weight of slab etc. Is 5 kN/m^2 and Live Load 4 kN/m^2 on each floor and 1.5 kN/m^2 on the roof. The building is situated in Zone IV. Assuming soil type II and storey height 3.5 m, determine lateral forces and shears at different storey levels. **[25]**

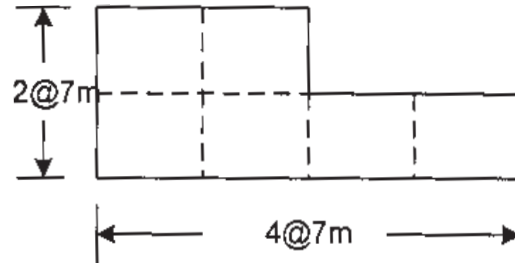


Figure 3.1

SECTION - II

- Q4)** a) What are the causes of instability of steel buildings? Discuss in detail the P- Δ Effect. **[10]**
b) Describe the procedure to carry out dynamic analysis to obtain the designed Seismic forces and its distribution along the height of multistory building. **[15]**
- Q5)** 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^2 , Type of soil - Rocky. **[25]**
- Q6)** a) How would you carry the assessment of RC building to ascertain the requirements and level of retrofitting? **[10]**
b) Describe with suitable sketches the various methods of retrofitting. **[15]**



Total No. of Questions : 06]

[Total No. of Pages : 2

P1529

[4065]-37

M.E. (Civil) (Structures)
STRUCTURAL DYNAMICS
(2002 Course) (501504)

Time : 4 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Answer any two questions from each section.*
- 2) Answers to the two sections must be written in separate 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) What are types of vibrations? Obtain general solution for Un-damped Forced SDOF system? Hence derive the equation for Dynamic Amplification Factor? **[7]**
- b) A vibrating system of SDOF consists of mass of 2kg and a spring of constant 20kN/cm. The system is viscously damped such that the ratio of any consecutive amplitudes is 1.00 : 0.90. Determine. **[8]**
- i) Natural Frequency
 - ii) Logarithmic Decrement
 - iii) Damping Factor
 - iv) Damping Coefficient
- c) Determine natural frequency and natural period of system consisting of a mass of 100kg attached to free end of a horizontal cantilever beam through a linear spring of constant 10kg/cm. The cantilever beam has thickness of 0.80 cm and width 1.2 cm. Take $E=2.1 \times 10^6 \text{kg/cm}^2$ and length of 70 cm. **[10]**
- Q2)** a) Derive the expression for logarithmic decrement ' δ ' in terms of damping ratio ' ζ '. **[9]**
- b) Obtain natural frequencies of the two storey shear frame having equal floor mass 'm' and stiffness of first storey half the second storey? **[16]**

P.T.O.

- Q3)** a) Illustrate how to obtain characteristic shapes and corresponding natural frequencies using matrix method in case of lumped mass multi-degree of freedom system? [10]
- b) Calculate the natural frequencies and mode shapes for a three storey building having equal floor masses and uniform stiffness of the columns. The building is of one bay only? [15]

SECTION - II

- Q4)** a) Explain Rayleigh's Method to determine frequency in fundamental mode of vibrations? [10]
- b) Obtain the equation of motion for the continuous system subjected to vibrations? Also obtain natural frequency of vibrations for uniform cantilever shear beam? [15]
- Q5)** a) Explain the concept of Shear Building. [10]
- b) Calculate normal frequency and mode shapes of a three storey building having masses as shown in figure4.1. The building consists of one bay only and EI for each column is $4.5 \times 10^6 \text{ N/m}^2$. [15]

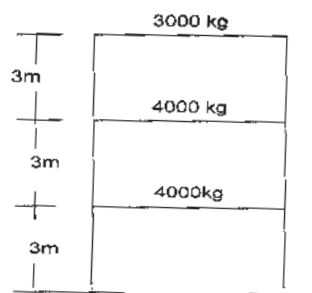


Fig.4.1

- Q6)** Write notes on : [25]
- Isolation of Vibrations
 - Orthogonality Relationship.
 - Wilson Theta Method.
 - Power Stodola Method.
 - Response of the system subjected to sudden constant force.



Total No. of Questions : 8]

[Total No. of Pages :2

P 1230

[4065] - 412

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

CONSTRUCTION CONTRACTS ADMINISTRATION & MGMT.

(2008 Course) (501108) (Sem. - II)

Time : 4 Hours]

[Max Marks : 100

Instructions to the candidates :

- 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) Define contract as per ICA 1872 and explain the various conditions necessary for the formation of a valid contract. **[1+8]**
- b) Compare and contrast between Lump Sum, Cost plus, and EPC contracts giving suitable examples. **[9]**
- Q2)** a) Draft various pre-qualifications necessary to execute a metro rail project of worth 2000 crores to be completed in 3 calendar years. Assume suitable additional data as required. **[8]**
- b) Discuss advantages and limitations of the e-tendering process with a case study. **[8]**
- Q3)** a) Explain the various types of the FIDIC document and state where each type is used. **[8]**
- b) Explain two bid system of tender submission in detail. **[8]**
- Q4)** Explain the following: **[16]**
- i) Causes for construction claims.
 - ii) Various types of advances given to contractor.
 - iii) Price escalation adjustment.
 - iv) Voidable and Void Contracts.

P.T.O.

SECTION-II

- Q5)** a) Explain “Breach of Contract” and its subsequent consequences as formulated in the ICA (1872) based on various sections. [9]
- b) Discuss “Institutionalised Arbitration” and explain its advantages over conventional arbitration. [6+3]
- Q6)** a) Explain the following types of dispute resolution mechanisms in brief:
- i) Mediation [2]
 - ii) Conciliation [2]
 - iii) Dispute adjudication board. [4]
- b) Explain (2AN–B) and concept of Evaluated Bid Price (EBP) with appropriate examples. [4+4]
- Q7)** With respect to the FIDIC New Red Book document, explain the provisions as regard: [16]
- i) Force Majeure
 - ii) Payment of Bills
 - iii) Defective work
 - iv) Liabilities of third parties
- Q8)** Explain the following:- [16]
- i) Particular conditions of contract.
 - ii) Mobilization and de-mobilization.
 - iii) Duties of Arbitrator.
 - iv) Extra Items and substituted items in a contract.

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Total No. of Questions : 6]

[Total No. of Pages :2

P 1649

[4065] - 42

M.E. (Civil-Structures)

HIGH RISE STRUCTURES

(2002 Course) (501510(a)) (Elective - II)

Time : 4 Hours]

[Max Marks : 100

Instructions to the candidates :

- 1) *Attempt any two questions from each section.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Assume suitable data, if necessary.*
- 6) *Use of cell phone is prohibited in the examination hall.*
- 7) *Use of electronic pocket calculator, latest I S codes and steel table is allowed.*

SECTION-I

Q1) Design a R C chimney for the following data: **[25]**

Height = 60 m

External diameter = 5.00 m

Wall thickness = 280 mm at top (linearly varying)

Safe bearing capacity of soil = 300 kN/m².

Q2) Design the suitable type of foundation for transmission tower. The foundation of leg member is subjected to the following loading. **[25]**

Type of load	Normal condition	Broken wire condition
Downward load	: 500 kN	600 kN
Upward load (Seismic/ wind)	: 400 kN	450 kN
Shear force	: 15 kN	25 kN
Moment in longitudinal dir ⁿ	: 25 kNm	50kNm
Moment in transverse dir ⁿ	: Nil	30 kNm

Q3) A 60 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) Describe the seismic behavior of various bracing system used in multistory buildings. [15]
- b) Members with variable second moment of area frequently used in tall building give the suitable reason. [10]
- Q5)** a) Compare the overall structural performance of shear walls, coupled shear and bracing in tall building with the earthquake excitations.[10]
- b) Explain with suitable sketches the effect of vertical settlement of foundation in tall building. [15]
- Q6)** A self supporting steel stack is 60 m high and its diameter at top is 3.0 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]

Total No. of Questions : 6]

[Total No. of Pages : 2

P1234

[4065]-445

M.E. (Civil / Hydraulics)

HYDROPOWER

(2008 Course) (501305(c)) (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 electronic pocket calculator is allowed.*
- 6) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) An upper middle class family has five rooms and the electricity consumption is as follows. Calculate monthly electricity bill in terms of units. **[8]**
- i) In each room, there are two lights (totaling 120 W and usage 4 hrs per day) and one fan of 50 W (usage 8 hrs per day).
 - ii) One refrigerator of 220 W and usage is 20 hrs per day.
 - iii) One AC of 1400 W and usage is 6 hrs per day.
 - iv) One geyser of 2000 W and usage is 1 hr per day.
 - v) One TV of 160 W and usage is 6 hrs par day.
 - vi) One mixer of 50 W and usage is 1 hr per day.
 - vii) One electric iron of 550 W and usage is 1 hr per day.
- b) State objectives of hydropower policy 1998 and briefly explain policy initiatives. **[4+8]**
- c) Comment on 'load duration curve'. **[5]**
- Q2)** a) State and explain various components of pumped storage power plant. **[10]**
- b) Write a note on hydro - thermal mix. **[5]**
- c) Explain advantages of hydroelectric power plants. **[10]**

P.T.O.

- Q3)** a) Explain principal components of a powerhouse. [12]
b) Write a short note on merits of underground powerhouse. [5]
c) Briefly explain any powerhouse you have visited. [8]

SECTION - II

- Q4)** a) Write a note on advantages and disadvantages of buried penstocks.[10]
b) State and explain possible cases wherein the penstock may burst. [5]
c) What is a surge tank? How it helps absorbing water hammer pressure?[10]
- Q5)** a) Determine minimum number of Francis turbines required for a power plant having 250 cumec flow and 25 m head. The generator is directly coupled to the turbine which has specific speed of 250 rpm, efficiency 85%. The frequency of generation is 50 cycles/s and number of poles used is 20. [8]
b) Explain theory of draft tube and its advantages. [10]
c) Describe governing of reaction turbine with neat sketch. [7]
- Q6)** a) Write a short note on objectives of micro hydro development. [15]
b) Briefly explain design aspects of micro hydro scheme. [10]



Total No. of Questions : 6]

[Total No. of Pages : 3

P1242

[4065]-460

M.E. (Civil - Structures)

ADVANCED DESIGN OF METAL STRUCTURES

(2008 Course) (501405(a)) (Elective - II)

Time : 4 Hours]

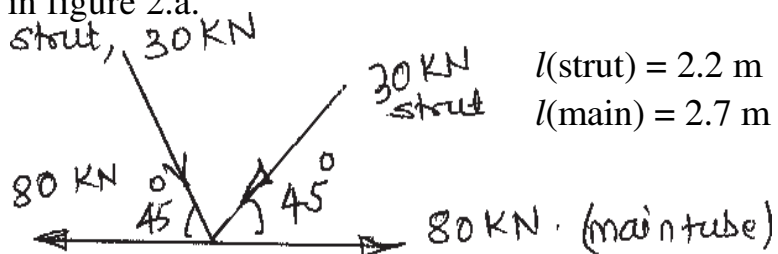
[Max. Marks : 100

Instructions to the candidates:

- 1) *Solve two questions from each Section.*
- 2) *Figures should be drawn if needed*
- 3) *Use of I.S. 800, 875, Tubular sections, Aluminium sections, light gauge section [801, 802, 806, 4014, 3908, 3909, 3921, 5384, 6445, 6476, 6475, 6449, 8147] is permitted.*
- 4) *Assume suitable data, if required.*
- 5) *Your paper will be assessed as whole.*

SECTION - I

- Q1)** a) Compare steel and aluminium structural sections, indicate advantages and disadvantages of aluminium sections. [6]
- b) Explain elastic behaviour of aluminium over steel. [4]
- c) Design using aluminium section the compression member to carry 250 kN of axial load. The effective length of member is 1.8m. Use usual factor of safety. [8]
- d) Find moment of resistance of ISALB 150 @ 12.1 kg/m, if used as simply supported beam loaded with udl. Over a span of 4.5 m. Beam is laterally constrained. [7]
- Q2)** a) Design the welded tube joint, where the two tubes meet at 45° with third tube as shown in figure 2.a. [20]



Design tube section and welded joint.

- b) Enlist the suitability of tubular structure; give suitable example. [5]

P.T.O.

- Q3)** A hoarding structure is to be designed, supported by two built up columns as back up structure.

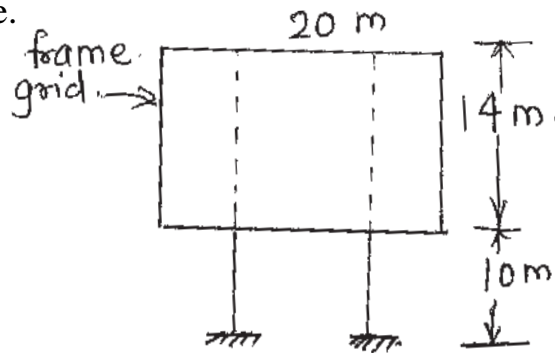


Fig 3

The frame grid can be assumed as members spaced at $2\text{m} \times 1\text{m}$ interval. Assume suitable weight for tube lights and other display accessories. Location of structure has basic wind speed 37 m/s .

- Suggest suitable structural scheme for hoarding structure with back up structure draw neat diagram showing arrangement. [8]
- Design grid member to cater for usual loads. [8]
- Find the design force for foundation bolts / anchors. [9]

SECTION - II

- Q4)**
- Explain utility of castellated beam with its advantages & disadvantages. [5]
 - Explain/derive with numerical calculation how moment of resistance is enhanced with castillation of rolled steel beam section. Use ISMB or ISHB of depth 500 mm to illustrate. Use hexagonal pattern for castillation with 200 mm as one of the side of hexagon span of beam 15 m. [15]
 - State expression for maximum bending stress in castellated beam. [5]
- Q5)**
- Draw schematic arrangements of structure used for transmission towers. State in which situation each type is used. [5]
 - Explain in details different loads considered while analysing transmission tower. [10]
 - Explain how tension in the cable is affected if it connects towers which are erected on different elevations. [5]
 - Explain effect of broken cables to be accounted while designing transmission tower. [5]

- Q6)** a) Design a column of length 2.7 m for axial load 500 kN. Using light gauge section use lipped channel section. [6]
- b) List advantages of light gauge steel sections. [4]
- c) Differentiate stiffened and unstiffened sections. [4]
- d) Design light gauge built up section for a beam of span 4.5m, loaded with 6.5 kN/m. udl. Use two lipped channel sections back to back. [11]



Total No. of Questions : 06]

[Total No. of Pages : 2

P1243

[4065]-461

M.E. (Civil) (Structures)

STRUCTURAL DESIGN OF STEEL BRIDGES

(2008 Course) (501405) (Elective - II)

Time : 4 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Explain the factors which govern in the selection of steel bridges. [9]
b) Explain with sketches, classification of steel bridges as per structural layout of the main load carrying element. [8]
c) Enlist the different methods for the erection of steel bridges. Explain any one in detail. [8]
- Q2)** A deck type plate girder railway bridge of span 24 m is to be provided for a single broad gauge track. The self-weight of stock rails and check rails are 0.65 and 0.45 kN/m respectively. The self-weight of sleeper is 3.25 kN/m. Design the cross section of the plate girder and the connections between flange plate and web plate. The EUDL for B.M. is 2280 kN, for S.F. is 2503 kN. The impact factor is 0.41. Draw neat design sketches. [25]
- Q3)** a) Explain the design procedure for truss girder railway bridges. [5]
b) A through type railway truss girder bridge consists of two Pratt trusses as shown in Fig. 3. The bridge supports an equivalent uniformly distributed live load 150 kN/m. The dead load transmitted to each truss inclusive of self-weight is 15 kN/m. Design the central top chord and bottom chord members using channel sections only. [20]

P.T.O.

Consider the impact factor as 0.15.

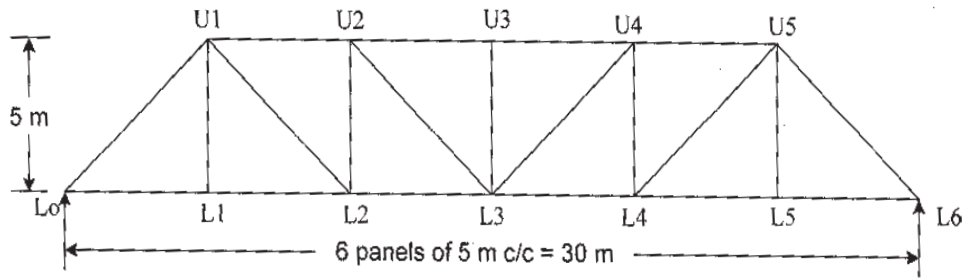


Fig. 3

SECTION - II

- Q4)** Design a deck type plate girder highway bridge for a span of 24 m. The bridge consists of two lanes with a reinforced concrete slab of 250 mm thick inclusive of the wearing coat. Two foot paths of 1.5 m are to be provided on either side of the carriage way. Design the plate girder for IRC class A loading shown in Fig. 4 and also sketch the details. [25]

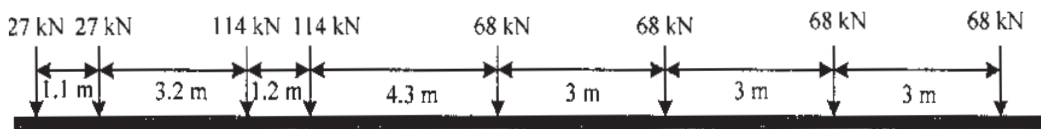


Fig. 4.

- Q5)** The effective span of through type truss girder highway two lane bridge is 24 m. The reinforced concrete slab is 250 mm thick inclusive of the wearing coat. Two foot paths are to be provided on either side of the carriage way. The highway bridge is to carry IRC class A loading. Suggest a suitable truss girder for the bridge. Design the central top chord and diagonal members of the central panel and sketch all the details. [25]
- Q6)** a) Explain the function of bearings in bridges. Sketch the different types of bearings. [5]
- b) The effective span of truss girder through type bridge for a single broad gauge track is 30 m. The reaction due to dead load, live load and impact load is 1200 kN. The vertical reaction due to wind is 200 kN. The tractive force is 981 kN and the braking force is 662 kN. Design a rocker bearing and sketch the details. [20]



Total No. of Questions : 6]

[Total No. of Pages :2

P 1244

[4065] - 464

M.E. (Civil) (Structures)

THEORY OF PLATES & SHELLS

(2008 Course) (501408) (Sem. - II)

Time : 4 Hours]

[Max Marks : 100

Instructions to the candidates :

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

SECTION-I

- Q1)** a) Explain clearly assumptions made in Classical Plate Theory (CPT) and hence derive displacement model of CPT. **[8]**
- b) Classical Plate Theory is applicable only for thin plates and not for thick plates. Write your comments. **[7]**
- c) Differentiate clearly difference between Navier's and Levi's solution in the analysis rectangular plates. **[10]**
- Q2)** a) A rectangular plate of length 1000 mm is simply supported on all sides and carries uniformly distributed load of intensity 30 N/mm². Determine maximum displacement and maximum stress in the plate. $E = 2 \times 10^5$ N/mm², $\nu = 0.30$. **[20]**
- b) Explain how the accuracy in the results of central displacement in the Navier's solution can be achieved and hence discuss convergence of result. **[5]**
- Q3)** Derive an expressions for transverse displacement, moments and shearing forces for edge simply supported circular plate subjected to uniform lateral loading. **[25]**

P.T.O.

SECTION-II

- Q4)** a) Derive equations of equilibrium for thin shells with neat diagram of geometry and stress resultants. [18]
b) Explain Membrane Theory for shells. [7]
- Q5)** a) Determine N_ϕ , N_θ forces for a spherical dome of constant thickness under its own weight. [15]
b) Explain Lundgren's beam theory for cylindrical shells. [10]
- Q6)** a) Derive equations of equilibrium for cylindrical shells. [15]
b) Determine N_x , N_θ and $N_{x\theta}$ forces for a horizontal circular cylindrical shell filled with liquid and supported at ends. [10]

⌘⌘⌘

Total No. of Questions : 8]

[Total No. of Pages :2

P 1626

[4065] - 481

M.E. (Civil) (Environmental Engg.)

OCCUPATIONAL SAFETY & HEALTH

(2010 Course) (501505(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) *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 important provisions made in Occupational Safety and health Act. [8]
b) Comment in detail on occupational safety and health administration. [8]
- Q2)** a) What are the measures for preventing ergonomics hazards? Explain. [8]
b) Explain ergonomics program. [8]
- Q3)** a) Explain human error and fault tree analysis. [8]
b) How to control hazards in Chemical industry. [8]
- Q4)** Write short notes on following: [18]
a) Hazard analysis
b) Task analysis
c) Needs of ergonomics

SECTION-II

- Q5)** a) What measures are required for the prevention and protections of the fire? Explain. [8]
b) Explain fire development and its severity. [8]

P.T.O.

- Q6)** a) Comment on occupational health. Explain requirement of safety consideration to maintain health. [8]
b) Explain different methods to control accidents at working place. [8]
- Q7)** a) What are the health problems in textile industries? [8]
b) Which occupational health and safety considerations are required in waste water treatment plants? Explain. [8]
- Q8)** Write short notes on following: [18]
a) Extinguishing fire.
b) Personal safety equipments.
c) Investigation methods to control accidents.

Total No. of Questions : 10]

[Total No. of Pages : 2

P1248

[4065]-484

M.E. (Civil) (Environmental Engg.)
INDUSTRIAL WASTE WATER MANAGEMENT
(2010 Course) (501508) (Sem. - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Answer any three questions from each section.*
- 2) Answers to the two sections should be written in separate answer books.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Figures to the right indicate full marks.*
- 5) 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 effects of industrial effluents on sewers and treatment plants?[8]
b) What are organic, chemical and biological characteristics of wastewater?[8]
- Q2)** a) Explain waste reduction and volume Reduction techniques. [8]
b) Explain neutralization and proportioning. [8]
- Q3)** a) State methods of removal of phosphorous from industrial wastewater and explain any one. [8]
b) State methods of removal of nitrogen from industrial wastewater and explain any one. [8]
- Q4)** a) Explain any one method of removal of heavy metal from wastewater.[8]
b) What is the necessity of treatment of industrial effluent? Explain grab and composite sampling. [8]

P.T.O.

- Q5)** Write short notes on the following (any Three): **[18]**
- a) Absorption and adsorption.
 - b) Equalization.
 - c) Air stripping.
 - d) Membrane Separation Process.

SECTION - II

- Q6)** a) Explain the manufacturing process of Textile industry. **[8]**
b) Draw a flow diagram of manufacturing process of Paper and Pulp industry. State the sources of wastewater generated from the manufacturing process of paper and pulp industry. **[8]**
- Q7)** a) Draw a flow diagram for treating wastewater of sugar and steel industry. **[8]**
b) What are the characteristics of Petroleum refineries and Tanneries? State the disposal methods of industrial treated waste water. **[8]**
- Q8)** a) Comment in detail on location and need of CETP? **[8]**
b) What are the applications of each treatment unit used for CETP? What are the Operation & Maintenance Problems of CETP? **[8]**
- Q9)** a) What is a necessity of Common Effluent Treatment Plant (CETP)? Enlist treatment units used for CETP. **[8]**
b) Which are the wastes generated from manufacturing process of distillery industry? Draw a flow diagram for treating wastewater of distillery. **[8]**
- Q10)** Write short notes on the following (any Three): **[18]**
- a) Trickling Filter.
 - b) Characteristics of dairy unit.
 - c) Treatability Index.
 - d) Disposal of effluent.



Total No. of Questions : 8]

[Total No. of Pages :3

P 1472

[4065] - 491

M.E. (Mechanical-Heat Power)

NUMERICAL METHODS IN THERMAL AND FLUID ENGINEERING

(2008 Course) (502101) (Sem. - I)

Time : 3 Hours]

[Max Marks : 100

Instructions to candidates :

- 1) Answer 3 Questions from each section.
- 2) Assume suitable data, if required.
- 3) Figures to the right (in square brackets) indicates full marks.
- 4) Use of a calculator is allowed.

SECTION-I

Q1) Consider the function.

$$f(x, y) = \frac{1}{x^2 + y^2}$$

Evaluate the double integral.

$$\iint_2^3 f(x, y) dx dy$$

Using

- a) Trapezoidal Rule with $\delta_x = \delta_y = 0.5$ [5]
- b) Trapezoidal Rule with $\delta_x = \delta_y = 0.25$ [12]

Q2) 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 corresponding to a specific heat of 1.1 and 1.2 kJ/kg k. [16]

Q3) Curve fitting by using Least Square

A metal sphere of 25 mm diameter initially at 325 is immersed in an oil bath at 0°C. The table below gives measurement of sphere temperature Vs time.

Temp.(°C) (y)	325	150	65	30	18	5	2
Time (Sec.) (x)	0	1	2	3	4	5	6

Using least Square Technique fit curve. $y = ae^{bx}$ [16]

P.T.O.

Q4) Consider one dimensional transient conduction in a rod of 1m length, given by

$$\frac{\partial T}{\partial t} = \alpha \frac{\partial^2 T}{\partial x^2}$$

The boundary and initial conditions are

- $T = 50$ at $t = 0$ (initial condition)
- $T = 0$ at $x = 0$ (boundary condition)
- $T = 100$ at $x = 1$. (boundary condition)

Choose $\delta_x = 0.25\text{m}$ and $\delta_t = 0.02\text{s}$. Take $\alpha = 1\text{m}^2/\text{s}$.

- a) Using the explicit method, advance by two time steps and determine the temperature field at $t = 0.04\text{s}$. [12]
- b) Form the equations for the semi-implicit scheme for one time step. The solution is not required. [5]

SECTION-II

Q5) Solve the system [16]

$$3x_1 + 2x_2 + x_3 = 10$$

$$2x_1 + 3x_2 + 2x_3 = 14$$

$$x_1 + 2x_2 + 3x_3 = 14$$

By using LU decomposition method.

Q6) Consider the matrix A given by

$$A = \begin{pmatrix} 3 & 2 & 1 \\ 2 & 3 & 2 \\ 1 & 2 & 3 \end{pmatrix} \quad \text{and} \quad b = \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}$$

- a) Determine the maximum eigen values using the Power method. [6]
- b) Determine the minimum eigen value using the Power method. [11]

Q7) Consider the equation $\frac{d^2 x}{dt^2} + 4x \frac{dx}{dt} + (x+6) \sin \omega t = 0$

With initial condition $\frac{dx}{dt} = 4$ and $x = 6$ at $t = 0$ and $\omega = 180$

- a) Decompose the equation into 2 first order equations. [2]
b) Integrate using Forward Euler with step size [15]
 $\partial t = 0.2$ from $t = 0$ till $t = 1$

Q8) Solve following equation over square domain
 $0 \leq x \leq 3$ and $0 \leq y \leq 3$ with $u = 0$ on boundary and $h = 1$.

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

- a) Form the equation at the nodes. [8]
b) Carry out 4 cycles of iteration, using the relaxation method. [8]

Total No. of Questions : 8]

[Total No. of Pages : 4

P1255

[4065]-501

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

ADVANCED GAS DYNAMICS

(502105 (d)) (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 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.*
- 5) Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Write notes on: **[8]**
- i) Control volume approach.
 - ii) Reynolds transport theorem.
- b) Derive the relations for stagnation & static temperature and pressure ratio in terms of Mach no, (M) and specific heat ratio (γ). **[8]**
- Q2)** a) Explain: **[6]**
- i) Sonic velocity and Mach No.
 - ii) Mach angle and Mach cone.
- b) Discuss the effect of area variation in a duct for a compressible flow with suitable diagram and equations. **[10]**
- Q3)** a) A supersonic plane moves with a Mach number of 2.2 at an elevation of 1000 m above a certain point F. If the atmospheric temperature is 22°C, what is the time lapse at which the sonic boom reaches an observer at F after the plane is directly overhead? How far will the plane be from F at that instant of the boom reaching F? **[8]**

P.T.O.

- b) A tank containing air at a pressure of 250 kpa (abs) and 35°C is discharging it through a convergent nozzle. If the velocity of flow at the nozzle throat is 200 m/ see, calculate the Mach no. At that section. [8]

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

- Thrust function.
- Nozzle performance.
- Supersonic wind tunnel.
- Real Nozzles and diffusers.

SECTION - II

Q5) a) Explain the strength of a shock wave with a suitable enthalpy-entropy chart. [6]

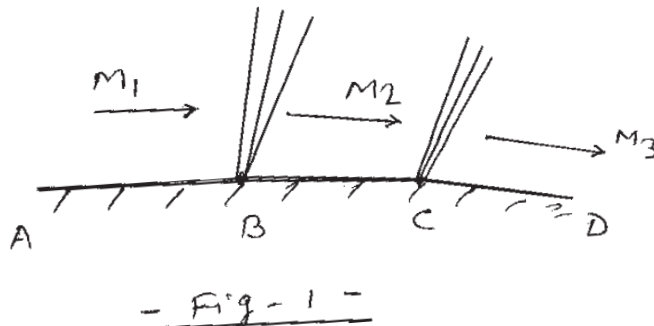
- b) Just downstream of a normal shock in air the pressure, temperature and velocity are 250 kpa (abs), 100°C and 180 m/s respectively. Calculate the pressure, temperature and velocity prior to the shock wave.

Take $\gamma = 1.4$ and $R = 287 \text{ J/kg-k}$. [10]

Q6) a) Write notes on: [8]

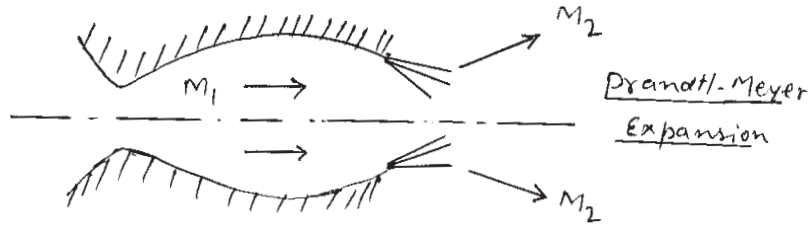
- Mach reflection.
- Detached shocks.

- b) A uniform supersonic flow at $M_1 = 2.0$, $P_1 = 0.8 \text{ bar}$ and temperature 270 k expands through two convex corners of 10° each as shown in fig-1. Determine the downstream Mach number M_3 , P_2 , T_2 . you may use the tables given at the end. [8]



Q7) a) Discuss prandtl-Meyer flow and prandtl-Meyer function. [8]

- b) The under expanded, two dimensional nozzle shown in fig-2, exhausts into an atmosphere with 1 bar pressure. For uniform flow at the nozzle exit with 2 bar pressure and $M = 2.2$, determine the Mach number and flow direction after the initial expansion. [8]



- Fig - 2 -

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

- $\theta - \beta - M$ relation.
- Thermal choking due to heating.
- Semi perfect gas behaviour.
- Fanno-flow and Rayleigh flow.
- Friction choking.

TABLE A1 Isentropic Flow of Perfect Gas ($\gamma = 1.4$)

M	p/p_0	T/T_0	ρ/ρ_0	A/A^*	a/a_0	M^*	μ	v
1.93	0.1425	0.5731	0.2486	1.593	0.7570	1.6005	31.207	24.432
1.94	0.1403	0.5705	0.2459	1.606	0.7553	1.6052	31.028	24.712
1.95	0.1381	0.5680	0.2432	1.619	0.7537	1.6099	30.852	24.992
1.96	0.1360	0.5655	0.2405	1.633	0.7520	1.6146	30.677	25.271
1.97	0.1339	0.5630	0.2378	1.646	0.7503	1.6192	30.505	25.549
1.98	0.1318	0.5605	0.2352	1.660	0.7487	1.6239	30.335	25.827
1.99	0.1298	0.5580	0.2326	1.674	0.7470	1.6284	30.166	26.104
2.00	0.1278	0.5556	0.2300	1.688	0.7454	1.6330	30.000	26.380
2.15	0.1011	0.5196	0.1946	1.919	0.7208	1.6977	27.718	30.425
2.16	0.0996	0.5173	0.1925	1.935	0.7192	1.7018	27.578	30.688
2.17	0.0980	0.5150	0.1903	1.953	0.7176	1.7059	27.441	30.951
2.18	0.0965	0.5127	0.1882	1.970	0.7160	1.7099	27.304	31.212
2.19	0.0950	0.5104	0.1861	1.987	0.7144	1.7139	27.169	31.473
2.20	0.0935	0.5081	0.1841	2.005	0.7128	1.7179	27.036	31.732
2.35	0.0740	0.4752	0.1556	2.295	0.6893	1.7745	25.184	35.526
2.36	0.0728	0.4731	0.1539	2.316	0.6878	1.7781	25.070	35.771
2.37	0.0717	0.4709	0.1522	2.338	0.6863	1.7817	24.957	36.017
2.38	0.0706	0.4688	0.1505	2.359	0.6847	1.7852	24.845	36.261
2.39	0.0695	0.4668	0.1488	2.381	0.6832	1.7887	24.734	36.504
2.40	0.0684	0.4647	0.1472	2.403	0.6817	1.7922	24.624	36.747
2.61	0.0493	0.4233	0.1166	2.923	0.6506	1.8602	22.528	41.639
2.62	0.0486	0.4214	0.1153	2.951	0.6492	1.8632	22.438	41.863
2.63	0.0478	0.4196	0.1140	2.979	0.6477	1.8662	22.348	42.086
2.64	0.0471	0.4177	0.1128	3.007	0.6463	1.8691	22.259	42.307
2.65	0.0464	0.4159	0.1115	3.036	0.6449	1.8721	22.170	42.529
2.66	0.0457	0.4141	0.1103	3.065	0.6435	1.8750	22.082	42.740
2.81	0.0363	0.3877	0.0936	3.534	0.6227	1.9167	20.847	45.954
2.82	0.0357	0.3860	0.0926	3.567	0.6213	1.9193	20.770	46.161
2.83	0.0352	0.3844	0.0916	3.601	0.6200	1.9219	20.693	46.368
2.84	0.0347	0.3827	0.0906	3.636	0.6186	1.9246	20.617	46.573
2.85	0.0341	0.3810	0.0896	3.671	0.6173	1.9271	20.541	46.778
2.86	0.0336	0.3794	0.0886	3.706	0.6159	1.9297	20.466	46.982
2.87	0.0331	0.3777	0.0877	3.741	0.6146	1.9323	20.391	47.185
2.88	0.0326	0.3761	0.0867	3.777	0.6133	1.9348	20.318	47.388
2.89	0.0321	0.3745	0.0858	3.813	0.6119	1.9373	20.244	47.589
2.90	0.0317	0.3729	0.0849	3.850	0.6106	1.9398	20.171	47.790



Total No. of Questions : 08]

[Total No. of Pages : 2

P1504

[4065]-51

**M.E. (Mechanical) (Heat Power)
ENERGY CONSERVATION AND MANAGEMENT
(2002 Course) (502108)**

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Answer any three questions from each section.*
- 2) Answers of two sections should be written in separate answer books.*
- 3) Neat diagram must be drawn wherever necessary.*
- 4) Figures to the right indicate full marks.*
- 5) Use of calculator Log tables and electronic calculator is allowed.*

SECTION - I

- Q1)** a) List down the objectives of the Energy Management. [8]
b) What is the significance of energy conservation act 2003? What are the various steps in implementation of the energy management in an organization. [8]
- Q2)** a) Explain the role of training and awareness in energy management program. [8]
b) What are the benefits of benchmarking the energy consumption? [8]
- Q3)** a) With the help of example explain payback period and life cycle costing.[8]
b) Write in short the steps involved in energy audit of refrigeration system.[8]
- Q4)** Write a short note on (Any three) : [18]
a) Sources of world Energy.
b) Energy audit of steam power plant.
c) Energy analysis of Refrigeration system.
d) Energy audit (Types and Methodology).
e) Instruments used in energy audit.

P.T.O.

SECTION - II

- Q5)** Explain any three of the following : **[18]**
- a) Energy efficient lighting.
 - b) Silent features of Electricity act 2001.
 - c) Importance of performance monitoring.
 - d) Automatic power factor controller.
- Q6)** a) Write notes on (any two) : **[8]**
- i) Lighting levels in various applications.
 - ii) Efficient options in lighting system.
 - iii) Energy efficient windows.
- b) Find the simple pay- back period required when Rs 10000/- is required to invest for replacing 20 incandescent lamps (40 W) by 9W CFLs (20 nos.) producing same lumen output. Assume 10 hrs of operations per day and electric charge of Rs 4/- per kWh. **[8]**
- Q7)** a) List the factors affecting on energy efficiency of electric motors. Explain the speed control of an electric motors. **[8]**
- b) Explain the energy conservation opportunities in furnaces. **[8]**
- Q8)** a) Explain in brief four types of topping cycle cogeneration systems. **[8]**
- b) List the advantages and limitations of cogeneration in steam power plant and diesel generating sets. **[8]**



M.E. (Mechanical) (Design Engineering)
ANALYSIS AND SYNTHESIS OF MECHANISMS
(2008 Course) (502210) (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 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.
- 7) Solve Graphical Problems on Drawing sheets.

SECTION-I

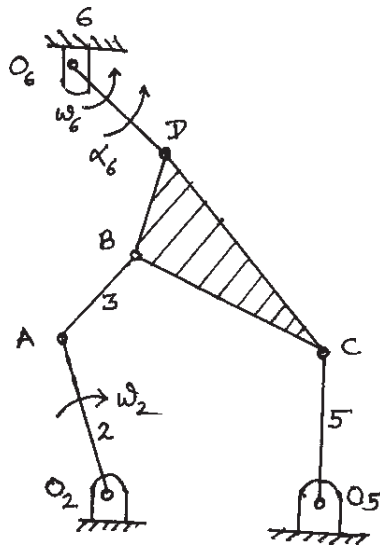
- Q1)** a) What do you mean by degree of freedom of a kinematic pair? How are pairs classified? Give examples. [8]
 b) What is kutzbach's criterion for degree of freedom of plane mechanisms? In what way Gruebler's criterion is different from. it?[8]

- Q2)** In the mechanism shown in fig. 1 $\omega_2 = 10 \text{ rad/s}$ (cw) constant. Determine ω_6 and α_6 using method of normal acceleration.

Given: $O_2A = 7.5\text{cm}$, $AB = 5\text{cm}$, $BC = 7.5\text{cm}$ $O_5C = 6.25\text{cm}$ (and is vertical), $CD = 10\text{cm}$, $BD = 5\text{cm}$, $O_6D = 5\text{cm}$.

$$\angle O_2AB = 110^\circ, \quad \angle ABC = 115^\circ, \quad \angle O_6DB = 117^\circ.$$

[16]



- Q3)** a) Explain the dynamics of mechanism with elastic links.. [8]
 b) Derive the Euler-savary equation. [8]
- Q4)** a) Explain the force analysis of a four bar slider-crank linkage. [8]
 b) Explain fixed centrode and moving centrode with a suitable example.[8]
- Q5)** Write short notes on any 3:- [18]
 a) Inflection circle
 b) Cubic of stationary curvature
 c) Analysis of mechanism by matrix method.
 d) Bobillier constructions.

SECTION-II

- Q6)** a) Design a four link mechanism when the motion of the input and the output links are governed by a function $y=x^2$ and x varies from 0 to 2 with an interval of 1. Assume θ to vary from 50° to 150° and ϕ from 80° to 160° . Use graphical method. [10]
 b) What is the pole of a coupler link of four link mechanism? Enumerate its properties. What is relative pole? [6]
- Q7)** a) Determine the lengths of the links of a four bar linkage to generate $y=\log_{10}x$ in the interval $1 \leq x \leq 10$. The length of the smallest link is 5cm. Use three accuracy points with chebychev's spacing. Use analytical method. [10]
 b) Explain cusp and crunode. [6]
- Q8)** a) Write a short note on branch and order defects. [8]
 b) Explain the term cognate and Roberts-chebychev theorem. [8]
- Q9)** a) Explain the Denavit-Hartenberg parameters for the Hooke, or cardan, universal joint with a neat sketch. [8]
 b) Explain the matrix method of analysis or spatial mechanisms. [8]
- Q10)** Write short notes on any 3:- [18]
 a) Bermester points.
 b) Center point and circle point circles.
 c) Synthesis of dwell mechanisms.
 d) Type synthesis and order synthesis.

Total No. of Questions : 8]

[Total No. of Pages :2

P 1517

[4065] - 540

M.E. (Mechanical) (Mechatronics)

DRIVES AND ACTUATORS

(2008 Course) (502810) (Sem. - II)

Time : 3 Hours]

[Max Marks : 100

Instructions to candidates :

- 1) *Answers to the two sections must be written on separate answer papers.*
- 2) *Figures to the right indicates full marks.*

SECTION-I

- Q1)** a) Explain any four types of thyristors. [8]
b) Describe the following ratings of SCR, [8]
i) Surge current rating
ii) i^2t rating
iii) di/dt rating
iv) dv/dt rating
- Q2)** a) Explain how speed of DC motor is controlled using converters. [8]
b) Explain with neat sketch, the four quadrant chopper for variable speed drive of a dc motor. [8]
- Q3)** a) Compare Diaphragm actuators and piston actuators. [8]
b) Describe in brief Hall resolver and pulse coder. [8]
- Q4)** Write any three short notes on: [18]
a) Four quadrant choppers
b) Synchronous motor
c) Output characteristics of n-channel MOSFET.
d) Cyclo-converters

SECTION-II

- Q5)** a) Discuss with one application, types of mechanical valves. [8]
b) What are gear boxes? How many types of gear boxes are used in final control? Discuss any one application of each type of gear box. [8]

P.T.O.

- Q6)** a) Compare Electric Motors and Hydraulic Motors as drives in final control elements. [8]
b) Enlist the advantages, limitations and applications of Hydraulic Systems and Pneumatic Systems. [8]
- Q7)** a) Explain chain boxes used in mobile cranes. [8]
b) Explain selection criterion of butterfly valves and ball valves. [8]
- Q8)** Write short note: [18]
a) Stepper motor
b) Four quadrant choppers
c) Induction motor used as drives.

Total No. of Questions : 8]

[Total No. of Pages :2

P 1558

[4065] - 563

M.E. (Mechanical) (Automotive Engineering)

AUTOMOTIVE CHASSIS DESIGN

(2008 Course) (502310) (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 answer books.*
- 3) *Neat diagrams should be drawn wherever necessary.*
- 4) *Assume suitable data, if required, but state the assumptions clearly.*
- 5) *Figures to the right indicate full marks.*
- 6) *Use of calculator is allowed.*

SECTION-I

- Q1)** a) What is the purpose of independent suspension system? How is it achieved in front and rear axel? [8]
- b) A helical compression spring is to be designed to absorb the shocks. The initial compression of spring is 30 mm and it is further compressed by 50mm while absorbing the shocks The spring is to absorb 250 J of energy during the process. The spring index can be taken as 6. The spring is made of patented and cold drawn steel wire with an ultimate tensile strength of 1500 N/mm² and modulus of rigidity of 81370 N/mm². The permissible shear stress for the spring wire should be taken as 30% of ultimate tensile strength. Calculate [8]
- i) Spring stiffness
 - ii) Wire diameter
 - iii) Mean coil diameter
 - iv) Number of active turns
- Q2)** a) What is true rolling? What is the condition to be satisfied by all types of steering mechanism for true rolling of a vehicle? [8]
- b) Compare manual steering with power assisted steering. Describe hydraulic power steering system with neat diagram. [8]
- Q3)** a) Explain the function and working of steering gear box mechanism with neat sketch. Name its components. [8]
- b) With the help of neat diagram explain the working and construction of disc brake. [8]

P.T.O.

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

- a) Mc pherson strut system
- b) Steering characteristics
- c) Hydraulic braking system
- d) Air spring

SECTION-II

Q5) a) Differentiate between reversible and irreversible steering. **[4]**

b) Give the construction of brake lining. How are they fixed to the brake shoes? **[6]**

c) Justify the need of variable rate spring for heavy duty commercial vehicle. Explain the salient features of variable rate leaf spring. **[6]**

Q6) a) Explain the parameters on which the tread wear fatigue life and road grip depend. **[6]**

b) What is run flat concept? What are the design features of run flat tyre? **[10]**

Q7) a) With the help of neat sketch explain suspension of rigid six wheelers. **[8]**

b) Explain spring stresses in rigid six wheelers. **[8]**

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

- a) Scammell articulated trailer
- b) Aspect ratio
- c) Active suspension
- d) Tread design



Total No. of Questions : 6]

[Total No. of Pages :2

P 1278

[4065] - 583

M.E. (Electrical) (Power Systems)

**POWER SECTOR ECONOMICS, MANAGEMENT AND RESTRUCTURING
(2008 Course) (503202) (Sem. -I)**

Time : 3 Hours]

[Max Marks : 100

Instructions to the candidates :

- 1) *Answer any two questions from each section.*
- 2) *Answers to the Two sections should be written in separate answer 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) What are the reasons for initiating the idea of deregulation in power sector? [8]
- b) Explain the regulatory process in India. Also discuss 'Rate of Return' regulation [8]
- c) With reference to tariff setting, how following points are considered.
- i) Fuel cost adjustments
 - ii) Subsidy
 - iii) Regulator asset and liabilities. [9]
- Q2)** a) What are different key performance indices used for assessment of performance of an utility? [8]
- b) Calculate life cycle costs (NPV) for the projects having initial investment of Rs. 100000/- each. The cash flow streams are given below.

Year	Project 1 cash flow in Rs.	Project 2 cash flow in Rs.
1	50000	20000
2	30000	20000
3	20000	20000
4	10000	40000
5	10000	50000
6	—	60000

Take discounting factor as 12%. Compare two projects for their economic viability. [9]

P.T.O.

- c) Explain effect of renewable energy on tariff. Also state factors to be considered for renewable energy tariff. [8]

- Q3)** a) What are different tariff setting principles? How tariff is linked with quality of supply? [9]
b) What are the challenges before Indian power sector undergoing reforms. [8]
c) Explain in detail performance based regulation and price cap regulation. [8]

SECTION-II

- Q4)** a) Explain forward and future contracts. [8]
b) Discuss features of deregulated power industry in UK. [8]
c) What are ancillary services? How these are acquired? [9]

- Q5)** a) Explain power system models used in energy trading. [8]
b) Discuss following: [9]
i) Zonal pricing
ii) Market clearing price.
iii) Non price issues in regulation.
c) What is congestion? How it can be managed? [8]

- Q6)** a) Explain methods of transmission pricing. [8]
b) Write notes on: [8]
i) Spot pricing
ii) Real-time pricing.
c) What are the responsibilities of ISO? Also explain option and contract for differences. [9]

Total No. of Questions : 6]

[Total No. of Pages :1

P 1289

[4065] - 598

M.E. (Electrical) (Power Electronics and Drives)

ENERGY MANAGEMENT AND POWER QUALITY IN ELECTRICAL DRIVES

(2008 Course) (503302) (Sem. -I)

Time : 3 Hours]

[Max Marks : 100

Instructions to 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) *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) Explain loss model optimal control of induction motor. [15]
b) Explain VFD controlled operation of fans and pumps. [10]
- Q2)** a) Which are different power quality issues present? [15]
b) Give capacitor size and location fixation criteria and cause of power losses. [10]
- Q3)** a) Explain factors affecting energy efficiency of refrigeration system.[15]
b) Explain cogeneration and its types and need. [10]

SECTION-II

- Q4)** a) Explain the term harmonics and corrective measures to be applied.[15]
b) Classify different power system disturbances in detail. [10]
- Q5)** a) What are different sources of harmonics? [10]
b) Explain various transformer connections for improving power quality.[15]
- Q6)** a) Explain series type Active power filter and reference signal generation. [15]
b) Explain different Power quality reliability indices. [10]

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Total No. of Questions : 6]

[Total No. of Pages :2

P 1611

[4065] - 608

M.E. (E&TC) (Microwave)

**APPLICATIONS OF MICROWAVES TO RADAR AND SATELLITE
(2008 Course) (504224 (a)) (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 answer books.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary.*

SECTION-I

- Q1)** a) Derive the RADAR range equation considering all the Losses. [10]
- b) RADAR is fit with an antenna and it has a radius of 0.5m. It has bandwidth of 0.5MHz while operating at a frequency of 8GHz. The radar cross section is 5m^2 at a maximum distance of 12km. Find peak transmitter power if the noise figure is 4.77dB. [10]
- c) Radar operates at 10GHz and peak power of 500kW. Its minimum receivable power is 0.1pW. Its antenna has a capture area of 5.0sqm and the radar cross section of the target is 20sqm. Find the maximum range of the radar. [5]
- Q2)** a) Explain the concept of Synthetic Aperture RADAR (SAR) with illustrations, block diagrams and its application. Also discuss the recent trends in SAR. [8]
- b) Explain the concept of Real Imaging RADAR with illustrations, block diagrams and its application. [7]
- c) What is RCS and how it is estimated? Explain with all relevant expressions? [10]
- Q3)** a) Explain the evolution of satellite communication systems. [5]
- b) Explain with relevant block diagrams the satellite subsystems: Telemetry, tracking, command, Power subsystems. [15]
- c) State and explain the Kepler's Laws of orbital motion. [5]

P.T.O.

SECTION-II

Q4) Suppose we have 4-GHz receiver with the following gains and noise temperature. **[25]**

$$T_{in} = 25^{\circ}\text{K}, T_{RF} = 50^{\circ}\text{K}, T_{IF} = 1000^{\circ}\text{K}, T_{in} = 25^{\circ}\text{K}, G_{RF} = 23\text{dB}, G_{IF} = 30\text{dB}$$

- a) Calculate the system noise temperature assuming that the mixer has a gain $G_{in} = 0\text{dB}$.
 - b) Recalculate the system noise temperature when the mixer has a 10dB loss.
 - c) How can the noise temperature of the receiver be minimized when the mixer has a loss of 10dB?
 - d) Suppose the system has an LNA with a gain of 50dB. A section of lossy waveguide with an attenuation of 2dB is inserted between the antenna and the RF amplifier. Find the new system noise temperature for a waveguide temperature of 300K.
- Q5)** a) Explain the power budget analysis in satellite link with suitable mathematical expressions. **[8]**
- b) A satellite at a distance of 6000km from a pilot on the earth's surface radiates a power of 3W from an antenna with a gain of 18dB in the direction of the observer. Find the flux density at the receiving point and the power received by antenna with effective area of 10m^2 . The satellite operates at a frequency of 10GHz. The receiving antenna has a gain of 50dB. Find the received power. **[10]**
- c) What is G/T ratio and explain its significance in satellite communications. **[7]**
- Q6)** Explain the following multiple access techniques in detail giving illustrations, applications, standards relevance to satellite communications. **[25]**
- a) FDMA
 - b) TDMA
 - c) SS-TDMA



Total No. of Questions : 08]

[Total No. of Pages : 2

P1612

[4065]-630

M.E. (E & TC) (VLSI & Embedded Systems)

MACHINE INTELLIGENCE

(2008 Course) (504184 (C)) (Elective - I)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) What is meant by topology of ANN? Give few basic topological structures of ANN? [4]
b) What is distinction between learning equation and learning law? Compare LMS, Perceptron and delta learning Laws. [8]
c) What is pseudo, inverse of a matrix. [4]
- Q2)** a) What are limitation of simple peceptrons? [4]
b) Explain the following :
i) Eigen values ii) Eigen vectors [4]
c) Derive the expression for δ_j & δ_K used by the MLP algorithm. [8]
- Q3)** a) Does the dot product of two vectors measures their closeness? Explain with illustrations. [8]
b) Draw and explain the Adaptive Neuro-Fuzzy Interface system (ANFIS) architecture for sugeno fuzzy model. Where weight normalization is performed at very last layer. [8]
- Q4)** Write short notes on (any three): [18]
a) LVQ
b) Hopfield networks.
c) Radial basis function networks.
d) Data clustering Algorithms.

P.T.O.

SECTION - II

- Q5)** a) Define membership function. List various methods employed for the membership value assignment. Explain in detail the inference method adopted for assigning membership values. [8]
- b) What are the role of α - cuts & strong α -cuts in fuzzy set theory. What is the difference between them? [8]
- Q6)** a) Let $D = \left\{ \frac{1}{0} + \frac{0.7}{1} + \frac{0.3}{2} \right\}$
- $$M = \left\{ \frac{0.5}{20} + \frac{1}{30} + \frac{0.6}{40} \right\} : F = \left\{ \frac{0.7}{20} + \frac{0.9}{30} + \frac{0.4}{40} \right\}$$
- Find
- i) $R = DXM$
- ii) For using max-min composition
- iii) For using max-product composition. [8]
- b) What is Fuzzy reasoning? Discuss in detail the fuzzy reasoning in multiple rules with multiple antecedents. [8]
- Q7)** a) What are problems occurring in determining the mathematical model for an unknown system by observing input. Output data pairs? How the parameter identification is being carried out in system Identification. [8]
- b) What is mean by genetic algorithm? Explain in detail about the various operators involved in genetic algorithm? [8]
- Q8)** Write short notes on (any three) [18]
- a) Fuzzy filtered neural networks
- b) Derivative based optimization
- c) Data clustering algorithm
- d) Defuzzification Methods.



Total No. of Questions : 8]

[Total No. of Pages : 2

P1650

[4065]-641

M.E. (E & T/C) (VLSI & Embedded Systems)

SYSTEM ON CHIP

(2008 Course) (504192) (Elective - IV)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Question N.o 1& 5 are Compulsory. Out of the remaining attempt 2 questions from Section- I and 2 questions from Section- II.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Use of electronic pocket calculator is allowed.*
- 5) *Assume suitable data, if necessary.*
- 6) *For metal-1 : $C_{metal-1, plate} = 0.04fF/\mu m^2$, $C_{metal-1, fringe} = 0.09fF/\mu m$.*

SECTION - I

- Q1)** a) What are the advantages of system on chip over digital circuits built from discrete components? How these advantages are translated into advantages at the system level? [4]
- b) How the cascaded inverters are used to drive a large capacitive load to a gate? [4]
- c) What are the types of simulators used for combinational logic design? Explain any one simulation type in brief. [4]
- d) Compare and contrast: Routing channel Vs feedthrough channel. [4]
- Q2)** a) Explain in brief CMOS fabrication process. [8]
- b) What is wire parasitic? What are the various parasitic elements? How to measure parasitic elements? Explain the same for any one element in brief. [8]
- Q3)** a) What is the use of sleep transistor in MTCMOS? Explain in detail MTCMOS and VTCMOS using logic diagram. [8]
- b) Plot Elmore delay for metal-1 wire size $2000 \lambda \times 3\lambda$ using: [8]
- i) 2-Sections
 - ii) 4-Sections
 - iii) 8-Sections
- Comment on result.

P.T.O.

- Q4)** Write short notes on (any three): **[18]**
- Hierarchy of Design Abstraction.
 - Leakage and Sub-threshold currents through MOSFET.
 - Scalable CMOS design rules.
 - Layout synthesis and optimization.
 - CMOS Cell Design.

SECTION - II

- Q5)**
- What do you mean by clocking discipline? State common clocking rules, clocking rules for Flip flop and Latches. **[4]**
 - Compare H tree and Balanced tree physical clock distribution networks. **[4]**
 - Enlist specifications and Sketch architecture of Kitchen timer chip. **[4]**
 - Why it is needed to estimate signal probabilities in the network? Compute the zero-delay signal probabilities for all signals in the network shown in figure (Fig. 5.d) assuming the signal probabilities for the primary inputs as shown. **[4]**

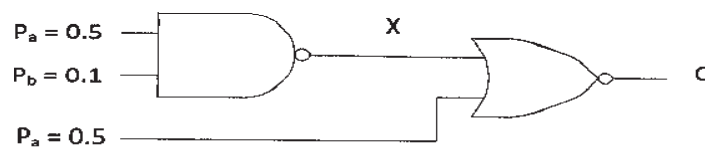


Fig. 5.d

- Q6)**
- Explain left-edge channel routing algorithm using suitable example? What is the drawback of the same? How to overcome it? **[8]**
 - What is crosstalk between RC wires? How it affects static and dynamic combinational logic? Explain Sakurai's analytical model for cross talk. **[8]**
- Q7)**
- Draw and Explain structure of carry-select adder and Manchester carry chain adder. List their advantages over look-ahead carry adder. **[8]**
 - How timing analysis differs from simulation? What is path delay, Critical path and false path? Explain the importance of these terms in chip design with suitable example. **[8]**
- Q8)** Write short notes on (any three): **[18]**
- Logic Synthesis/Optimization.
 - Power optimization.
 - Global Routing.
 - A Generic IC design Flow.
 - Pad Design.



Total No. of Questions : 10]

[Total No. of Pages :2

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[4065] - 642

M.E. (E&TC-VLSI and Embedded Systems)

SOFTWARE DEFINED RADIO

(504192) (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) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary.*

SECTION-I

- Q1)** a) Explain the concept and need of Software defined radio? List the advantages of software defined radio over existing wireless technologies. [8]
- b) How is software radio different than other radios? Explain the relation between cognitive radio and software defined radio. [8]
- Q2)** a) Explain the relation of software communications architecture (SCA) in relation with Software defined radio. [8]
- b) Explain different overview in relation to SDR namely: Architecture Overview. Functional Overview and Networking Overview. [8]
- Q3)** a) In relation to SRD. explain the steps involved in transmitter and receiver of RF front end. [8]
- b) Explain how smart selection of ADC/DAC enables better design of software defined radio? [8]
- Q4)** a) Draw and explain the functional architecture (typical architecture) of Software defined radio. [8]
- b) Enlist the various factors to be considered while designing the dynamic range of SDR receiver? [8]

P.T.O.

- Q5)** Write short notes on (Any Three): **[18]**
- a) SDR Forum.
 - b) Joint Tactical Radio System (JTRS).
 - c) COBRA in relation to SDR/JTRS.
 - d) SPEAKeasy.
 - e) SDR and hardware issues (FPGA/CPLD/ASIC).

SECTION-II

- Q6)** a) What are the different adaptive techniques involved in the processing of Software defined radios? Explain any one of them. **[8]**
- b) How to apply Software defined radio's principles to antenna systems? **[8]**
- Q7)** a) What are the factors to be considered while selecting the antenna for SDR? **[8]**
- b) Explain the implementation of low cost SDR platform? **[8]**
- Q8)** a) Explain the role of Digital Signal processing algorithms in software defined radios. **[8]**
- b) Explain the parameters to be considered for selecting a processor for SDR application? **[8]**
- Q9)** Explain any two applications of SDR/JTRS amongst the following: **[16]**
- a) Military
 - b) Commercial systems
 - c) RFID
 - d) Aerospace

- Q10)** Write short notes (Any Three): **[18]**
- a) Smart Antennas
 - b) Future of Software defined radio
 - c) GNU radio
 - d) RTOS
 - e) Core Framework in relation to JTRS



Total No. of Questions : 8]

[Total No. of Pages :2

P 1313

[4065] - 661

M.E. (E & TC) (Signal Processing)

COMPUTER VISION

(2008 Course) (504511) (Elective - IV)

Time : 3 Hours]

[Max Marks : 100

Instructions to candidates :

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

SECTION-I

- Q1)** a) Explain working of CMOS camera sensor. Explain what is meant by camera resolution. [8]
b) What is Bayer filter array? How it is used to capture color information? [8]
- Q2)** a) Explain the following: [8]
i) Homogeneous coordinate system
ii) Affine transformation
b) A scene point at coordinates (400, y, 1200) is perspective projected into an image at coordinates (24,36), where both coordinates are given in millimeters in the camera coordinate frame. The camera's principal point is at coordinates (0,0,f) (i.e., $u_0 = 0$ and $v_0 = 0$). Assuming the aspect ratio of the pixels in the camera is 1. What is the focal length of the camera and y coordinate of the scene point? [8]
- Q3)** a) Explain Epipolar line and Epipolar constraint in stereo imaging?[8]
b) Explain use of triangulation in stereo imaging for depth finding. [8]
- Q4)** a) Define optical flow in images. Explain optical flow iterative estimation technique. [8]
b) Consider a single scan line in a rectified stereo rig. Suppose the left scan line observes the features [a a c c a b c] and the right scan line observes [a c c a a b c] for the different features 'a', 'b', and 'c'. Assume that the left and right side of the scan lines align perfectly. Using

P.T.O.

dynamic programming, compute the most likely correspondence, assuming a constant cost of '2' for a feature mismatch, and a cost of '1' for occlusion. [10]

SECTION-II

- Q5)** a) What is perspective projection? Give properties of perspective projection. [8]
b) Explain orthographic and weak perspective projection. [8]
- Q6)** a) What is infrared imaging? Give its advantages and applications. [8]
b) Explain Fourier slice theorem. [8]
- Q7)** Write short notes: [16]
a) Kalman filter
b) Image Rectification
- Q8)** Explain: [18]
a) Fundamental matrix
b) Camera parameters

Total No. of Questions : 08]

[Total No. of Pages : 2

P1316

[4065]-667

M.E. (Electronics) (Digital System)
WIRELESS AND MOBILE TECHNOLOGIES
(2008 Course) (504197(c)) (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 must be written in separate answer books.*
- 3) Figures to the right indicate full marks.*
- 4) Assume suitable data, if necessary.*
- 5) Use of scientific calculator is allowed.*

SECTION - I

- Q1)** a) Explain the term hand-off. How will you select the thresholds for Power received to take a decision for hand off? How are the channels allocated when hand off occurs? **[8]**
- b) Explain multipath fading. Explain a z-ray model. (ground reflection model). What is a long term and a short term fading! **[8]**
- Q2)** a) Explain the problem of hidden and exposed terminals. Also explain near-far effect. **[8]**
- b) Explain different carrier sense multiple access schemes for medium access control. Clearly explain the different in 1- persistent and P-persistent CSMA. **[9]**
- Q3)** a) Explain CDMA. How will you select chipping sequences. Explain how the spectrum spreads in case of Direct sequence spread spectrum scheme: **[9]**
- b) Explain how a multiple access collision avoidance scheme can avoid the problem of exposed terminals and hidden terminals. **[8]**
- Q4)** a) Draw a functional architecture of a GSM system. Explain the function of each block. **[8]**
- b) Explain control channels in GSM. **[8]**

P.T.O.

SECTION - II

- Q5)** a) Explain how a mobile terminated call executes with a suitable diagram. [8]
b) Explain medium access control in IEEE 802.11. Explain basic CSMA/CA scheme in detail. [9]
- Q6)** a) Explain how the mobile IP packet delivery occurs to and from the mobile node. Explain what is encapsulation. [8]
b) Explain how a change of foreign agent is handled with the optimized mobile IP. [8]
- Q7)** a) Explain the fundamental differences between wired and ad-hoc networks related to routing. [8]
b) Explain DHCP protocol. [9]
- Q8)** a) Explain Indirect TCP. What are advantages of I-TCP? [8]
b) Define components and interfaces of the WAP architecture. [8]



Total No. of Questions : 8]

[Total No. of Pages :2

P 1497

[4065] - 671

M.E. (Electronics) (Digital systems)

EMBEDDED SYSTEMS

(2008 Course) (504201) (Sem. - II)

Time : 3 Hours]

[Max Marks : 100

Instructions to 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 is market window? Explain with suitable example why it is so important for embedded products to reach the market early in this window? [8]
- b) Compare RISC and CISC processor from design of embedded system point of view. [8]
- Q2)** a) List five types of exceptions in ARM processor. What are the activities that take place when an exception occurs? What are the preferred ways of returning from exception handler. [8]
- b) Describe hardware and software architecture of Embedded system.[8]
- Q3)** a) List out different development tools used in embedded development system and explain its importance. [8]
- b) Explain the selection criteria required for embedded operating system. Also compare any three Embedded operating systems along with its performance measures. [8]
- Q4)** Write short notes on any three: [18]
- a) ARM architecture versions and Variants.
 - b) IEEE 802.11 protocol.
 - c) Thumb instruction mode of ARM processor.
 - d) Waterfall model for development of embedded system.

P.T.O.

SECTION-II

- Q5)** a) Explain memory management functions of RTOS. [8]
b) What is scheduler in RTOS? Explain pre-emptive and Non pre-emptive scheduling with example. [8]
- Q6)** a) Explain how μ COS-II operating system is suitable for Embedded System development along with its features. [6]
b) List various feature /specification regarding mobile phone as Embedded System. Draw and Explain the development cycle for it along with its block diagram. Also list out different development tools required for it. [10]
- Q7)** a) Explain how memory management is organized in μ COS-II operating system. [8]
b) Explain the importance of semaphore during shared data problems in resource sharing. [8]
- Q8)** Write short notes: [18]
a) Code optimization technique in Embedded Systems.
b) Vx Works RTOS.
c) μ COS-II operating system Service functions for task criteria for selection of RTOS.
d) Task and thread.

⌘⌘⌘

Total No. of Questions : 8]

[Total No. of Pages :2

P 1567

[4065] - 679

M.E. (Electronics) (Digital System)

DIGITAL SIGNAL COMPRESSION

(2008 Course) (504205) (Elective - IV)

Time : 3 Hours]

[Max Marks : 100

Instructions to 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) *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) A source emits letters from an alphabet $A=\{a_1, a_2, a_3, a_4, a_5\}$ with probabilities $\{0.2, 0.2, 0.4, 0.1, 0.1\}$ respectively. [8]
- i) Calculate entropy of the source.
 - ii) Find the Huffman code for this source.
 - iii) Average length of the Huffman code.
 - iv) The Huffman tree.
- b) Explain performance measures of data compression algorithms. [8]
- Q2)** a) Explain the adaptive quantization scheme. How can we make use of statistics of signal to design adaptive quantizer? [8]
- b) Explain ADPCM coding for speech with the help of block schematic. What is the advantage of using differential coding? [8]
- Q3)** a) Explain rate distortion theory. Explain any one method to find the optimal code for given distortion? [8]
- b) Consider a source with symbol probabilities $P(a_1) = 0.8, P(a_2) = 0.02$ and $P(a_3) = 0.18$. Find the tag using arithmetic coding for a sequence a_1, a_3, a_2, a_1 . Assume that we are using the mid point of interval as the tag. [10]

P.T.O.

- Q4)** a) Explain A-Law and μ -law companding. How to realize these companding curves in practice? [8]
- b) Explain the effect of variance mismatch on the performance of a uniform quantizer. Plot SNR Vs ratio of input to design variance.[8]

SECTION-II

- Q5)** a) Explain the meaning of zero tree. Justify how wavelet coefficients are useful for EZW chart. [8]
- b) Consider wavelete decomposition of 4×4 image with data specified row-wise as [34, 0, 1, -1], [0, 0, -1, 1], [4, -4, 10 -6] and [-4, 4, 6, -10] respectively for 4 rows. Demonstrate various steps is EZW algorithm. [10]
- Q6)** a) What is a wavelet? Explain any one method of wavelet decomposition. What is the meaning of perfect reconstruction filter bank? [10]
- b) Explain how MIDI is used for interfacing musical instruments. [6]
- Q7)** a) What is motion vector? How it is useful for video compression. Explain any one method of estimating a motion vector in video coding. [10]
- b) What is streaming Video? How is it achieved? [6]
- Q8)** a) Explain the basic structure of compression algorithm proposed by MPEG. [10]
- b) Compare performance of DFT, DCT and KLT. Which is the optimal transform? [6]



Total No. of Questions : 8]

[Total No. of Pages : 2

P 1318

[4065] - 685

M.E. (E & TC) (Communication Network)

ADHOC NETWORKS

(2010 Course) (504603 (C)) (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 answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Assume suitable data, if necessary.*
- 5) *Figures to the right indicate full marks.*

SECTION-I

- Q1)** a) Explain the power control MAC protocol in adhoc wireless network. [9]
b) Explain the receiver based autorate MAC protocol in adhoc wireless network. [9]
- Q2)** a) Explain the temporally ordered on demand routing protocol (TORA). [8]
b) Explain the following hybrid routing protocol. [8]
• Zone Routing Protocol (ZRP).
- Q3)** a) Explain the following hierarchical routing protocol [8]
• Fisheye state routing protocol.
b) Compare table driven routing protocol and on demand routing protocol. Is table driven routing protocol suitable for high mobility environment. Justify the answer. [8]
- Q4)** a) What are the design issues of multicast routing protocol? [8]
b) Explain the following tree based multicast routing protocol. [8]
• Bandwidth Efficient Multicast Routing Protocol (BEMRP).

P.T.O.

SECTION-II

- Q5)** a) Explain why TCP does not perform well in adhoc wireless network. [9]
- b) Explain any one the following transport layer protocol in adhoc wireless network. [9]
- i) Application Controlled Transport Protocol (ACTP).
- ii) Adhoc Transport Protocol.
- Q6)** a) What are the key management approaches? Explain key management approaches in adhoc wireless network? [8]
- b) Explain the network security attacks in adhoc wireless network. [8]
- Q7)** a) What are the issues and challenges for QoS support in adhoc wireless network. [8]
- b) Explain any one of the following QoS frameworks. [8]
- i) INSIGNIA
- ii) SWAN
- Q8)** a) What is the need for energy management in adhoc wireless network? Which battery is commonly for portable mobile nodes such as laptops? [8]
- b) What are the battery management schemes? Explain any one in detail? [8]

Total No. of Questions : 12]

[Total No. of Pages : 3

P1322

[4065]-704

M.E. (Production)

ADVANCED MACHINE TOOL DESIGN

(511104 (D)) (2008 Course) (Elective - I)

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

SECTION - I

Unit - I

- Q1)** a) Discuss briefly the salient features to be considered for selecting and designing a suitable drive system in a machine tool. **[8]**
- b) Develop a generalized empirical relationship for the thrust and torque in drilling and compare the same with turning to validate Optiz's hypothesis that the principles of cutting mechanism fall into the same category. **[10]**

OR

- Q2)** a) Find out the method of differentiating a special purpose machine from a general purpose machine based on the kinematic structure. **[6]**
- b) Make a compact speed ray diagram for compromise gear box having 15 nos. of spindle speeds between 90 rpm and 2100 rpm. Make a layout of a gearbox and draw the structure diagram. **[12]**

Unit - II

- Q3)** a) Explain the method of evaluating the stiffness and natural frequency of vibration of a machine tool bed having two-tier cross-section with stiffeners, using Krylov's function. State the final expression for frequency of vibration. **[8]**

P.T.O.

- b) In designing the bed of a machine tool, it is often found that the hollow rectangular cross-section is the most suitable one. Make a comprehensive evaluation of the various types of cross sections commonly used in machine tool on the basis of stress and deflection in both bending and torsion. [8]

OR

- Q4)** a) Discuss the importance of following elements in spindle design:
i) Diameter of front journal bearing.
ii) Additional spindle support.
iii) Location of bearing and drive element.
iv) Balancing. [8]
- b) Analyze the load taken by the balls in a ball bearing used as a spindle support and show that due to contact deformation not more than 80% of the balls take the entire thrust. [8]

Unit - III

- Q5)** a) What is meant by regenerative chatter? Explain it with reference to any one type of machine tool. [8]
- b) Draw the entire hydraulic circuit for obtaining forward as well as quick return motion of a shaping machine. Indicate all the parts and elements and describe briefly their characteristic functions. [8]

OR

- Q6)** a) Discuss with neat sketch the feed gearbox, operated by Tumbler gears. Showing three positions forward, neutral and reverse. [8]
- b) With neat sketches of circuit diagrams show the functioning of a thermal relay and an electrical braking system. [8]

SECTION - II

Unit - IV

- Q7)** a) Describe a built-in auto inspection system for measuring the outside diameter of a cylindrical grinding machine. With a neat sketch explain the functioning of various elements of the system. [8]
- b) What procedure is used by the operator to determine the tool length offsets? [8]

OR

- Q8)** a) Compare CNC machine tool and conventional machine tool with respect to:
i) Accuracy.
ii) Rigidity.
iii) Productivity.
iv) Economy. [8]
- b) Explain with neat sketches the five basic types of tool changers? [8]

Unit - V

- Q9)** a) 'It is necessary to have high damping coefficient and large stiffness of the tool to reduce such vibration' –Discuss the statement giving specific example of a turning operation. [8]
- b) Explain with suitable example dynamic characteristic of the cutting process.[10]

OR

- Q10)** a) Enumerate the various methods, used in practice to reduce the positional displacement error due to 'Stick Slip'. [8]
- b) With suitable sketches explain the procedure followed in performing acceptance tests on milling machine. [10]

Unit - VI

- Q11)** a) Discuss in detail modern trends in design of machine tools. [8]
- b) Enumerate the different CAD techniques applied in design of machine tool structures. [8]

OR

- Q12)** a) Explain with a suitable example the importance of aesthetics in machine tool design. [8]
- b) Discuss the role of ergonomics in manufacturing of machine tools. [8]



Total No. of Questions : 8]

[Total No. of Pages : 2

P1498

[4065]-709

M.E. (Production)

MATERIAL TECHNOLOGY

(511108) (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) *Question Nos. 1 and 5 are compulsory. Out of the remaining attempt 2 questions from Section I and 2 questions from Section II.*
- 3) *Answers to the two sections should be written in separate books.*
- 4) *Neat diagrams must be drawn wherever necessary.*
- 5) *Figures to the right indicate full marks.*
- 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 Mechanisms of plastic deformation explain in detail. [6]
b) What is precipitation Hardening? What are the necessary conditions for any alloy for precipitation Hardening. Explain with suitable example.[6]
c) Fatigue strength increases with increasing surface finish explain. [4]
d) For selection of material chemical industry which is one of important property taken into consideration. [2]
- Q2)** a) Explain characteristics of fatigue fracture with neat diagram. [6]
b) An aluminum alloy with yield strength 475 MPa and fracture toughness $21 \text{ MPa}\sqrt{\text{m}}$ is suggested for the manufacture of structural component with more design stress half of the yield point. The inspection facilities are capable of detecting defect of 3mm length or greater, calculate critical crack size in the component. [4]
c) Explain how the material suitable for crank shaft in truck will be selected. Explain the procedure. [6]

P.T.O.

- Q3)** a) What is transition temp. Explain its importance with reference to fracture. Explain with relevant example. [6]
 b) Explain internal, external factors affecting the fracture. [8]
 c) Creep is intergranular fracture explain. [2]
- Q4)** a) Which is the most suitable strengthening mechanism for pure metal explain with example. [6]
 b) Explain process of failure analysis with suitable example. [6]
 c) What are the requirements for the materials used for high temperature application. [4]

SECTION - II

- Q5)** a) Explain in detail maraging steel w.r.t. its chemical composition, heat treatment. [6]
 b) What is HSLA explain with min one example. [4]
 c) What are new plastic materials. Why they are said superior to rubber explain. [6]
 d) What is composite material ? Give its min 2 uses. [2]
- Q6)** a) What is TRIP explain. [4]
 b) What is ceramic? Explain following ceramics with respect to their properties & processing.
 i) Al_2O_3 ii) TiC [10]
 c) What is micro-alloyed steel. [2]
- Q7)** a) With a suitable diagram explain classification of composite material. Give minimum one use of each of them. [6]
 b) Explain ceramic-matrix composite. [4]
 c) Explain and compare flake and fiber composites. [6]
- Q8)** Write short note on (any four) : [16]
 a) Shape memory alloys.
 b) Bio-materials.
 c) Dual phase steels.
 d) Dispersion strengthen composites.
 e) Nano materials.



Total No. of Questions : 8]

[Total No. of Pages : 3

P1622

[4065]-71

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

RELIABILITY ENGINEERING

(2002 Course) (Elective - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *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) Explain availability & maintainability. Explain types of availability of the system. **[8]**

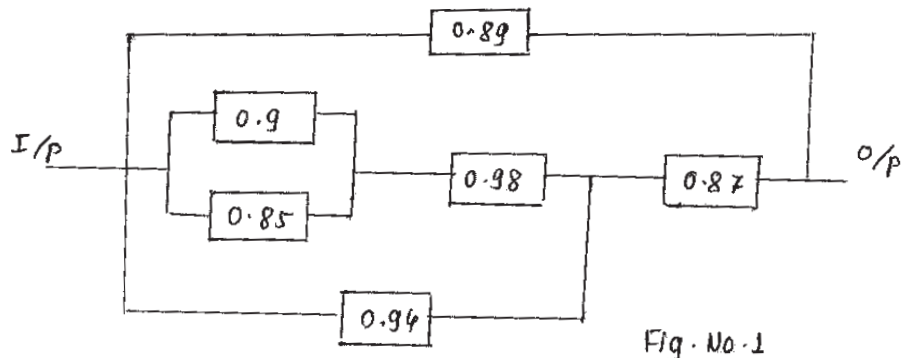
b) In a survival test conducted on 100 cardboard boxes for their strength under impact loading, the following results were obtained. **[10]**

No. of impacts	20	22	24	26	29	32	35	37	40
No. of boxes failed	7	10	14	16	15	14	13	10	7

Calculate failure density, hazard rate & reliability.

Q2) a) State & explain total probability theorem. **[8]**

b) Find the reliability of the system as shown in figure No.1



P.T.O.

Q3) a) Derive the expression. [8]

$$MTTF = \frac{1}{N} \sum n_k K \Delta t$$

b) A system consist of 10 components connected in series. The predicted reliabilities obtained from failure data are given in table. It is desired that the system reliability be 0.97. Determine reliability goal for all components. [8]

Component No.	1	2	3	4	5	6	7	8	9	10
Predicted Reliability	0.95	0.98	0.96	0.99	0.97	0.99	0.98	0.97	0.97	0.98

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

- a) Central limit theorem.
- b) Causes of failures & unreliability.
- c) System reliability.

SECTION - II

Q5) a) Explain different types of loads considered in designing machines & structures. [8]

b) Tests conducted on a sample of 100 automobile brakes have yielded a mean value of 56, 679.5 and standard deviation of 12, 493.64 miles for the life of brakes. Assuming normal distribution, find the probability of realizing the life of brakes less than 50,000 miles.

Z	0.53	0.54
$\phi(Z)$	0.7019	0.7054

[10]

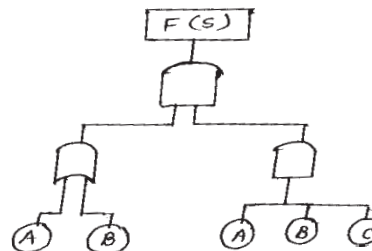
Q6) a) Fig. No. 2 shows the fault tree diagram. The probability of failure of each basic fault is given. Find the reliability of the system. [8]

$$P(A) = 0.01$$

$$P(B) = 0.1$$

$$P(C) = 0.05$$

Fig. No. 2



- b) Ten identical components are connected in parallel to achieve the system reliability of 0.9. Determine the additional number of components to be added in parallel to increase the reliability to 0.95. [8]

Q7) a) Explain the magnified loading & sudden death testing for any system.[8]

- b) Explain with the help of any mechanical component-strength base reliability. [8]

Q8) Write short note on (Any two): [16]

- a) Reliability testing.
b) Failure mode & effects analysis.
c) FMECA.



Total No. of Questions : 08]

[Total No. of Pages : 3

P1331

[4065]-721

**M.E. (Production) (CAD/CAM)
COMPUTER AIDED MANUFACTURING
(2010 Course) (511202) (Sem. - I)**

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) What are the types of machining centers? Describe some of the accessories that make the machining centers so versatile. [8]
- b) What is need of DNC? How does DNC system operates? How can it benefit a CNC shopfloor manufacturing? [8]
- Q2)** a) What do you understand by canned cycle? Explain some of the milling canned cycles. [8]
- b) Figure 1. shows a turned finished component write a manual part programme to machine the component on CNC lathe, by deciding the operation plan and process parameters.

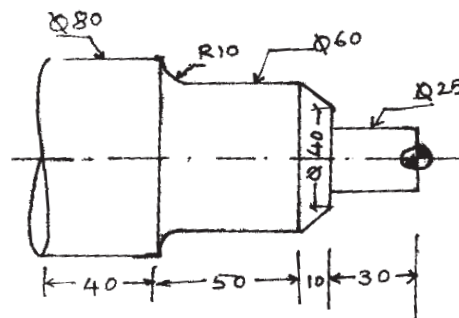


Figure 1
Dimensions in mm

The bar size is $\phi 100 \times 150$ L. Use rough and finish canned cycles. [8]

P.T.O.

- Q6)** a) Differentiate between contact and non-contact inspection techniques.[8]
b) Describe any four hardware items of a typical part delivery system in an automated assembly system. [4]
c) Explain any four methods used to collect data from the shop-floor. [4]
- Q7)** a) Describe what kinds of tasks that people will require to do in future automated factory. [4]
b) Explain with neat sketch the three common configurations or topologies used in Local Area Network (LAN). [6]
c) What are the basic types of barcodes? Explain with suitable examples.[6]
- Q8)** Write short notes on any three of the following: [18]
a) Carousel storage systems.
b) Machine vision and its applications.
c) Communication media used in AGVs.
d) Information system in an automated factory.



Total No. of Questions : 10]

[Total No. of Pages :3

P 1333

[4065] - 723

M.E. (Production Engineering) (CAD/CAM)

ADVANCED STRESS ANALYSIS

(2008 Course) (511204) (Elective - I)

Time : 3 Hours]

[Max Marks : 100

Instructions to candidates :

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

SECTION-I

- Q1) a) Determine the principal directions and principal values of the second order Cartesian tensor (stress tensor) T as given below. [8]

$$[\sigma_{ij}] = \begin{bmatrix} 3 & -1 & 0 \\ -1 & 3 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

- b) Split the stress tensor $[\sigma_{ij}] = \begin{bmatrix} 12 & 4 & 0 \\ 4 & 9 & -2 \\ 0 & -2 & 3 \end{bmatrix}$ into its hydrostatic and

deviator parts and show that the first invariant of the deviator is zero.[8]

OR

- Q2) Show that the Airy stress function $\phi = 2x_1^4 + 12x_1^2x_2^2 - 6x_2^4$ satisfies the biharmonic equation $\nabla^4 = 0$ and determine the stress components assuming plane strain. [16]

P.T.O.

- Q3)** a) Determine the principal values and directions of the symmetric stress tensor. [8]

$$[\sigma_{ij}] = \begin{bmatrix} 7 & 3 & 0 \\ 3 & 7 & 4 \\ 0 & 4 & 7 \end{bmatrix}$$

- b) Determine the principal deviator stress values for the stress tensor. [8]

$$[\sigma_{ij}] = \begin{bmatrix} 10 & -6 & 0 \\ -6 & 10 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

OR

- Q4)** Describe complex formulation of the plane elasticity problem. [16]

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

- Experimental stress analysis
- Generalized Hook's law
- Invariants of stress tensor

SECTION-II

- Q6)** Using the Paris-Erdogan equation for fatigue crack propagation, calculate the number of fatigue cycles corresponding to the combinations of initial and final crack radius for a semicircular surface flaw tabulated below. Assume that the crack radius is small compared to the cross section of the

structure. $\frac{da}{dN} = 7.17 \times 10^{-12} (\Delta K)^3$, where da/dN is in m/cycle and ΔK is in

MPa \sqrt{m} . Also, $\Delta\sigma = 190$ MPa. [16]

Initial crack radius (mm)	Final crack radius (mm)
1	10
1	20
2	10
2	20

Discuss the relative sensitivity of N_{tot} to:

- Initial crack size and
- Final crack size

(Assume $\Delta K = 0.713 \Delta\sigma \sqrt{\pi a}$)

OR

Q7) Consider an unnotched specimen with an endurance limit of 315 MPa. If the specimen was notched such that $K_f = 1.25$, what would be the factor of safety against failure for $N > 10^6$ cycles at a reversing stress of 125 MPa?

(a) Solve by reducing S'_e .

(b) Solve by increasing the applied stress. [16]

Q8) A semicircular surface crack in a pressure vessel is 2.87 mm deep. The crack is on the inner wall of the pressure vessel and is oriented such that the hoop stress is perpendicular to the crack plane. Calculate K_I if the local hoop stress is 132 MPa and the internal pressure = 9 MPa. Assume that the wall thickness $\gg 3$ mm. [16]

OR

Q9) a) Describe stages in crack growth. [8]

b) Explain Paris equation and its application. [8]

Q10) Write short notes on: [18]

a) Investigation and analysis of failures

b) J – Integral

c) CTOD

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Total No. of Questions : 8]

[Total No. of Pages :2

P 1334

[4065] - 726

**M.E. Production (CAD/CAM)
CONCURRENT PRODUCT DESIGN
(2008 Course) (511204(d)) (Elective-I)**

Time : 3 Hours]

[Max Marks : 100

Instructions to candidates :

- 1) *Answer any three questions from Section-I and three questions from Section-II.*
- 2) *Use separate answer books for each section.*
- 3) *Use of calculator, std. data table is allowed.*
- 4) *Assume suitable data, if required.*

SECTION-I

- Q1)** a) Explain with suitable example different phases in products life cycle. [8]
b) What do you know about Benchmarking? How will you decide benchmarking explain with suitable example? [8]
- Q2)** a) What are the functional requirements for any product design? [8]
b) Explain concurrent design for Design of Product. Differentiate sequential design and concurrent design. [8]
- Q3)** a) What are the important principles that should be considered while designing for Assembly? [8]
b) Explain different approaches for material and process selection. [8]
- Q4)** Write a short note on: [18]
a) Technology life cycle
b) Process models
c) Design for maintainability and serviceability.

SECTION-II

- Q5)** a) Explain with suitable example the different consideration of cost in product design. [8]
b) What is cost index? Explain its importance in cost estimation of a product? [8]

P.T.O.

- Q6)** a) Explain with suitable example a product design based on Internet.[8]
b) What is concurrent engineering? Explain its importance in product development. [8]
- Q7)** a) Explain the concept of modular product design with suitable example. [8]
b) How the concurrent engineering is used to enhance the manufacturability & other attributes of electronic products? [8]
- Q8)** Write a short note on: [18]
a) Life cycle Cost of product,
b) PDM tools,
c) Role of supplier in product development.

Total No. of Questions : 08]

[Total No. of Pages : 2

P1342

[4065]-738

M.E. (Production) (CAD/CAM)

COMPUTER AIDED PRODUCTION PLANNING

(2010 Course) (511212) (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 answer 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) Best company has the following sales pattern during 2005 to 2011. Compute the sales forecast for 2012.

Year	2005	2006	2007	2008	2009	2010	2011	
Sales (in Lakhs)	39	48	65	78	95	91	112	[8]

b) Briefly explain ALDEP for facility layout. [8]

Q2) a) Explain rank order clustering (ROC) algorithm for GT. [8]

b) Explain OPITZ classification system of GT. [8]

Q3) a) What are the major modules of process planning software and the database required? [8]

b) Discuss operations management with schematic representation. [8]

Q4) a) Discuss the major non-contact inspection methods. [9]

b) Explain mathematical model for machine component cell formation.[9]

P.T.O.

SECTION - II

- Q5)** a) What is master production schedule? Why it is essential for MRP? [8]
b) Which factors are considered for selecting an ERP package? [8]

- Q6)** a) A foreman wants to process four different jobs on three machines. The sequence of operation for all the four jobs is shaping-drilling-tapping. The process period for all the jobs on three machines are given in table below.

Job	Processing time (min)		
	Shaping	Drilling	Tapping
1	11	3	15
2	16	8	4
3	8	7	13
4	20	5	8

Find the sequence in which the job should processed so as to minimize the total time of all the four jobs. Show the optimal schedule on a Gantt chart. [8]

- b) Briefly explain shop floor data collection system. [8]
- Q7)** a) Describe procedure of simulation using simulation package. [8]
b) Briefly describe the types of simulation. [8]
- Q8)** Write short notes on: [18]
a) Manufacturing resource planning.
b) Generic model for ERP system.
c) Heuristics to production scheduling.



Total No. of Questions : 12]

[Total No. of Pages :3

P 1343

[4065] - 740

M.E. (Production)

DESIGN OF EXPERIMENTS & RESEARCH METHODOLOGY

(2008 Course) (511212) (Elective - IV)

Time : 3 Hours]

[Max Marks : 100

Instructions the condidates :

- 1) *All questions are Compulsory.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Assume suitable data, if necessary.*

SECTION-I

- Q1)** a) Explain in brief difference between mathematical research and experimental research. [8]
- b) Explain research process with flow chart. [8]

OR

- Q2)** a) Explain steps and its significance of each for research methods. [8]
- b) Explain Objective of research. [8]
- Q3)** a) What are the techniques of interpretation? [8]
- b) Explain formulating research problem. [8]

OR

- Q4)** Write short notes on following: [16]
- a) Criteria of good research
 - b) Motivation in research
 - c) Problem solving process
 - d) Brain Storming and Delphi method

- Q5)** a) Explain Data consideration and testing of models. [8]
- b) Explain simulation in terms of Meaning, Application, Classification of Models. [10]

OR

- Q6)** a) Explain process of simulation with steps and features and validation process. [8]
- b) Explain use of analogy, data consideration and model testing. [10]

P.T.O.

SECTION-II

- Q7)** a) What are the objectives of experimentation? [8]
 b) What are the steps in design of experimentation? [8]

OR

- Q8)** a) Explain Replication randomization and blocking. [8]
 b) Explain factorial experimental design. [8]

- Q9)** a) Explain Taguchi approach to parameter design. [8]
 b) The following table presents the effective life (in hrs) observed in battery design. [8]

The row & column totals are shown in the margins of the table and the circle Numbers are the cell totals life data (in hrs) for the battery design experiment.

Material	Temperature (F)						
Type	15		70		125		Yi
1	130	155	34	40	20	70	
	(539)		(229)		(230)		998
	74	180	80	75	82	58	
2	150	188	136	122	25	70	
	(623)		(479)		(198)		1300
	159	126	106	155	58	45	
3	138	110	174	120	96	104	
	(576)		(583)		(342)		1501
	168	160	150	139	82	60	
Yj	1738		1291		770		3799=Y

OR

- Q10)** a) Explain application of experimental design. [8]

- b) The impurity present in chemical products is affected by two factors pressure & temperature. The Impurity data from single replicate of factorial experiment is as shown in the table. [8]

Temperature	Pressure					
(F)	25	30	35	40	45	
Y _i						
100	5	4	6	3	5	
23						
125	3	1	4	2	3	
13						
100	1	1	3	1	2	8
Y _j	9	6	13	6	10	44=y

- Q11)** a) Explain format in report writing. [8]
 b) Explain Univariate and Bivariate analysis with suitable example. [10]

OR

- Q12)** a) Explain a Hypothesis Testing Parametric and Non Parametric approach with suitable Examples. [10]
 b) What precaution one has to take while writing the research report. [8]

Total No. of Questions : 8]

[Total No. of Pages : 2

P1346

[4065]-745

M.E. (Computer Engineering)

ADVANCED SOFTWARE ENGINEERING

(510104) (2008 Course) (Elective - I)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) What is meant by legacy systems? Explain it's main components? [4]
b) Prove/Disprove the following statement "You cannot assume that reliable systems will always be available and vice versa". [6]
c) Explain the following terms with respect to security
i) Corruption of program.
ii) Denial of service. [6]
- Q2)** a) Develop a set of use-cases that could serve as a basis for understanding the requirements of a Internet banking system. [8]
b) What are the different approaches used for user interface prototyping? [6]
c) What is meant by formal specification? [2]
- Q3)** a) What are the advantages of dynamic binding in a service-oriented system? [4]
b) Suggest circumstances where it is appropriate to use a fault-tolerant architecture when implementing a software-based control system and explain why this approach is required. [6]
c) What are the essential conditions for software re-engineering to be successful? [4]
d) Write short note on: Software reuse. [4]

P.T.O.

- Q4)** Write short notes on (Any two): **[16]**
- a) Real-time systems.
 - b) Socio-technical systems.
 - c) Application Architectures.

SECTION - II

- Q5)** a) How is the lines of code (LOC) for a software determined? Discuss the cost estimation method based on function point with reference to function oriented metrics. **[8]**
- b) What is risk projection? Explain how a risk table is developed? **[5]**
- c) What is software configuration management? Explain the use of configuration items. **[5]**
- Q6)** a) Explain the extreme programming release cycle. **[4]**
- b) Explain the following terms with respect to Extreme programming.
- i) Test-first development
 - ii) Pair programming **[4]**
- c) Write short notes on: **[8]**
- i) Soft systems
 - ii) Clean Room Software Engineering.
- Q7)** a) Discuss the importance and the various types of maintenance activities carried out in software maintenance? **[8]**
- b) Explain software portability and reuse with suitable examples. **[8]**
- Q8)** a) How test cases are derived? Explain with suitable example. **[6]**
- b) How requirement analysis bridges the gap between system engineering and design? **[4]**
- c) Write short note on : Software Economics. **[6]**



Total No. of Questions : 8]

[Total No. of Pages :2

P 1347

[4065] - 746

M.E. (Computer Engineering)

INTELLIGENT SYSTEMS

(510104 (B)) (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 answer books.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary.*

SECTION-I

- Q1)** a) What is a utility function? Differentiate between goal based agents and utility based agents? Explain a complete utility-based agent structure with a neat diagram. [8]
b) What are the factors of rationality? Explain an environment simulator program that keeps track of the performance measure for each agent. [8]
- Q2)** a) What is problem formulation? Explain the different types of problems with a suitable example. [8]
b) What is problem? How to solve an 8-Queens problem to move to an unattacked square. [8]
- Q3)** a) What are the criteria for evaluating search strategies? Explain Iterative deepening search algorithm with a suitable example. [8]
b) Explain the search algorithms that are designed to conserve memory. [10]
- Q4)** a) Write and explain an algorithm for the simple planning agent? Compare between problem solving and planning. [8]
b) What are the components involved in a plan? Solve the shoes-and-socks problem by defining partial plans and initial plans. [8]

SECTION-II

- Q5)** a) Write and Explain a partial-order planning algorithm (POP). [8]
b) How POP deals with possible threats? Write an algorithm to support for partially instantiated operators in POP. [8]

P.T.O.

- Q6)** a) Explain the limitations of STRIPS language in the AIV domain? Write an algorithm for hierarchical decomposition partial-order planning algorithm. [8]
- b) Explain the relevant components of partial-order planner with Disjunction, Universal quantification Negation and Conditional effects (POP-DUNC). [8]
- Q7)** a) Describe an CPOP algorithm for constructing conditional plans. [8]
- b) Explain fully integrated planning and execution with a suitable example. [10]
- Q8)** a) Define belief network. How it is used in probabilistic reasoning? Describe a method for constructing belief networks. [8]
- b) Explain the kinds of inferences in belief network? Describe an algorithm for answering queries. [8]

P1348**[4065]-747****M.E. (Computer Engineering) (Network Engg.)****INTERNET ROUTING DESIGN****(510104(c)) (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 answer books.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
- 5) Assume suitable data, if necessary.

SECTION - I

- Q1)** a) Consider an IPv4 packet going through a router- **[8]**
- i) Determine which fields in the header are minimally changed before the packet is Forwarded.
 - ii) Which fields are also possibly changed at a router?
- b) i) Consider IP address 10.22.8.92 that is given to be part of a /14 address block. Determine the IP prefix it belongs to in the CIDR notation. **[4]**
- ii) Consider IP address 10.21.5.90 that is given to be part of a /17 address block. Determine the IP prefix it belongs to in the CIDR notation. **[4]**

- Q2)** a) For the network example presented in figure 2.1, compute the shortest paths from node 2 to all other nodes using the centralized Bellman-Ford algorithm. **[9]**

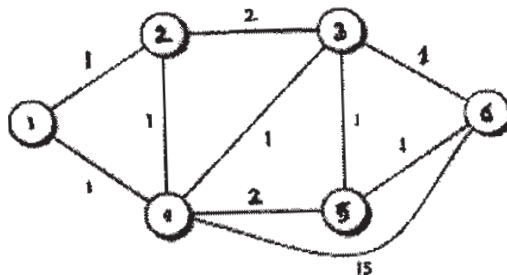


Figure 2.1. A six-node network (the entry shown next to a link is the cost of the link).

P.T.O.

- b) Apply a simple Path Vector Protocol for link 1-6 using the topology and cost given in figure 2.2, ignoring the time dependency. Generate the path table. [9]

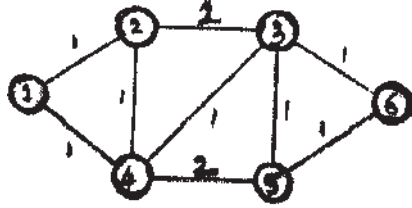


FIGURE 2.2 A six-node network

- Q3) a) Develop a specialized k-shortest paths algorithm, given that a path cannot consist of more than two links. [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) a) Identify issues faced in a distance vector routing protocol and suggest the suitable solution to overcome these issues. [8]
 b) i) Explain any one Router Architecture. [4]
 ii) Differentiate between RIP v1 and RIP v2. [4]

SECTION - II

- Q5) a) What are the main factors that impact memory requirement at a BGP speaker? [8]
 b) What are the main differences between classful addressing scheme and CIDR? [8]
- Q6) a) What is binary trie? Convert the following Prefix table into the binary trie data structure and explain brief how it can be used for organizing IP prefixes. [9]

Prefix table

Prefix label	Prefix
P1	0*
P2	00001*
P3	001*
P4	1*
P5	1000*
P6	1001*
P7	1010*
P8	1011*
P9	111*

- b) What are the different types of matches allowed in packet classification rules? Explain any one packet classification algorithm. [9]
- Q7)** a) Compare different 2- Dimensional Packet Classification Algorithms on the basis of Time and Space complexity. [8]
- b) Explain IP/MPLS traffic management by taking a 4-node example with different link capacity. [8]
- Q8)** Write short notes on **any three** : [16]
- a) Hardware algorithms of lookups.
 - b) Importance of Packet classification.
 - c) ATM PNNI.
 - d) QOSPF.



Total No. of Questions : 8]

[Total No. of Pages :2

P 1354

[4065] - 768

M.E. (Computer) (Computer Networks)

ADVANCED TCP/IP

(2008 Course) (510304(b)) (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 answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 5) *Assume suitable data, if necessary.*

SECTION-I

- Q1)** a) Explain with examples how to obtain information about hosts, Networks, Protocols and network services in a client server environment? [8]
- b) An ISP is granted a block of addresses starting with 120.60.4.0/20. The ISP wants to distribute these blocks to 100 organizations with each organization receiving 12 addresses only. Design the sub blocks and give the slash notation for each sub block. Find out how many addresses are still available after these allocations? [8]
- Q2)** a) Show the contents of all fields for a BOOTP request & reply packet sent from a client with physical address 00:11:22:EF:EA:15? Encapsulate these packets in UDP user & IP Datagram? [8]
- b) How DHCP exchanges different messages? Find the efficiency of a BOOTP packet versus RARP packet. [8]
- Q3)** a) Draw and compare DNS structure with the Unix directory structure.[8]
- b) Why DHCP is required? Explain Address Acquisition States with message types in DHCP operation? [8]

P.T.O.

- Q4)** Write short note on any three: **[18]**
- a) RARP Server
 - b) Working of relay agent in BOOTP
 - c) Network Virtual Terminal
 - d) H.323 Protocol

SECTION-II

- Q5)** a) Show the sequence of bits sent from a client TELNET for binary transmission of 11110011 00111100 11111111? What is minimum number of bits at TCP level? **[8]**
- b) Explain the modes of operation of Telnet? Explain with diagram the use of SUPPRESS, GO AHEAD and ECHO options? **[8]**
- Q6)** a) Show the encapsulation of the WRQ message in the UDP user datagram. Assume the filename is "Report" and mode is ASCII. What is the size of the UDP datagram? **[8]**
- b) Show the FTP commands and response to store a image (binary) file from the client directory /usr/local/image/file1. **[8]**
- Q7)** a) What is difference between an HTTP PUT command and an HTTP POST command? When is each useful? **[4]**
- b) If a browser does not send an HTTP content-length header before a request, how does server respond? **[4]**
- c) Explain SMTP mail transfer phases with example? **[8]**
- Q8)** a) Explain Real Time Transport Control Protocol (RTCP). Compare RTCP with RTP? **[10]**
- b) Differentiate between HTTP and HTTPS. Explain under what circumstances can a proxy caches web page, while using HTTPS?[**8]**

Total No. of Questions : 8]

[Total No. of Pages : 3

P1643

[4065]-794

M.E. (Chemical)

ADVANCED REACTION ENGINEERING

(2008 Course) (509111 (b)) (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 answer books.*
- 3) Figures to the right indicate full marks.*

SECTION - I

Q1) Derive expression for 'Thiele Modulus' from the fundamentals for a solid catalyzed reaction. Discuss about the interpretations associated with its values and its importance in the reaction control. **[16]**

Q2) The reaction $A \rightarrow B$ is to be carried out in a straight-through transport reactor containing a catalyst that decays as a result of coking. The reaction is carried out at 750°F. The entering concentration of A is 0.4 kmol/m³. The catalyst particles are assumed to move with the mean gas velocity ($U_g = U_s = 9\text{m/s}$) and with residence time as t_r . The rate law is,

$$-r_A = -r_A \rho_b = \frac{kC_A}{1 + k_A C_A} a(t)$$

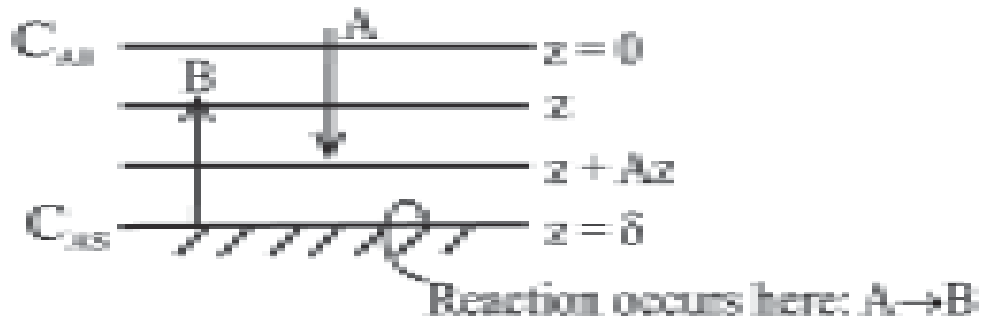
Given, $k_A = 4.13 \text{ m}^3/\text{kmol}$, The bulk density, $\rho_b = 0.69$, $k = 8 \text{ s}^{-1}$. At 750°F, the catalyst activity for short contact times (i.e., less than 100s) is

$$a(t) = \frac{1}{1 + At_r^{1/2}}$$

Where, $A = 7.6\text{s}^{-1/2}$. As a first approximation, neglect volume change with reaction, pressure drop, and temperature variations. Determine the conversion as a function of distance down the reactor if the reactor length is 10m. **[16]**

P.T.O.

Q3) A gas A (Ammonia) diffuses through a stagnant gas B (Air). The gas A diffuses ($D_{AB} = 4.2 \times 10^{-5} \text{ m}^2/\text{s}$) through a planar geometry (with thickness of 1 mm) as shown in the following figure. Derive a general expression for the molar flux of A, W_A , and the mass flux of A, m_A and concentration profile through the stationary frame at steady state. Also plot the concentration profile of A across the film thickness. [16]



Q4) Write a Note on (Any Three) : [18]

- Ideal Reactors.
- Rate Limiting step.
- Bulk density.
- Catalytic loading.

SECTION - II

Q5) For a series of n tanks in series, each one behaving as an ideal CSTR derive expression for $E(t)$ for a first order reaction from the first principles. $C_{a(n-1)}$ = Incoming concentration to the n^{th} reactor, $C_{a(n)}$ = Leaving concentration to the n^{th} reactor. All reactors are having equal volumes. Assume the rest of the data. [16]

Q6) What is use of RTD in the design of reactors? Define function $E(t)$. Discuss use of $E(t)$ in determining non idealities with proper example. [16]

Q7) For one of the gas solid catalyzed reactions $A \rightarrow R$ adsorption, surface reaction and desorption reaction steps are represented as, $A + x_1 \leftrightarrow x_2$, $x_2 \leftrightarrow x_3$, $x_3 \leftrightarrow R + x_1$, respectively. The rate constants in the forward direction are k_1, k_2, k_3 respectively, and those in the back ward direction are k_{-1}, k_{-2}, k_{-3} respectively. Find the expression for the net rate of formation of R from the first principles. **[16]**

Q8) Write a Note on (Any three): **[18]**

- a) Weisz Prater factor.
- b) Coking as Catalyst deactivation.
- c) F(t) Curves.
- d) Dispersion Models.



Total No. of Questions : 6]

[Total No. of Pages :2

P 1414

[4065] - 933

M.E. (Printing Engineering & Graphic Communication)

PRINT MEDIA COMMUNICATIONS

(2008 Course) (New) (508108) (Sem. - II)

Time : 3 Hours]

[Max Marks : 100

Instructions to candidates :

- 1) *Answer any two questions from Section-I and any two questions from Section-II.*
- 2) *Answers to the Two sections should be written in separate answer books.*
- 3) *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 various methods for Surface Design with the focus on technical skills. **[15]**
- b) Compare the skills used in creating design for substrates like Ceramic, Glass and Plastic. **[10]**
- Q2)** a) State and explain in brief the best practices used in Digital Asset Management. **[15]**
- b) Explain the significance of Color space and Conversions. **[10]**
- Q3)** a) How CAD can be used in the field of Creative Media Production?**[15]**
- b) Explain the advantages and disadvantages of Human Vision System. **[10]**

SECTION-II

- Q4)** a) ‘Many times the design of Book cover will determine its placement on book store Shelves and Displays’. Justify with few examples.**[15]**
- b) Explain the following in brief related to Text typography: **[10]**
- a) Legibility.
 - b) Readability.

P.T.O.

- Q5)** a) Explain in brief the new trends that are used in today's design and publishing of newspapers. [15]
b) What are the standard formats used for Newspaper design. [10]
- Q6)** a) How an effective newspaper advertisement can be designed? Explain with Proper example. [15]
b) State and explain the applications of Printing design concepts in brief. [10]

⌘⌘⌘

P1223**[4065]-401****M.E. (Civil) (Construction & Management)****MATHEMATICS****Probabilistic Methods, Statistical Methods, Simulation****Applications in Construction****(501101) (2008 Course) (Sem. - I)***Time : 4 Hours]**[Max. Marks : 100**Instructions to the candidates:*

- 1) *Answers three questions from Section - I and three questions from Section - II.*
- 2) *Answers to the two sections should be written in separate 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) With practical examples, explain utility of the following mathematical tools in project management.

- a) Sensitivity analysis. [6]
- b) Measures of dispersion. [6]
- c) Co-relation Analysis. [6]

Q2) a) An RMC plant is delivering concrete to 8 transit mixers at a time. Equipment /plant downtime is 15%. Transit mixer capacity is 4 m³ and each mixer is expected to do at least 5 trips, based on its cycle time. Find the probability of achieving productivity per hour as

- i) 90%
- ii) 75%
- iii) 50%
- iv) 15%, if targeted hourly

Production is 250 m³ of concrete. [8]

- b) In an item including dewatering at contractor's cost, for a particular strata and for a particular quantity of work, following costs have occurred on 10 previous projects.

Sr. No.	Cost in Rs.
1	3,000
2	7,000
3	15,000
4	5,000
5	2,500
6	9,000
7	3,200
8	12,000
9	4,000
10	2,300

P.T.O.

- i) Find mean and standard deviation. [1+3]
- ii) Rate accepted in the tender is Rs. 3500 which includes 10% profit. Assuming normal distribution, determine the probability of completing the above activity in the tendered cost. [2]
- iii) Determine cost based on 3 point cost estimate. [1]
- iv) Forecast whether execution of above activity will be profitable or not and explain why. [1]

- Q3) a)** Explain application of Nunally and Vorster - Sears models in predicting and controlling construction equipment breakdown costs with practical examples. [8]
- b) Vendor A has delivered 70 lots last year out of which 3 were rejected. Lowest bid price by any vendor is Rs. 1.50 per unit. Price of Vendor A is Rs. 1.80 per unit. Out of 70 lots, 25 lots were delayed. Vendor B who delivered 32 lots in time out of 40 had a bid price of Rs. 1.60 per unit. 10 lots were rejected because of poor quality. Weightages decided are Quality 50%, time 30% and price 20%. Determine the performance rating index for vendor's A and B and decide with reason, which vendor you would select. [8]

- Q4) a)** Explain the various mathematical tools available to deal with uncertainties in construction, based on the degree of uncertainty. [4]
- b) Prepare a simulation model based on Monte carlo simulation, to generate a range of random numbers, for the mean, as well as deviation from the mean, for the actual cost of 20 projects of similar nature as given below. (Random number table is not required as you are not to run/operate the simulation). Select suitable range for each. [12]

Project No.	Project cost in Lakhs
1	35
2	20
3	25
4	37.2
5	55.3
6	43
7	23.8
8	62.3
9	18.0
10	15.0
11	24.0
12	28.0
13	33.9
14	43.9
15	21.9
16	39.9
17	44.3
18	31.2
19	11.5
20	13.5

SECTION - II

Q5) You are the materials manager of a very reputed construction company. On a prestigious construction project, your company requires 2 lakhs cement bags annually. Cement bag cost including taxes and transportation is Rs. 375/- per bag. Ordering cost is Rs. 5000/- per order. Inventory carrying cost is 15% of average annual inventory. Overstocking cost may be computed as follows :

[18]

Duration of overstock in months	% of Basic unit price
upto 3, inclusive	2
3.1 to 6	2.5
beyond six	4.5

Understocking cost may be considered as 3% of the cost of the total cement bags causing the understocking.

The monthly consumption of cement is as follows :-

Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
8000	12000	16000	20000	24000	32000	26000	22000	16000	12000	8000	4000

Decide suitable order Quantity.

Q6) The duration of an activity depends upon the resources allocated (ultimately the total money spent) and proper utilization of these resources (Rated on a 10 point scale with higher rating meaning improper utilization) A particular construction activity has the following historical track record.

Activity duration (y) days	Funds allocated (Rs.) $\rightarrow (x_1)$	Score for resource utilization (x_2)
25	25,000	8
10	55,000	3
40	13,000	4
12	50,000	6
15	45,000	9
27	24,000	8
38	14,000	5
45	10,000	7
18	30,000	2
32	17,000	3

Determine

- a) Individual co-relation coefficients between y and x_1 as well as y and x_2 . [8]
- b) Partial co-relation coefficients between y and x_1 and y with x_2 . [3]
- c) Total co-relation coefficients between y and x_1 and y with x_2 . [3]
- d) Comment on the co-relations obtained. [2]

Q7) a) For the data given in Question ‘6’, establish the linear regression equation linking the activity duration in days with the resources consumed and its proper utilization. Comment on the accuracy of the relationship. [9+1]

b) With any practical example, explain how multiple linear regression equations can be framed for a project management problem involving a total of 6 variables. What is the utility of such regression equations? [5+1]

Q8) a) Explain the various types of data, which needs to be maintained on a construction project in order to apply Griff’s mathematical model for a RMC activity? [4]

b) Determine spearman’s rank correlation coefficient based on following data. [6]

Item	Grade given by quality manager	Grade given by senior engineer
Excavation	A ⁺	A
PCC	B ⁺	A
RCC	B	B ⁺
Plinth filling	A ⁺	C ⁺
Brick work	C	C ⁺
Plaster	B ⁺	A ⁺
Woodwork	D	C ⁺
Painting	B	B
Plumbing	B ⁺	B
Electrification	A	A ⁺

Consider gradation on a 10 point scale.

c) Explain different types of risks associated with construction projects with practical examples and elaborate on how and which mathematical tools will enable project managers to predict and hence mitigate these risks. [6]



P1237**[4065]-453****M.E. (Civil/Structures)****STRUCTURAL MATHEMATICS****(2008 Revised Course) (Sem. - I) (501401)***Time : 4 Hours]**[Max. Marks : 100**Instructions to the candidates:*

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

SECTION - I

- Q1) a)** Analyze the non-prismatic fixed beam shown in Fig. 1.a, using stiffness member approach or flexibility method for the effect of indirect loading in the form of support movements : [12]
- i) a clockwise rotational slip of 0.002 radians at the fixed end A and
 - ii) a downward settlement of 10 mm at support C. Assume $EI = 80000 \text{ kNm}^2$. Draw the shear force and bending moment diagram.



Fig.1.a

- b) Show how the 4×4 element stiffness matrix for a plane truss element can be transformed from local coordinates to the global axes system, in terms of the direction cosines using matrix transformation techniques. [5]
- Q2) a)** A Plane steel truss is as shown in the Fig. 2.a. The modulus of elasticity is 200 GPa. The cross sectional area of member 1 and 2 is 2500 mm^2 , 3 and 4 is 2000 mm^2 , and that of 5 is 1000 mm^2 . The truss is subjected to horizontal load of 100 kN at joint C. Develop the force displacement relationship in matrix form using stiffness method for the given truss. Comment on how the effect of prestrain (lack of fit) in a specific member is incorporated in the stiffness method. [12]

P.T.O.

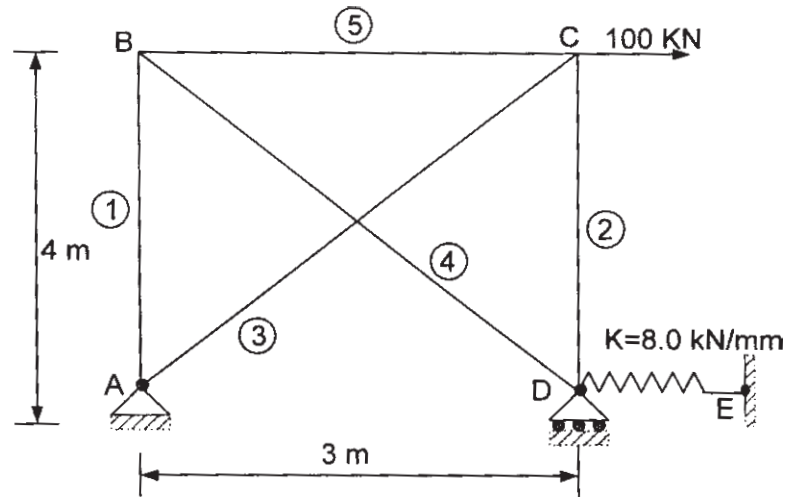


Fig. 2.a

- b) For a space frame member, develop the member stiffness matrix with reference to local axes with proper sketches. [5]

- Q3) a) Find the member stiffness matrix for structure axes with reference to the origin shown; for the member '2' of the portal frame shown in the Fig. 3.a. [10]

Take $E = 200 \text{ GPa}$, $I_z = 1.5 \times 10^{-3} \text{ m}^2$, $A_x = 0.03 \text{ m}^2$ for both the members.

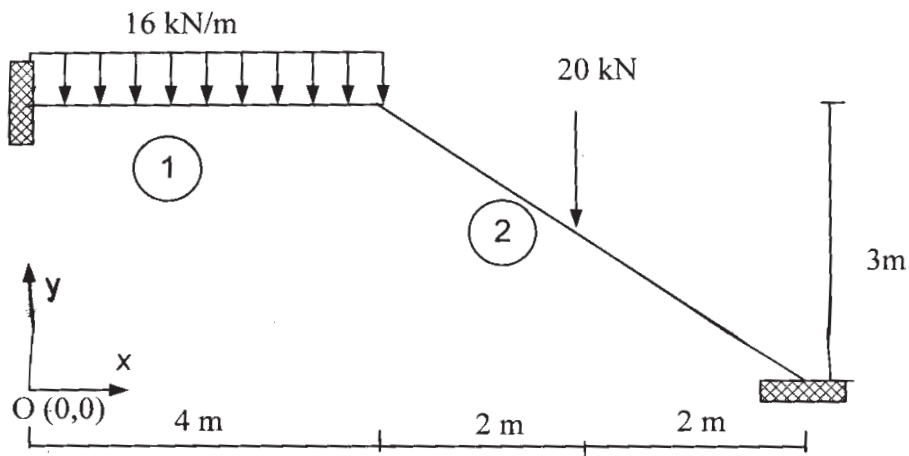


Fig. 3.a

- b) For the column shown in the Fig. 3.b determine the first three eigen values and the corresponding buckling loads. [6]



Fig. 3.b

- Q4) a)** Using Modified Euler method, solve the pair of the following differential equations and find $y_1(0.2)$ and $y_2(0.2)$ [8]

$$\frac{dy_1}{dx} = y_2$$

$$\frac{dy_2}{dx} = y_1 \times y_2 + x^2 + 1$$

given $y_1(0) = 1; y_2(0) = 0$

- b)** Solve the following differential equation for $y(0.2)$ using fourth order Runge-Kutta method. [8]

$$\frac{d^2y}{dx^2} + 2\left(\frac{dy}{dx}\right) - 3y = 6x$$

Given $y(0) = 0, y'(0) = 1$

SECTION - II

- Q5) a)** A square plate of size $4 \text{ m} \times 4 \text{ m}$ is simply supported along all the edges. The plate support a uniformly distributed load over the whole surface of intensity 50 kN/m^2 . The thickness of the plate is 50 mm , Poisson's ratio is 0.25 and modulus of elasticity is 200 GPa . Use finite difference technique to obtain deflection at the centre of the plate. Use an interval of 1 m .

Comment on how the problem will be solved if the uniformly distributed load is replaced by a concentrated load P at the center. [7]

- b)** Determine the deflections at nodal points 1, 2 and 3 and the sudden change of the slope at the internal hinge located at the nodal point 2 as shown in the Fig 5.b. The moment of inertia increases linearly from I at nodal point 0 to $2I$ at nodal point 4. Use Finite difference method. [10]

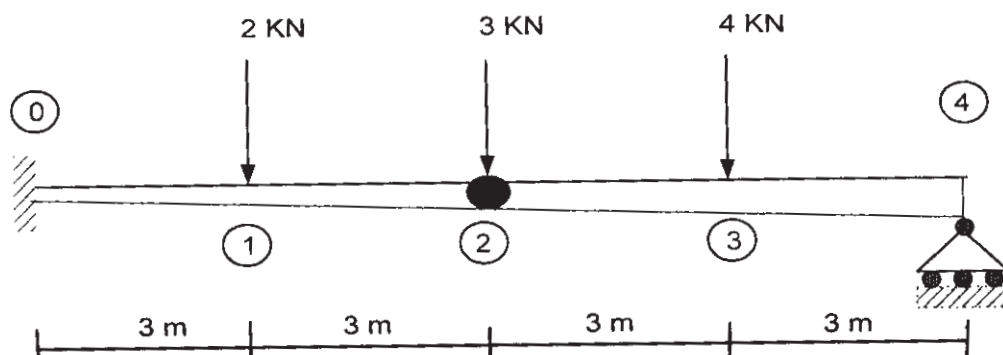


Fig. 5.b

- Q6) a)** Find the suitable values of 'a' and 'b' to fit the equation $y = \frac{ax}{b+x}$ to the data given below. **[10]**

x	2	4	6	8
y	1.4	2.0	2.4	2.6

- b) What do you understand by Spline interpolation? What are cubic splines? State the conditions for a spline to be cubic. **[6]**

- Q7) a)** Develop required cubic splines for the data given below to predict $f(7)$ and hence find $f(7)$. **[10]**

Points; i	0	1	2
x	4	9	16
$f(x)$	2	3	4

- b) Derive the n^{th} order Lagrange interpolation polynomial. **[7]**

- Q8) a)** Evaluate $I = \int_0^4 te^{2t} dt$ using **[10]**

- i) Trapezoidal rule.
 - ii) Simpson's 1/3rd and 3/8th Rule
 - iii) Two point Gauss Quadrature formula.
- Compare each with the exact solution.

- b) Find the fourier expansion up to three terms for the function $f(x) = \sin ax$ in the interval $-1 < x < 1$ **[6]**



P1257

[4065]-511

**M.E. (Mech.) Design Engg. & Automotive Engg.
MATHEMATICAL MODELLING AND ANALYSIS
(2008 Course) (502201) (Sem. - I)**

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Solve any three questions from Section I and any three questions from Section II.*
- 2) *Answers to each section should be written in separate answer book.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data wherever necessary but mention it clearly.*
- 5) *Use of scientific calculator is allowed.*

SECTION - I

- Q1)** a) Write short note on Cause variables and Effect variable with suitable example. [8]
- b) Define Input node, output node, transmittance, non - touching loops, feed forward path, and touching loops with respect to Masson's Gain Formula. [8]
- Q2)** a) Figure Q 2 (a) shows a block diagram. Apply block diagram algebra to evaluate $C(s)/R(s)$. [8]

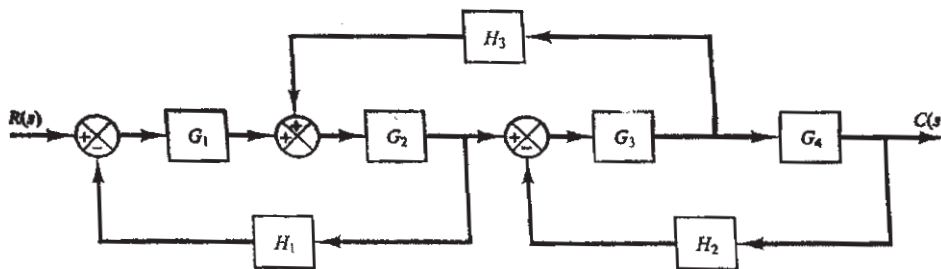


Figure Q 2 (a)

- b) Construct signal flow graph for Figure Q 2(a). [8]
- Q3)** Obtain expression for $Y(s)/X(s)$ from the signal flow graph shown in Figure Q 3. [16]

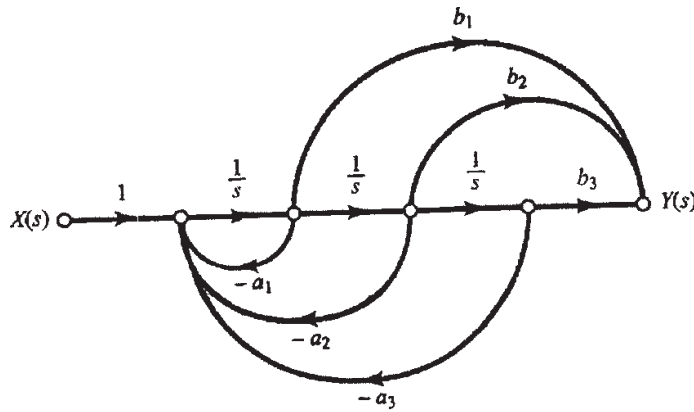


Figure Q 3

Q4) Figure Q 4 shows a mechanical system with mass, spring and damper. Obtain mathematical model (state space representation) for this system, and find **A,B,C&D** [16]

$$\dot{x} = \mathbf{A}x + \mathbf{B}u$$

$$y = \mathbf{C}x + \mathbf{D}u$$

(Hint : The system equation is $m\ddot{y} + b\dot{y} + ky = u$ with usual notations)

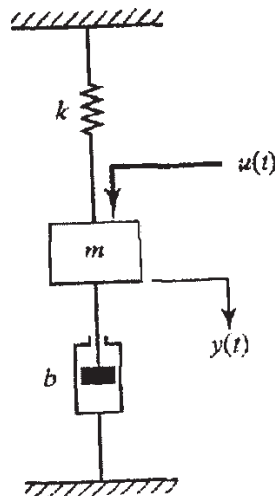


Figure Q 4

Q5) a) Construct signal flow graph for [12]

$$\begin{Bmatrix} x_1 \\ x_2 \\ x_3 \end{Bmatrix} = \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix} \begin{Bmatrix} x_1 \\ x_2 \\ x_3 \end{Bmatrix} + \begin{Bmatrix} b_1 \\ b_2 \\ 0 \end{Bmatrix} u$$

b) Define System, Environment, and Variable in mathematical modeling. [6]

SECTION - II

Q6) For the transformed equation [16]

$$N_o(s) = \frac{3N_{in}(s) - 3sU(s)}{s^2 + 4s + 3}$$

Determine the response when

i) $N_{in}(s) = \frac{1}{s}$ and $U(s) = 0$

ii) $N_{in}(s) = 0$ and $U(s) = \frac{1}{s+1}$

Q7) (a) Determine the z transform of $F(s) = \frac{1}{s+2}$ using Residue method. [8]

(b) The z transform of a digital control system is [10]

$$C(z) = z \frac{z+2}{(z-0.5)^2(z-1)}$$

Determine the inverse z transform.

Q8) Figure shows a square mesh. The nodal values are given as shown in Figure

Q 8. Using Laplace Equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ and Libmann's method obtain the

values of inside nodes. Compute three iterations with over relaxation ($\lambda = 1.5$), percent relative error ($\% \epsilon_r$), and tabulate the result. Use

$$u^{Relaxed} = \lambda u^{Current} + (1 - \lambda) u^{Previous}$$

$$\% \epsilon_r = \left| \frac{u^{New} - u^{Old}}{u^{New}} \right| * 100 \quad [16]$$

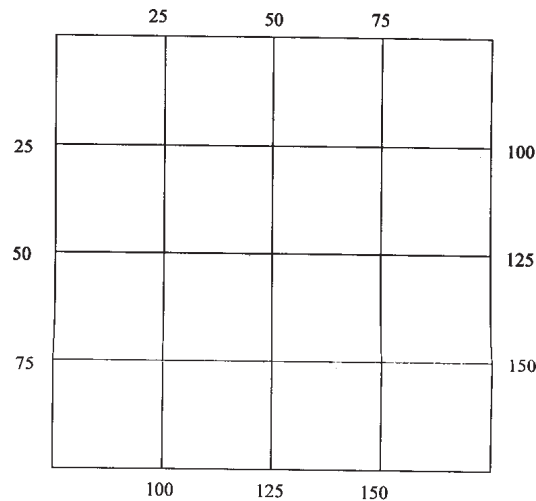


Figure Q 8

Q9) a) Discuss in brief the simulation approaches in Design Engineering. [8]

b) For $y = f(x) = 3x^2 + 2x + 5$, from $x = 1.5$ to $x = 4.5$, using 4th order RK method evaluate the integral with $h = 3$. [8]

Q10) a) Compare Over relaxation with Under relaxation employed in solving elliptic differential equations. [8]

b) Define z transform and find the z transform whose Laplace transform is

$$\frac{1}{s(s+1)} \quad [8]$$



P1279**[4065]-413****M.E. (Civil) (Const. & Mgmt.)****PROJECT ECONOMICS AND FINANCIAL MANAGEMENT****(Sem. - II) (Common to Old & New) (501109)***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) Assume suitable data, if necessary.

SECTION - I

Q1) Explain any 2 traditional and any 2 modern methods of capital budgeting and discuss their merits and de-merits. **[18]**

Q2) Determine NPV (12) and NPV (16) for the following cash flows and decide

- a) Whether you should invest in the proposal.
- b) Which of the two interest rates you would adopt, if you have to invest in the proposal? Why? **[16]**

Year	Cash Inflow (Rs)	Cash Out flow (Rs)
1	3,00,000	10,00,000
2	4,00,000	15,00,000
3	10,00,000	17,00,000
4	12,00,000	6,00,000
5	15,00,000	16,00,000
6	22,00,000	5,00,000
7	25,00,000	25,00,000
8	16,00,000	3,00,000
9	12,00,000	2,00,000
10	6,00,000	1,00,000

Q3) a) Portfolio A has a risk of 12% and a return of 16%, whereas portfolio B has a risk and return both of 10%. Which portfolio would you invest in and why? Justify. Make suitable assumptions as necessary. **[10]**

b) Explain the cash flow cycle involving current assets and current liabilities with an example. **[6]**

P.T.O.

Q4) Explain the following :-

- a) Methodology to account for inflation effect and risk effect during capital budgeting. [8]
- b) Micro - finance [4]
- c) CRISIL rating [4]

SECTION - II

Q5) With any case study, explain how various fund generation mechanisms are required to be used in order to generate funds for a major project estimated at a cost more than 2000 crores. [18]

- Q6)**
- a) Differentiate between financial analysis and economic analysis with an example. [4]
 - b) In case of SION flyovers, explain
 - i) How various costs were determined? [4]
 - ii) How cash inflows were determined? [4]
 - iii) How economic appraisal was conducted? [2]
 - iv) What were the results and what was the appraisal decision based on the results? [2]

Q7) Explain following documents with examples

- a) From construction projects. [8]
 - i) Balance sheet.
 - ii) Profit and loss statement.
- b) Explain the procedure for determining the working capital requirements for any contractor executing construction projects. [8]

Q8) Explain the following :- [16]

- a) Acquisitions and mergers.
- b) Effective use of different financial indices.
- c) Role of lender's engineer.
- d) Method of keeping construction cost accounts.



P1285

[4065]-590
M.E. (Electrical) (Power System)
POWER SYSTEM PLANNING AND RELIABILITY
(Sem. - II) (2008 Course) (503209)

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) *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) *Neat diagrams must be drawn wherever necessary.*
- 7) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Describe factors affecting non-weather sensitive load forecast. [15]
b) Describe extrapolation method use for load forecasting. [10]
- Q2)** a) Explain & compare between long term and medium term planning. [15]
b) Write a short note on reactive power planning. [10]
- Q3)** a) Explain Markov process in detail with its advantages & disadvantages. [15]
b) Explain recursive technique for reliability calculation. [10]

SECTION - II

- Q4)** a) What do you mean by inter connected generation system. Explain factors affecting interconnection under emergency assistance. [15]
b) Differentiate between LOLP and LOLE in detail. [10]
- Q5)** a) Explain objectives of transmission system planning. [15]
b) A transmission line has following data
i) Customer served - 1,00,000.
ii) Number of Interruptions - 1500.
iii) Number of customer Interruptions - 2,20,000
iv) Number of minutes customer interrupted - 1,25,00,000.
Calculate [10]
1) ASAI,
2) SAIFI,
3) SAIDI &
4) CAIDI

P.T.O.

- Q6)** a) Discuss series and parallel systems with reference to reliability concepts. **[15]**
- b) What are the factors affecting distribution system reliability. Describe the methods to improve distribution system reliability. **[10]**



P1296

[4065]-615
M.E. (E&TC) (Micro wave)
SIGNAL PROCESSING FOR WIRELESS COMMUNICATION
(2008 Course) (504229) (Sem. - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Define the following **[10]**
- i) Likelihood function.
 - ii) Sufficiency
 - iii) Probability distribution function
 - iv) Probability density function
 - v) Discrete random signals.
- b) Explain Maximum likelihood estimate. **[2]**
- c) Explain any two distribution function with the help of equation and sketches. **[6]**
- Q2)** a) Explain Gauss Markov model. **[6]**
- b) Explain the term wide sense stationary random process. **[3]**
- c) What is correlation receiver? **[4]**
- d) Explain colored noise and white noise. **[3]**
- Q3)** a) Explain the correlation receiver for binary decision problem with block diagram. **[8]**
- b) Explain how to implement Matched filter with correlation receiver. **[8]**
- Q4)** a) Draw the receiver structure of colored noise and explain. **[8]**
- b) Explain the discrete kalman filter structure for estimation problem for non stationary process. **[8]**

P.T.O.

SECTION - II

- Q5)** a) Explain what are adaptive filters. [4]
b) Why are adaptive filters used? [2]
c) What do you mean by minimum mean square error? [2]
d) Explain LMS algorithm starting from basics of Wiener filter theory. [8]
- Q6)** a) Explain what do you mean by power spectrum estimation. [3]
b) Explain in detail the difference between parametric and non parametric power spectrum estimation. [6]
c) Explain Welch method of power spectrum. [7]
- Q7)** a) Explain any two parametric methods of power spectrum estimation in detail. [8]
b) Explain the concept of spread spectrum communication in detail. [8]
- Q8)** Write short notes on (any three) : [18]
a) Optimum receiver for OOK.
b) Comparison of digital transmission system.
c) Intersymbol interference in digital transmission systems.
d) Radar target models.



P1312

[4065]-658

**M.E. (E&TC) (Signal Processing)
MULTIMEDIA TECHNIQUES
(2008 Course) (Elective - III) (504510)**

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.*

SECTION - I

- Q1)** a) How does multimedia computing differ from any other computing? What are the hardware and software components of a multimedia platform? Using block diagram explain the functions of multimedia development system. [10]
- b) What is MM authoring tool and list different functions of MM authoring software. [8]
- Q2)** a) What are the different types of pictures defined in MPEG-I standard for trade - off between coding efficiency & random access? Briefly explain the interdependence among these picture types in a typical video sequence. [8]
- b) Compare lossless compression with lossy compression technique. [8]
- Q3)** a) Draw and explain the block schematic of PAL system encoder. [8]
- b) Describe in detail the BMP graphic file format. [8]
- Q4)** Give short notes on [16]
- a) Audio file formats.
- b) ADPCM for voice encoding.

SECTION - II

- Q5)** a) With the help of a neat diagram explain the scheme of JPEG encoder & decoder. Give the header of JPEG file. [10]
- b) Explain different types of animation. [8]
- Q6)** a) Explain MIDI in brief and compare with digital audio. [8]
- b) Briefly explain the role of psychoacoustic analysis in MPEG audio. [8]

P.T.O.

- Q7)** a) Explain the techniques for video recovery. [8]
b) Explain the steps in creating 3D animation. [8]

- Q8)** Write short notes on : [16]
a) AVI file format.
b) Multimedia Presentation.



P1326

[4065]-712
M.E. (Production)
PLASTICS PROCESSING
(2008 Course) (Elective - III) (511111 (a))

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer any three questions from each section.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Assume suitable data, if necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of non - programmable electronic calculator is allowed.*

SECTION - I

- Q1)** Explain in details polymerization Techniques. Also explain weight, size and distribution of molecules. **[16]**
- Q2)** a) Explain with neat sketch In - line screw Injection Molding. **[8]**
b) Explain process and design considerations for direct screw transfer process. **[8]**
- Q3)** a) Explain the molding of general purpose polyester compounds. **[8]**
b) Explain with neat sketch plunger type transfer mold. **[8]**
- Q4)** a) Compare Compression and Transfer Molding. **[8]**
b) Explain constructional features and layout of gates. **[8]**
- Q5)** Write short notes on : **[18]**
- a) Advantages of using plastics.
 - b) Advantages of transfer molding.
 - c) Reaction Moulding.

SECTION - II

- Q6)** Explain the basic design for wall thickness, under cuts and drafts. **[16]**
- Q7)** a) Explain how will you avoid warpage with specific reference to mold design : **[8]**
- i) gate location.
 - ii) gate size.
- b) Explain silicone foams. **[8]**

P.T.O.

Q8) a) Explain ejection system and gating system. [8]

b) Explain different types of inserts : [8]

Q9) Explain various software available mold flow analysis and defect analysis. [16]

Q10) Write short notes on : [18]

a) Molds for reaction molding.

b) Rotary Injection blow molding.

c) Standard tolerance of ABS.



P1327

[4065]-713

**M.E. (Production) (Manufacturing and Automation)
PRODUCT LIFE CYCLE MANAGEMENT
(2008 Course) (Elective - III) (511111 (b))**

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 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 engineering data management? How it can be integrated with computer aided design and product data management? [8]
- b) Why openness and harmonization is essential for the development of product life cycle management (PLM) applications? [8]
- Q2)** a) What is digital manufacturing? Explain with suitable example the benefits of digital manufacturing with respect to : [8]
- i) Shortening manufacturing planning process.
 - ii) Reduction in design changes.
 - iii) Reduction in data search time.
- b) What is role of top management in implementing the PLM strategies? [8]
- Q3)** a) Explain following capabilities of product data management (PDM) system : [8]
- i) Access control.
 - ii) Product structure.
 - iii) Engineering changes
 - iv) Product structure modeling
- b) What are barriers to the implementation of PDM system. [8]
- Q4)** Write short notes on : [18]
- a) Opportunities and benefits of PLM.
 - b) Change management for PLM.
 - c) External and internal drivers for PLM.

P.T.O.

SECTION - II

- Q5)** a) Explain with suitable examples the basic principles of design for manufacture. [8]
- b) The weights and ratings for various attributes of four alternative product designs (PD1 to PD4) are shown in Table 1. Evaluate the best product design using weighted matrix rating system. [8]

Table 1 : Matrix for product evaluation

Factor	Weight	Rating			
		PD1	PD2	PD3	PD4
Minimize future tooling	4	5	3	0	4
Minimize indirect labor	3	3	2	4	1
React to engineering changes	5	1	5	3	2
Minimize lead time	2	2	1	3	4
Minimize WIP inventory	3	1	2	2	5

- Q6)** a) Explain the operational phase of new product development. [8]
- b) Explain the role of various sources of idea generation in new product development. [8]
- Q7)** a) Explain the method of relevance trees for technology forecast. [8]
- b) Explain the benefits of rational and explicit methods of technology forecasting. [8]
- Q8)** Write short notes on : [18]
- a) Design for casting
 - b) Concept of redesign of product.
 - c) Modeling and simulation in product design.



P1329

[4065]-715

M.E. (Production)

SURFACE TREATMENT PROCESSES

(2008 Course) (Elective - III) (511111 (d))

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Solve any three questions from each section.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Figures to the right indicate full marks.*
- 4) *Draw neat sketches wherever required.*

SECTION - I

- Q1)** a) Discuss various surface dependent properties and its importance in assemblies. [8]
b) Explain the scope of surface engineering in nonmetal – plastic and ceramic. [8]
- Q2)** a) Explain need for surface cleaning and factors considered for selection of different surface cleaning processes. [8]
b) Explain with neat sketch any two surface coating processes. [8]
- Q3)** a) What meant by electro chemistry? Compare electro deposition with electroless deposition. [8]
b) Explain any two conventional surface modification methods along with application, advantages and limitations. [8]
- Q4)** Write short notes on : [18]
a) Ultrasonic surface cleaning process.
b) Surface dependent engineering properties.
c) Different coating materials and their selection.

SECTION - II

- Q5)** a) Explain with neat sketch and controlling parameter for obtaining desired thickness of Coating for following - [10]
i) Plasma,
ii) Ion implantation.
b) Discuss the various characteristics of coated surfaces. [6]

P.T.O.

- Q6)** a) What are the recent development methods for adhesion measurement of coated surface. [8]
b) Explain different ways for evaluation of surface geometry. [8]
- Q7)** a) Explain different characteristics of engineered surface at different level of scale. [8]
b) Explain different Use of laser in surface engineering. [8]
- Q8)** Write short notes on any three [18]
a) Physical vapor coating.
b) Surface engineering problems.
c) Tribological characteristics of surface.



P1340

[4065]-734

**M.E. (Production) (CAD/CAM)
PRODUCT LIFE CYCLE MANAGEMENT
(2010 Course) (Elective - III) (511211 (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) Explain opportunities and benefits of PLM. [8]
b) What are the component of PLM? Explain it. [8]
- Q2)** Write short notes on : [16]
a) Bottom - up design.
b) Modular design.
c) Concurrent engineering.
- Q3)** a) What are the different types of product models? [8]
b) Explain effect of standardization in product modeling. [8]
- Q4)** a) What are the steps in developing a PLM strategy? Explain with suitable example. [8]
b) Explain & state the guidelines of 'Design for assembly'. [10]

SECTION - II

- Q5)** a) How manufacturing cost is estimated in DFM process? [8]
b) Explain How component cost is reduced in DFM. [8]
- Q6)** a) Explain acquisition and implementation of PDM. [8]
b) Explain PDM architecture. [8]
- Q7)** a) Explain how soft computing facilities are used in product development process. [8]
b) Explain advanced database design for the integrated manufacturing. [8]

P.T.O.

Q8) Write short notes on any three :

[18]

- a) Component of PDM.
- b) Quality Function Deployment (QFD)
- c) Benefits of PDM.
- d) Design for product life cycle.



P1341

[4065]-736
M.E. (Production) (CAD/CAM)
MANUFACTURING SYSTEMS DESIGN
(2010 Course) (Elective - III) (511211(c))

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) If you were asked to manufacture a high precision automobile crank shaft, where quality and production rate are of primary concern, which process or processes would you choose? Discuss your answer? [10]
- b) Why do machining operations have an optimum (non-zero, non-infinite) cutting speed? Explain with an example? [6]
- Q2)** a) What is a techno-economical model? Describe the inputs and outputs of any two techno-economical models that you think would be useful in manufacturing? [10]
- b) A manufacturing system currently manufactures product A, It is to be converted to the production of a second - generation product, which will be either product B (with a 90% probability), or Product C (with a 10% probability). The cost of converting the system to manufacture Product B is Rs. 10 lac, while the cost of converting the system to manufacture Product C is Rs. 40 lac. What is the product flexibility of the system as measured by the penalty of change (POC)? [6]
- Q3)** a) What is “ concurrent engineering”? From what perspective can CAPP aid concurrent engineering? [5]
- b) How can the “Axiomatic Approach” be applied in decision making? [5]
- c) Why is discounted cash flow preferred over return on investment and pay back as a method for the appraisal of a manufacturing system? [6]
- Q4)** Discuss the following in brief : [18]
- a) Structural and transformational aspects of manufacturing systems.
 - b) Criteria for line balancing
 - c) Optimization procedure for single stage manufacturing systems.

P.T.O.

SECTION - II

- Q5)** a) Draw a flowchart and explain the flow of control in a Discrete Event Driven Simulation Program? [8]
b) What is a multistage decision process? Briefly describe how dynamic programming may be used to optimize a multistage decision process. [8]
- Q6)** a) What are the advantages and disadvantages of computer simulation models versus analytical models of manufacturing systems? [8]
b) What makes an automated manufacturing system flexible? Name some of the FMS software and control functions? [8]
- Q7)** Explain the following with an example : [16]
a) Hierarchical and Relational Database structures.
b) Primary and foreign keys used in database design.
c) Relational operators used in query languages.
- Q8)** Write a short note on the following : [18]
a) On-line and Off-line data collection systems.
b) Principles of agile manufacturing.
c) Hollier method for GT cellular layout.



P1352

[4065]-757

M.E. (Computer Engineering)

PATTERN RECOGNITION AND MACHINE VISION

(2008 Course) (510111(B)) (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) Discuss the problem of polynomial fitting to a set of N data points by the technique of minimizing an error function. [8]
b) What is the use of kernel method in pattern recognition? Define a kernel function and explain any simple example of kernel density estimation. [8]
- Q2)** a) Explain with example a non linear model for pattern classification. [8]
b) Explain how Bayesian estimation technique can be used to calculate a posterior density $p(\theta/D)$ and the desired probability density $p(x/D)$. [10]
- Q3)** a) Define the LMS rule and discuss the LMS procedure for multi - category pattern classification. [8]
b) With algorithm, discuss the Tomasi-kanade factorization approach for affine shape from motion. [8]
- Q4)** a) Discuss the discriminant analysis for 2 - class problem with suitable example. [8]
b) Describe Levenberg- Marquardt algorithm used for minimizing a sum of squares error. [8]

SECTION - II

- Q5)** a) Define and discuss the use of Fundamental matrix. State its properties. [8]
b) What is an interpretation tree? How this approach can be used to estimate the motion field? [8]
- Q6)** a) Explain the object tracking using path coherence function. [8]
b) Explain the use of invariant indexing for object recognition. [8]

P.T.O.

- Q7)** a) Discuss different approaches for optical flow computation of an image sequence and dynamic image pairs. [10]
- b) Explain in detail the various stages of machine vision with example. [8]
- Q8)** Explain in detail one problem of object Recognition by linear combination of views and virtual views. Discuss the importance of feature extraction in object recognition. [16]



P1363

[4065]-791
M.E. (Chemical Engg.)
ADVANCED TRANSPORT PHENOMENA
(Sem. -II) (2008 Course) (509109)

*Time : 3 Hours]**[Max. Marks : 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) The analytical expressions for dot and cross products may be used to prove vector identities hence show that

$$[\mathbf{u} \times [\mathbf{v} \times \mathbf{w}]] = \mathbf{v}(\mathbf{u} \cdot \mathbf{w}) - \mathbf{w}(\mathbf{u} \cdot \mathbf{v}) \quad [8]$$

b) State and explain the Gauss - Ostrogradskii divergence theorem. [8]

Q2) Derive the equation for steady state laminar flow inside the annulus between two concentric horizontal pipes. The flow occurs in concentric pipe exchangers. [16]

Q3) a) Derive the equation of motion for cylindrical co-ordinate system and hence show that it obeys Newton's second law of motion. [12]

b) Derive the equation which describe the time rate of change of fluid density at a fixed point in space. [6]

Q4) a) A liquid is being heated in a pipe 60 m long the temperature varies linearly from 80°C to 98°C from inlet to outlet. The liquid flows at a velocity of 15 m/s. The steady state conditions prevail. [10]

i) What is partial time derivative of temperature.

ii) What is substantial time derivative of temperature.

b) Describe the energy equation in curvilinear co-ordinates. [6]

P.T.O.

SECTION - II

- Q5) a)** Estimate the maximum diameter of microspherical catalyst particles that could be lost in the stack gas of a fluid cracking unit under the following conditions :
- Gas velocity at axis of stack = 1.0 ft/s (vertically upward)
Gas viscosity = 0.026 cp
Gas density = 0.045 lb/Ft³
Density of catalyst particle = 1.2 g/cm³
Express the result in microns? **[10]**
- b) Obtain dimensional analysis of the equation of change for a binary isothermal fluid mixture. **[6]**
- Q6) a)** Explain multicomponent fluxes in terms of the transport properties. **[10]**
- b) Describe Fick's first and second laws? Explain under what circumstances they are applicable. **[6]**
- Q7) a)** Derive the expression for velocity distribution with more than one independent variables. **[12]**
- b) What are different time smoothing equations of change? Describe them in short. **[4]**
- Q8) Write a note on** **[18]**
- a) Momentum, heat and mass transfer analogies.
b) Boundary layer theory.
c) Reynold stresses.



P1364**[4065]-795****M.E. (Chemical)****MATHEMATICAL METHODS IN CHEMICAL ENGINEERING
(2008 Course) (Theory) (Elective - III) (509111 (c))***Time : 3 Hours]**[Max. Marks : 100**Instructions to the candidates:*

- 1) *Any three questions from each section should be solved compulsorily.*
- 2) *Assume suitable data wherever necessary.*

SECTION - I

- Q1)** a) What are various applications of tensors and matrices in chemical engineering. Explain with suitable examples in the field of chemical engg. [6]
 b) What are various properties of tensors. List them. [6]
 c) What are various properties of eigen values and eigen vectors. List them. [6]
- Q2)** a) Use Gauss elimination to solve

$$3x_1 - 0.1x_2 - 0.2x_3 = 7.85$$

$$0.1x_1 + 7x_2 - 0.3x_3 = -19.3$$

$$0.3x_1 - 0.2x_2 + 10x_3 = 71.4$$
 Carry out six significant figures in calculation. [6]
 b) What are pitfalls of elimination methods? List and explain each of them with suitable examples. [6]
 c) What do you mean by singular systems? Explain. [4]
- Q3)** a) Use Gauss seidal method to solve following system of equations. [10]

$$10x - 2y - z - t = 3 \text{ ————— } \textcircled{1}$$

$$-2x + 10y - z - t = 15 \text{ ————— } \textcircled{2}$$

$$-x - y + 10z - 2t = 27 \text{ ————— } \textcircled{3}$$

$$-x - y - 2z + 10t = -9 \text{ ————— } \textcircled{4}$$

 b) Explain the convergence criteria for the Gauss seidal method. Give an example. [6]
- Q4)** a) Write short note on : [10]
 i) Elementary stability and bifurcation analysis.
 ii) Phase portraits of multidimensional systems.

- b) Use fixed point iteration method to determine the root of

$$u(x, y) = x^2 + xy - 10 = 0$$

$$v(x, y) = y + 3xy^2 - 57 = 0$$

Note that correct pair of roots is $x = 2$ and $y = 3$. Initiate computation with guesses of $x = 1.5$ and $y = 3.5$. [6]

SECTION - II

- Q5)** Use direct approach finite element method to generate matrix equation that describes the behaviour of rod shown in following Figure.

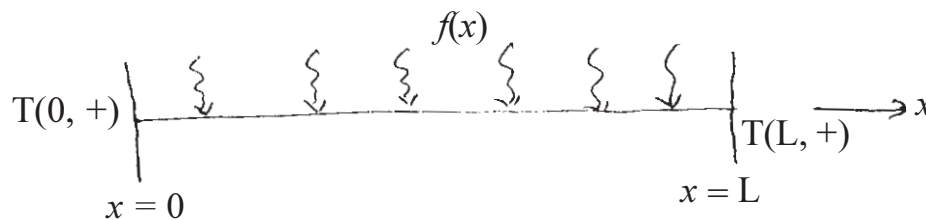


Fig.A long thin rod heated and of length L.

The rod is made of 10 cm length with boundary conditions of $T(0,+) = 40$ and $T(L,+) = 200$ and uniform heat source of $f(x) = 10$. The equation for the

same is $\frac{d^2T}{dx^2} = -10$. [16]

- Q6)** a) Differentiate between regular and singular perturbation. [6]
 b) Use Gauss seidal method to solve for temperature distribution of heated plate in following Figure. [10]

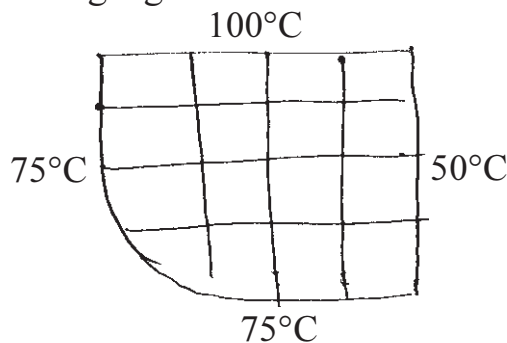


Fig.A heated plate with irregular boundary, fixed boundary conditions and equal grid spacing.

In the shown figure $\Delta x = \Delta y$, $\alpha_1 = B_1 = 0.732$ and $\alpha_2 = B_2 = 1$.

- Q7)** Formulate the equation for determining temperature at point (4, 2) of following figure using control volume approach. [16]

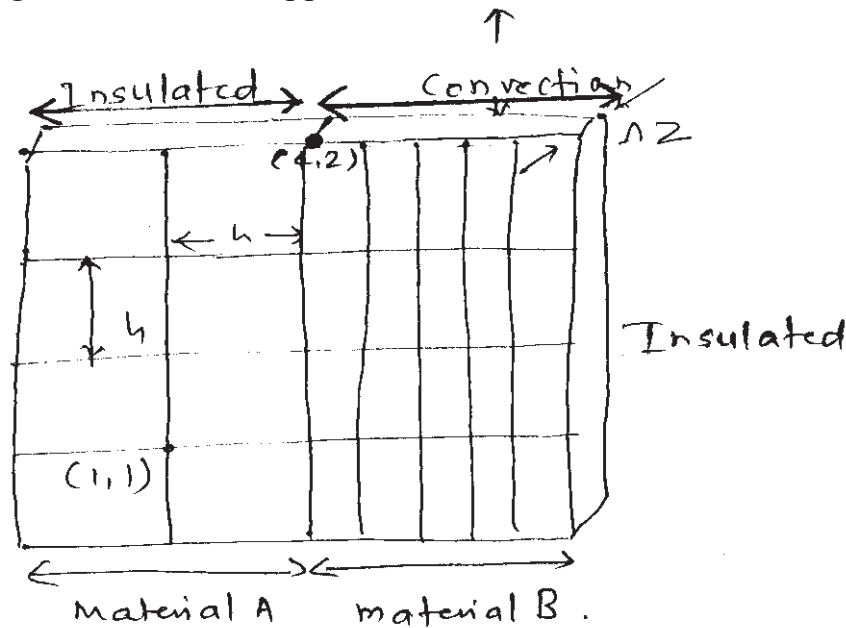


Fig. A heated plate with unequal grid spacing two materials and mixed boundary conditions.

- Q8)** a) Derive formula for explicit method of finite differences using Laplace equation. [4]
- b) What do you mean by convergence and stability in case of explicit method. [4]
- c) Use the Crank Nicolson's method to solve for temperature distribution of long, thin rod with a length of 10 cm and following values : $K' = 0.49$ cal/s.cm $^{\circ}\text{C}$, $\Delta x = 2$ cm and $\Delta t = 0.15$. At $t = 0$, the temperature of the rod is zero and boundary conditions are fixed for all times at $T(0) = 100^{\circ}\text{C}$ and $T(10) = 50^{\circ}$ degC. Note that rod is of aluminium with $C = 0.2174$ cal/g. $^{\circ}\text{C}$ and $\rho = 2.7$ g/cm 3 . Therefore $K = 0.835$ cm 2 /s and $\lambda = 0.020875$. Solve for 1 iteration. [10]



P1389

[4065]-882

M.E. (Instrumentation and Control) (Process and Biomedical)

TRANSDUCER DESIGN

(506101) (2008 Course) (Sem. - I)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** In the production of compressed air containers a leak test must be carried out. It is to be carried out in an automatic production line. Only 10 seconds are available for the complete test cycle. The test equipment must detect a 0.1% loss of pressure within about 5 seconds. Design a suitable scheme for this application. **[16]**
- Q2)** In a pathology laboratory Blood pH and urine pH measurement is to be carried out. Suggest a suitable setup. Consider all variations in the pH and temperature. **[16]**
- Q3)** In a foundry application molten steel temperature is continuously measured. The maximum temperature is around 1500°C. Suggest one contact type and one non-contact type technique for the application. Compare both the techniques. Which would be the best option? Justify your answer. **[16]**
- Q4)** Write a short notes on : **[18]**
- a) Six component accelerometer.
 - b) LVDT displacement transducer with DC output.

SECTION - II

- Q5)** Write a short notes on : **[16]**
- a) Sensors in Effluent treatment plant.
 - b) Optic ring gyro employing Sagnac effect.

P.T.O.

Q6) Design Force Measuring System for :

[18]

- Force 1000N
- Length of Cantilever Beam 15 cm
- Width 10mm
- Young's Modulus for SS 200GN/Sqm
- Strain at root not to exceed 1000 microstrain.
- Use Excitation Voltage between 10 to 15 V
- Strain Gauge width 3mm and Length 5 mm with tabs
- Strain gauge resistance 350 ohms +/-1 ohm
- Strain gauge power dissipation on SS is 50mW
- Use ADC having at least 8 bit output
- Use Micro controller typical 89c51 or equivalent
- Use Instrumentation amplifier AD 522 with guard terminal
- Use LCD Display.

Find

- a) Thickness of the beam
- b) Output for Full scale Load of 1000N
- c) Gain to suit ADC Input using Instrumentation Amplifier.

Q7) It is required to measure flow in an open channel system. It is carrying water from dam to village farms. Suggest a suitable flow monitoring system and related signal conditioning. **[16]**

Q8) A container is equipped with a stirrer motor, the torque of which has to be measured. The measurement will be used to determine the consistency of the contents of the container. Measured values must be presented in digital form and be printed on a digital printer at certain intervals. Design a suitable scheme for this application. **[16]**



P1407

[4065]-924

**M.E. (Printing Engineering and Graphic Communication)
PROBABILITY, STATISTICS & QUEUEING THEORY
(2008 Course) (Sem. - I) (508101)**

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer any two questions from each section.*
- 2) *Answer to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Use of electronic calculator is permitted.*
- 5) *Use of statistical data tables is permitted.*
- 6) *Figures on right indicate marks.*

SECTION - I

- Q1)** a) 10 unbiased coins are tossed simultaneously find the probability that there will be **[10]**
- i) Exactly 5 heads
 - ii) At least 8 heads
 - iii) Not more than 3 heads
 - iv) At least one head
 - v) If this exercise is carried out 50 times how many times we can get exactly 5 heads.
- b) If 5% of electric bulbs manufactured by a company are defective use Poisson distribution to find the probability that in a box of 100 bulbs. **[9]**
- i) None is defective.
 - ii) 3 bulbs are defective.
 - iii) More than 3 bulbs are defective (Given $e^{-5} = 0.007$)
- c) A job can be done on an average in 4 days. The time requirement follows exponential distribution **[6]**
- i) What is the probability of completing job within 3 days.
 - ii) What is the probability of not completing the job before 4 days.

P.T.O.

Q2) a) The chosen population in following conditions are normally distributed [13]

- i) $(\mu + 1\sigma) = 300$ and $(\mu - 1\sigma) = 200$ Area under the curve between them is 0.5004. Find the point above which the area under the curve is 0.063.
- ii) The area under the curve between 'r' std. deviations on both sides of mean is 0.34. Area under the curve between r^{th} std. deviation & m^{th} standard deviation is 0.2 find all possible values of m. Round the answer to nearest 3rd decimal.
- iii) Mean length of 5 sticks is 50 cm with std deviation of 3cm. What are the chances of having the mean length of next 5 sticks more than 53 cm?

b) $X = \{1, 2, 3, 2, 7, 10, 11, 11\}$ [12]

- i) Find out mean mode, middle
- ii) Find out standard deviation.

Q3) a) Given data [12]

X	0	1	2	3	4	5	6	7	8	9
Y	9.1	7.3	3.2	4.6	4.8	2.9	5.7	7.1	8.8	10.2

- i) Fit a regression curve of the form $MY/X = \beta_0 + \beta_1x + \beta_2x^2$.
- ii) Estimate MY/Z.

b) The data given below shows amount of dissolve salts at given temp. [13]

Dissolved salt %	31.5	32	34.3	35.1	37.2	38.7	39.3	40.1	41.5
Temperature Celsius	20	25	30	35	40	45	50	55	60

- i) Fit linear regression model & provide the ANOVA.
- ii) Will the salt dissolve at 0° C according the model.
- iii) Estimate the amount of dissolved salts at 42°C.
- iv) Find the residual at 35°C.

SECTION - II

Q4) a) A product must survive 50 min below water level at 1 m depths. The product life in these conditions is normally distributed. A batch of product has standard deviation of 3 min for survival time. If 36 samples are to be chosen for acceptance sampling test, draw an OC curve which will indicate the acceptance probabilities for different amount of mean survival time. Also find the probability of acceptance of batch if mean survival time is 49 min. [10]

- b) The sample of size 50 are taken every hour from process producing a certain type of item that is either considered defective or not defective. Twenty samples are taken. [15]

Sample	No. of defective items	Sample	No. of defective items
1	4	11	2
2	3	12	4
3	5	13	1
4	3	14	2
5	2	15	3
6	2	16	1
7	2	17	1
8	1	18	2
9	4	19	3
10	3	20	1

- i) Construct a control chart for control of proportion defective.
- ii) Does this process appear to be in control? Explain.

Q5) Suppose that we wish to use a half - replicate to study the effects of five factors each at two levels on some response & it is known that what ever the effect of each factor it will be constant for each level of other factor. In other words, there are no interactions let the defining contrast to ABCDE. Causing main effects to be aliased with four factor interactions. The pooling of contrasts involving interactions provides $15-5 = 10$ degrees of freedom for error. Perform an analysis of variance on the following data testing all main effect is for significance at the level 0.05. [25]

- Q6)** a) Explain Kndall's Notation. What are little's formulae? [12]
- b) For a fast food counter the time of serving is 1.5 min per customer. The customer arrive at rate of 30 per hour. The queue model is M/M/1. [13]
- i) What is queue length at any given time?
 - ii) What will be the queue length if the arrival rate is reduced by $(1/3)$ of the original.
 - iii) If the serving time is increased by 15 sec & the waiting time for customer is considered as Rs. 2 per min what will be the loss per customer.



Total No. of Questions : 6]

[Total No. of Pages : 1

P1417 [4065]-938
M.E. (Printing Engg. & Graphic Communication)

PRESS FINGER PRINTING

(Elective - III) (2008 Course) (508111 (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 on right indicate marks.*

SECTION - I

- Q1)** a) What is press fingerprinting? [15]
b) Discuss benefits of press fingerprinting in detail. [10]
- Q2)** a) What are variables considered on press optimization? [10]
b) Give short note on hue error. [8]
c) What is density and dot gain? [7]
- Q3)** a) State and explain the instruments and test charts required for press fingerprinting. [15]
b) Write short notes on: [10]
i) Balls and Beads.
ii) Slur Target.

SECTION - II

- Q4)** a) Comment on ICC profiling. [15]
b) State and explain standardization essentials. [10]
- Q5)** a) Explain analysis of results in fingerprinting. [15]
b) Write about the substrate white point in brief. [10]
- Q6)** a) Explain use of statistical techniques sample analysis. [10]
b) Write note on Short-Term & Long-Term Variation. [8]
c) Explain process stability and process capability. [7]



Total No. of Questions : 6]

[Total No. of Pages : 1

P1440

[4065]-222

M.E. (Petroleum Engineering)

Advanced Natural Gas Engineering and Technology

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

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Answer two questions from each section.*
- 2) Answers to the two sections must be written in separate answer books.*
- 3) Figures to the right indicate full marks.*
- 4) Neat diagrams should be drawn wherever necessary.*
- 5) Use of a non-programmable calculator is allowed.*
- 6) Assume suitable data, if necessary and clearly state it.*

SECTION - I

Q1) State 5 properties of Natural Gas and how are they obtained. **[25]**

Q2) Derive the Weymouth Equation. **[25]**

Q3) Sketch a reciprocating compressor and briefly explain all parts. **[25]**

SECTION - II

Q4) Explain phase behavior of a gas reservoir and material balance equation. **[25]**

Q5) Draw a process flow diagram to show two methods how H₂O is removed from a natural gas stream. **[25]**

Q6) Derive the equation used to calculate flow rate in a orifice meter. **[25]**



Total No. of Questions : 8]

[Total No. of Pages : 2

P1478

[4065]-680
M.E. (E&TC) (Communication Networks)
CODING & MODULATION TECHNIQUES
(2010 Course) (Sem. - I) (504601)

Time : 3 Hours]

[Max. Marks : 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 right indicate full marks.*
- 5) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Compare in detail Television standards [8]
i) PAL
ii) NTSC
iii) SECAM
b) What is wireless communication? Explain path loss model in wireless communication. [8]
- Q2)** a) Explain in detail different MPEG standards? [8]
b) What is JPEG? Explain JPEG standards & its modes? [8]
- Q3)** a) Explain multipath propagation in detail? [8]
b) Explain frequency domain & Time domain equalization? [8]
- Q4)** Write short notes [any two] [18]
a) PN Code properties.
b) Information & source coding for discrete source.
c) Channel coding.

SECTION - II

- Q5)** a) Explain in detail CDMA [8]
b) Explain analog & digital modulation techniques? Compare in detail? [8]
- Q6)** a) Explain block matching algorithm [8]
b) Explain in detail Run - length encoding. [8]

P.T.O.

Q7) a) Explain frequency selective fading in detail. [8]

b) Define OFDM? Explain in detail with neat diagram? [8]

Q8) Write short notes [any two] [18]

a) Dolby Audio System.

b) Video compression.

c) Wideband Rake Receiver.



P1483

[4065]-830

M.E. (Petroleum Engg.)

**GIS AND COMPUTER APPLICATIONS IN PETROLEUM INDUSTRY
(2008 & 2002 Course) (512108) (Sem. - II)**

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answers to the two sections should be written in separate answer books.*
- 2) *Attempt any two questions from Section I and from Section II.*
- 3) *Assume additional data if required.*
- 4) *Use of graph paper is allowed.*

SECTION - I

- Q1)** a) Summarize the arguments for raster GIS and application areas in which it has advantages and disadvantages. **[15]**
- b) Write notes on **any two** of the following : **[10]**
- i) Georeferencing.
 - ii) Standard map projection systems.
 - iii) Autocorrelation.

OR

- Q2)** a) Explain the difference between spaghetti and topological data structure in vector GIS? Describe with the help of a sketch, the spatial components used in topological data structure. **[15]**
- b) Classify natural and artificial spatial objects giving suitable examples of each. **[10]**
- Q3)** a) Write down and illustrate 16 Boolean combinations for polygons A and B. **[15]**
- b) What are multivariate maps? **[10]**

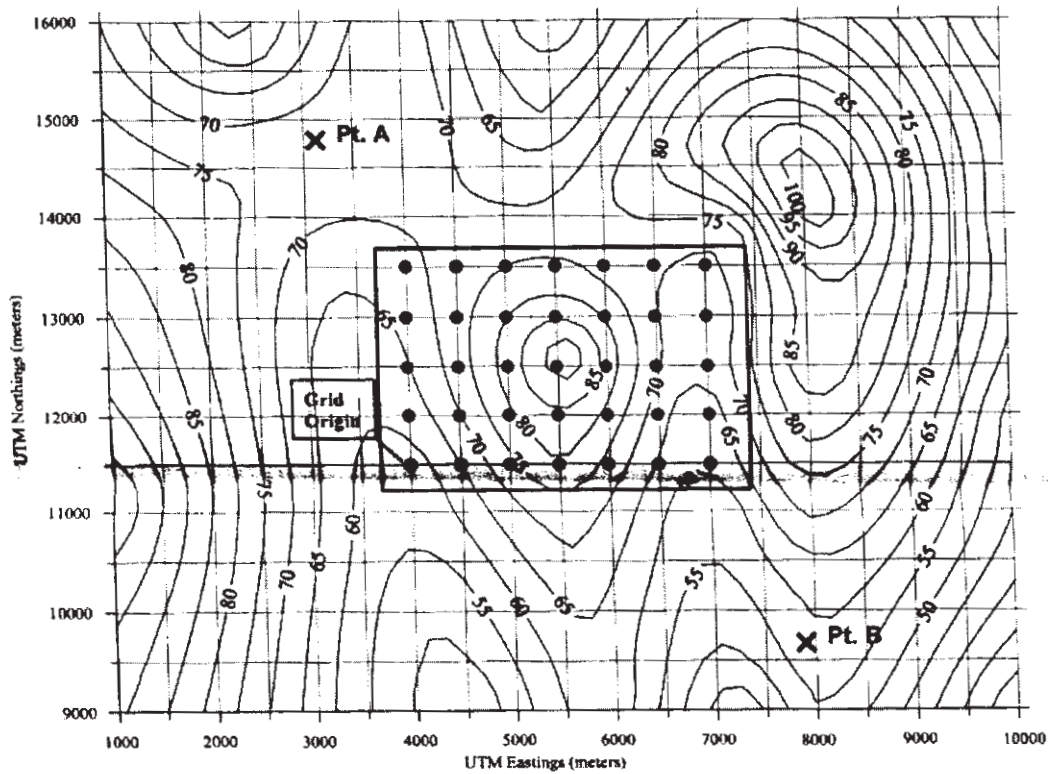
OR

- Q4)** a) How does Structured Query Language help in the creation of maps based on selective attribute data? What are the major types of SQL? **[15]**
- b) Discuss the results of using the polygon area and point in polygon algorithm when the polygon is not correctly sutured. **[10]**

SECTION - II

- Q5)** a) What is Spatio - temporal data model in GIS? Explain in brief main concepts defined for a space-time path. **[15]**
- b) The vector - line subsurface marker horizon map below is overlain with a raster grid of columns and rows. Determine the value for each intersecting point in the grid marked at the centre. Prepare a table to create a raster - based, grid DEM data set. **[10]**

P.T.O.



Find out their respective elevations using interpolation method. How is autocorrelation attempted in this map?

OR

- Q6)** a) Define Fractals. Illustrate the importance of scale dependency, self-similarity and scaling. How fractals are useful in GIS operations. [15]
- b) Distinguish between perspective models and predictive models. Discuss and illustrate their field of applications. [10]

Q7) a) A crude oil refinery is in operation for last 40 years adjacent to a river, which is a major source of water for many villages. The company management is responsible for the environmental conditions. The facility is located over the area of approximately 350 acres and potentially there have been many releases of many different chemicals. A lot of residential and commercial activity has taken place in last ten years adjacent to the refinery. There are, therefore, a lot of potential sources of leakage, and the location of many of these sources is unknown. Good Number of potential receptors is also recognized in the area.

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.

Develop an approach utilizing GIS and a decision analysis frame work as the basis for making risk - based decisions for corrective action. You are requested to take into consideration. [15]

- i) Information about environmental measurements at the site, such as concentration data, groundwater levels, and soil profiles.
 - ii) The spatial database including structures, storage tanks, pipelines , surface cover, and surface hydrology. Regional features include land use, census tracts, soils data, and climate data.
 - iii) Is it necessary to add temporal component to the project?
- b) What is the difference between deterministic and probabilistic approach in the mapping of oil spill hazard and contingency planning using GIS and Remote sensing techniques? [10]

OR

Q8) a) A terminal for the storage of oil is under consideration outside a metro city. The site must be located so that all conditions mentioned below are fulfilled :

- i) Be in an area where unconsolidated superficial material has minimum thickness,
- ii) Permeability of foundation material (bedrock) is low, preventing contamination below the surface,
- iii) Slope is gentle where river flooding is unlikely,
- iv) Bed rock is not fractured,
- v) It should be located in the agricultural zoning outside the limit of metro city and near to the industry, it should not be a prime land.
- vi) The site should have excellent transportation facility,
- vii) There are certainly other factors like cost of land and size of the land (Approximately 2 km²), which should be taken into consideration.

Develop a stepwise procedure starting with the types of maps required. How will you create a suitability map by using the above conditions for the selection of this site. [15]

- b) What are buffers/Dilation? Explain in brief basic methods of determining buffer distances. [10]



P1489**[4065]-31****M.E. (Civil - Structures)****NUMERICAL METHODS AND FINITE ELEMENT METHODS
(2002 - Course) (501501)***Time : 4 Hours]**[Max. Marks : 100**Instructions to the candidates:*

- 1) Answer any Two questions from each section.
- 2) Answers two questions from Section - I and two questions from Section - II.
- 3) Answers 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) Solve the equation $\frac{d^2 y}{dx^2} - y^2 \frac{dy}{dx} = x$, subject to the conditions at $x = 1$,

$y = 2, \frac{dy}{dx} = 1$, Calculate 'y' at $x = 1.4, h = 0.2$ using Runge - Kutta fourth - order method. **[15]**

b) Employ the power method to determine the lowest eigen value for the matrix. **[10]**

$$\begin{bmatrix} 2 & 8 & 10 \\ 8 & 4 & 5 \\ 10 & 5 & 7 \end{bmatrix}$$

Q2) a) Solve the Laplace's equation $U_{xx} + U_{yy} = 0$, in the domain of $0 \leq x \leq 3, 0 \leq y \leq 3$ with boundary conditions. **[15]**

$$u(x, 0) = 0 \text{ at } x = 1, x = 2$$

$$u(3, y) = 0 \text{ at } y = 1, y = 2$$

$$u(0, y) = 0 \text{ at } y = 1, y = 2$$

$$u(x, 3) = 1 \text{ at } x = 1, x = 2$$

b) Solve the equation $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ subject to the conditions $u(x, 0) = 0, u(0, t) = 0, u(1, t) = t$ using crank. Nicholson Method. **[10]**

P.T.O.

Q3) Solve the boundary value problem defined by $y'' + y = -x, 0 < x < 1,$
 $y(0) = y(1) = 0,$ using **[25]**

- i) Rayleigh - Ritz Method
- ii) Galerkin Method.

SECTION - II

Q4) a) Derive shape function in natural co-ordinates for 2D, three noded triangular element. **[10]**

b) A beam with rectangular cross-section is of span 'L' meters and is supported by hinge at one end and roller at other end. It is loaded with point load at centre of span. Discretize the structure into nodes and elements. Define boundary conditions and loads. **[8]**

c) State types of elements and its typical application. **[7]**

Q5) a) Explain plain stress, plain strain & axisymmetric problem.

Using r, θ, z co.ordinate system write all six components of strains and show that in case of axi symmetric problem these are reduced to four. **[15]**

b) Explain assembly process to obtain overall structure equation. How node number affects the bond width. **[10]**

Q6) a) Explain aspect ratio for elements. **[4]**

b) Explain Raileyh Ritz method. **[7]**

c) Principle of minimum potential energy. **[7]**

d) Give suitable examples for plain stress; plain strain and axisymmetric problem. **[7]**



P1492**[4065]-46**

**M.E. (Mechanical Engineering) (Design and Heat Power)
 NUMERICAL METHODS AND COMPUTATIONAL TECHNIQUES
 (502101) (2002 Course)**

*Time : 3 Hours]**[Max. Marks : 100**Instructions to the candidates:*

- 1) Answer 3 questions from each section.
- 2) Assume suitable data, if required.
- 3) Figures to the right (in square brackets) indicate full marks.
- 4) Use of a calculator is allowed.

SECTION - I

Q1) The deflection curve of a beam subjected to a linearly increasing load can be given as

$$y = C(-x^5 + 2L^2x^3 - L^4x)$$

where $C = 4.5 \times 10^{-5} / m^4$ and L (beam length) = 4m.

- a) Write the equation for the maximum deflection. Use Newton Raphson method to determine the point of maximum deflection. **[12]**
- b) Compute the maximum deflection. **[4]**

Q2) Solve the following system using Gaussian elimination (or any other direct method) : **[16]**

$$5x_1 + x_2 + 2x_3 = 3.5$$

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

$$x_1 + x_2 + 2x_3 = -0.5$$

Time (min)	10	15	20	25	40	50	55
Tensile Str	5	21	19	37	42	54	70

Q3) Consider the following data on the variation of tensile strength of a plastic as a function of time it is heat treated.

- a) Fit a straight line to the data. **[12]**
- b) Use the same to determine the tensile strength at a time of 36 min. **[4]**

Q4) Consider one dimensional transient conduction in a rod of 1 m length, given by

$$\frac{\partial T}{\partial t} = \alpha \frac{\partial^2 T}{\partial x^2}$$

The boundary and initial conditions are

- $T = 0$ at $t = 0$ (initial condition)
- $T = 0$ at $x = 0$ (boundary condition)
- $T = 90$ at $x = 1$ (boundary condition)

Choose $\delta x = 0.25m$ and $\delta t = 0.01s$. Take $\alpha = 1m^2/s$.

- a) Using the explicit method, advance by two time steps and determine the temperature field at $t = 0.02s$. [12]
- b) Form the equations for the implicit scheme for one time step. The solution is not required. [6]

SECTION - II

Q5) Consider the function

$$f(x) = x^2 - \frac{2}{x}$$

Integrate this function from $x = 1.2$ to $x = 2.4$ with a step size $h = 0.2$

- a) using Trapezoidal rule. [6]
 - b) using Simpson's one - third rule. [6]
 - c) compare both methods against the exact solution. [4]
- Q6)**
- a) Derive the (first order accuracy) forward and (second order accuracy) central difference approximations to the first derivative, along with the leading error term. [7]
 - b) Derive the approximation for the second derivative along with the leading error term. [4]
 - c) Consider $f(x) = \sin(x)$. Taking $\delta x = 0.05$, determine the (first order) forward and (second order) central difference approximations to the derivative at $x = 1$ radian. Compare against the exact solution. [5]

Q7) For the case of water draining out from the bottom of a tank, the water level in the tank can be given as

$$\frac{dy}{dt} = -k\sqrt{y},$$

where $k = 0.1 m^{1/2}/min$.

The initial condition is $y = 2.2m$ at $t = 0$

Integrate this from $t = 0$ to $t = 2$ min.

- a) Using Forward Euler with $\delta t = 0.5min$. [6]
- b) Using Fourth Order Runge Kutta with $\delta t = 1$ min. [12]

Q8) Consider steady state conduction given by the Laplace equation in a square of 1m length. The boundary conditions are as follows :

- $T = 120$ for $y = 0, 0 \leq x \leq 1$
- $T = 180$ for $y = 1, 0 \leq x \leq 1$
- $T = 70$ for $x = 0, 0 \leq y \leq 1$
- $T = 240$ for $x = 1, 0 \leq y \leq 1$

With $\delta x = \delta y = \frac{1}{3}$,

- a) Form the equations at the interior nodes. **[8]**
- b) Carry out 2 cycles of iteration. **[8]**



P1503**[4065]-49****M.E. (Mechanical) (Heat Power Engg.)****THERMAL AND MECHANICAL DESIGN OF HEAT EXCHANGERS
(502107) (2002 Course)***Time : 3 Hours]**[Max. Marks : 100**Instructions to the candidates:*

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

SECTION - I

- Q1)** a) Explain the heat exchanger design methodology with suitable example. [10]
b) Differentiate between rating and sizing of heat exchangers. [6]

- Q2)** a) Show that for counterflow heat exchanger when, $\frac{C_{\min}}{C_{\max}} = 1$, effectiveness

is given by $\varepsilon = \frac{NTU}{1 + NTU}$ with standard notation. [8]

- b) Explain the various streams of flow on shell side in shell and tube heat exchanger with neat sketch. [8]

- Q3)** Explain step by step the Kern method for design/analysis of shell and tube heat exchanger with appropriate assumptions. [16]

- Q4)** Distilled water with a flow rate of 60 kg/s enters a baffled shell-and-tube heat exchanger at 32°C and leaves at 25°C. Heat via be transferred to 140 kg/s of raw water coming from supply at 20°C. Design and estimate constructional parameters of heat exchanger. A single shell and single pass is preferable. The tube diameter is 19 mm OD and 16 mm ID and tubes are laid out on 25.4 mm sq. pitch. The maximum length of heat exchanger required is of 7 m because of space limitation. Estimate shell side heat transfer coefficient by Kern method; assuming constant properties. The properties of the fluid at average temperature are : [18]

Properties	Tube side fluid	Shell side fluid
Specific heat, C_p (J/kg.K)	4182	4179
Dynamic viscosity, μ (Pa.s)	10.02×10^{-4}	8.15×10^{-4}
Thermal conductivity, k (W/m.k)	0.598	0.612
Density, ρ (kg/m ³)	998.2	996
Prandtl number, Pr	7.01	5.75

P.T.O.

SECTION - II

- Q5)** a) Explain the important aspects of TEMA standards. [8]
b) What are various types of regenerators? Explain the regenerator used for power plant. [8]
- Q6)** a) What are the various components of pressure drop considered while calculating the total shell side pressure drop in Bell Delaware method? [8]
b) Outline the step by step thermal hydraulic design procedure for design/performance analysis of Gasketed plate heat exchanger. [8]
- Q7)** a) Explain spiral heat exchanger with neat sketch. [8]
b) Explain with specific example the use of different types of fins for heat exchanger. [8]
- Q8)** Write short notes on (any three) [18]
a) Flow induced vibrations.
b) Temperature approach, meet and cross
c) Causes and effects of fouling
d) Heat pipe heat exchangers



P1506

**[4065]-205
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 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) 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) With reference to the basic call setup scenario describe the process of mobile unit originating a call to a PSTN/ISDN subscriber. Using a suitable diagram show the various stages of call setup starting from RIL-RR channel request until RIL-CC channel connect acknowledge when the conversation starts. **[16]**

Q3) What are the five different kinds of bursts used in a GSM system? Describe the detailed functions of any two of them. **[16]**

Q4) a) State five major features of wireless application protocol (WAP)
b) Draw a WAP architecture showing it's three major components.
c) State the specific aspects of wireless application environment and wireless protocol stack.

[18]

P.T.O.

SECTION-II

- Q5)** Write short notes on the following : **[18]**
- a) SMS Gateway
 - b) Cell splitting.
 - c) Session Initiation protocol
- Q6)** With respect to a MS explain the meaning of the following terms : **[16]**
- a) IMSI attached
 - b) Roaming
 - c) Location updating.
 - d) Handover
 - e) Locating
- Q7)** Write short notes on the following : **[16]**
- a) Wired Equivalent Privacy (WEP)
 - b) Base Station System (BSS)
 - c) SMS security.
- Q8)** a) Draw a frequency versus time plot showing time and frequency domain access for GSM cellular radio. Show horizontal channel strips and frequency distance between channel strips. On a given channel strip show time segments for frames and physical time slots for a typical frame. Assume 25 MHz band and state how many carriers are actually used in practice. **[8]**
- b) State how a logical channel for digital speech is mapped to a physical channel. State what are the different types of TCH. **[8]**



P1511

[4065]-447

M.E. (Civil) (Hydraulic Engineering)

HYDROLOGY

(2008 Course) (501309) (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 to be written in separate answer books.*
- 3) *Figures to the right indicate full marks.*
- 4) *Draw neat diagrams wherever necessary.*
- 5) *Use of calculators is allowed.*
- 6) *Assume suitable data if necessary.*

SECTION - I

- Q1)** a) Explain the double mass curve technique to test the consistency of record. [10]
b) Describe the principle of rainfall measurement using RADAR with neat sketch, also state its advantages over other rain gauges. [8]

OR

- Q2)** a) Define evapotranspiration. How evapotranspiration is measured? Explain lysimeter. [10]
b) Explain instantaneous unit hydrograph with sketch and explain its application in water resources engineering. [8]

- Q3)** a) What is infiltration? Write the equations for infiltration indices. How will separate the base flow? Explain in detail with neat sketch. [8]
b) What are initial abstractions? Explain interception and depression storage with sketch. [8]

OR

- Q4)** a) Explain what do you understand by return period? Give few formulae to determine return period. [8]
b) Explain extreme value (Gumbel's) distribution. [8]

- Q5)** a) Write a note on Envelope curves. [8]
b) Explain Khosla's method to estimate runoff. [8]

P.T.O.

OR

- Q6)** a) State various methods of flood estimation and explain rational method in detail. [8]
b) Explain recuperation test. What should be the diameter of an open well to give safe yield of 6.8 lit/sec? Assume the working head at 4.75 m and the subsoil consists of fine sand. (For fine sand specific yield = 0.5/hour) [8]

SECTION - II

- Q7)** a) Explain with neat sketch the Cooper and Jacob method of determining the aquifer parameters. [10]
b) Explain Chow's method of determining aquifer parameters using the pumping test data. [8]

OR

- Q8)** a) Derive the expression for steady state discharge of a fully penetrating well into a unconfined aquifer with a neat sketch. [10]
b) In an artesian aquifer of 8 m thick, a 10 cm diameter well is pumped at a constant rate of 100 lit/minute. The steady state drawdown observed in two wells located at 10 m and 50 m distances from the centre of the well are 3 m and 0.1 m respectively, compute the transmissivity and the hydraulic conductivity of the aquifer. [8]
- Q9)** a) Explain Dupuits - Thiems theory and state the assumptions made for it also explain method of images in short. [10]
b) Enlist different types of tube wells and explain any one type with a neat sketch. [6]

OR

- Q10)** a) Write notes on [12]
i) Ground water budget.
ii) Ground water pollution control
iii) Pumping equipments for tube wells.
b) Describe any one method of artificial water recharge with sketch. [4]
- Q11)** a) What is Pade's approximation? [4]
b) What are the steps involved in steepest gradient method? [6]
c) Which are the various methods in potential theory? [6]

OR

- Q12)** a) State and prove that conformal map preserves the angle between two differentiable arcs. [8]
b) What are models? What is use of models? Which are the different types of models to solve ground water flow problems? [8]



P1526**[4065]-792****M.E. (Chemical)****ADVANCED PROCESS CONTROL
(2008 Course) (Sem. - II) (509110)**

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

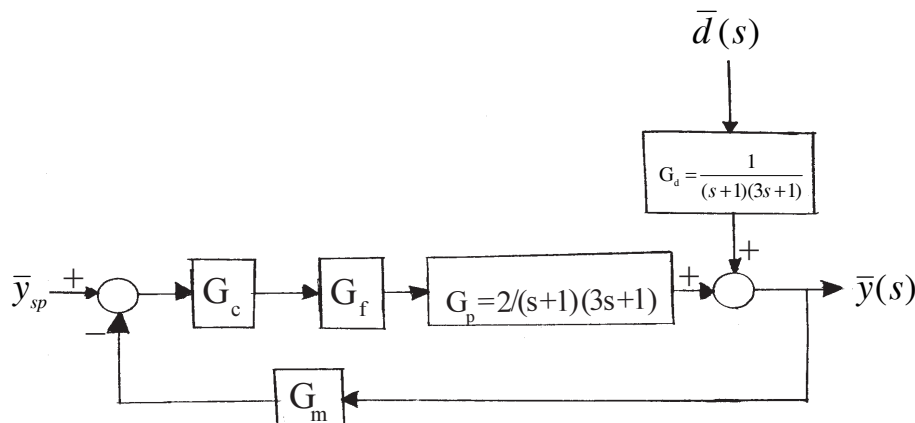
- 1) Answer 3 questions from Section - I and 3 questions from Section - II.
- 2) Answers to the two sections should be written in separate books.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Figures to the right indicate full marks.
- 5) Use of logarithmic tables slide rule, Mollier charts,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

SECTION - I**Q1)** The dynamic behavior of a physical process is modeled as first - order DE

$$a_1 \frac{dy}{dt} + a_0 y = bf(t)$$

Where the symbols have their usual meanings.

- a) Derive transfer function $\frac{\bar{y}(s)}{\bar{f}(s)}$ [3]
- b) Derive the expression for unit step response of the system. Sketch the input and output response curves. Indicate the value of static gain K and time constant τ on the response curve. [5]
- c) Derive the expression for unit impulse response of the process and sketch the response curves. [5]
- d) Derive the expression for output response if input is given unit ramp change. Sketch the response curves. [5]

Q2)**P.T.O.**

For the feedback control system shown in the figure, assuming $G_f = G_m = 1$. [16]

- a) If a P - controller is used with gain 5, derive the servo response transfer function and hence closed - loop response for unit step change in set - point. Find the ultimate response and hence the offset if any.
- b) Find the range of values of gain K_c of a P - controller that produce stable closed - loop response (use Routh - Hurwitz criterion)
- c) Draw root locus of a closed - loop system.
- d) Find the gain of a P-controller that produces a closed - loop servo response with a decay ratio equal to 1/4.

Q3) a) For a FOPDT candidate model

$$G(s) = \frac{\bar{y}(s)}{\bar{f}(s)} = \frac{K \exp(-\theta s)}{\tau s + 1}$$

Derive the theoretical expressions for static gain K , time constant τ and dead time θ .

If unit step response data $y(t)$ is available, explain how will you determine K , τ & θ graphically. [8]

- b) i) Sketch single - loop feedback control strategy for controlling temperature inside a CSTR (in which exothermic reaction is carried out) by manipulating the flow rate of coolant circulated through jacket.
- ii) Sketch and explain cascade control strategy for above CSTR with coolant temperature as secondary variable. Draw block diagram of this cascade control strategy. What are the advantages of cascade control strategy over single - loop control? [8]

Q4) a) Sketch and explain feed forward control strategy for controlling temperature of the exit hot stream from a counter - current heat exchanger by manipulating flow rate of steam based on controlling the disturbances - i.e. flow rate and temperature of entering cold stream. [8]

- b) Draw and explain control scheme for controlling ratio of fuel to air in a burner with air flow as wild stream. [8]

SECTION - II

Q5) For a MIMO process having the input - output relationship **[16]**

$$\bar{y}_1 = \frac{1}{s+1} \bar{m}_1 + \frac{1}{0.1s+1} \bar{m}_2$$

$$\bar{y}_2 = \frac{-0.2}{0.5s+1} \bar{m}_1 + \frac{0.8}{s+1} \bar{m}_2$$

- a) Draw block diagram of the process.
- b) Calculate the RGA.
- c) Recommend the best pairing of input-output variables that can form control loops with minimum interaction.
- d) Derive the expressions for decouplers between $\bar{m}_1 - \bar{y}_1$ & $\bar{m}_2 - \bar{y}_2$ and draw block diagram with these decouplers.

Q6) Explain direct synthesis (DS) control strategy. Derive the DS controllers for the following processes that will produce a first - order closed - loop behavior

given by $Q(s) = \frac{1}{\tau_r s + 1}$. **[16]**

- a) Pure gain process with $G(s) = K$
- b) Pure capacitive process with $G(s) = \frac{K}{s}$.
- c) F.O. process with $G(s) = \frac{K}{\tau s + 1}$
- d) S.O. process with $G(s) = \frac{K}{\tau^2 s^2 + 2\tau\xi s + 1}$

Q7) Draw block diagram of a feedback control strategy with $G_m = G_f = 1$. **[16]**

- a) If an approximate plant model is \bar{G}_p is known, then derive the expression for IMC strategy. Draw the corresponding block diagram.

- b) Design a IMC controller for a F.O. process with $G_p(s) = \frac{5}{8s+1}$ using a

F.O. filter $\bar{f}(s) = \frac{1}{\lambda s + 1}$. Compare this IMC controller with conventional classical controller.

Q8) Write short notes on the following :

[18]

- a) Model predictive control.
- b) Batch process control.
- c) Fuzzy Logic Control (FLC).



P1540

[4065]-272
M.E. (CSE) (IT)
INTELLIGENT SYSTEMS
(2002 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 on separate answer books.*
- 3) *Assume suitable data if necessary.*
- 4) *Draw sketches wherever necessary.*
- 5) *Figures to the right indicate full marks.*

SECTION - I

- Q1)** a) Prove that if a heuristic is consistent, it must be admissible. Construct an admissible heuristic that is not consistent. **[8]**
- b) What do you mean by agent program? Explain with schematic diagram, four basic kinds of agent program. **[8]**
- Q2)** a) Define in your own words the following terms : **[8]**
- i) State and state space
 - ii) Search tree
 - iii) Search node
 - iv) Goal
 - v) Successor Function
 - vi) Solution path
 - vii) Branching Factor
 - viii) Action
- b) Solve following problem using any of the Search technique. “You have to color a planar map using only four colors, in such a way that no two adjacent regions have the same color”. **[8]**
- Q3)** a) What is memory bounded search? Explain IDA* with suitable example. **[8]**
- b) Explain the difference between Hill Climbing Search and Best first search strategy with suitable example. Also explain the problems associated with hill climbing. **[8]**

P.T.O.

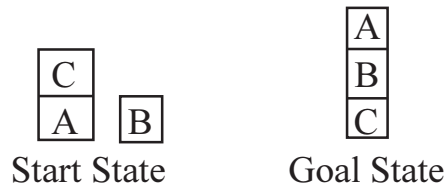
Q4) Write short notes on any three :

[3 × 6 = 18]

- a) Rational Agent.
- b) Properties of task environments.
- c) Contingency Problems.
- d) Minimax algorithm.

SECTION - II

Q5) a) What is goal stack planning? Solve the following blocks world problem with goal stack planning using STRIPS notation. **[8]**



b) Explain how planning problem is expressed in STRIPS with the help of suitable example. **[8]**

Q6) a) Explain Continuous planning with suitable example. **[8]**

b) What do you mean by Partial Order planning? Explain with suitable example partial order plan vs total order plan. **[8]**

Q7) a) Explain four planning methods for handling indeterminacy. **[8]**

b) Explain conditional planning in partially observable environments. **[8]**

Q8) Write short notes on any three :

[3 × 6 = 18]

- a) HTN planning
- b) Probabilistic Reasoning systems.
- c) First order logic
- d) Uncertainty



P1543

[4065]-506
M.E. (Mechanical) (Heat Power)
CRYOGENIC ENGINEERING
(Elective - III) (502111 (b)) (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 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 effect of heat exchanger effectiveness on performance of liquefaction system. [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) Meissner effect.
 b) Vacuum shielded vessels.
 c) Cryogenic Valves.
 d) Stirling Cycle Refrigerator.

P.T.O.

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) Methods of draining the vessels.
- ii) Cryogenic fluid storage vessel piping arrangements.
- Q6)** Discuss the problems and scope of cryogenic instrumentation. Explain with neat sketches the instruments used for cryogenic measurements of [16]
- a) Liquid level
- b) Flow
- c) Strain,
- d) Temperature
- Q7)** a) Explain with neat sketches the working of different compressors and expanders used in cryogenic practice. [12]
- b) Explain briefly the variation of Thermal properties of solids in cryogenic range of temperature. [4]
- Q8) Write short note on :** [18]
- a) Cryogenic engineering applications in transport.
- b) Helium Dilution Refrigeration.
- c) Cryogenic applications in medicine and biology.



P1548

[4065]-523
M.E. (Mechanical) (Design Engineering)
RELIABILITY ENGINEERING
(2008 Course) (502211 (a)) (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 answer 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)** What is mean by failure density & Hazard Rate? Calculate failure density, Hazard Rate and reliability for the survival data of 200 components tested simultaneously for 100 hrs. Plot the functions against time. **[10]**

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

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

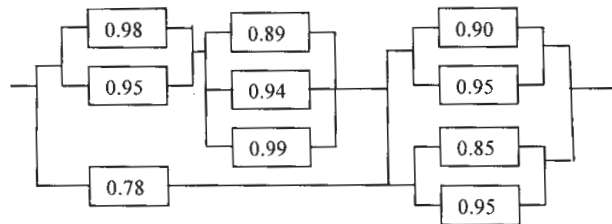


Fig. - 1

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

Z	- 0.5	0.5
$\Phi(Z)$	0.3521	0.69146

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

P.T.O.

- Q3)** a) What is meant by Redundancy in a system? Explain the significant difference between active partially active and passive redundancy. [6]
- b) Find the reliability of system shown in Fig. 2 using conditional probability method. The values in the blocks show reliabilities of each element. [10]

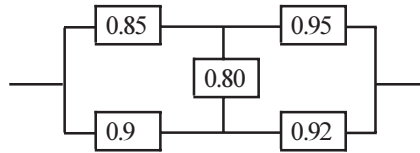


Fig. - 2

- Q4)** a) Explain the difference between Predictive Preventive Maintenance and Periodic Preventive Maintenance. [8]
- b) If in a system we need at least one out of 3 units to operate for the successful working of the system, then prove that the system reliability can be written as :

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

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

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

- Probability Distributions.
- Life characteristic phases.
- Availability & its type.
- MTBF & Reliability relationship
- Markov chain analysis.

SECTION-II

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

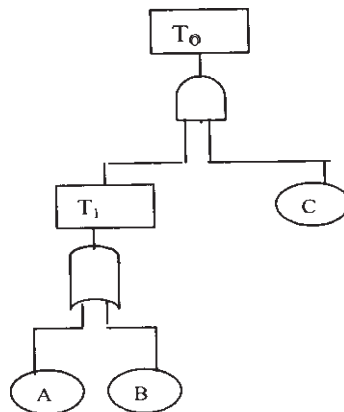


Fig. 3

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

- Q7) a)** The stress developed in an engine component is known to be normally distributed with a mean of 350 MPa and std. deviation of 35 MPa. The material strength distribution based on the expected temperature range and various other factors, is known to be normal with a mean of 820 MPa and std. deviation of 80 MPa. Calculate factor of safety and Reliability of component.

If poor heat treatment and larger variation in environmental temperatures cause the std. deviation for the strength of the component to increase to 150 MPa, calculate the reliability. **[8]**

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

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

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

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

The following data are available.

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

Find the individual reliabilities of the sub-systems.

- Q9) a)** Explain briefly the various methods of assessing reliability of a component through accelerated tests. **[8]**
- b) Explain Tie Set & Cut Set method of reliability evaluation. **[8]**

Q10) Write Short notes on (Any three) :

[18]

- a) Minimum Effort method.
- b) Ishikawa Diagram
- c) FMECA
- d) Reliability Growth Testing.
- e) Safety Factor & Safety Margin.



P1549

[4065]-525
M.E. (Mechanical - Design Engineering)
COMPUTER AIDED ENGINEERING
(502211(c)) (Elective - III) (2008 Course)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer any THREE questions from each section.*
- 2) *Answer to the two sections should be written in separate answer books.*
- 3) *Draw neat sketches wherever necessary.*
- 4) *Figures to the right indicate full marks.*

SECTION - I

- Q1)** a) Discuss steps used for simulation model building with suitable example. [10]
b) Explain the role of assembly modeling in CAE. [6]
- Q2)** a) Discuss major general modules available in CAD/CAM software. [8]
b) Explain node - based fully automatic mesh generation technique. [8]
- Q3)** a) Differentiate between CSG and B-rep solid modeling techniques. [8]
b) Explain coupled thermo mechanical stress analysis with suitable example. [8]
- Q4)** a) Explain the typical common observations made by CAE engineer before start meshing. [8]
b) Explain the importance of convergence criteria used in finite element analysis. [8]
- Q5)** Write short notes on :
- a) Role of CAE software in engineering. [6]
 - b) PDES data exchange format. [6]
 - c) Analytical techniques for thermo-fluid systems. [6]

SECTION - II

- Q6)** a) Classify 3D meshing techniques of FEA and explain any one in detail. [8]
b) Enlist different types of methods used to verify FEA Results. [8]
- Q7)** a) Explain some of the quality checks used to check 2D meshing in FEA. [8]
b) Explain 'P' and 'h' Version of mesh refinement methods. [8]

P.T.O.

- Q8)** a) Explain general procedure for transient response analysis used in FEA. [8]
b) Discuss the criteria used for the selecting the element type for meshing. [8]
- Q9)** a) Write Navier-stoke equation in conservation form and explain meaning of each term. [5]
b) Explain basic general steps of thermal analysis. [6]
c) CFD as a design and research tool. [5]
- Q10)** Write short notes on :
- a) Meshing for Thermal analysis. [6]
b) Weakness and Strengths of CFD against experimental fluid dynamics.[6]
c) Implicit verses Explicit methods. [6]



P1552

[4065]-541
M.E. (Mechanical) (Mechatronics)
COMPUTER AIDED DESIGN
(502811 (a)) (Elective - III) (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) *Assume suitable data, if necessary.*
- 6) *Use of pocket non programmable electronic calculator is allowed.*

SECTION - I

- Q1)** a) Discuss different stages of technological product development cycle. [8]
b) Explain the role of Quality Function Deployment in product design. [8]
- Q2)** a) Enlist the major surface modeling entities available in commercial modeling software's, Explain any one in detail. [8]
b) Compare Explicit and Implicit non parametric representation of curve. Explain the parametric representation of a line and its advantages over non parametric representation with suitable example. [8]
- Q3)** a) The coordinates of four points given by $P_0(2,2,0)$, $P_1(2,3,0)$, $P_2(3,3,0)$, and $P_4(3,2,0)$. Find the equation of Bezier curve. Plot the same for the value of $u = 0, 0.2, 0.4, 0.6, 0.8, \text{ and } 1.0$. [8]
b) Compare between Feature Based Modeling and Constrain Based Modeling techniques. [8]
- Q4)** a) Derive generalized transformation matrix to mirror an object about an arbitrary line $y = x + 30$ [8]
b) A triangle ABC has vertices $A(1,1)$, $B(2,1)$ and $C(2,3)$. It is to be rotated by an angle of 60° CCW direction about an arbitrary point $P(3, 2)$, Determine : [8]
i) The composite transformation matrix.
ii) The co-ordinate of transformed triangle.

P.T.O.

- Q5)** a) Enlist advantage and disadvantages of primitive instancing solid modeling technique. [6]
b) Explain briefly IGES data exchange format. [6]
c) Explain the role of specifications in product design. [6]

SECTION - II

- Q6)** a) What are the functions served by preprocessor and postprocessor in FEA software? [8]
b) Discuss Relay - Ritz method used in FEA. [8]
- Q7)** a) Explain elimination approach and penalty approach method used in FEM. [8]
b) Derive an elemental stiffness matrix using Potential Energy approach method. [8]
- Q8)** a) Differentiate between laminated object manufacturing and fused decomposition modeling techniques. [8]
b) Discuss the factors to be considered during designing a product for manufacturing. [8]
- Q9)** a) Discuss Activity scanning process interaction simulation approach. [6]
b) Enlist Need, Advantages, Disadvantages and pitfalls of simulation. [10]
- Q10)** Write Short Notes on
- a) Shape functions used in FEM. [6]
b) Rapid tooling. [6]
c) Steps in simulation study. [6]



P1553

[4065]-542
M.E. (Mechanical) (Mechatronics)
ROBOTICS
(502811(b)) (Elective - III) (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) *Assume suitable data, if necessary.*
- 6) *Use of pocket non programmable electronic calculator is allowed.*

SECTION - I

- Q1)** a) Discuss various types of linkages used in the base, body, wrist and end effectors of robot manipulator. **[10]**
- b) In one degree of freedom robot, it has one sliding joint with full range of 5 meter. The robots control memory has a 32 bit storage capacity. Determine the control resolution for this axis of motion. **[4]**
- c) Explain briefly the classification based on robot motion. **[4]**
- Q2)** a) A point P(5, 4, 3), is attached to a frame (uvw) is subjected to the transformations, but all transformations relative to the current moving frame are as follows. **[8]**
- i) A rotation of 90 degree about the u-axis.
 - ii) Then a translation of (3, -4, 5) along uvw.
 - iii) Followed by a rotation of 90 degree about the w-axis.
- Find new coordinate point of a frame.
- b) Explain the steps to implement D-H convention for three axis articulated arm robot. **[8]**
- Q3)** a) Derive forward and inverse kinematics equations of four degree of freedom three dimensional Manipulator. **[10]**
- b) Determine the time required for each joint of a three axis RRR manipulator to travel the following distances using slew motion. Joint 1, 30°; Joint 2, 60°; Joint 3, 90°. The joints 1, 2 and 3 are travel at a rotational velocity of 30°/s, 45°/s and 60°/s respectively. **[6]**
- Q4)** Lagrange - Euler formulation used for describing the rigid body dynamics. **[16]**

P.T.O.

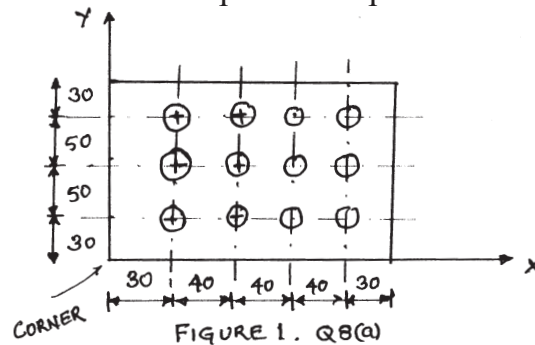
- Q5)** a) Explain the importance of Repeatability, Spatial and Control resolution used in robotics. [8]
 b) Explain the procedure to obtaining rotary joint jacobian. [8]

SECTION - II

- Q6)** a) How the trajectory planning for joint space scheme is done using cubic polynomial fit. [8]
 b) Explain rotary position sensors used in Robot Joints. [8]

- Q7)** a) Explain walk through Robot programming method. [8]
 b) It is desired to have the first joint of six axis of robot go from initial angle of 30 degree to the final angle of 75 degree in 5 seconds. Using a third order polynomial. Calculate the joint angle at 1,2,3 and 4 seconds. [8]

- Q8)** a) In a pallet objects protruding 40 mm from the face of the pallet located in a number of rows and columns as shown in figure 1. The plane of the pallet is assumed to be parallel to the XY plane. The objects are to be picked up one after another from the pallet and placed in allocation chute. [10]



- b) Explain micro robot fabrication technology. [6]

- Q9)** a) Explain five basic functions of robot machine vision system with the help of neat block diagram. [10]

- b) A certain video camera has a 256×256 pixel matrix. Each pixel must be converted from analog to digital signals by A/D converter. The A/D conversion process takes 0.1 micro second to complete. Assuming that there is no loss time between two pixels, how long will it take to collect the image data for one frame, and is this time compatible with processing at the rate of 30 frames per second. [6]

Q10) Write short notes on

- a) Micro-electro-mechanical systems. [6]
 b) Robot Applications in material handling. [6]
 c) Velocity and acceleration sensors. [6]



P1585

[4065]-843

**M.E. (Information Technology) (CSE - IT)
SOFTWARE ARCHITECTURE
(Theory) (2008 Course) (Elective - I) (514404(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) Write Short Notes on ANY THREE. [18]

- a) Global analysis of product factors (Hint performance...)
- b) View of architecture : EXECUTION.
- c) Modularization, Layering
- d) CONNECTORS (Hint IPC, MoM..)
- e) Design pattern : observer
- f) Levels of EAI (Hint : ui level, method, api, data)

Q2) Explain ANY FOUR of the following concepts in context of software architecture with examples. [16]

- a) Definition of architecture.
- b) Architecture evaluation.
- c) Architecture description / documentation using UML.
- d) Architect's role and responsibilities.
- e) Stakeholders of architecture and their needs.
- f) Architecture versus design.

Q3) Write in brief on ANY FOUR [16]

- a) Service naming and location (in context of networked and concurrent patterns).
- b) UML profile for archetype pattern.
- c) Architectural style : Pipes and filters.
- d) Concurrency, locks (Hint : networked and concurrent patterns)
- e) Archetypes : product, Unique product, identical product.
- f) design pattern : factory method.

P.T.O.

- Q4) Explain** **[16]**
- a) Use of UML diagrams for describing design patterns.
 - b) Design patterns versus architecture patterns.
 - c) Importance of software Architecture to achieve quality/nonfunctional requirements.
 - d) FACADE design pattern.

SECTION - II

- Q5) In brief state the concept/term; illustrate with good examples for ANY FOUR of the following concepts.** **[16]**
- a) Multithreading.
 - b) Applications of PROXY pattern.
 - c) Compare and Contrast : centralized and distributed applications.
 - d) XML data, tags.
 - e) HTML forms, form validations.
 - f) Design patterns.

- Q6) Write short notes on ANY THREE** **[18]**
- a) TCPIP sockets and use for network applications.
 - b) Security : access control, authorization, nonrepudiation
 - c) JDBC, JDBC DRIVERS
 - d) J2EE technologies : JMS, JNDI, JSP
 - e) Enterprise applications and their challenges, features.
 - f) Deployment diagrams in context of software architecture.

- Q7) What do you understand by the following concepts.** **[16]**
- a) Event driven architecture.
 - b) Message queues, message oriented middleware.
 - c) Webservices.
 - d) Quality factors : Interoperability, Integration of applications.

- Q8) Write in brief on ANY FOUR of the following** **[16]**
- a) JAVA interfaces, Java classes.
 - b) Presentation layer (UI) in three tier architecture.
 - c) Quality factors of a software system : USABILITY
 - d) What is XML DOM.
 - e) Compare and contrast OODBMS, ORDBMS
 - f) ARCHITECTURAL style : peer to peer.



P1591**[4065]-459****M.E. (Civil/Structures)****DESIGN OF FOUNDATIONS****(2008 Course) (Elective - I) (501404 (d))***Time : 4 Hours]**[Max. Marks : 100**Instructions to the candidates:*

- 1) Answer any Two questions from each section.
- 2) Use separate answerbook for section I & II.
- 3) Use of non programmable calculator is allowed.
- 4) Assume suitable data, if necessary.

SECTION - I

- Q1) a)** A building column has a footing area of $2\text{ m} \times 3\text{ m}$, & transmits a pressure increment of 150 kN/m^2 , at its base embedded 1.6 m in sand, below G.L. total depth of sand below G.L. is 3.6 m & below that clay layer was found up to 2 m . depth. Assuming a pressure distribution of $2\text{ V} : 1\text{ H}$, determine the consolidation settlement at the middle of clay layer. Consider the pressure variation across the 2 m deep clay layer. [15]
- i) For sand - $\gamma = 16.5\text{ kN/m}^3$ & $\gamma_{\text{sat}} = 18.5\text{ kN/m}^3$
 - ii) For clay - $\gamma_{\text{sat}} = 16\text{ kN/m}^3$, $e_0 = 0.95$, $C_c = 0.26$ Assume GWT at 2.6 m below G.L.
- b) Discuss A - line chart for soil classification [5]
- c) Explain soil structure interaction, with ref. to spring analogy. [5]
- Q2) a)** Explain with sketches the different types of raft foundations & its need relating to site condition. [9]
- b) Explain the steps for design of 'Flat Slab Raft', giving sample calculations. [8]
- c) Explain the steps for design of 'Beam & raft (slab) foundation', giving sample calculations. [8]
- Q3) a)** Differentiate clearly between the design of foundations for rotary machines & impact machines, in the light of, IS - 2974 (pt - II) - 1966. [15]
- b) In a vibration test resonance have occurred at a frequency of 30 cycles/sec . in a vert. vibration of a test block $1\text{ m} \times 1\text{ m} \times 1\text{ m}$. Determine the coefficient of elastic uni. compression (C_u). The wt. of oscillator is 800 N . & the force produced by it after 15 cycles is 1500 N . Compute the max. Amplitude in the vert. direction at 15 cycles/sec . wt. of Block is 24 kN/m^3 . [10]

P.T.O.

SECTION - II

- Q4)** a) Compute the settlement of pilegroup, to carry a load of 3000 kN including the wt. of pile cap, with a uniform clay upto a depth of 20 m. Width of pile cap is 5m. Length of pile is 10 m & ϕ of pile is 0.5 m. The $q_u = 70$ KN/m², clay is underlain by rock. The load to be transferred at 2/3 length of the pile. Assume the pressure distribution angle 30°. Liquid limit is 60% & FOS against shear is 3. **[15]**
- b) Distinguish between precast & cast in - situ piles, explaining the design steps. **[6]**
- c) Discuss 'Negative skin friction'. **[4]**
- Q5)** a) Design an RCC precast pile to sustain a working load of 800 kN. Length of pile is 10 m with a ϕ of 0.4m. The q_u of soil is 40 kN/m². Design with suitable reinforcement & Check for handling stressed. **[17]**
- b) Explain 'Rees & Matlock method', for analysis of laterally loaded pile. **[8]**
- Q6)** a) Explain stepwise the design of pile cap, with the help of sample calculations. **[9]**
- b) Describe different types of 'Shell foundations', stating their suitability & IS code recommendations. **[8]**
- c) Compare Hyperbolic & conical RC shell foundations, with & without edge beams. **[8]**



P1596

[4065]-480

M.E. (Civil) (Environmental Engg.)

ENVIRONMENTAL IMPACT ASSESSMENT AND MANAGEMENT

(Elective - I)(501504 (c)) (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) *Your answers will be valued as a whole.*
- 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)** Discuss about following methodologies. **[16]**
- a) Mitigation.
 - b) Screening.
 - c) Check list
 - d) Interaction matrices.
- Q2)** Write in details about environmental indices and indicators for describing affected environment. **[16]**
- Q3)** a) What are the basics steps associated with predication of changes in air quality and assessment of impact of these changes. **[9]**
- b) Briefly discuss about air pollution dispersion potential. **[9]**
- Q4)** Write details about existing noise levels and standards also discuss about noise control practices. **[16]**
- Q5)** a) Define air pollution and state about identification of type and quantity of air pollutants. **[9]**
- b) Discuss about environmental setting. **[7]**

P.T.O.

SECTION - II

- Q6)** Write in brief about basis steps associated with prediction of changes in water environment & assessment of the impact of these changes. [16]
- Q7)** Discuss about soil environment. Soil standards prediction & assessment of impact on soil & its mitigation. [16]
- Q8)** Write short note on : [18]
- a) Identification of potential cultural resources.
 - b) Signification of cultural resources.
 - c) Socioeconomic environmental setting.
- Q9)** Briefly discuss about any one case study related to environmental Impact Assessment. [16]
- Q10)** a) Write about post Environmental monitoring. [8]
- b) Write the procedure for environmental clearance for Industries. [8]



P1606

[4065]-439
M.E. (Civil - Hyd. Engg.)
FLUID MECHANICS
(501303) (2008 Course) (Sem. - I)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Derive the three - dimensional form of equation of continuity in cylindrical co-ordinate system. [9]
- b) Velocity components for three - dimensional flow are as follows :
 $u = x + y + z; v = x - y + z; w = x + y + c$ [9]
- i) Check whether flow is possible.
 - ii) If so, then check whether flow is rotational or irrotational.
 - iii) Obtain the expression for velocity potential function in case the flow is irrotational.
- Q2)** a) Starting from Navier - Stokes equations, obtain the expression for velocity distribution for steady laminar flow between parallel surfaces. [8]
- b) Two horizontal parallel plates are 12 mm apart. The lower plate is stationary and the upper plate is moving with a steady velocity of 0.24 m/sec. The fluid between the plates has a dynamic viscosity of 1.48 N-s/m². Calculate the pressure gradient which will correspond to the condition of zero discharge between the plates. Also calculate the shear stress at each of the plates. [8]
- Q3)** a) For laminar boundary layer at a zero pressure gradient having the velocity profile given by the equation $\frac{u}{U} = \frac{3}{2} \left(\frac{y}{\delta} \right) - \left(\frac{y}{\delta} \right)^3$ obtain the expressions for nominal thickness of boundary layer, wall shear stress, local drag co-efficient and mean drag co-efficient. Notations have usual meanings. [10]
- b) State and briefly explain the methods of controlling the boundary layer separation. [6]

P.T.O.

Q4) Write short notes on any Four of the following : **[16]**

- a) Source and sink.
- b) Conformal mapping.
- c) Relaxation method for solution of laplace equation.
- d) Laminar flow through annulus.
- e) Turbulent boundary layer.
- f) Laminar sub-layer.

SECTION - II

Q5) a) State Reynolds' equation of motion. Explain the physical significance of Reynolds' stress. **[6]**

b) Differentiate between homogeneous and isotropic turbulence. **[4]**

c) A smooth copper pipe 80 mm in diameter and 800 m long carries water at the rate of 8 lit/sec. If the kinematic viscosity of water is 0.02 stokes, calculate the loss of head, wall shear stress, centre line velocity, shear stress and velocity at 10 mm from the pipe wall and the thickness of laminar sublayer. **[8]**

Q6) a) Explain any two of the following : **[6]**

i) Prandtl's mixing length hypothesis.

ii) Hydrodynamically smooth and rough boundaries.

iii) Moody's diagram.

b) In order to determine the discharge of water through 200 mm diameter rough pipe, prandtl pitot tubes were installed at the centre and at quarter point from the pipe wall. The velocities at these locations were recorded as 1.55 m/s and 1.35 m/s respectively. Determine the discharge, friction factor and height of roughness protrusions, assuming the flow to be turbulent. **[10]**

Q7) a) Derive the equation for velocity of propagation of a compression pressure wave in an elastic medium in its general form. Modify this equation for isothermal flow and frictionless adiabatic flow. **[8]**

b) Air at 28°C and at a pressure of 292 kN/m²(abs) flows into another reservoir through an orifice of diameter 80 mm. If the pressure in the reservoir is 146 kN/m²(abs), what is the air discharge? Take R = 287 J/kgK, k = 1.4 for air and C_d = 0.66 for the orifice. **[8]**

- Q8)** a) Show that for frictionless adiabatic (isentropic) flow through a pipe of varying cross - section, the continuity equation takes the form

$$\frac{dA}{A} = -\frac{dV}{V}(1 - M_a^2) \text{ with usual notations.} \quad [6]$$

- b) Conditions immediately upstream of a normal shock wave in an air flow are given as follows : $P_u = 35 \text{ kN/m}^2$; $T_u = 0^\circ\text{C}$ and $V_u = 1050 \text{ m/s}$. Calculate the conditions immediately downstream of the shock. Assume $R = 287 \text{ J/kgK}$ and $k = 1.4$ [10]



P1614

[4065]-702
M.E. (Production Engg.)
RELIABILITY & FAILURE ANALYSIS
(511104 (b)) (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 answer 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)** Calculate the reliability for the system shown in Fig. 1. The numbers in each block shows the reliability of individual component. **[10]**

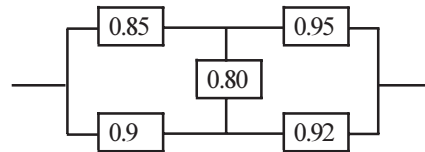


Fig. - 1

- b) State the characteristics of weibull probability distribution. **[6]**

- Q2) a)** Find the reliability of system shown in Fig. 2. **[8]**

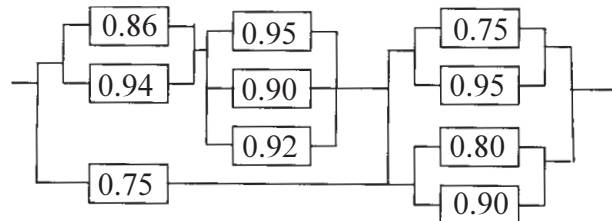


Fig. - 2

- b) Define tie - sets and cut - sets. Write the various tie - sets and cut - sets for the Fig. 3. Also mention minimal tie sets and minimal cut sets for probability analysis. **[8]**

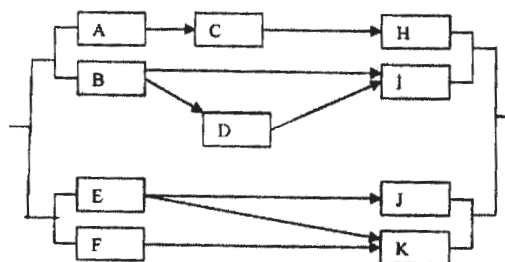


Fig. - 3

- Q3) a)** Explain the steps involved in Construction of FMEA Table. [8]
- b)** A logic gate diagram for FTA study has been shown in Fig. 4. The failure probabilities for basic modes A,B,C,D and E are 0.002, 0.01, 0.04, 0.005 and 0.05 respectively. Find out the failure probability of T_0 . Assume mission time of 200 hrs. Also calculate the reliability of system. [8]

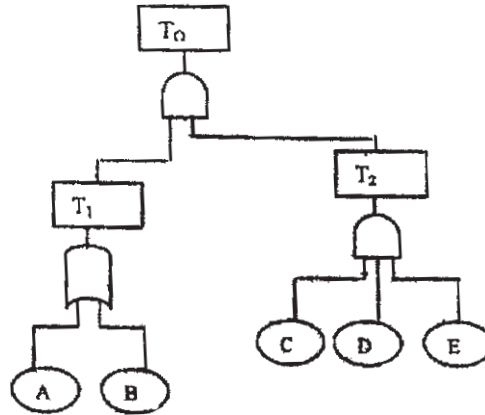


Fig. - 4

- Q4) a)** 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 : [8]

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

Where λ - failure rate and t - mission time.

- b)** Allocate failure rates and reliabilities for the following data if the reliability goal is 0.95. [8]

i	No. of modules	Importance factor	Operating time
1	25	1	12
2	50	0.95	12
3	70	0.98	12
4	80	1	12

- Q5) Write short note on following (Any three) [18]**

- Event Tree Analysis.
- Star - Delta Method
- Risk Priority Number
- Graph Theory.
- ARINC method for Reliability allocation.

SECTION - II

- Q6)** a) Explain RBD approach for series & parallel configuration? Give the types of redundancies. [8]
 b) Explain the features of Bath-tub curve. [8]

- Q7)** a) Discuss the methods of accelerated tests for reliability assessment. [6]
 b) In a short sample “accelerated life testing” of a system, based on Weibull distribution the following data is recorded. [10]

Failure No.	1	2	3	4	5	6	7	8	9
MTTF (Hrs)	28	22	18	26	35	32	30	19	25

Plot the variation of reliability against time using

- i) Mean ranking and
 ii) Median Ranking Method

- Q8)** a) The following data refer to predicted reliability of eight components in series. In case the desired reliability of the system is not to 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	0.950	0.985	0.960

- b) Find the reliability and the corresponding central factor of safety of a system for which $\mu_s = 25000 \text{ kg/cm}^2$ and $\mu_L = 20000 \text{ kg/cm}^2$. $\sigma_s = 3000 \text{ kg/cm}^2$ and $\sigma_L = 1000 \text{ kg/cm}^2$ and S & L follows normal distribution. The table shows normal variant (z) and $\Phi(z)$. [8]

z	1.56	1.58	1.60
$\Phi(z)$	0.9406	0.9429	0.9452

- Q9)** a) Explain the following [8]
 i) Condition Monitoring Techniques
 ii) Reliability Centered Maintenance

- b) What do you understand by the term ‘Operational Availability’ and ‘Inherent Availability’?

The following data have been collected at the plant :

Mean time before failure = 30 hours

Mean time to repair = 10 hours

Administrative logistics time is 50% of Mean Down Time (MDT)

Calculate the operational availability and inherent availability of the plant. [8]

Q10) Write short notes on (Any three)

[18]

- a) Replacement Models in reliability management.
- b) SOAP for Wear debris monitoring
- c) Vibration Signature Analysis
- d) Safety margin.
- e) Reliability Growth monitoring.



Total No. of Questions : 8]

[Total No. of Pages : 2

P1619

[4065]-8

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

PROFESSIONAL PRACTICES IN CONSTRUCTION

(2002 Course) (501507)

Time : 4 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 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)** Compare and contrast between lump-sum, item rate, cost plus and EPC contracts. **[18]**
- Q2)** Design a weighted point score prequalification system for tender evaluation of a nuclear power project worth 2000 crores to be completed by fast track construction in 18 calendar months. **[16]**
- Q3)** Discuss various methods of dispute resolution and compare them for benefits and limitations. **[16]**
- Q4)** State and explain the provisions made for any 8, GCC as expressed in the FIDIC New Red Book document. **[16]**

SECTION - II

- Q5)** Explain the various provisions in the Indian contract Act (1872) as regards
- a) Revocation of tender. **[3]**
 - b) Performance of contract **[8]**
 - c) Valid excuses for non-performance **[3]**
 - d) Breach of contract. **[4]**
- Q6)** a) Compare and contrast between the Arbitration Act of (1940) and the Arbitration & Conciliation Act of (1996). Which is better? Why? **[10]**
- b) With examples explain how arbitration is a semi-judicial process and list the duties of arbitrator. **[6]**

P.T.O.

Q7) Discuss various reasons for occurrence of construction claims and suggest remedies to control their effects. Also suggest preventive measures to reduce the claims. **[16]**

Q8) Explain the following. **[16]**

- a) Need for unified contract conditions in the Indian context.
- b) Single stage and 2 stage tendering
- c) Benefits, procedure of e - tendering.
- d) Voidable and Void contracts.



P1621

[4065]-68

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

MACHINE TOOL DESIGN

(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 of non-programmable electronic calculators is allowed.*

SECTION - I

- Q1)** a) Discuss in brief how design considerations of feed gear box differ from speed gear box. **[4]**
- b) Design a speed gear box for a machine tool to have speed variation from 100 to 1200 rpm in nine steps. The input shaft of a gear box runs at a constant speed of 300 rpm and output speeds are to be in geometric progression. Draw the best possible structural diagram and the speed chart to design the speed box compact and economical. Also sketch the schematic layout of the gear box. **[12]**
- Q2)** a) With a neat sketch explain the method of obtaining a near approach to stepless speed using epicyclic mechanism. **[6]**
- b) How can you make a conical friction variator, having driving roller in contact with internal conical surface work with positive self locking? Deduce necessary expression for such self locking. **[10]**
- Q3)** a) Ads amounting to 15 kN is supported by guides on both sides taken together and of the oil used is 0.067 Ns/m² and minimum oil film thickness is taken as 0.02 breadth of the guide, assuming the table moving with the velocity of 30mm/s sity of the guide pressure not to exceed 0.05 N/mm². Also calculate the length of the table required. **[8]**
- b) State merits and demerits of hydrostatic guide ways used in machine tools along with typical applications. **[4]**
- c) Show that the rigidity of a hydrostatic slideways is 50% higher than that of the same slideways under hydrodynamic lubrication. **[4]**

P.T.O.

- Q4)** a) Explain dynamic rigidity of a machine tools. State the factors affecting it. [6]
 b) Discuss the design considerations of rectangular column of drilling machine. [6]
 c) Discuss the effect of stiffener arrangement on bending and torsional stiffness of box type structure. [4]

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

- a) Methods of wear compensation in guides
 b) Selection of electric motors for machine tools.
 c) Feedbox with Meander's Mechanism
 d) Vertical roller feed screw.
 e) Devices for intermittent motion.

SECTION - II

- Q6)** a) Show that in a lead screw working on sliding friction, the total error in pitch can be expressed as : [6]

$$\varepsilon = \Delta_1 \left[1 + \frac{1}{2\eta} \left(\frac{p}{D} \right)^2 \right]$$

Where, ε – total pitch error, Δ_1 - pitch error due to direct axial load, η – efficiency of the lead screw, p – pitch of the lead screw and D – effective diameter of the lead screw.

- b) Discuss merits and demerits of using recirculating ball screws. [4]
 c) Show any typical method of preloading a lead screw and major considerations there of. [6]
- Q7)** a) With a neat sketch of the hydrostatic power pack used on machine tool Show the functioning of each element on the system. [8]
 b) Discuss design considerations of high speed spindle. Draw sketch of typical spindle unit used on machine tools. [8]
- Q8)** a) Discuss special design considerations and NC, CNC machine tools as compared to conventional machine tools. [6]
 b) What is the function of a shaft encoder? Why in some cases we use 'Gray Code' instead of 'Binary code' for designing encoders? [4]
 c) With a neat sketch explain the operation of a thermal relay and push button control of a driving motor of a machine tool. [6]

Q9) a) Discuss the meaning of stick-slip vibration in a machine tool. How does it affect the positional displacement? [4]

b) Explain the methods of reducing stick slip vibrations in machine tools.[4]

c) With the neat sketch explain the operation of thermal relay and push button control of driving motor of a machine tool. [8]

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

a) 'Modular design' concept in machine tools.

b) Adaptive Control System.

c) Automatic tool changer.

d) Alignment tests of machine tools.

e) Recent trends in development of machine tools.



P1636

[4065]-758

**M.E. (Computer) (Computer Networking)
NETWORK PROGRAMMING
(2008 Course) (510311 (c)) (Elective - III)**

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 of section - I and section - II should be written on separate answer sheets.*
- 3) *Figures to the right indicate full marks.*
- 4) *Draw neat diagrams wherever necessary.*
- 5) *Make suitable assumptions wherever necessary.*

SECTION - I

- Q1)** a) Explain how buffer size limits the size of input datagram? [8]
b) With the help of state transition diagram explain TCP connection establishment and termination process. [8]
- Q2)** a) Explain Socket function in details. [8]
b) Compare the various socket address structure of IPV4, IPV6, UNIX domain and Data Link. [8]
- Q3)** a) Explain three types of operations which are supported on routing socket. [8]
b) Explain interface name and index functions in detail. [8]
- Q4)** Write Short notes on any three [18]
a) Domain Name System.
b) Byte order function.
c) Concurrent servers.
d) Allocation of port number scheme.

SECTION - II

- Q5)** a) What is Resource discovery? Explain the internet applications that use broad casting with examples. [8]
b) Explain the steps that allow an IPV4 TCP Client to communicate with an IPV6 server. [8]

P.T.O.

- Q6)** a) Explain the Race Condition for shared data accession in detail. [8]
b) Explain different forms of addressing supported by IPV4 and IPV6 along with TCP and UDP. [8]
- Q7)** a) Write a program for TCP based echo server using Threads. [8]
b) Explain Thread functions for creating and Termination. [8]
- Q8)** Write short notes on any three [18]
a) TCP iterative server.
b) Pre-Forking process.
c) Simple Network Time protocol
d) Web client and simultaneous connections.



Total No. of Questions : 8]

[Total No. of Pages : 2

P1654

[4065]-705

M.E. (Production Engg.)

ADVANCED ROBOTICS

(2008 Course) (Elective - II) (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 answer books.*
- 3) *Neat diagrams must be drawn, whenever necessary.*
- 4) *Use of calculator is allowed.*
- 5) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Explain Robot Anatomy with neat sketch. **[10]**
b) Define and explain the meaning of the following terms. **[8]**
i) Spatial Resolution.
ii) Control Resolution
iii) Accuracy
iv) Repeatability.
- Q2)** a) Explain Direct Kinematics and inverse kinematics. **[8]**
b) For a pick and place type of robot, the gripper is initially located at (50, 60, 90) and the following movements are in sequence. **[8]**
i) Rotation about X - axis by 90° .
ii) Translation along Z by 30 units. Find the position of gripper w.r.t. the original system by using transformation matrix method.
- Q3)** a) Classify various types of grippers used in robots. Describe magnetic gripper in detail. **[8]**
b) Describe the various considerations in Gripper design & selection. **[8]**
- Q4)** a) Explain with neat sketch PID controller and control stability. **[8]**
b) What are the major differences between open-loop and closed-loop servo systems? **[8]**

P.T.O.

SECTION - II

- Q5)** a) Discuss Robot Programming Language structure w.r.t. operating system, modes of operation and language element functions. [10]
b) Explain in brief the various programming methods used in robotics. [8]
- Q6)** a) Describe force and torque sensors used in Robot. [8]
b) Describe various image processing steps in Robotic vision system. [8]
- Q7)** a) Explain the grasp planning considerations with example. [8]
b) Explain the role of Jacobian matrix in the path control strategy. [8]
- Q8)** a) Explain Cylindrical co-ordinated robot with its schematic diagram and degrees of freedom. [8]
b) Describe a position control system in robotics with a neat block diagram. [8]



P1655

[4065]-499

M.E. (Mechanical) (Heat Power)

**ADVANCED AIR CONDITIONING & HEATING & VENTILATION
(2008 Course) (502105) (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 separate answer books.
- 3) Neat diagrams must be drawn whenever necessary.
- 4) Figures to the right indicate full marks.
- 5) Use of Mollier charts, psychometric chart and electronic pocket calculator is allowed.
- 6) Assume suitable data if necessary.

SECTION - I

- Q1)** a) Enumerate all the conditions and factors governing the choice of inside design conditions. [5]
b) Discuss the various types of fans and their operating characteristics used in Air Conditioning. [5]
c) The indoor design conditions are 25°C and 50% relative humidity. The RSH and RLH are 100 kW and 20 kW respectively. [8]
i) Find minimum volume flow rate and the volume flow rate at supply air temperature of 14°C, 15°C and 16°C.
ii) If the bypass factor of the cooling coil is 0.5, find the supply air state and volume flow rate.
- Q2)** Give the typical layout of an auditorium of capacity 300 seats located in a city like Pune where summer outside conditions may be taken as DBT = 42°C and WBT = 28°C. Also calculate the heat load with appropriate assumptions, for air conditioning system to be used for the same. [16]
- Q3)** a) Explain the VAV system concept. List the special characteristics of VAV systems. Discuss the different VAV systems. [10]
b) Explain the procedure of duct sizing by equal friction method. Give suitable examples. [6]
- Q4)** Write short notes on (any four) [16]
a) Air locks, Air curtains and Air Showers
b) Laminar flow clean rooms
c) HEPA filters
d) Thermal lag
e) All air system

P.T.O.

SECTION - II

- Q5)** a) Differentiate clearly between direct and indirect evaporative cooling systems. Show the processes on chart. Explain the working of a two stage evaporative cooling system using cooling tower. [10]
b) Discuss different methods of measuring humidity. [6]
- Q6)** Explain with neat sketches the working of the following equipments- [16]
a) Chillers
b) Condensing units
c) De-humidifiers
- Q7)** a) 1000 m³/min of recirculated air at 22°C DBT and 11°C DPT is adiabatically mixed with 450 m³/min of fresh air at 28°C DBT and 50% RH. Evaluate the enthalpy, specific volume, humidity ratio, final DBT and RH of the mixture. Draw the process on psychrometric chart. [6]
b) Desert air cooler is used to cool air from 45°C DBT, 24%RH to 25°C by evaporative cooling. Estimate the volume flow rate of air in m³/hr and the quantity of water required per hr for cooling capacity of 2.5TR. [6]
c) Discuss the effect of change in fan speed and change in air density on system performance. [6]
- Q8) Write short notes on (any four) [16]**
a) Comfort chart
b) Solar heat gain
c) Infiltration load
d) Modern Controls for odour and bacteria.
e) Static Regain method.



P1658**[4065]-619****M.E. (E & TC) (Microwave)****EMI AND EMC TECHNIQUES****(2008 Course) (504231) (Elective - III)***Time : 3 Hours]**[Max. Marks : 100**Instructions to the candidates:*

- 1) Solve any TWO questions from each section.
- 2) Figures to right indicate full marks.
- 3) Assume suitable data whenever necessary.

SECTION - I

- Q1)** a) Explain uncertainty and confidence in measurement. [15]
 b) How the calibration of network analyzer is achieved? [10]

- Q2)** a) Explain inductive voltage divider attenuator method hence derive

$$A_{DUT} = \left[20 \log_{10} \frac{(V_{out 1})}{(V_{out 2})} \right] A_{gha} + A_{DUT}$$

- where A_{gha} = Gauss block attenuation & A_{dut} is device under test [17]
 b) Explain in brief power splitter, coupler & reflectometer. [8]

- Q3)** a) Explain MMIC measurement technique using network analyzer. [15]
 b) Derive an expression for noise figure of two port network. [10]

SECTION - II

- Q4)** a) What are power sensors? Compare different power sensors with respect to their specifications. [15]

- b) Discuss basic principle of attenuation measurement with respect to two port network. [10]

- Q5)** a) Explain in detail with block diagram 30 dB attenuation measurement. [15]
 b) Discuss instrument input and output effect on the measurement. [10]

- Q6)** a) Write short notes on : [15]
 i) Noise figure analyzer.

ii) Mismatch effect in noise measurement.

iii) Measurement accuracy in noise measurement.

- b) Discuss impedance and admittance parameters. [10]



P1662

[4065]-623

**M.E. (E & TC) (Microwave)
SOFTWARE PROJECT MANAGEMENT
(2008 Course) (Elective - IV) (504232 (d))**

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) What are the main challenges while implementing the Software Project? How to overcome these challenges? **[4]**
- b) What is the main output of activity sequencing? Explain any one technique for showing activity sequencing? **[6]**
- c) A software house has developed a customized annual budgeting system for a client. You are an employee of the software house that has been asked to organize a training course for the end users of the system. At present a user handbook has been produced but no specific training material. A plan is now needed for the project which will set up the delivery of the training courses. The project can be assumed to have been completed when the first training course starts. Among the things that will need to be considered are the following : **[8]**
- Training material will need to be designed and created;
 - A time table will need to be drafted and agreed;
 - Date (s) for the course will need to be arranged;
 - The people attending the course will need to be identified and notified;
 - Rooms and computer facilities for the course will need to be provided for.
- i) Identify the stakeholders for this project.
 - ii) Draw up a list of stakeholders for this project
 - iii) For each of the objectives, identify the measures of effectiveness.
 - iv) For each objective, write down the stakeholders who will be responsible for the achievement of that objective.

P.T.O.

- Q2) a)** The software project consists of a list of tasks along with their estimated durations which are shown in the estimation table below. The project manager also knows the dependencies among those tasks. Please make a CPM graph and a Gantt chart to show how to organize all the tasks so that the project can be down in the shortest time by Shilpa and Nudaa and answer the following : **[10]**

Tasks	Dependency	Duration
A		3
B		4
C	A	7
D	A	8
E	B and C	12
F	B and C	9
G	D and E	5
H	D and E	2
I	F and G	6

- i) Draw the dependency graph.
 - ii) Find the critical path and earliest completion time.
 - iii) Assign the tasks to Nancy and Julia, and compute the earliest start time.
 - iv) Compute the latest possible start time given the earliest completion time, 30.
- b)** What are the major difficulties with PERT, and how can they be overcome? Do you think software tools should use PERT, or is CPM adequate, since it is all just “guestimating” any way? **[6]**
- Q3) a)** Why do you think schedule issues often cause the most conflicts on projects? **[6]**
- b)** Identify the actions that could prevent each of the following risks from materializing or could reduce the impact if it did occur : **[10]**
- i) The government changes the taxation rules which alter the way that VAT is to be calculated in an order processing system under development.
 - ii) A key member of the programming team leaving;
 - iii) A new version of the operating system being introduced which has errors in it;
 - iv) A disk containing copies of the most up-to-date version of the software under development being corrupted;
 - v) System testing unearths more errors than were expected and takes longer than planned;

- Q4)** a) Suppose that the cases are being matched on the basis of two parameters, the number of inputs to and number of outputs from the system to be built. The new project is known to require 8 inputs and 15 outputs. One of the past cases, project A, has 9 inputs and 17 outputs. Project B has 6 inputs and 10 outputs. What would be the Euclidean distance between the project and the target new project being considered above? Is project B a better analogy with the target than project A? [8]
- b) What are the problems with over and under estimates? Explain in brief, software effort estimation techniques? [8]

SECTION - II

- Q5)** a) Explain the categories of data function types. Also explain the rules for identification? [8]
- b) A software application is to be designed and built to assist in software cost estimation. It responds to certain input parameters and produces initial cost estimates to be used at bidding time. [8]
- i) It has been suggested that a software prototype would be of value in these circumstances. Explain why this might be.
- ii) Explain how such prototyping could be controlled to ensure that it is conducted in an orderly and effective way and within a specified time span.
- Q6)** a) What is the objective of risk management? Explain the Boehm's risk engineering task breakdown structure. [8]
- b) A software developer working on a college payroll project has written the first 500 lines of a COBOL program that is estimated to require 1000 lines of code. Explain why it would be unreasonable to assume that the programming task is 50% complete. How might you make a reasonable estimate of how near completion it might be? [8]
- Q7)** a) Can function points be used : [8]
- For GUI based systems.
 - For client/server systems and
 - With object oriented development. Explain.
- b) Define the transaction function. Explain the two components of transaction function that decides its complexity. [8]
- Q8)** Explain any **THREE** of the following : [18]
- a) Cost of Quality.
- b) Product versus Process Quality Management
- c) CMM key process areas
- d) Project Control in Project Management.



P1669

[4065]-777

**M.E. (Computer) (Computer Networks)
CONVERGENCE TECHNOLOGY
(2008 Course) (510312 (b)) (Elective - IV)**

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 codec? Explain G.711 and G.276 codec with suitable diagram. **[8]**
- b) Define the following parameters for a switching network :
N = Number of hops between two given end systems
L = Message length in bits
B = Data rate, in bits per second (bps), on all links
P = Fixed packet size, in bits
H = Overhead (header) bits per packet
S = Call setup time (Circuit switching or Virtual circuit) in seconds
D = Propagation delay per hop in seconds
For $N = 4$, $L = 3200$, $B = 9600$, $P = 1024$, $H = 16$, $S = 0.2$, $D = 0.001$, compute the end-to-end delay for circuit switching, Virtual circuit packet switching and Datagram packet switching. Assume that there are no acknowledgements. **[10]**
- Q2)** a) Explain the terms CIR, Bc and Be? Also explain their effectiveness in dealing with congestion? **[8]**
- b) Explain ISDN address structure? Is it different than ISDN number? Justify? **[8]**
- Q3)** a) Compare X.25, FR, ATM and IP Protocol. **[8]**
- b) Explain TE1 and TE2 with example. How a TE2 can be mapped with ISDN interface? What functions are required to map TE2 and who performs this? **[8]**

P.T.O.

Q4) Write short note on any THREE [16]

- a) SS7 Protocol Architecture
- b) General Q.931 Message Format
- c) Difference between AAL1 and AAL2
- d) BRI and PRI

SECTION - II

Q5) a) What is a Technological Convergence? How does the ATM provide convergence of various data types? [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. [10]

- 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?

Q6) a) What is QoS? Explain in details the various ATM QoS parameters specifying their category of assessment. [8]

b) The Connection Admission Control (CAC) mechanism in ATM traffic management acts as '*Preventive Congestion Control*' mechanism, justify with an algorithm. [8]

Q7) a) Which ATM adoption layer will you choose for the following applications? Why? [8]

- i) Uncompressed Video
- ii) Compressed Video
- iii) Classical IP over ATM

b) What is Circuit Emulation Services (CES)? What are its drawbacks? How are these removed in Dynamic Bandwidth Circuit Emulation Services (DBCES)? [8]

Q8) Write short note on any THREE [16]

- a) MGCP Functional Architecture
- b) VoIP and IPTel Gateways
- c) ATM Service Categories
- d) Net Meeting



P1699

[4065]-215
M.E. (Computer)
APPLIED ALGORITHMS
(2002 Course) (Elective - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer three questions from each section.*
- 2) *Answer 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) Demonstrate the action of bubble sort and selection sort on the given array $a[] = \{33,2,56,23,55,78,2,98,61,108,14,60,56,77,5,3,1\}$, For the above data, how many number of comparisons are needed in bubble sort and selection sort? **[10]**
- b) How do we analyze the algorithm if it contains **[6]**
- i) for loop
 - ii) recursive call
 - iii) while loop
- Q2)** a) Trace the action of binary search algorithm, including listing the value of Low, High and Mid after each iteration, for the list $\{2,3,5,7,11,13,17,19,23,29,31,37\}$ for each of the following search elements. **[8]**
- i) $X = 3$
 - ii) $X = 24$
 - iii) $X = 108$
 - iv) $X = 13$
- b) Design and analyze a divide and conquer algorithm for finding the maximum and minimum number in an array that uses $[3n/2]-2$ comparison for any n – number of elements. **[8]**
- Q3)** a) Trace the action of Huffman coding algorithms using greedy method for the letters $\{a,b,c,d,e,f,g,h\}$ occurring with frequencies $\{10,7,3,5,9,2,3,2\}$ **[8]**
- b) Explain How Greedy strategy is applied in minimum spanning tree problem? Analyze the Kruskal's algorithm using greedy algorithm **[8]**

P.T.O.

- 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) Give an algorithm to detect whether a given undirected graph a cycle. If the graph contains a cycle, then your algorithm should output one. (it should not output all cycles in graph, just one of them) the running time of your algorithm should be $O(m + n)$ for a graph with n node and m edged. [10]

SECTION - II

- Q5)** a) $N = 4$ and $\{a_1, a_2, a_3, a_4, \}$ = {count, float, if, while} Let $p(1: 4) = (0.05, 0.2, 0.1, 0.05)$ $q(0 : 4) = (0.2, 0.2, 0.2, 0.05, 0.05)$
Compute and construct OBST for above values using Dynamic approach [10]
- b) What is principle of optimality in dynamic programming? Write any three points of comparison between dynamic programming, greedy approach and divide & conquer approach to solve the problem. [8]
- Q6)** a) Draw a state space tree for 8-queen problem and with respect to state space tree drawn above explain the following terms : [8]
- i) Solution states
 - ii) State space
 - iii) answer states
 - iv) static trees
 - v) dynamic trees
 - vi) live node
 - vii) bounding function
- b) Let $W = \{5, 7, 10, 12, 15, 18, 20\}$ and $M = 35$, find all the possible subset of W that sum to M , draw the portion of state space that is generated. [8]
- Q7)** a) Explain the following : [10]
- i) computational complexity
 - ii) decision problem
 - iii) deterministic and non-deterministic algorithms
 - iv) complexity classes
 - v) intractability
- b) Show that the job sequencing problem is NP Hard [6]

Q8) Describe the following with respect to Branch and Bound

[16]

- a) the methods
- b) Least cost search (LC Search)
- c) control abstraction for LC search
- d) Bounding

And take an example of traveling salesman problem using branch and bound.



P1224

[4065] - 402

M.E. Civil (Construction & Management)
MANAGEMENT & PROJECT PLANNING IN
CONSTRUCTION
(Sem. - I) (2008 & 2002 Course) (501102)

*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 in weeks	Cost Rs.	Duration in weeks	Cost Rs.
1 - 2	10	8000	6	24000
1 - 3	8	16000	4	48000
1 - 4	14	20000	10	60000
2 - 3	8	10000	6	20000
3 - 4	6	20000	4	34000
3 - 7	20	60000	16	72000
4 - 5	8	12000	6	16000
4 - 6	4	10000	2	28000
5 - 6	2	10000	2	10000
6 - 7	6	24000	2	48000

The indirect costs are Rs. 3000/- per week.

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.

Q2) The following data pertains to a construction project which needs a number of skilled workers to carry out certain activities. **[16]**

Activity i – j	Duration (weeks)	Number of workers
1 – 2	2	3
1 – 4	2	6
1 – 7	1	3
2 – 3	4	4
3 – 9	1	4
4 – 5	5	2
4 – 8	8	4
5 – 6	4	2
6 – 9	3	2
7 – 8	3	5
8 – 9	5	2

Carry out resource levelling and work out a suitable plan if only Nine skilled workers are available at a time. Find EFR for the EST solution as well as for the optimal solution.

- Q3)**
- a) Describe briefly the contributions made by mayo and megregor towards methods of management. **[8]**
 - b) Explain the following : **[8]**
 - i) Work breakdown structure.
 - ii) LOB Technique
- Q4)**
- a) How will you mobilize the site for a highway bridge to be constructed across a river? **[8]**
 - b) Explain the importance of training of construction managers. **[8]**

SECTION - II

- Q5)** a) Explain project influence and cost relationship with a diagram, considering the project life cycle. Explain with a practical example importance of the above diagram in effectively managing a construction project. [8]
- b) Explain the role of a Project Management Consulting firm during pre-tender and post-tender activities on an infrastructure project, with any practical example. [10]
- Q6)** Develop a comprehensive organisational structure for a contractor's organisation required on site, for execution of a marine project which includes major activities like pneumatic sinking, piling, prestressed-precast concrete girders, steel structures use of various new technologies, of an estimated cost of Rs. 400 crores to be completed under a contract period of 2 years. The project is to be executed under DBFO contract make suitable assumptions as required. Work out the % cost on the organisational structure as compared to the annual project cost. [16]
- Q7)** a) Discuss various types of project feasibilities with practical examples. Explain why feasibility studies are very important for successful project completion. [12]
- b) Discuss the M&E co-ordination necessary on construction projects. [4]
- Q8)** Discuss/ Explain the following : [16]
- a) Konkan Railway Project – A management success or failure.
- b) Resources management for long-lead items.
- c) Application of work study in improving effectiveness on construction projects.
- d) Principle centered leadership.



P1226

[4065] - 405

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

DISASTER MANAGEMENT

(2008 Course) (501104) (Elective - I)

Time : 4 Hours]

[Max. Marks :100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Industrialization is an essential component for economic development of a country. However industrial disasters can have a significant social and economic impact. Explain this statement with suitable examples. **[9]**
- b) Most of the disasters in urban centers are predominantly because of man made reasons rather than natural reasons. Justify this statement with suitable examples. **[9]**
- Q2)** a) With the help of neat labeled sketch explain volcanoes. Give the classification of volcanoes. **[8]**
- b) Natural ecosystems act as a first line of defense against natural disasters. Explain this statement with suitable example. Also justify can natural ecosystems act as a line of defense against man made disasters. **[8]**

P.T.O.

- Q3)** a) Compare the effects of following natural disasters: [8]
- i) Earthquakes and Floods.
 - ii) Landslides and Volcanoes
- b) Can use of non-conventional source of energy help to minimize the risks of natural disasters. Explain this statement with suitable example. [8]

- Q4)** Write short notes on: [16]
- a) Forest fires.
 - b) Urbanization and natural disasters.
 - c) Deforestation and related disasters
 - d) Droughts.

SECTION - II

- Q5)** a) Explain in details vulnerability with reference to Earthquake disaster. List down the preparatory majors for minimizing vulnerabilities related to Earthquake. [10]
- b) Explain the terms relief, recovery and rehabilitation In case of any natural disaster. Enlist which agencies are involved in these processes. [8]
- Q6)** a) Bring out the importance of resource planning in disaster response system. What are the factors considered in quantifying and distributing the resources amongst the affected community? [8]
- b) It is often said the Disasters know no boundaries and religions. How will you manage cross border natural disasters affecting multiple countries? What will be the issues involved: [8]
- i) If the countries are friendly.
 - ii) If the countries are hostile.

- Q7)** a) Enlist various selection criteria considered for choice of following source of water for drinking water in case of disaster: **[8]**
- i) Surface source of water.
 - ii) Sub-surface source of water.
- b) Discuss in detail the measures to be adopted for waste and debris management in disaster affected site as well as relief camps. Also state the minimum acceptable standards for the same. **[8]**
- Q8)** Write short notes on: **[16]**
- a) Phases in Disaster Response.
 - b) Role of International Consultants and Donor agencies in Disaster Response mechanisms.
 - c) Community Based disaster management.
 - d) Disaster Relief Kit.



P1227

[4065] - 407

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

CONSTRUCTION SAFETY

(2008 Course) (501104) (Elective - I)

Time : 4 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) *Question 1 and 5 are compulsory. Out of remaining solve any two questions from each section.*
- 2) *Numbers to the right indicate full marks.*
- 3) *Neat figures are drawn wherever required.*
- 4) *Answers to each section must be written in separate answer books.*
- 5) *Assume suitable data wherever necessary.*

SECTION - I

- Q1)** a) What are the safety precautions to be taken while working in multistoried construction? **[10]**
- b) Write a note on importance of training related to safety in construction industry. **[8]**
- Q2)** Write the checklists to be completed before start of following activities. **[16]**
- a) Concreting of slab
 - b) Blasting for tunnel
 - c) Excavation near building
 - d) Pile driving
- Q3)** a) Give the responsibilities to be shared by the safety officer. **[8]**
- b) Write a detailed note on Personal Protective equipments. **[8]**

P.T.O.

- Q4)** A huge arch fabricated for an over bridge is to be lifted by crane. The crane is to be mounted as near to the bridge deck. What safety precautions you will take for **[16]**
- a) Common public
 - b) Traffic
 - c) Workers
 - d) Operators
- Explain it by giving sequence of operations

SECTION - II

- Q5)** Write a detailed note on Operational Health Hazards based on following points **[18]**
- a) Its causes and effects.
 - b) Remedial measures
 - c) Direct and Indirect Cost associated with it
- Q6)** a) ‘Demolition is more hazardous than construction’. Discuss the sentence w.r.t. safety norms. **[8]**
- b) Write a short note on group safety policy for workers. **[8]**
- Q7)** a) List down the common accidents that take place on a multistoried construction site. **[8]**
- b) What are the component of first aid to be provided on. **[8]**
- i) A tunnel site.
 - ii) While working in pneumatic caisson
- Q8)** a) Write a safety policy for construction of metro. **[8]**
- b) What are various clauses included in Workman’s compensation act? Explain in brief. **[8]**



P1228

[4065] - 408

M.E. (Civil) (Construction and Management)**RESOURCES MANAGEMENT****(2008 Course) (501105(a)) (Elective - II)***Time : 4 Hours]**[Max. Marks :100**Instructions to the candidates:*

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

SECTION - I**(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	3800	Precast Piles	500
Cement	6750	Reinf. Steel	1200
Bricks	1800	Steel Fixtures	150
Aggregates	1050	Timber	1050
Paints	980	Rubble	250
Tools and Plant	650	Plumbing	2200
Plastering materials	500	Fuel items	300

Plot the ABC Curve.

- b) A-B-C analysis is one of material classification/inventory control technique. Enlist various other methods of inventory control technique. Explain any four of them along with their application specifically in construction sector. **[8]**

P.T.O.

- Q2)** a) Material procurement and consumption can be one of the important tools for construction project monitoring and control. Explain this statement with respect to a residential township project with 450 dwelling units. [8]
- b) The success of materials management is dependent on inventory management. Explain this statement with suitable example. Enlist different types of inventories in construction sector along with suitable examples. [8]
- Q3)** a) A door manufacturing industry requires 25000 hinges annually. The price of hinge is Rs. 50 per unit. The ordering cost is Rs. 45 per order. Inventory carrying cost is 20%. The dealer offers discount based on the volume of purchase as under : [10]
- i) 5% if no. of hinges ordered is 15000 and above.
- ii) 3% if no. of hinges ordered is 10000 and above.
- iii) 2% if no. of hinges ordered is 5000 and above.
- iv) No discount for no. of hinges ordered below 5000. Estimate the EOQ and total cost with price discounts.
- b) One of the losses related to materials is storage and handling loss. With suitable example of construction materials explain this concept. Also discuss measures to minimize the storage and handling losses. [6]
- Q4)** Write short notes on (any FOUR) : [16]
- a) Ethics and code of practice for materials managers.
- b) Vendor networking and vendor development.
- c) Steps involved in Material procurement.
- d) Codification and classification of materials.
- e) Buffer stock.

SECTION - II

(Human Resource Management and Equipment Management)

- Q5)** a) Human Resource is a life giving resource for construction projects. Explain this statement in context of shortage of skilled workforce, increasing mechanization and tight project time deadlines. [6]
- b) Performance appraisal system is one of the important components of HRD. Enlist various methods of Performance appraisal system. Explain any two methods in detail. [6]
- c) Explain the OCTAPAC principles of conduct of training programme. Enlist various methods of conduct of training. Which of these methods is most suitable method in construction sector? Explain. [6]

- Q6)** a) Explain in detail the procedure for procurement of new construction equipments. [6]
- b) One of the complicated decisions an equipment manager has to take is whether to purchase equipment or bring the equipment on long term lease. Explain in detail what factors are to be considered so as to arrive at an appropriate decision in this case. [6]
- c) Enlist and explain various factors affecting selection of construction equipments. [4]

- Q7)** a) Determine probable ownership cost and operating cost of a power shovel with following data : [12]

Factory price of shovel:	Rs. 10,00,000/-
Freight charges:	Rs. 150 per tonne.
Shipping weight of shovel:	120 tonne.
Unloading & Assembly Charges:	Rs. 7,500/-
Useful Life:	10 years.
Operating hours per year:	2,000 hours.
Salvage value:	10% of total cost.
Maintenance & Repair cost:	100% of depreciation cost.
Cost of fuel:	Rs. 45 per litre.
Cost of lubricants and oil:	Rs. 100 perlitre.
Investment cost:	15% of average annual investment.

- b) It is said that for countries like India, construction industry should adopt selective mechanization. Justify this statement with suitable supporting facts. [4]

- Q8)** Write short notes on (**any four**): [16]

- a) Importance of training in development of HR.
- b) Spare parts inventory management for construction equipments.
- c) Career planning.
- d) Depreciation.
- e) Equipment down time – causes and measures to minimize it.



P1229

[4065] - 409

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

TQM IN CONSTRUCTION

(2008 Course) (501105) (Elective - II)

Time : 4 Hours]

[Max. Marks :100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) In the era of fierce global competition in the Indian construction industry, TQM approach is the only solution for successful business growth. Explain the validity of this statement with practical examples. [6]
- b) Explain short term and long term objectives of TQM in construction with practical examples. Which factors are deterrent to the implementation of TQM? How can these be solved? [8+2+2]
- Q2)** a) Classify the various defects in construction. Give examples of these defects. What preventive measures would you suggest to avoid above defects on your site? Explain. [4+2+2]
- b) Explain the eight principles of ISO 9001 : 2000 and explain how each principle is very useful in achieving TQM. [8]
- Q3)** In the construction of Pavement Quality Concrete (PQC) which has a rate of Rs. 6000/- per m³, 30% of the entire concreting done, is not as per specifications. The total quantity of PQC executed is 10,000 m³. Enumerate the various sub-activities which constitute construction of PQC and devise a rating system on a 3 point scale. Based on a case study, rate every sub-activity. Work out the cost of defects for the above work. Suggest measures to prevent occurrence of these defects. Work out the sigma level for the above activating. Recommend processes which may be changed to achieve a higher level of sigma score in the future. [16]

P.T.O.

- Q4)** a) Discuss the 5 domains in which the PRRT software is detailed. With a case study, highlight the benefits achieved by using this software. **[5+3]**
- b) Design a QIT for improving the quality of a bridge project, for a contractor's organisation which executes projects based on DBFOT basis. List assumptions made. **[8]**

SECTION - II

- Q5)** a) Explain how IRC has classified the various quality assurance levels for different highways. Explain the difference between Q1 and Q3 levels for various project requirements classified under different major parameters; in a tabular format.

Detail out the different types of data necessary in order to achieve the expectations of the Q3 quality level. **[12]**

- b) Explain any 3 definitions of quality with practical examples. **[6]**
- Q6)** a) With neat labelled sketches, explain any 5 quality control tools which are very useful in the construction industry. Explain utility of each tool with practical examples. **[10]**
- b) Explain the term 'DPMO' and show how the various sigma categories get decided, based on it. State advantages of 6 sigma technique. **[1+3+2]**

- Q7)** You are the manager for implementation of quality in a reputed construction organisation.

You have to improve the quality of the brickwork and external plaster being executed in the building.

- a) Suggest various options through which you are able to determine the existing quality of these items, in order to identify existing poor quality issues.
- b) Set reasonable bench marks for
- i) Various geometric, physical, chemical properties to be achieved for different materials to be used for above items, including tolerances.
 - ii) Quality of workmanship to be achieved in these items.

- c) Devise a measurement system to identify whether the targeted quality is achieved or not.
- d) Suggest preventive processes in order to achieve good quality - first time and everytime.
- e) Explain, which statistical tools will help you in improving and maintaining quality giving reason. [16]

Q8) Explain the following : [16]

- a) PDCA cycle - Importance in TQM.
- b) Quality circles.
- c) Quality control and quality assurance.
- d) 5 'S', Japanese system.



Total No. of Questions : 8]

[Total No. of Pages : 2

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[4065]-416

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

INFRASTRUCTURE DEVELOPMENT

(2008 Course) (501111(B)) (Elective-III)

Time : 4 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Question No.1 and 5 are Compulsory. Out of the remaining attempt any two questions from Section I and two questions from Section II.*
- 2) *Answers to the two Sections must be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of logarithmic tables, slide rule, Moiller charts , electronic pocket calculator and steam tables is allowed.*
- 6) *Assume suitable data whenever necessary.*

SECTION - I

Q1) Explain what constitutes development of physical infrastructure and explain in detail the various phases of NHDP programme. **[6+12]**

Q2) Explain any four projects in India being executed under the power sector covering: **[16]**

- a) Thermal power plants.
- b) Nuclear power plants.
- c) Rural Development Project.
- d) Hydro-electric Project.

Q3) Discuss the various challenges faced by Planners while planning aviation projects in India. Identify the bottlenecks and suggest remedies for them. **[16]**

Q4) Explain in brief: **[16]**

- a) JNNURM Scheme.
- b) Solutions to problems of Pune Metro.
- c) Ports connectivity projects.
- d) Pavement management systems.

P.T.O.

SECTION - II

- Q5)** a) List out the areas from where the funds are created for planning of Rural Road Development and explain them. [9]
b) Explain the methodology and operations used for the SPV models for road and rail connectivity in development of major ports. [9]
- Q6)** a) What are the major activities and clearances required in ULTRA MEGA Power Project covered under the schemes for the development of Thermal Power Plants? [8]
b) Explain in detail any one of the above activity and area of work where detailed planning is required. [8]
- Q7)** a) What are the items to be studied to find out implementation of metro rail for a particular city? [8]
b) What are the parameters to be followed in monitoring Environmental Management System? [8]
- Q8)** Write short notes on (**any Four**): [16]
a) Provisions made in National Electricity Policy.
b) Source of Financing PPP model for Ports.
c) Provisions made in any one airport developed by private sector using PPP model.
d) Policies and incentives followed by NHDP in road works.
e) Advantages of BRTS proposals.
f) Alternative source of energy.



Total No. of Questions : 12]

[Total No. of Pages : 3

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[4065]-449

M.E. (Civil) (Hydraulics)

IRRIGATION & DRAINAGE

(2008 Course) (501311) (Elective - III)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Describe briefly with help of sketch various forms of soil moisture, Which of these soil moistures is mainly available for utilisation by the plant. [6]
- b) Describe briefly the various soil groups of India. [6]
- c) Explain how soil properties affect the irrigation requirements. [6]

OR

- Q2)** a) Explain the terms: [9]
- i) Saturation capacity
 - ii) Field capacity
 - iii) Moisture equivalent
 - iv) Wilting point
 - v) Available moisture
 - vi) Readily available moisture.
- b) Find the field capacity of a soil for the following data [9]
- i) Depth of root zone=2m
 - ii) Existing water content=5%
 - iii) Dry density of soil=1500Kg/m³
 - iv) Water applied to soil=600m³
 - v) Water lost due to evaporation & deep percolation=10%
 - vi) Area of land irrigated=900m²

P.T.O.

Q3) a) Explain different methods of measuring evaporation & explain any two methods in detail. [12]

b) Explain field method of measuring evapotranspiration. [4]

OR

Q4) a) Explain the terms: [12]

i) Intensity of irrigation

ii) Kor watering

iii) Kor depth

iv) Kor period

v) Outlet factor

vi) Overlap allowance

vii) Crop ratio

viii) Time factor.

b) Explain the term duty & delta & Derive the relation between them. [4]

Q5) What are the different factors responsible for making a agricultural land into saline land how you will such land also. Explain about the department of reclamation of saline land in the state of maharashtra. [16]

OR

Q6) State different factors responsible for soil erosion and state different methods of soil conservation. Explain any one method in detail also give details regarding the efforts taken by Maharashtra government for conservation of soil. [16]

SECTION - II

Q7) Explain with a neat sketch the layout of drip irrigation system for a agricultural land (black-cotton soil) measuring 6 acres and explain various components of drip irrigation system. [16]

OR

Q8) Explain the advantages & disadvantages of drip irrigation system & state various components of drip irrigation system and Explain their design concepts. [16]

Q9) Explain in detail the lift irrigation scheme for a water-user-society. Explain with a neat sketch the layout of the system & explain various Components involved in the drip irrigation system. Explain the design concept for rising main. [16]

OR

Q10) Explain with a neat sketch design concepts for jackwell, distribution system also explain in detail the cost-economics study of lift irrigation scheme. [16]

- Q11)**a) Explain advantages of sprinkles irrigation also state disadvantages of sprinkles irrigation. [6]
b) Give details of CADA(Command Area Development Authority). [6]
c) Explain in detail Warabandi. [6]

OR

- Q12)**a) Explain the criteria for judging the behaviour of semi-modular and modular outlets. [12]
b) Explain the subsurface drainage of a farmland. [6]



P1238

[4065] - 454

M.E. Civil (Structure)

ADVANCED SOLID MECHANICS

(Sem. - I) (2008 Course) (501402)

Time : 4 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) Answer any two questions from each section.
- 2) Answers to the two sections must be written in separate 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) Obtain the differential equation of equilibrium to be satisfied by rectangular stress components acting on element in a stressed body. [7]
- b) A plane passing through point(x,y,z) in a stressed elastic body has its normal 'n' with direction cosines cos(n,x),cos(n,y),cos(n,z). Obtain expressions for the stress resultants (T_n) and its direction in terms of six independent components at that point. [8]
- c) Given the following strain field -
- $$\begin{aligned}\epsilon_{xx} &= 2x^2 + 3y^2 + z + 1 \\ \epsilon_{yy} &= x^2 + 2y^2 + 3z + 2 \\ \epsilon_{zz} &= 3x = 2y + z^2 + 1 \\ \gamma_{xy} &= 10xy \\ \gamma_{yz} &= \gamma_{zx} = 0\end{aligned}$$
- i) Check whether this strain field is compatible.
- ii) Compute the values of strain variables at the origin for this strain field. [10]
- Q2)** a) What is Airy's stress function? Show that the Airy's stress function for 2D problem satisfies the bi-harmonic equation? [7]
- b) In a plane stress problem where the weight is the only body force, the Airy's stress function is given by $\Phi = 6.x^5 + a.x^4 y + b. x^2.y^4 - 3y^3$. Calculate the constants 'a' and 'b'. [8]
- c) Explain the concept of Stress Invariants? Hence ,discuss the state of pure shear and hydrostatic state of stress? [10]

P.T.O.

- Q3)** a) Obtain the solution for stress distribution σ_r and σ_θ in a solid cylinder subjected to uniform external pressure. ' P_o '. [7]
- b) In a plane elasticity problem, obtain the equations of equilibrium in polar Co-ordinates. [8]
- c) Find stress components of cantilever beam loaded with point load at the free end by using Airy's stress function? [10]

SECTION - II

- Q4)** a) Define an axi-symmetric problem in elasticity stating its conditions in case of polar co-ordinate system? [3]
- b) Starting from governing equation $\Delta^4 \Phi = 0$, prove that, for obtaining the stress distribution in such case in plane elasticity the stress function $\Phi(r, \theta)$ is $\Phi = A \cdot \log(r) + B \cdot r^2 \cdot \log(r) + C \cdot r^2 + D$ where A, B, C, D are constants. [10]
- c) A thick walled long cylinder with closed ends has internal and external radii 'a' and 'b' respectively. It is subjected to uniform internal and external pressure P_i and P_o respectively. Treating this as an axially symmetric plane strain problem, obtain expressions for radial and tangential stresses in the cylinder wall. [12]
- Q5)** a) State the assumptions in the solution by St. Venant for the torsion of non-circular section? Hence starting from the displacement field, obtain conditions to be satisfied by the stress function $\psi(x, y)$ in terms of i) Equilibrium ii) Boundary conditions. [13]
- b) A prismatic bar having an elliptical cross section with semi major and semi minor axes 'a' and 'b' respectively is subjected to an axial torque M_t . Using Prandtl's approach, obtain the stress function $\Phi(x, y)$ conditions of equilibrium and boundary conditions? [12]
- Q6)** a) Explain classification of beams on elastic foundation? [3]
- b) A semi infinite beam is subjected to a force 'P' and a moment ' M_o ' at one end. Starting from the solution for an infinite beam, obtain the solution at a section 'z' from the beam end for
 i) deflection 'y'
 ii) Bending moment M_x . [12]
- c) A timber beam of rectangular cross section 60mm X 120mm is 6m long and attached to a rubber foundation with $K = 30$ MPa. It carries a bending moment of 0.5 kN-m at one end. Compute the maximum flexural stress in the beam stating its location? Take $E = 13$ GPa for timber. [10]



P1240

[4065] - 456

M.E. (Civil) (Structures)

ADVANCED DESIGN OF CONCRETE STRUCTURES

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

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 on three sides with remaining shorter side unsupported
 - ii) Regular hexagonal slab fixed at all sides
- b) Explain Hillerborgs strip method with sketches **[7]**
- c) Design a RCC simply supported slab for a rectangular hall of sides $5\text{m} \times 4\text{m}$ using Yield Line Theory. Assume the support thickness 230mm. Use M20 Fe500 take Live load = 4.5 kN/m^2 & floor finish load = 1.2 kN/m^2 . Draw details of reinforcement in plan and sectional elevation. **[10]**
- Q2)** a) Design a grid slab for a floor of hall $12 \times 15\text{m}$ c/c having square grid of 1.5m. Use M25 TMT steel take Live load = 4kN/m^2 & floor finish load = 1.2 kN/m^2 . Apply the required check & draw details of reinforcement. **[15]**
- b) 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 500mm dia. Use M20 & TMT steel take Live load = 5 kN/m^2 & floor finish load = 1 kN/m^2 . Draw reinforcement details. **[10]**

P.T.O.

- Q3)** Design a RCC staging for ESR, square in plan for 3 lakh liters with staging height 12m using M25, Fe500 in earthquake zone III. Safe bearing capacity is 200 kN/m². Assume approx dimension of container, wall, top, bottom slab thickness, beams sizes & number and pattern of columns. Design must include calculations of vertical loads and horizontal force calculations Design the bracings, columns and foundations. Draw the reinforcement details. Design of container is not required. [25]

SECTION - II

- Q4)** Design deep beam of a hall for flexure and shear for the following:
Clear span = 4m, width of support = 500mm. working UDL on the beam 1200kN/m. Take the total depth of beam = 3.2m Use M30 & Fe500. Show all Analysis and Design calculations & draw the reinforcement details. [25]
- Q5)**
- a) Write detailed note on bell shaped shear wall. [7]
 - b) A two span prestressed concrete continuous beam ABC having AB = BC = 14m and having cross section 230 × 800 is mm simply supported at A & C and continuous over B. The eccentricities of the parabolic cables at A & C = 0, at B = 240mm above neutral axis and at midspan of AB & BC = 300mm below it. Material used is M45 and multistrand cables 2 Nos 9T13 stressed to 75% of f_y , each span is of 15m, superimposed load on both the spans 16 kN/m. [18]
 - i) Determine primary, secondary moment at support at prestress and dead load.
 - ii) Draw the resultant line of thrust at working load.
 - iii) Calculate shift and stress in extreme fibers at working load.
- Q6)** Design post tensioned prestressed concrete slab for a floor for the following Flat simply supported panel of 7m × 7m, live load on slab 5 kN/m², floor finish load on slab = 1.5 kN/m², concrete grade M50 and multistrand cables S3 of cross sectional area 300 mm² with $f_y = 1900$ N/mm². Assume single panel and width of the beam on periphery of floor is 600mm. Design must include check fiber stresses in concrete and deflection. Draw sketches showing cable profiles and non tension reinforcement. [25]



Total No. of Questions : 10]

[Total No. of Pages : 2

P1249

[4065]-488

M.E. (Civil) (Environmental Engineering)
AGRICULTURAL POLLUTION CONTROL &
ENVIRONMENTAL BIOTECHNOLOGY
(2010 Course) (501511(b)) (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 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 are the water and nutrients requirement of crop. [8]
b) Explain various types of farming systems. [8]
- Q2)** a) Enlist any four pesticides. What are the uses of these pesticides? [8]
b) What are the types of fertilizers? State major and macro nutrients. [8]
- Q3)** a) What are the causes of water logging? Explain any one method of control of water logging. [8]
b) What are the effects of water logging? Explain with any one example phenomenon of water logging. [8]
- Q4)** a) Comment in detail on management and control of agricultural waste. [8]
b) What are the benefits of recycling and reuse of wastewater in agriculture? [8]
- Q5)** Write short notes on the following (any **Three**) [18]
a) Agricultural Pollution.
b) Agro meteorology.
c) Bioremediation of soil.
d) Soil Conservation.

P.T.O.

SECTION - II

- Q6)** a) Comment in detail on Concept of Environmental Biotechnology and Environmental Engineering. [8]
b) Explain Genetic engineering structure of DNA and RNA. [8]
- Q7)** a) Explain the operating and biological process of Up flow Anaerobic Sludge Blanket Reactor. [8]
b) Describe the advantages and disadvantages of ASP. [8]
- Q8)** a) What is the difference between high rate and low rate trickling filters? [8]
b) Explain with sketch the biological process in trickling filter. [8]
- Q9)** a) What is meant by activated sludge? Describe with sketch the treatment of the sewage by activated Sludge process(ASP). [8]
b) What is biotechnology? Explain any one method of biotechnology for reduction of CO₂ emission. [8]
- Q10)** Write short notes on the following (any **Three**): [18]
a) Biodegradable Plastics.
b) Methane Production.
c) Bio-membrane.
d) Root zone treatment of wastewater.



P1250

[4065] - 492

M.E. (Mechanical – Heat Power)
ADVANCED THERMODYNAMICS
(Sem. - I) (2008 Course) (502102)

*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, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 6) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Show that, the pressure, exerted by a colliding gas molecule with a smooth wall of infinite mass, is given by $P = \frac{1}{3} m n \bar{v}^2$ with usual notations. [16]
- b) Write a note on Clausius equation of state.
- c) Calculate the rms speed and mean translational kinetic energy of a molecule of Oxygen at 400 K. Take $k = 1.38 \times 10^{-23}$. [8]
- Q2)** a) On mollier diagram, why do the isobars diverge from one another. [8]
- b) Determine the exergy of 0.2 kg of steam at 40 bar and 773K. Assume a dead state of 100 kPa and 27°C. [8]
- Q3)** a) Derive an equation for exergy balance for a closed system. [8]
- b) Air expands through a turbine from 6 bar, 550°C to 1 bar and 250°C. During expansion 15 kJ/kg of heat is lost to the surroundings which is at 1 bar and 25°C. Neglecting PE and KE changes, determine per kg of air. [8]
- i) decrease in availability
 - ii) the maximum work and
 - iii) the irreversibility.
- Take $C_{p,air} = 1.005 \text{ kJ/kg-k}$, & $R = 0.287 \text{ kJ/kg-k}$.

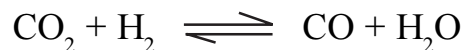
P.T.O.

- Q4)** Write short notes (Any three) : **[18]**
- Enthalpy departure.
 - Clapeyron equation.
 - Volume expansivity and isothermal compressibility.
 - Hydrogen gas needs to be pre-cooled before throttling; explain.

SECTION - II

- Q5) a)** Show that heat of reaction ΔH is given by $\Delta H = 19.148 \frac{T_1 \cdot T_2}{T_1 - T_2} \ln \left(\frac{K_1}{K_2} \right)$
 where K_1 and K_2 are equilibrium constants at temperatures T_1 and T_2 respectively. **[8]**
- b)** What is adiabatic flame temperature? **[8]**

- Q6) a)** Write a note on chemical exergy. **[8]**
- b)** For the following chemical reaction **[8]**



determine the equilibrium constant if the equilibrium value is 0.56 at 1200 K.

- Q7) a)** Derive Gibb's function for a mixture of inert ideal gases. **[8]**
- b)** A mixture of ideal gases consists of 2kg of N_2 and 3 kg of CO_2 at a pressure of 3.5 bar and temperature 17°C. Find. **[8]**
- the mole fraction of each constituent
 - equivalent molecular weight of the mixture and
 - equivalent gas constant of the mixture.

- Q8) a)** As applied to statistical thermodynamics, explain the principle of equipartition of energy. **[18]**
- b)** Calculate fermi energy for copper and hence estimate the equivalent gas temperature for the free electrons corresponding to their average energy at absolute zero temperature.

Take : Mol wt. of copper = 63.57, g/g mol

$$\rho_{\text{cu}} = 8.94 \text{ g/cm}^3, h = 6.624 \times 10^{-34} \text{ J-S}$$

$$m_e = 9.1 \times 10^{-31} \text{ kg.}$$

copper has one free electron per atom.



P1262

[4065]-524

M.E. (Mechanical) (Design Engineering)
ENGINEERING FRACTURE MECHANICS
(2008 Course) (502211(b)) (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) Figures to the right indicate full marks.
- 4) Use of electronic pocket calculator is allowed.
- 5) Assume suitable data, if necessary.
- 6) Neat diagrams must be drawn wherever necessary.

SECTION - I

- Q1)** a) 'A notch increases the tendency for brittle fracture'. Justify this statement. [6]
b) Explain in brief the influence of material behavior on fracture properties? [6]
c) Distinguish between the trans-granular and intergranular fracture? [4]
- Q2)** a) Why does linear elastic and elastic-plastic fracture mechanics concepts are inadequate for characterizing the behavior of small cracks. [6]
b) Discuss the plastic zone shapes for plane stress and plane strain conditions according to: [10]
i) Von Mises criterion
ii) Tresca criterion
- Q3)** a) Determine the plastic zone length at fracture for a mild steel with $K_{IC}=70\text{MPa}\sqrt{m}$ and uni-axial yield stress $\sigma_{ys}=450\text{MPa}$ for [8]
i) Plane stress and
ii) Finite thickness condition
b) Define the terms COD and CTOD. Explain the relationship between COD and CTOD? [8]

P.T.O.

- Q4)** a) Explain in brief the finite element method and the boundary integral equation method for evaluating fracture toughness? [10]
 b) What is stress intensity factor? Explain in brief the *Inglis theory of stress*? [6]
- Q5)** Write a short note on any three of the following: [18]
 a) Plastic constraint factor
 b) Elastic-plastic and fully plastic cracked bodies
 c) Compliance method
 d) Strain energy release rate

SECTION - II

- Q6)** a) What is the significance of J- integral being path independent? What are the different methods of determining J-integral? Explain any one? [12]
 b) What are the advantages of the J-integral approach to fracture toughness testing over the plane strain fracture toughness measurement for ductile materials? [4]
- Q7)** a) Describe the development of crack tip stress fields for a stationary crack subjected to a constant load at elevated temperature? [8]
 b) Discuss the sources of non linearity in load displacement diagrams during fracture toughness testing? [8]
- Q8)** a) Define creep? Explain with neat diagrams the differences between High load - Low temperature creep and Low load - Higher temperature creep? [10]
 b) Draw the fatigue-creep interaction diagram at constant temperature and explain? [6]
- Q9)** a) A large centre cracked plate containing an initial crack of length $2.a_0=10\text{mm}$ is subjected to a constant amplitude cyclic tensile stress ranging between a minimum value of 100 MPa and a maximum of 200MPa. Assuming the fatigue crack growth rate is governed by the equation
- $$\frac{da}{dN} = 0.42 \times 10^{-11} (\Delta K)^3 \text{ (m/cycle)}$$
- i) Calculate the crack growth rate when the crack length has the following values $2.a=10\text{mm}$, 30mm, 50mm. [8]
 ii) Assuming further that the relevant fracture toughness is

- 60MPa \sqrt{m} . estimate the number of cycles to failure. [4]
- b) Explain the role of fatigue pre-cracking in fracture toughness testing?[4]

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

- a) Creep deformation mechanisms
- b) Sub critical crack growth
- c) Fatigue crack propagation laws
- d) Creep resistant materials



P1265

[4065] - 530

M.E. (Mechanical) (Mechatronics)
MECHANICAL & ELECTRONIC MEASUREMENTS
(Sem. - I) (2008 Course) (502802)

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 the following terms : **[8]**
- i) Resolution.
 - ii) Linearity.
 - iii) Precision.
 - iv) Sensitivity.
- b)** Explain different measurement methods in instrumentation. **[8]**
- Q2) a)** Explain the properties of correlation co-efficient. **[8]**
- b)** In a correlation study the following values are obtained. **[10]**
- | | | |
|-----------------------------|-----|-----|
| Mean : | X | Y |
| | 65 | 67 |
| Standard deviation | 2.5 | 3.5 |
| Co-efficient of correlation | 0.8 | |
- Find the two regression equations that are associated with the above values.
- Q3) a)** Explain mean, Mode, Deviation, variance and probability of error. **[10]**
- b)** A differentiator input signal frequency. Varies between 10Hz to 1000Hz. If the capacitance of 0-1 μ F has been used in the differentiator circuit, find the value of feed backresistor R_F . **[6]**

P.T.O.

- Q4)** a) Explain with a block diagram working of logic analyzer. [10]
b) For a McLeod gauge, with a capillary of 1 mm diameter and effective bulb volume of 80 cc, find readings as indicated by Mercury column for 20 Pa pressure. [6]

SECTION - II

- Q5)** a) Explain successive approximation method in ADC. [8]
b) Explain total radiation Pyrometer with a neat sketch. [8]
- Q6)** a) Explain NPL interferometer with a neat sketch. What are applications of interferometry? [8]
b) Explain electromagnetic compatibility. [8]
- Q7)** a) Explain the working of ultrasonic flow meter with a neat sketch. [8]
b) What are various methods used for measurement of surface finish. [8]
- Q8)** Write short notes on any THREE : [18]
a) Digital storage oscilloscope.
b) Spectrum Analyzer.
c) Load cell.
d) Volt standard.



Total No. of Questions : 8]

[Total No. of Pages : 2

P1269

[4065]-539

M.E. (Mechanical) (Mechatronics)

INDUSTRIAL AUTOMATION

(2008 Course) (502809) (Sem. - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Attempt any three questions from each section.*
- 2) *Answers to the sections should be written in separate books.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of Scientific calculator is allowed.*

SECTION - I

- Q1)** a) Explain Examine ON and examine OFF conditions with two suitable examples of each in the form of ladder diagrams. [8]
- b) Write a short note on Boolean Algebra with two examples. [8]
- Q2)** a) Write a PLC program to control direction of DC motor with two NO, push-to-on switches. [10]
- b) Explain Sourcing inputs and sinking outputs w.r.t. PLC [8]
- Q3)** a) With Block Diagram explain working of PLC. [8]
- b) Compare Contractor Logic and Ladder Logic with two suitable examples. [8]
- Q4)** a) Explain three user Requirement Specification Formats with respect to Automation. [8]
- b) Compare delay on and delay off timers with suitable industrial application. [8]

P.T.O.

SECTION - II

- Q5)** a) Discuss in brief the flexible manufacturing w.r.t. application, cost, production volume and suitability. [8]
b) Discuss in brief tool offset and wear offset in CNC programming. [8]
- Q6)** a) Explain the significance of absolute coordinates and incremental coordinates with suitable example. [8]
b) Explain circular interpolation used in CNC programming with corresponding G codes. [8]
- Q7)** a) Explain any three preparatory functions with suitable application. [9]
b) Explain advantages and limitations of CNC with conventional machine tools with three illustrations. [9]
- Q8)** a) Explain four advantages of subprograms in APT programming. [8]
b) Compare G Codes with M Codes with three examples of G and M Codes. [8]



Total No. of Questions : 10]

[Total No. of Pages : 2

P1270

[4065]-543

M.E. (Mechanical) (Mechatronics)

AUTOMOTIVE ELECTRONICS

(2008 Course) (502811(c)) (Elective - III)

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 answer books.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of Scientific calculator is allowed.*
- 5) *Assume suitable data wherever necessary but mention it clearly.*

SECTION - I

- Q1)** Write short notes on (any two): **[18]**
- a) Multipoint Fuel injection systems in Spark Ignition Engines.
 - b) Discuss Modern Wiper system over conventional one speed wiper system.
 - c) The sensors, controls, and displays employed in Automobile speed measurement.
- Q2)**
- a) Describe Automobile Battery with respect to types, recent trends, protections. **[8]**
 - b) Compare Microprocessor assisted Engine Cooling System with fan driven by crank shaft. **[8]**
- Q3)**
- a) Describe sensors used in Automated Parking. **[8]**
 - b) Discuss Antilock Breaking System. **[8]**
- Q4)**
- a) Explain controls used in Automotive Heating system. **[8]**
 - b) Explain Throttle position sensor and its advantages. **[8]**
- Q5)**
- a) Discuss the Electronics involved in Head Lamps in modern automobiles. **[8]**
 - b) Describe Electronic Injection Advance in Compression Ignition Engines. **[8]**

P.T.O.

SECTION - II

- Q6)** a) Anti-Fog system in Automobiles. [9]
b) Electronic Fuel Injection System. [9]
- Q7)** Discuss Diesel Engine Control System with representative block diagram. Identify major inputs and outputs to engine control unit along with the corresponding sensors and actuators. [16]
- Q8)** a) Discuss recent trends in power windows. [8]
b) Sensors used in wheel alignment and balancing of wheels. [8]
- Q9)** a) Compare 8 bit microprocessors and 16 bit microprocessors in Luxury Cars. [8]
b) Discuss the controls used in Automotive Air conditioning. [8]
- Q10)** a) Discuss the Battery tests. [8]
b) Advantages of microprocessors used in Automobiles. [8]



P1271

[4065] - 548

M.E. (Mechanical) (Automotive Engineering)**AUTOMOTIVE ENGINE DESIGN****(Sem. - I) (New Course 2009) (502301)***Time : 3 Hours]**[Max. Marks :100**Instructions to the candidates:*

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

SECTION - I

- Q1)** a) What are equivalent conditions in similar engines? Under equivalent conditions list properties of theoretically similar engines. **[8]**
- b) In an Otto engine pressure and temperature at the beginning of compression are 1.14 bar and 40°C respectively. Peak temperature during the cycle is 1700° C and the pressure at the end of the adiabatic compression is 14 bar. Calculate
- i) theoretical thermal efficiency
 - ii) heat supplied per kg of air
 - iii) the work done per kg of air and
 - iv) the pressure at the end of adiabatic expansion. Take $C_v = 0.717$ kJ/kg K and $\gamma = 1.4$. **[8]**

OR

- Q2)** a) Draw a neat sketch of trunk type I C engine piston. **[6]**
- b) In an ideal Diesel cycle the pressure and temperature are 1.1 bar and 37° C respectively. The maximum pressure in the cycle is 45 bar and the heat supplied during the cycle is 525 kJ/kg. Determine. **[10]**
- i) the compression ratio
 - ii) the temperature at the end of compression
 - iii) the temperature at the end of constant pressure combustion and
 - iv) the air-standard efficiency. Assume $\gamma = 1.4$ and $C_p = 1$ kJ/kg K for air.

P.T.O.

- Q3)** a) Which materials are most commonly used for piston? Explain the merits and limitations. [6]
- b) A multi-cylinder engine is to run at a constant load at a speed of 600 rpm. Determine suitable dimensions for cast iron flywheel with a rim whose breadth is twice its radial thickness and mass is 143.5 kg. The density of cast iron is 7250 kg/m^3 , and its working stress in tension is 6 MPa. Consider only the tensile stress due to centrifugal force. [10]

OR

- Q4)** a) List and explain factors to be considered in general engine design. [8]
- b) A four-cylinder automotive spark-ignition square engine is being designed to provide a maximum brake torque of 155 N-m in the mid-speed range (= 2750 rev/min). Estimate the required engine displacement, bore and stroke, and the maximum brake power the engine will deliver. Assume bmep at the maximum engine torque point is 900 kPa and maximum mean piston speed, 14 m/s. [8]

Q5) Write short notes on : [18]

- a) Principle of similitude in design.
- b) Relationship between engine performance parameters.
- c) Forces acting on crankshaft.

SECTION - II

- Q6)** The design diagram of a camshaft can be considered as a free two-support beam loaded where the follower exerts maximum force of 2417 N on the cam at distance of 26 mm from left support. Length of camshaft span is 95 mm, outer diameter of camshaft is 32 mm and inner diameter is 10 mm. Find maximum deflection of camshaft. Take $E = 220 \text{ GPa}$. [16]

OR

- Q7)** Explain with neat sketch and mathematical expressions how the dynamic analysis of reciprocating and rotating masses of IC engine is carried out. [16]

- Q8)** A 4-cylinder engine and flywheel coupled to a propeller are approximated to a 3- rotor system in which the engine is equivalent to a rotor of moment of inertia 795 kg-m^2 , the flywheel to a second rotor of 325 kg-m^2 and the propeller to a third rotor of 20 kg-m^2 . The first and the second rotors being connected by 55 mm diameter and 2 m long shaft and the second and the third rotors connected by a 35 mm diameter and 2 m long shaft. Neglecting the inertia of the shaft and taking its modulus of rigidity as 75 GPa, determine [16]
- natural frequencies of torsional oscillation and
 - the positions of the nodes.

OR

- Q9)** A four cylinder vertical engine has cranks 155 mm long. The planes of rotation of the first, second and fourth cranks are 400 mm, 200 mm and 200 mm respectively from the third crank and their reciprocating masses are 55 kg, 65 kg and 55 kg respectively. Find the mass of the reciprocating parts for the third cylinder and the relative angular positions of the cranks in order that the engine to be in complete primary balance. [16]

- Q10)** Write short notes on : [18]
- Design of intake system for CI engine.
 - Design of radiator.
 - Selection of lubricant.



P 1273

[4065] - 552

M.E. (Mechanical) (Automotive Engineering)

ADVANCED HYDRAULIC AND PNEUMATIC SYSTEMS

(2008 Course) (502302(C)) (Elective - I)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) *Solve any three questions from each section.*
- 2) *Use separate answer sheet for each section.*

SECTION - I

- Q1)** a) Enlist the type of hydraulic fluid and explain the factors affecting the performance of the oil in hydraulic system. [8]
b) Describe the types and material used for packing and seals. [8]
- Q2)** a) Describe the factors affecting the selection of components of hydraulic power unit. [8]
b) Explain different applications of hydraulic and pneumatic in Automotive Engineering. [8]
- Q3)** a) Explain Pump performance characteristics and its testing procedure.[8]
b) What are the specifications of the compressor? Explain the compressed air generation and distribution system. [8]
- Q4)** a) Explain the pressure compensated vane pump. [8]
b) Describe the different application circuits of Accumulator. [8]
- Q5)** Answer any three of the following : [18]
a) Explain the loading mechanism of hydraulic cylinder
b) Explain theoretical torque, power and flow rate in hydraulic system
c) Describe Hydrostatic Transmission
d) Explain design of air cylinder in brief
e) Write short notes on performance of hydraulic motor

SECTION - II

- Q6)** a) What are the specifications of pressure reducing valve? Explain typical application circuit using pressure reducing valve. [8]
b) Explain the classification of flow control valve. Compare the different types of speed control circuits. [8]
- Q7)** a) Explain the solenoid operated 5/2 DCV used in pneumatic system. [8]
b) Explain the hydraulic circuit for sequencing of two actuators' using roller operated valve. [8]
- Q8)** a) Describe the working of FRL Unit used in Pneumatic system. [8]
b) Suggest the pneumatic circuit for the following sequence of operation. [8]
i) Extension of piston using manual operated valve.
ii) Piston should remain extended for 10 minutes.
iii) Automatic retraction of piston after 10 minutes.
- Q9)** Two cylinders A and B are to be operated simultaneously. The operating details are:
a) The cylinder A has a load of 25 KN and cylinder B has a load of 20 KN.
b) Both cylinder has a stroke of 1 m.
c) The working stroke is to be complete in 20 seconds.
d) The return stroke of B starts only after the complete retraction of A.
- Design the circuit to fulfill the above requirements and suggest the selection ratings of different components used in the circuit. [16]
- Q10)** Answer any three of the following : [18]
a) Explain the pneumatic-safety system.
b) Describe MPL Control System.
c) What are basic fluidic devices?
d) Explain dual pressure hydraulic system.



Total No. of Questions :10]

[Total No. of Pages :3

P1274

[4065] - 554

M.E. (Mechanical) (Automotive Engineering)
AUTOMOTIVE SAFETY AND REGULATIONS
(2008 Course) (Elective - II) (502303)

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 Calculator is allowed.*
- 6) Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Why road safety is important? What are various causes of road accidents? Explain. **[8]**
- b) Describe what do you understand by Active safety? What are various components of it? **[8]**
- Q2)** a) What is vehicle crash worthiness? What are various characteristics of it? **[6]**
- b) Define and briefly describe the significance of crash pulse in a frontal crash of vehicle. **[6]**
- c) Describe regulatory requirements for crash testing? **[4]**
- Q3)** a) Explain with example what do you understand by Occupant Restraint System? Describe it with neat sketch. **[6]**
- b) Describe various causes for occupant injury. Which parts of human body is affected by injury. Explain. **[6]**
- c) Explain concept of impact sensitivity of human being. **[4]**

P.T.O.

- Q4)** a) Describe various design requirements for crash test dummies. [6]
b) Explain various features for Hybrid III dummy used in frontal crash tests. [6]
c) Explain Role of ergonomics in vehicle safety. [4]

- Q5)** Write short note on the following. [18]
a) Evolution of safety systems.
b) Governing material properties for vehicle crashworthiness.
c) Crash Energy Management.

SECTION - II

- Q6)** a) What is a function of a Car Bumper? Explain various requirements of crashworthiness of it. [6]
b) Describe Head Restraint geometry for the horizontal and vertical measurement between head and restraint with neat sketch. [6]
c) Describe with neat sketch automobile seat. Explain various parts of it. [4]

- Q7)** a) Describe role of side door intrusion beam in providing passive safety in cases of side impacts. [6]
b) What is meant by collapsible steering? Explain its role in passive safety. [6]
c) Explain role of automobile seat anchorage. [4]

- Q8)** a) What are the different types of automobile head lamp designs used in today's cars? Explain with sketch. [6]
b) Explain asymmetrical beam used in head lamp. What is merit and demerits of plastic lens head lamp? [6]
c) Describe Head lamp low beam measuring screen test point grid. [4]

- Q9)** a) What do you mean by type approval? What are various standards and regulations for it? Explain. [6]
- b) Describe various passive safety regulations adopted in India as per IS / AIS. [6]
- c) Explain in brief The Motor vehicle act 1988. [4]

Q10) Write short note on the following: [18]

- a) Sketch any three road signs specifying dimensions and color code as per CMVR rule.
- b) Reflex reflector
- c) Specifications of number plate lamp.



P1276

[4065] - 580

**M.E. (Electrical) (Control System)
ADVANCED DRIVES & CONTROL
(2008 Course) (Elective - IV) (503112)**

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) State and explain the factors affecting the time and energy during starting of the electric drive. [6]
- b) Write in detail a note on Rating of an electric motor and thermal consideration. [6]
- c) Explain and derive the transfer function of the d.c. motor in a closed loop control of the drive receiving the feed back from the tachogenerator coupled to the armature. Comment on the dynamic behaviour of the drive. [6]

OR

- Q2)** a) Justify the statement that the A.C. Drives are preferred to D.C. Drives, on the basis of maintenance, range of speed control, solid state power controller employed in the system and multi-quadrant operation. [9]
- b) Explain plugging and regenerative mode of operation of induction motor with reference to its multi-quadrant operation. Explain third quadrant operation. Is it possible? How? [9]

- Q3)** A d.c. motor is driving a constant torque load of 50% of its full load torque. The following two controllers are available for speed control to vary the speed above the normal speed. [16]

- a) Two units of single phase converter controllers.
- b) Two units of chopper controller.

P.T.O.

If a.c. as well as d.c. supply of rated voltage is available, draw the circuit diagrams and explain the possible operation in case i) and in case ii) Explain the variation of trigger angle / duty cycle, variations in applied voltage including limiting cases.

OR

Q4) Write in detail the note on any two of the following : [16]

- a) Torque pulsation in d.c. drives and the solid state controllers.
- b) Limitations and performance of field weakening method for speed control of d.c. drives using various controllers.
- c) Ripple factor in the armature current and the solid state controllers.
- d) Stability consideration in modifying speed torque characteristic of the electric motor employing solid state controllers.

Q5) a) The analysis of the output waveform of the voltage of the inverter results in harmonic generation. Justify the statement and explain the effect of the time harmonics on the performance of the a.c. drive. How does the pulse width modulated technique help in elimination of the selected harmonics? Explain in detail. [8]

- b) Explain in detail the effect of the space harmonics those are present in the inverter fed a.c. drive. State the reason of their generation and method to control or reduce their effects. [8]

OR

Q6) Explain in reference with inverter fed induction motor the following : [16]

- a) Necessity of volts/frequency ratio to control the speeds below normal speed.
- b) Operation at speeds above normal speed.
- c) Current source inverter.
- d) Voltage source inverter.

SECTION - II

Q7) a) Explain with the help of the circuit diagram and block diagram the 'SLIP-POWER RECOVERY' method for wound rotor induction motor, to result speed control. [8]

- b) Explain dynamic d-q model and small signal model of the induction motor. [8]

OR

- Q8)** Explain the following in reference to the VECTOR-CONTROL method of speed and torque control of induction motor. [16]
- a) Flux vector determination.
 - b) Direct vector control.
 - c) Indirect vector control.
 - d) Parameter algorithm.

- Q9)** Explain with reference to synchronous motor.
- a) Wound field machine drive. [8]
 - b) Trapezoidal S.P.M. Drive. [8]

OR

- Q10)** Write notes on :
- a) Synchronous Reluctance motor. [8]
 - b) Permanent magnet synchronous motor and its solid state controller. [8]

- Q11)** In a closed loop control of the electric drive explain and compare the performance of the PID controllers with reference to the integral gain constant and the delay time derivative gain constant. [18]

OR

- Q12)** In closed loop control of the electric drive :
- a) Explain the effect of RMS voltage variation on the performance. [9]
 - b) State and explain the modern trends in the industrial application and the role of the micro computers in the closed loop system as a current controller. [9]



P1280 [4065] - 585

M.E. (Electrical) (Power System)

DIGITAL SIGNAL PROCESSING & ITS APPLICATIONS

(2008 Course) (Elective - I) (503204(a))

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Find Z transform and ROC of following signal
 $x(n) = 3(4)^n - 5(3)^n u(n)$. [6]
- b) State and prove final value theorem for z transform. [6]
- c) Explain i) causal & Non-causal systems ii) Time variant & time invariant systems. [6]
- d) Explain frequency aliasing & sampling theorem. [7]
- Q2)** a) Explain how linear convolution can be obtained using circular convolution. [5]
- b) Use four point DFT and IDFT to determine circular convolution of sequences.
 $x_1(n) = (1, 2, 3, 1)$, $x_2(n) = (4, 3, 2, 2)$ [12]
- c) Explain Radix - 2 DIT (Decimation in time) FFT algorithm. [8]
- Q3)** a) Explain concept of FIR filter and its advantages over IIR filter. [8]
- b) Explain design steps for IIR filter using rectangular window. [8]
- c) Explain how detection of fault in bearings can be obtained using frequency domain analysis. [9]

SECTION - II

- Q4)** a) Obtain digital IIR filter $H(z)$ from given analog transfer function $H(s)$ at 5Hz sampling frequency.

$$H(s) = \frac{2}{(s+1)(s+2)} \quad [8]$$

- b) Explain direct form I and direct form II realization of IIR filters. [10]
c) Explain design steps for designing digital IIR filter using chebyshev method. [7]

- Q5)** Write note on : [25]

- a) Desirable features of DSP processor.
- b) Von Neumann Architecture.
- c) Multiply Accumulate Unit.
- d) Pipelining.
- e) Addressing modes in DSP.

- Q6)** a) With help of functional block diagram explain the features of TMS 320C50 DSP processor. [15]

- b) Write a note on DSP based power factor correction system. [10]



P1281

[4065] - 586

**M.E. (Electrical) (Power Systems)
ADVANCED POWER ELECTRONICS
(Sem. - I) (2008 Course) (503204) (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) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Explain the construction and different characteristics of SCR and GTO. [9]
- b) Explain in detail the connections of transformer and 6-pulse converters in order to obtain 24-pulse and 48-pulse operation. [8]
- c) Compare VSC and CSC. [8]
- Q2)** a) For a 3-phase AC-DC controlled converter and continuous current conduction, derive the expression for average and RMS output voltage. [6]
- b) Explain in detail the programmed harmonic elimination switching for a 2-level inverter. [7]
- c) Write short note on :
- i) di/dt and dv/dt protection for MOSFET. [6]
- ii) Gate driver circuit for MOSFET. [6]
- Q3)** a) Explain the principle of operation of a 3-level inverter and the procedure to eliminate n^{th} harmonic from its output voltage. [12]
- b) Explain Space Vector PWM for a 3-phase 2-level DC-AC converter. [13]

P.T.O.

SECTION - II

Q4) Write short notes on : -

- a) Fly wheel energy storage systems. [8]
- b) Super conducting magnetic energy storage. [9]
- c) Active filters for harmonic and reactive power compensation. [8]

Q5) a) Explain the principle of operation of diode clamped multilevel inverter. [9]

b) Compare cascaded multilevel inverter and flying capacitor multilevel inverter. [8]

c) Find the RMS value of following voltage

$$V = 310 \sin (\omega t) + 17 \sin (5\omega t) + 19 \sin (9\omega t) + 13 \sin (13\omega t) \quad [8]$$

Q6) a) Explain shunt current compensation for a non-linear load by using p-q theory. [8]

b) Explain dc link capacitor voltage balancing for multi-level inverter. [8]

c) Explain the working of flying capacitor multi-level inverter. [9]



P1282

[4065] - 587

M.E. (Electrical) (Power Systems)

**ARTIFICIAL INTELLIGENCE AND ITS APPLICATIONS
IN POWER SYSTEMS**

(2008 Course) (Elective - II) (503205 (a))

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) What is Fuzzy Logic? Explain any three applications of Fuzzy logic for power system problems. **[8]**
- b) Explain following methods of generation of membership function **[8]**
- i) Choice based on intuitive understanding.
 - ii) Generation of membership function based on subjective perception and inductive reasoning
- c) Prove following relations using truth table method **[9]**
- i) $F \vee (G \wedge H) = (F \wedge G) \wedge (F \vee H)$
 - ii) $N(F \wedge G) = (NF) \vee (NG)$

- Q2)** a) Explain fuzzy relations. Explain different operations on fuzzy sets. [10]
- b) Explain following methods of associating crisp set with a given fuzzy set. [10]
- 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
- c) With examples explain following numbers associated with fuzzy set. [5]
- i) Height of a fuzzy logic
 - ii) Normalization of a fuzzy set.

Q3) Explain 'Propositional Logic' PL(1) with reference to following points giving appropriate examples. [25]

- | | |
|---------------------|------------------------|
| a) Syntax of PL (1) | b) Semantics of PL (1) |
| c) Inference Rule | d) Derivation |
| e) Resolution. | |

SECTION - II

- Q4)** a) Explain fundamental logic of following artificial tools [8]
- | | |
|------------------------|-------------------------------|
| i) Expert System | ii) Fuzzy Logic |
| iii) Genetic algorithm | iv) Artificial Neural Network |
- b) Explain basic McCulloch Pitts' non linear model of a neuron. Give analogy between biological neuron and artificial neuron. [8]
- c) Explain following concepts with reference to Artificial Neural Network. [9]
- i) Different transfer function and Bias
 - ii) Fault tolerance nature of ANN
 - iii) Input-output Mapping ability of ANN
 - iv) Adaptability

- Q5)** a) Define learning of artificial neural network. Explain types of learning methods. [8]
- b) Explain algorithm of 'Perceptron learning Rule'. Explain 'learning rate' and 'momentum coefficient'. [8]
- c) Use perceptron convergence algorithm and calculate optimum set of weights for following set of input and output. [9]

Input = [1, 0, 0]

Desired Output = [0]

Initial weights (W) = [0.8, 0.9, 0.6]

Learning rate = 0.5

- Q6)** a) With neat diagram explain the architecture of 'Multilayer Perceptron'. Also explain basic rules of signal flow graph. [10]
- b) Explain with mathematical formulae, the error back propagation algorithm. [10]
- c) Explain the competitive learning of neural network. [5]



Total No. of Questions :6]

[Total No. of Pages :2

P1283

[4065] - 588

**M.E. (Electrical) (Power System)
RENEWABLE ENERGY SOURCES
(2008 Course) (503205) (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 answer books.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Figures to the right indicate full marks.*

SECTION - I

- Q1)** a) What is Energy? What are the different forms of Energy? Draw coal energy chain by thermal power plant Route. **[5]**
- b) State and explain various subsystems in a solar thermal energy conversion system giving neat diagram. **[10]**
- c) “Electrical Energy is used universally as a vehical for Energy”. Comment w.r.t. its effects and advantages. **[10]**
- Q2)** a) Define the terms: **[5]**
- i) Radiation
 - ii) Irradiation
 - iii) Insolation
 - iv) Constant
 - v) Concentration ratio w.r.t. solar energy.
- b) Describe the construction of a typical three blade horizontal shaft wind turbine generator unit OR Darrieus Rotor wind turbine generator units. **[10]**
- c) State and Explain different types of solar collector. **[10]**

P.T.O.

Q3) Write short notes on any three:

- a) Merits and Demerits of wind Energy. [8]
- b) Merits and Demerits of solar PV systems. [8]
- c) Comparison between conventional and Renewable energy. [8]
- d) Factors favouring and against Renewable energy sources. [8]
- e) Essential features of a site for a wind farm. [9]

SECTION - II

Q4) a) What is biomass energy? State useful secondary energy forms with biomass. Name the four Biomass source from cultivated Energy Resource. [5]

b) State different types of Battery and enumerate Major features and Applications for any one. [10]

c) Explain the concept of Hybrid system Economics. [10]

Q5) a) State five each non-rechargeable and rechargeable batteries. [5]

b) Discuss the Merits and Limitations of Tidal Power. [10]

c) What is the effect of harmonic distortion and voltage transients on power quality? [10]

Q6) Write short notes on any three:

a) OTEC systems. [8]

b) Ultra capacitors. [8]

c) Generation from municipal solid waste. [8]

d) Power systems stiffness. [8]

e) Importance of Grid integration with the system. [9]



Total No. of Questions : 6]

[Total No. of Pages : 2

P1287

[4065]-595

M.E. (Electrical) (Power System)

PARTIAL DISCHARGES IN ELECTRICAL POWER

APPARATUS

(2008 Course) (503212(b)) (Elective-IV)

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 the phenomenon of partial discharge (PD) define: [12]
- i) Partial Discharges.
 - ii) Partial Discharge intensity.
 - iii) Apparent charge
 - iv) Repetition rate
 - v) Energy of an individual partial discharge.
 - vi) Average discharge current.
- b) With reference to nonelectrical discharge detection discuss. [13]
- i) Noise detection in air and
 - ii) The photomultiplier units.
- Q2) a)** Explain with neat circuit diagram function of each component used for narrow band PD measuring technique. [13]
- b) Discuss with neat circuit diagram calibration of partial discharge detection circuit. [12]

P.T.O.

- Q3)** a) With reference to the screening and filtering problems during partial discharge measurements discuss: [16]
i) Need for screening.
ii) Design of screens.
iii) Completely enclosed screen.
iv) Effect of corners.
- b) Explain [9]
i) The design of filters and
ii) Measurement of screening efficiency.

SECTION - II

- Q4)** a) Discuss the effects of partial discharges on gaseous insulating materials and liquid insulating materials. [10]
b) Explain the phenomena of surface discharges and internal discharges in mixed dielectrics system. [15]
- Q5)** With reference to evaluation of partial discharges discuss.
a) Relation between measured and actual charge. [13]
b) Relation between the time-dependent occurrence of PD. [12]
- Q6)** Write short notes on:
a) Need for PD measurement. [6]
b) Development of PD measuring techniques in cables. [6]
c) Reflections and superposition effects. [6]
d) Location of partial discharges. [7]



Total No. of Questions :6]

[Total No. of Pages :2

P1291

[4065] - 603

M.E. (Electrical) (Power Electronics & Drives)

FACTS AND HVDC

(2008 Course) (503305 (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) 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) From fundamentals obtain expression for power in a transmission line also show the voltage variation in the line is maximum at the midpoint. **[15]**
- b) Explain what is the need of reactive power compensation in transmission line. **[10]**
- Q2)** a) What is the difference between Series compensation and Shunt Compensation? Explain any one method for series compensation in detail along with diagram. **[12]**
- b) With neat figure explain the principle of operation of Thyristor Controlled Reactor (TCR). Obtain the expression for effective reactive admittance and RMS value of fundamental and n^{th} harmonic current. **[13]**
- Q3)** a) What is Unified Power flow? Explain the working of Unified Power Flow Control (UPFC) with the help of neat diagram. **[12]**
- b) What are the different types of FACTS controller used for power system stability? Explain the basics of STATCOM along with its block diagram and applications. **[13]**

P.T.O.

SECTION - II

- Q4)** a) Compare AC and DC Transmission system on the basis of economy, technical performance and reliability. Also discuss the merits and demerits of HVDC system over AC Transmission system. **[15]**
- b) Draw a schematic diagram of a typical HVDC converter station and explain the working of each part of it in detail. **[10]**
- Q5)** a) What is Graetz bridge? Draw a typical Graetz bridge and find the analysis of it neglecting overlap. Also draw the waveform for output voltage and voltage across thyristor for $\alpha = 30^\circ$. **[20]**
- b) How the choice of the converter for any pulse number is selected? **[5]**
- Q6)** a) From fundamentals explain basic principle of DC link control? Draw and explain basic converter control characteristics. **[12]**
- b) Discuss firing angle control and explain the basic requirement for firing angle generation. Explain anyone type of firing angle control in detail. **[13]**



Total No. of Questions :8]

[Total No. of Pages :2

P1293

[4065] - 606

**M.E. (E & TC / Electronics/
Digital Systems / VLSI Embedded Systems / Communication
Network / Microwave / Signal Processing)
PRINCIPLES AND PRACTICES FOR IT MANAGEMENT
(Sem. - I) (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) Discuss the following functions of management. **[10]**
- | | |
|-----------------|----------------|
| i) Planning | ii) Organizing |
| iii) Staffing | iv) Directing |
| v) Controlling. | |
- b) Explain the various management skills required for the manager. **[6]**
- Q2)** a) Explain the process of creating Work Breakdown Structure (WBS). **[8]**
- b) Define project goals. Discuss in detail establishing project priorities. **[8]**
- Q3)** a) Explain the need for project revision with reference to project delays. **[8]**
- b) Discuss organizing a project team and team issues. **[8]**
- Q4)** Write short notes on any three: **[18]**
- a) Tools & techniques of strategic management.
 - b) Process of creating a budget.
 - c) Tracking project progress & financial obligations.
 - d) Business ethics & social responsibilities.
 - e) Gathering project information.

P.T.O.

SECTION - II

- Q5)** a) Explain conflict process & strategies for resolving conflicts for various types. [8]
b) Discuss in detail the stress management. [8]
- Q6)** a) Discuss the concept of Supply Chain Management (SCM) as modern approach to management. [8]
b) State and explain various project quality standards. [8]
- Q7)** a) Explain the applications of IT in quality control and customer relationship. [8]
b) Discuss in detail Intellectual Property Rights (IPR) and cyber laws. [8]
- Q8)** Write short notes on any three: [18]
a) Formal and Informal groups.
b) Six Sigma.
c) CMMI.
d) Impact of IT quality management system.
e) Energy management and energy audit.



Total No. of Questions :8]

[Total No. of Pages :2

P1294

[4065] - 609

M.E. (E&TC) (Microwave)

DIGITAL IMAGE PROCESSING AND ANALYSIS

(Elective - I) (2008 Course) (504224 (B))

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) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 4) Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) What is histogram? Discuss a technique to improve the dynamic range of the histogram of an image with example. **[8]**
- b) What are the steps in image digitization? Explain image quantization in detail. **[8]**
- Q2)** a) Give the equation of 2D FFT. What are the properties of 2D DFT? Explain in detail. **[8]**
- b) Explain Power Law Transformation of images. **[8]**
- Q3)** a) What is the drawback of Laplacian operator? What is the advantage of using LOG filter? Explain. **[8]**
- b) Explain Additive and Subtractive color models. **[8]**
- Q4)** Give short notes on : **[18]**
- a) KL transform.
 - b) Homomorphic Filtering.
 - c) JPEG Encoding.

P.T.O.

SECTION - II

- Q5) a)** Given 10 x 10 image I, perform dilation using structuring element J given as follows **[10]**

$$I = \begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 1 & 1 & 1 & 1 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 & 1 & 1 & 1 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 & 0 & 0 & 1 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 & 0 & 0 & 1 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 & 1 & 1 & 1 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 & 1 & 1 & 1 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$J = \begin{pmatrix} 1 & 1 \\ 1 & 1 \end{pmatrix}$$

- b) Explain Segmentation using thresholding. **[8]**
- Q6) a)** With the help of neat block diagram explain Lossy Predictive Coding. **[8]**
- b) Explain edge linking using Hough Transform. **[8]**
- Q7) a)** Explain the algorithm for pseudo coloring. **[8]**
- b) For the given 2x2 image K find DCT and show that DCT preserves signal energy. **[8]**
- $$K = \begin{pmatrix} 2 & 2 \\ 1 & 2 \end{pmatrix}$$
- Q8) a)** What is the difference between statistical classification and syntactical classification? **[8]**
- b) What is Artificial Neural Network? Explain Back Propagation Algorithm. **[8]**



Total No. of Questions :8]

[Total No. of Pages :3

P1295

[4065] - 612

M.E. (E & TC) (Microwave)

SPEECH PROCESSING AND APPLICATIONS

(2008 Course) (504225 (b)) (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) Figures to the right indicate full marks.*
- 4) Assume suitable data, if required.*
- 5) Use of scientific Calculator is allowed.*

SECTION - I

- Q1)** a) Draw and explain the speech chain with the help of neat diagram. **[10]**
b) Define vowels and consonants. **[4]**
c) Define the following: **[4]**
i) Bilabial
ii) Labiodental
- Q2)** a) What type of Quantization is suitable for speech? Justify your answer. **[2]**
b) Explain the following digitization techniques with the help of block diagram. **[10]**
i) Adaptive Differential Pulse Code Modulation (ADPCM).
ii) Adaptive Delta Modulation (ADM)
c) Compare the performance of speech digitization techniques with respect to bit rate and bandwidth. **[4]**

P.T.O.

- Q3)** a) Explain the principle of speaker recognition with the help of block diagram. Explain clearly the difference between speaker identification and speaker verification. [10]
- b) Twenty four voice signals are sampled uniformly and then have to be time division multiplexed. The highest frequency component for each voice signal is equal to 3.4kHz. [6]
- i) If the signals are pulse amplitude modulated using Nyquist rate sampling what would be the minimum channel bandwidth required?
- ii) If the signals are pulse code modulated with an 8 bit encoder what would be the sampling rate? The bit rate of the system is given as 1.5×10^6 bits/sec.
- Q4)** a) Explain the following: [6]
- i) Cepstrum
- ii) Mel frequency cepstrum
- b) Explain how neural network approach can be used for automatic speech recognition. Explain any one neural network architecture used for the Automatic Speech Recognition (ASR). [10]

SECTION II

- Q5)** a) Explain the steps involved in the basic text to speech with the help of block diagram. [10]
- b) Explain auditory nerve representation of speech with the help of Ensemble Interval Histogram (EIH). [6]
- Q6)** a) Explain clearly the difference between Markov and Hidden Markov Model (HMM). [3]
- b) Explain the three problems associated with HMM. [6]
- c) Explain how HMM can be used for speech recognition with the help of block diagram. [7]

- Q7)** a) Explain the basic capabilities of voice processing system. [3]
b) Explain the hardware architecture of voice processing system with the help of block diagram. [8]
c) Explain standalone versus network controller based voice processing architecture. [5]

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

- a) Speech production mechanism.
b) Lpc spectral matching measures.
c) Adaptive echo cancellation for speech signals.
d) Speech enhancement techniques.



P1301

[4065] - 628

M.E. (E&TC) (VLSI & Embedded System)

ASIC DESIGN AND MODELLING

(2008 Course) (504184(a)) (Elective - I)

Time : 3 Hours]

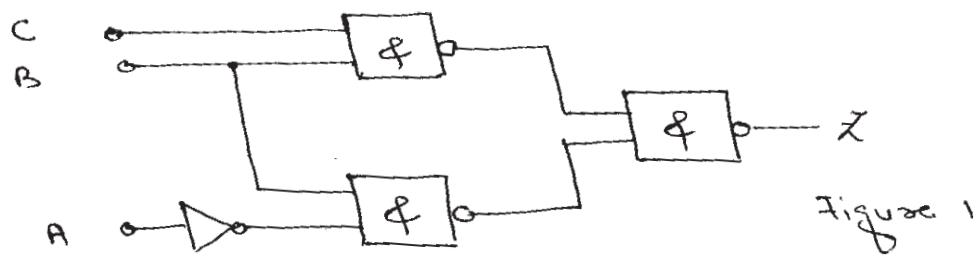
[Max. Marks :100

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.

SECTION - I

- Q1)** a) Classify and explain in detail Gate Array based ASIC's. [8]
 b) With neat flow chart explain the sequence of steps to design an Application specific Integrated circuits. [10]
- Q2)** a) Explain in brief different modeling techniques used in VHDL. [8]
 b) Classify and explain in detail different simulation modes in simulators. [8]
- Q3)** a) With neat timing diagram, explain step by step process of SCAN Path technique for testing of sequential circuit. [8]
 b) Define path sensitization. Explain step by step process to derive the test set for the figure 1 using the same method. [8]



- Q4)** Write short note on : - [18]
- a) Automatic Test Vector Generation.
 - b) Methods to minimise clock skew.
 - c) Differentiate Testing and Verification.

SECTION - II

- Q5)** a) List out goals and objectives for each block in the physical design of ASIC. [8]
b) Explain with step by step process, K-L algorithm for system partitioning. List out different issues to be considered before the implementation. [8]
- Q6)** a) Classify placement algorithm. With example explain one from each in detail. [8]
b) What are different approaches to global routing. Explain in detail one algorithm to find the shortest path. [8]
- Q7)** a) Explain in detail the different factors contribute to best floor planning. Also define wire load model. [6]
b) Classify and explain different issues in verification. [6]
c) Write a note on DRC. [6]
- Q8)** Write short note on : [18]
a) Power dissipation.
b) Measurement of interconnect delay.
c) Features of EDA tool.



P1302

[4065] - 632

M.E. (E & TC) (VLSI and Embedded Systems)

MEMORY TECHNOLOGIES

(2008 Course) (Elective - II) (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) Figures to the right indicate full marks.*
- 5) Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Draw and explain various CMOS SRAM cell configurations. [6]
b) Draw and explain various circuit elements of BiCMOS circuit. [6]
c) Compare SRAM and DRAM based various performance parameters of memory technology. [6]
- Q2)** a) Draw and explain the functional diagram of a typical Application Specific SRAM? [8]
b) Explain trench cell and stacked capacitor cell structure of DRAM. [8]
- Q3)** a) Explain with block diagram CMOS ROM. [8]
b) Explain with block diagram flash memory architecture. [8]
- Q4)** a) Explain Silicon-on-insulator (SOI) technology? What are advantages and disadvantages of the same? [8]
b) Explain with sketches soft failure error in DRAM. [8]

P.T.O.

- Q5)** a) What is Non volatile memory and explain with different classifications highlighting the silent features. [6]
b) Explain OTP with silent features. [6]
c) What is antifuse, explain in brief. [4]

SECTION - II

- Q6)** a) List the different faults that can occur in a memory chip and explain in brief? [8]
b) Explain Pattern sensitive fault in detail? [8]
- Q7)** a) Explain any one algorithm used for functional testing of RAM? [8]
b) Explain bathtub curve in the context of memory failures. [8]
- Q8)** Write short notes on any four. [16]
a) Operational life test (OLT)
b) Radiation hardening techniques.
c) Analog memory.
d) Ferroelectric memories.
e) Radiation effects on semiconductor memory.
- Q9)** a) Explain in detail various high density memory packages in both insertion mount and surface mount technologies. [8]
b) Explain in detail 3D memory stacks in multichip modules (MCM). [8]
- Q10)** Write short notes on any three: [18]
a) Digital Tablet PC.
b) LCD
c) DVD Player.
d) Memory cards
e) High-density memory packaging future directions.



P1306

[4065] - 647

M.E. (E&TC) (Signal Processing)
DIGITAL IMAGE PROCESSING
(2008 Course) (504503(a)) (Elective - I)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) Answer any three questions from each section.
- 2) Figures to the right indicate full marks.
- 3) Assume suitable data, if necessary.

SECTION - I

- Q1)** a) What is histogram equalization? Explain with suitable example. [8]
 b) Explain monochrome vision model. [8]

- Q2)** a) Give the equation of 2D FFT. What are the properties of 2D DFT? Explain in detail. [8]
 b) Compute inverse 2D DFT of the transform coefficients given by $F(k,l)$. [8]

$$F(k,l) = \begin{vmatrix} 16 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{vmatrix}$$

- Q3)** a) What is the drawback of Laplacian operator? What is the advantage of using LOG filter? Explain in detail. [8]
 b) Explain Additive and Subtractive color models. [8]

- Q4)** Give short notes on : [18]
 a) KL transform.
 b) Finger Print recognition.
 c) MPEG standard.

SECTION - II

- Q5)** a) Give application of Wiener filter. Explain its characteristics in detail. What is the equation for Wiener smoothing filter? [10]
b) Find the expression for the signatures of following boundaries and plot the signatures. [8]
i) Square
ii) Equilateral Triangle
- Q6)** a) Explain fidelity criteria and bit plane coding? [8]
b) With the help of masks give the process of point detection, line detection and edge detection. [8]
- Q7)** a) Find the set of codewords and average word length using Huffman coding scheme for a set of gray levels with probabilities given below. [8]
- | | | | | | | | | |
|-------------|------|-----|------|-----|------|------|------|-----|
| Input | G1 | G2 | G3 | G4 | G5 | G6 | G7 | G8 |
| Probability | 0.03 | 0.1 | 0.02 | 0.1 | 0.05 | 0.15 | 0.25 | 0.3 |
- b) Explain region growing algorithm for image segmentation. [8]
- Q8)** a) Discuss degradation models for image restoration. [8]
b) What is the importance of Hough Transform? Where is it used? [8]



P1307

[4065] - 650

M.E. (E & TC) (Signal Processing)
BIO-MEDICAL SIGNAL PROCESSING
(2008 Course) (Elective - II) (504504 (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) Describe a generalized bio-instrumentation system with a neat block diagram. [6]
- b) What are the measurement constraints in a biomedical instrumentation system? [6]
- c) How are the biomedical instruments classified? Explain with suitable examples. [6]
- Q2)** a) Describe the cell bio-electric phenomenon with a neat figure. [8]
- b) Calculate the resting potential of a cell when the ratio of intracellular ion concentration to the extracellular ion concentration is 30 at room temperature of 27°C. [8]
- Given: R = Gas constant = 8.31436 Joule⁻¹deg⁻¹
- F = Faraday constant = 96488 coulomb/gm-equivalent.

P.T.O.

- Q3)** a) Explain the mechanism of an electromagnetic blood flow transducer. [8]
 b) Describe the semiconductor temperature transducer (PTAT) and derive the expression for its output voltage as a function of absolute temperature. [8]
- Q4)** a) Describe the Goldberger Augmented Lead system for ECG and show that the augmented signal is 50% larger than the signal with the Wilson central terminal chosen as reference. [8]
 b) Explain the phonocardiogram signals and their relationship with cardiac cycle events. [8]
- Q5)** a) Explain the 10-20 system employed to record the spontaneous electroencephalogram. [8]
 b) Explain the “Back-projection” method of image reconstruction used in computed tomography. [8]

SECTION - II

- Q6)** a) What are the isolation techniques employed in medical isolation amplifiers? List commonly used devices with their specifications. [8]
 b) Design an active filter to reject a single frequency of 50Hz. Justify the filter topology used and mention the specification requirements of the components used. [8]
- Q7)** a) An ECG signal of 1 volt peak-to-peak has a bandwidth of 0.01 to 100 Hz. Assume that broadband noise may be present in the signal at about 0.1 volts. This signal is filtered using a four-pole low-pass filter. What sampling frequency is required to ensure that the error due to aliasing is less than -60 dB? [8]
 b) Why do we need anti-aliasing filters? Explain with a suitable example. [8]
- Q8)** Design a Low-pass FIR filter using window method with following specifications:
 Filter length $L = 8$, cut-off frequency = 100Hz, sampling frequency = 360Hz.
 Given $x(n) = (0, 0.7660, 0.9848, 0.5, -0.3420, -0.9396, -0.8660, -0.1736)$, compute the filter response $y(n)$. [16]

Q9) a) Prove that averaging noise from different sensors, or multiple observations from the same source, will reduce the standard deviation of the noise by the square root of the number of averages. **[8]**

b) What are the effects of signal windowing? Explain the various types of windowing techniques with necessary equations, time domain and spectral responses. **[8]**

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

a) Sources of variability in biomedical signals.

b) Ensemble Averaging.

c) Welch method for spectral density estimation of a signal.



Total No. of Questions : 8]

[Total No. of Pages : 2

P1310

[4065]-654

M.E. (E & TC) (Signal Processing)

ADVANCED DIGITAL SIGNAL PROCESSING

(2008 Course) (504508) (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 must be written in separate answer books.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary.*
- 5) *Use of Scientific calculator is allowed.*

SECTION - I

- Q1)** a) Draw a block schematic for the interpolator by a factor of I. Draw the spectrum of the signal at the output of each block. Derive the expression for the output of the interpolator. [8]
- b) Draw a polyphase interpolator for interpolation factor of 4. Set the length of the filter be 16. Explain how the multiplication with zeros is avoided. [9]
- Q2)** a) Design the specifications for a two stage interpolator filters to increase the sampling frequency from 128kHz to 512kHz. [8]
- b) Draw the block schematic for over sampling ADC and explain the function of each block. [8]
- Q3)** a) Draw the block schematic for LMS algorithm and explain it. [8]
- b) Explain what is deconvolution. How will you use predictive deconvolution for data processing. [9]
- Q4)** a) Discuss the stability and performance of LMS algorithm. [8]
- b) Explain efficient implementation of decimator and interpolator. [8]

P.T.O.

SECTION - II

- Q5)** a) Draw a second order Lattice filter for FIR filter realization. Write the equations for the output of the filter. Find the relation between predictor coefficients and the reflection coefficients. [9]
- b) Draw the direct form FIR filter realization. What are the applications for FIR filters. [8]
- Q6)** a) Explain least squares Lattice algorithm. What is the meaning of gradient adaptive lattice filter? [8]
- b) Draw and explain delay and sum beamformer. [8]
- Q7)** a) Explain how adaptive beamformer can be used in radar and sonar applications. [8]
- b) Explain the architectural differences between TMS and ADSP processors. [8]
- Q8)** a) Draw a super Harvard architecture and explain how it is useful for execution of MAC instruction. What is the use of program Cache? [9]
- b) Write an algorithm for implementation of a decimator. Modify it for implementation of sampling rate converter by a factor of 5/2. [8]



Total No. of Questions : 12]

[Total No. of Pages : 2

P1328

[4065]-714

M.E. (Production)

WELDING AND JOINING

(2008 Course) (511111 (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 answer books.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 5) *Assume suitable data, if necessary.*
- 6) *Neat diagrams must be drawn wherever necessary.*
- 7) *Your answers will be valued as a whole.*

SECTION - I

Unit-I

- Q1)** a) Explain in brief epitaxial, cellular and dendritic solidification in welding. [8]
b) What is weld decay? Explain different ways to prevent weld decay? [8]

OR

- Q2)** a) What are different methods of weldability testing? Explain in brief. [8]
b) Explain the relation between peak temperatures experienced by various regions in HAZ, with the help of iron-carbon phase diagram. [8]

Unit-II

- Q3)** a) What is Arc blow? What are the causes of arc blow? How to reduce sensitivity of arc blow? [8]
b) What are the different flux ingredients used in welding? Explain their functions. [8]

OR

- Q4)** a) Explain the importance of selection of polarity in electric arc welding? How is polarity selected? [8]
b) Explain the electrical characteristics of an Arc. [8]

Unit-III

- Q5)** a) Discuss the effect of microstructure on fatigue crack of stainless steel welds. [9]
b) What is the role of surface tension on fusion welding? Discuss. [9]

P.T.O.

OR

- Q6)** a) What are the different methods to improve metallurgical properties of electrosag welding? Explain. [9]
b) Discuss three dimensional geometric effect on residual stress and strain in welding process. [9]

SECTION - II

Unit-IV

- Q7)** a) Explain any two power sources used for welding applications. [8]
b) How the arc length is controlled in mechanised welding process? Explain in brief. [8]

OR

- Q8)** a) Explain the constant current characteristics of power sources used in arc welding processes. [8]
b) What are the different types of rectifiers used in welding? Explain any one in detail. [8]

Unit-V

- Q9)** a) Explain the relation between current and melting rate of carbon steel electrodes of different sizes. [9]
b) Explain different forces affecting metal transfer during welding. [9]

OR

- Q10)** a) With the help of graph “Droplet transfer frequency for steel with different welding processes”. [9]
b) Explain pulse transfer-plasma arc welding in brief. [9]

Unit-VI

- Q11)** a) Explain laser beam welding in detail. [8]
b) What is high energy rate welding? Explain. [8]

OR

- Q12)** a) Explain friction welding in brief. [8]
b) What is cold pressure welding. [8]



P1353

[4065] - 762

M.E. (Computer)

DATA WAREHOUSING AND DATA MINING

(2008 Course) (510112 (C)) (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 answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Your answers will be valued as a whole.*
- 6) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) What is data Mining? Explain how the evolution of database technology led to data mining. Describe the steps involved in data mining when viewed as a process of knowledge discovery. [8]
- b) List and describe the *five* primitives for specifying data mining task. [8]
- Q2)** a) What is Data Mining Query Language (DMQL)?
Using any suitable example, explain '*define cube*' statement in DMQL. Assume the data warehouse is to be implemented using '*fact constellation*' scheme [8]
- b) Write a note on 'web mining'. [8]
- Q3)** a) Consider the following set of values of attribute 'age'. [10]
13, 15, 16, 16, 19, 20, 20, 21, 22, 22, 25, 25, 25, 25, 30, 33, 33, 35, 35, 35, 36, 40, 45, 46, 52, 70
- i) Show an *equal-width histogram* of width 10.
 - ii) Partition the data into bins using *equal-frequency* partitioning.
 - iii) Partition the data into bins using *equal-width* partitioning.
 - iv) Partition the data using *Clustering*.
 - v) Use *smoothing by bin means* to smooth the data, using bin depth of 3.
- b) Write a note on attribute selection. [8]

P.T.O.

Q4) a) Consider the following set of transactions : **[10]**

Transaction ID	Itemset
01	{‘webcam’, ‘laptop’, ‘printer’}
02	{‘laptop’, ‘printer’, ‘scanner’}
03	{‘desktop’, ‘printer’, ‘scanner’}
04	{‘desktop’, ‘printer’, ‘webcam’}

Calculate support and confidence of all items/sets of items that appear in these transactions. What is the support and confidence of the following rules.

Buys {‘webcam’} → Buys {‘laptop’}

Buys {‘printer’} → Buys {‘scanner’}

Buys {‘scanner’} → Buys {‘printer’}

b) Differentiate between the following : **[6]**

i) Training data and test data.

ii) Supervised learning and Unsupervised learning.

iii) Large dataset and high dimensional dataset.

SECTION - II

Q5) a) Suppose you want to design a data mining system for a University to examine University course database, that contains the following information: the name, address, and status (UG or PG) of each student, the course taken, percentage of marks obtained, Describe the architecture you would choose. What is the purpose of each component of this architecture? **[8]**

b) Describe the differences between the following approaches for integration of a data mining system with a database or data warehouse system: *no coupling, loose coupling, semi-tight coupling and tight coupling*. State which approach is the most popular, and why **[8]**

Q6) a) Consider the following two-dimensional data set as two-dimensional data points : **[8]**

	A ₁	A ₂
X ₁	1.5	1.7
X ₂	2.0	1.9
X ₃	1.6	1.8
X ₄	1.2	1.5
X ₅	1.5	1.0

Given a new data point, $x = (1.4, 1.6)$ as a query, rank the database points based on the similarity using

- i) Euclidean distance
 - ii) Manhattan (or city block) distance
- b) Consider the following group of data : [8]
200,300,400,600,1000
Normalize the data using
- i) Min-max normalization by setting $\min = 0$ and $\max = 1$
 - ii) Z-score normalization

- Q7)** a) What is Concept Hierarchy? Can a dimension have multiple hierarchies? Illustrate using suitable example of dimensions. Discuss how concept hierarchy may be computed automatically? [6]
- b) What is a measure? Briefly explain the three categories of measures? Why often a distributive measure is preferred over holistic measure? [6]
- c) What is the star-net query model? Explain using suitable example application. [6]
- Q8)** a) Using suitable example, explain the algorithm used for the Decision Tree construction. [8]
- b) What is clustering? Explain any clustering algorithm you know using suitable example. [8]



Total No. of Questions :8]

[Total No. of Pages :2

P1358

[4065] - 783

M.E. (Chemical)

**PROCESS DESIGN & SYNTHESIS
(2008 Course) (509104(b)) (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 answer books.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Figures to the right indicate full marks.*
- 5) Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 6) Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Discuss the product design flow diagram in detail. [12]
b) Explain - life cycle of product. [6]
- Q2)** a) Explain the basic concepts related to green process engineering. [10]
b) Discuss the health and safety aspects to be considered in process design. [6]
- Q3)** a) Describe the engineering ethics for process engineering. [8]
b) Explain hierarchy of process synthesis. [8]
- Q4)** a) Write a note on heat and power integration. [8]
b) Describe the pinch point approach used for designing a heat exchanger network. [8]

SECTION - II

- Q5)** a) Explain the terms : - i) trade off ii) performance targets iii) process engineering economics iv) sharp splits. [8]
b) Explain sequencing of distillation columns using phase diagram. [10]

P.T.O.

- Q6)** a) Discuss distillation column sequencing for a non azeotropic system with 4 components. [10]
b) Describe separation using pressure swing. [6]
- Q7)** a) What are residue curve maps? Explain the topology for them. [8]
b) Explain the sequencing of distillation columns for azeotropic system with an example. [8]
- Q8)** a) What is attainable region approach? Explain how it is used in reactor network design. [8]
b) Describe the various factors affecting the reactor selection decision. [8]



P1359

[4065] - 785

M.E. (Chemical)

COMPUTER AIDED DESIGN

(2008 Course) (509104(d)) (Elective - I) (Theory)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) Answer any three out of four from each section.
- 2) Assume suitable data, wherever necessary.

SECTION - I

- Q1)** What do you mean by computer aided design in chemical engineering. Explain in detail with its applications in chemical engg. [16]
- Q2)** What are main components of CAD softwares. Explain function and working of each of them with suitable examples. [16]
- Q3)** a) What are various property and thermodynamic packages used in commercial CAD softwares. List them with its use for various applications. [8]
- b) List commercial CAD softwares available in the field of chemical engg. Explain two of them in detail. [8]
- Q4)** Write a 'C' program to determine the root of equation. $x^3 - 1.8x^2 - 10x - 17 = 0$ by using bisection method. [16]

SECTION - II

- Q5)** a) Write a flow chart to write a program for computer aided design of binary distillation column. [10]
- b) Write a flow chart to write a program for computer aided design of CSTR. [8]
- Q6)** a) List differences in specifications of steady state and dynamic state simulation. [8]
- b) Differentiate between steady state and dynamic simulation. [8]

P.T.O.

- Q7)** a) What do you mean by stiff differential equations. Explain with suitable example. [8]
- b) Write short note on : [10]
- i) Linear algebra and its numerical methods.
- ii) Differential equations and its numerical methods.
- Q8)** a) Write a 'C' program for the solu of differential equation $y' = x - y$ (x_0 and y_0 and h is given) by using Euler's method. [10]
- b) Write a flow chart for the same question Q.8. (a). [6]



P1365

[4065] - 797

M.E. (Chemical)

CATALYSIS & SURFACE PHENOMENA

(2008 Course) (Elective - IV) (509112(a))

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) Answer any three questions from each section.
- 2) Answers to the two sections should be written in separate answer books.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Figures to the right indicate full marks.
- 5) 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 role of a catalyst? [4]
 b) Explain how adsorption precedes any catalytic activity. [6]
 c) Explain the concept of rate controlling step and how it can be determined. [8]
- Q2)** a) What information can be obtained from adsorption isotherms? Explain with examples. [8]
 b) Derive the Langmuir adsorption isotherm, stating all the assumptions. [8]
- Q3)** a) What is XRD technique? Explain its working principle. [8]
 b) Derive and explain Elovich equation. [8]

- Q4)** a) Surface area of a 0.5 gm. sample of silica gel was obtained by using nitrogen. The following data was obtained :

Equilibrium	0.8	3.3	5.0	6.3	7.5	9.0
pr. (kPa)	11.2	18.7	30.7			
Volume adsorbed (STP)	3.4	6.4	6.7	7.0	7.2	7.4
$V_x \times 10^6 \text{ m}^3$	7.7	8.5	9.9			

The temperature was maintained at the normal boiling point of N_2 (liq.) (77 K). Area of plane surface that a single molecule of N_2 occupies is $16.2 \times 10^{-20} \text{ m}^2$. Calculate the specific surface area of silica gel. [16]

P.T.O.

SECTION - II

- Q5)** a) Explain the significance of Thiele modulus. Derive its equation for cylindrical pellet. [10]
b) Explain the random pore model. [8]
- Q6)** a) Explain the methanol synthesis process. [12]
b) What is a dual function catalyst. [4]
- Q7)** a) Explain the functioning of monolith catalyst. [8]
b) Explain one method for catalyst preparation. [8]
- Q8)** a) How does catalyst deactivation occur? [8]
b) What are spinels? Explain with examples. [8]



Total No. of Questions :8]

[Total No. of Pages :2

P1367

[4065] - 801

M.E. Chemical (Environmental)
ENVIRONMENTAL GEOSCIENCES
(Sem. - I) (2008 Course) (509132)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

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

SECTION - I

- Q1)** Write notes on the following: **[16]**
- a) Forest ecosystem.
 - b) GrassLand ecosystem.
 - c) Desert ecosystem.
 - d) Ocean ecosystem.
- Q2)** Describe Atmosphere, Lithosphere and Hydrosphere of the earth. **[16]**
- Q3)** Describe **[18]**
- a) Causes of volcanicity.
 - b) Discordant and concordant intrusions.
 - c) Extrusive volcanicity.
- Q4)** Define air pollution, state various air pollutants and their sources. What are effects of air pollution on humans and plants? **[18]**

P.T.O.

SECTION - II

- Q5)** Explain following Ore deposits. **[16]**
- a) Magmatic deposits.
 - b) Metamorphic deposits.
 - c) Sedimentary deposits.
- Q6)** Write an essay on Application of Remote sensing and GIS in Environmental science. **[16]**
- Q7)** Write a detailed note on Environmental impact of mineral exploration Mineral processing and smelting. **[18]**
- Q8)** Describe in detail Acid Mine drainage. **[18]**



P1369

[4065] - 804

M.E. (Chemical) (Environmental Engg.)**GROUND WATER CONTAMINATION & POLLUTION TRANSPORT****(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 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) With a neat sketch of hydrologic cycle explain the role of various components of hydrologic cycle in the formation of groundwater. [8]
b) What are the main geological formation that aid formation & movement of groundwater? [6]
c) Explain the effect of soil & rock on groundwater quality. [4]
- Q2)** a) Distinguish between ground surface contour & water table contour. Explain how water table contour are prepared & state their uses. [6]
b) Determine the i) specific yield ii) change in ground water storage for an aquifer having a porosity of 15% & specific retention 8%. The aquifer spreads over an area of 105 ha & water table drops by 3.8m. [6]
c) Discuss the role of groundwater as a source of water Resource of a country. [4]
- Q3)** a) Tracer injected into a well took 5hours to travel to another well 50m apart. The difference in water surface elevation was found to be 1.0m. The aquifer samples indicated a porosity of 30%. Determine the i) Permeability ii) Seepage velocity & iii) Reynold's number for flow. Assume average grain size is 1mm, kinematic viscosity at 27°C for water = 0.008 stokes. [6]
b) Derive the mass conservation equation for transient flow in saturated porous medium. [8]
c) Explain Hydraulic diffusivity. [2]

P.T.O.

- Q4)** a) What are the different methods to obtain solution to groundwater flow equation? What is refraction of flow lines & derive the tangent law for refraction of groundwater flow lines in heterogeneous media. [8]
- b) In a flownet analysis the number of flow line is 24 & number of head drop is 8. The flow medium has a hydraulic conductivity of 0.02 cm/sec. & a head loss of 15m. Calculate the average discharge. [4]
- c) What are different objective of ground water studies? Explain pumping test to obtain aquifer parameter. [4]

SECTION - II

- Q5)** a) What are the various of ground water contamination? Explain underground travel phenomenon of ground water contamination. [6]
- b) What is the necessity of modelling of groundwater system? What are the different types of ground water models? Discuss the various types of mechanical Analog models. [8]
- c) Discuss Retardation & what is its effect on groundwater contamination. [4]
- Q6)** a) Discuss i) Molecular diffusion ii) Homogeneous reaction, as applied to solute transport. [6]
- b) Explain, with appropriate sketch the various process involved in pollution transport phenomenon & give the appropriate equation for pollution transport. [6]
- c) What are different types of waste disposal? How does industrial waste water impartment effect ground water formation? [4]
- Q7)** a) What are hydrochemical facies? Discuss briefly the utility of trilinear diagram for classification of hydrochemical facies. [6]
- b) What is chemical equilibria of ground water? What are the factors that alter equilibria of ground water. [6]
- c) Discuss the role of adsorption in organic chemical transfer into soil. [4]
- Q8)** a) Explain the usefulness & advantage of Numerical methods in ground water problem. What are the different numerical methods & discuss briefly finite difference method. [6]
- b) What is salt water intrusion? Explain control of salt water intrusion by hydraulic barrier. [6]
- c) Discuss the dispersion analysis of contaminant transport in fractured rock. [4]



P1370

[4065] - 806

M.E. (Chemical) (Environmental Engineering)
AIR & NOISE POLLUTION CONTROL
(2008 Course) (509134(d)) (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 answer books.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 5) Assume suitable data, if necessary.*

SECTION - I

- Q1)** Explain the conventional & non-conventional energy sources & their effects on environment. Suggest suitable strategies for conservation of energy & reduce environmental degradation. **[18]**
- Q2)** Discuss the effects of air pollutants on materials. Discuss the mechanism of there effects, write the natural factors which aggravate these effects. **[16]**
- Q3)** Discuss the different models for pollutant dispersion. Discuss any one in detail with assumptions & limitations, with formula. **[16]**
- Q4)** Write short notes on : - **[16]**
- a) Control of NOX.
 - b) Electrostatic precipitator.

SECTION - II

- Q5)** Discuss the design of the following with neat diagram. **[18]**
- a) Cyclone separator.
 - b) Dust chambers.
- Q6)** Give the characteristics, sources and effects of noise pollution. Discuss the action plan to control the noise pollution of a pilgrim center. **[16]**
- Q7)** Explain the Dry & wet method to control the SOX in detail. **[16]**
- Q8)** Write shrot notes on : **[16]**
- a) Plume Behaviour.
 - b) Design of stack.



P1371

[4065] - 807

M.E. (Chemical) Environmental Engineering
MEMBRANE TECHNOLOGY IN ENVIRONMENTAL
ENGINEERING

(Elective - II) (2008 Course) (509135 (a))

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *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 Industrial applications of membrane processes. [6]
b) How membrane separation processes are classified? [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 controlling factors for the selection of polymers for the membrane preparation. [12]
- Q3)** a) Explain classification of separation process with suitable example in detail. [8]
b) Explain how performance of membrane is determined? [8]

P.T.O.

- Q4)** Write short notes on the following: **[16]**
- a) Natural membranes
 - b) Inorganic membranes
 - c) Charged membranes.
 - d) Polymer coating process.

SECTION - II

- Q5)** a) How modules are selected for the membrane process? **[6]**
b) Explain Sol - Gel process for inorganic composite membrane. **[6]**
c) How asymmetric membranes are prepared? **[6]**
- Q6)** a) Explain various methods used for membrane preparation. **[8]**
b) Explain ultrafiltration and state its industrial applications. **[8]**
- Q7)** a) Explain electro dialysis process. **[6]**
b) Explain flow patterns in membrane technology. **[6]**
c) What is mean by fouling of membrane? **[4]**
- Q8)** Write short notes on : **[16]**
- a) Reverse osmosis.
 - b) Liquid membranes.
 - c) Desalination processes.
 - d) Ion exchange process.



Total No. of Questions :6]

[Total No. of Pages :1

P1376

[4065] - 824

M.E. (Petroleum Engineering)

OIL AND GAS FIELD DEVELOPMENT

(2008 Course) (512104 C) (Elective - I) (Sem. - I)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) Answer any two questions from each section.*
- 2) Answers to the two sections should be written in separate answer books.*
- 3) Figures to the right indicate full marks.*
- 4) Neat diagrams should be drawn wherever necessary.*
- 5) Use of a non-programmable calculator is allowed.*
- 6) Assume suitable data if necessary and clearly state it.*

SECTION - I

- Q1)* Explain planning and development of an oil field? [25]
- Q2)* Explain how material balance calculations can be used for development of an oil field? [25]
- Q3)* What log and seismic data is required for an oil field development assuming one well is drilled where oil has been found? [25]

SECTION - II

- Q4)* How is reservoir simulation used in field development? [25]
- Q5)* Explain the special development of a gas field. [25]
- Q6)* How can the field development be influenced by water flooding? [25]



Total No. of Questions :6]

[Total No. of Pages :1

P1377

[4065] - 828

M.E. (Petroleum Engineering)
WELL TESTING AND ANALYSIS
(512105 (c)) (2008 Course) (Elective - II)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) Answer two questions from each section.*
- 2) Answers to the two sections must be written in separate answer books.*
- 3) Figures to the right indicate full marks.*
- 4) Neat diagrams should be drawn wherever necessary.*
- 5) Use of a non-programmable calculator, log-log, semi-log paper is allowed.*
- 6) Assume suitable data if necessary and clearly state it.*

SECTION - I

- Q1)* Derive the diffusivity equation in cartesian coordinate system. [25]
- Q2)* Give suitable examples of Derivative Plots and explain. [25]
- Q3)* Derive the line source solution to the diffusivity equation. [25]

SECTION - II

- Q4)* State the complete methodology in analysis of a Pressure Draw down Test. [25]
- Q5)* State the complete methodology in analysis of Horizontal wells. [25]
- Q6)* Explain Drawdown test for gas wells using pseudo pressure, pressure squared and pressure analysis. Which is the best and why? [25]



Total No. of Questions :12]

[Total No. of Pages :3

P1380

[4065] - 841

M.E. (IT)

SOFTWARE ENGINEERING METHODOLOGIES

(2008 Course) (Sem. - I) (514402)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) Answers to the two sections should be written in separate answer books.
- 2) From section I answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 and from section II answer Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Figures to the right indicate full marks.

SECTION - I

Q1) Show correlation between the framework activities of software process model and Unified software process model activities with the help of a diagram and explain the same. **[18]**

OR

Q2) a) Write short note on Spiral software process model. **[10]**
b) State one application for using prototype software process model and justify for the selection of the model. **[8]**

Q3) a) Read the following description of the system and answer the questions given below:

A university conducts practical oral examinations of Engg college students. It is desired to build a portal for coordinating such activity. Following are the expectations to be fulfilled by the portal

- i) Every college affiliated to University should be able to upload the college time table. This should be the time bound activity. [there should be start date and end date for time table upload activity]
- ii) The university authorities should be able to prepare the master time table. [this should be spreadsheet with practical oral examination time span dates as columns and examiner names as rows. This should be executed for every centre].

P.T.O.

- iii) Every practical/oral chairman should be able to view the master time table of that head. [He should be able to view the rows pertaining to his subject code only].
- iv) Every practical/oral chairman should be able to prepare the time table of his practical/oral head.
- v) Every practical/oral chairman should be able to view the time table in prescribed format.
- vi) Every practical/oral chairman should be able to send the time table to the university authorities.
- vii) The university authorities should be able to view the time tables of all the practical oral heads.
- viii) Every college should be able to view the time table of that college centre code only.
- ix) Every college should be able to download its own time table.
 - I) Identify the actors in the system. **[4]**
 - II) Identify the use cases for each actor and draw use case diagram for the system, using applicable notations from UML2.0 **[6]**
- b) Write the relevance of any one of following diagrams with the context of UML 2.0. **[6]**
 - i) Interaction overview diagram.
 - ii) Package diagram.

OR

- Q4)** a) Use the same system details as described in Q3 a) and draw a detailed activity diagram using all applicable notations from UML2.0 **[8]**
- b) What is OCL? Show the usage for the keywords invariant, context, forall and self in the context of OCL using suitable examples. **[8]**

- Q5)** a) Explain the relevance of deployment diagram and list down the meaning of the keywords execution environment, node, server, communication path, war file, device, and deployment specification. **[8]**
- b) In the context of sequence diagram, what are the various fragments introduced in UML 2.0? Write the notation and purpose of any four such fragments. **[8]**

OR

- Q6)** a) Write short note on CORBA. **[8]**
- b) What is requirement traceability, explain in brief. **[8]**

SECTION - II

- Q7)** a) Explain the software design concepts coupling and cohesion. [8]
b) Illustrate, with examples the following relationships present in the context of class diagram of UML 2.0 [10]
i) Dependency.
ii) Two way association.
iii) Aggregation.
iv) Composite.
v) Realization.

OR

- Q8)** a) Explain the lifecycle of designing a system from Object oriented perspective. [10]
b) Explain the steps involved in user interface design. [8]
- Q9)** a) What is acceptance testing? [2]
b) What is hybrid integration testing? Explain in brief. [8]
c) What is regression testing? Explain in brief. [6]

OR

- Q10)** a) What is stress testing and smoke testing? Explain. [8]
b) What is use case based software estimation? Explain in brief. [8]
- Q11)** a) Explain Ishikawa's seven tools for quality in brief. [10]
b) What is structural testing? [6]

OR

- Q12)** a) Explain software debugging. [8]
b) State the salient features of process assessment model CMMI. [8]



P1382

[4065] - 846

M.E. (Information Technology)

INFORMATION ASSURANCE AND SECURITY

(2008 Course) (Elective - II) (514405 (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) Differentiate between the following terms:- **[8]**
- i) Confidentiality and authentication
 - ii) Active and Passive attack
 - iii) Known plain text attack and chosen plain text attack
 - iv) Cryptography and steganography
- b) What is firewall? List the characteristics of a good firewall implementation.
What are the limitations of firewall? **[10]**
- Q2)** a) Discuss why encryption is the most resorted security tool. Explain the conventional encryption principles. **[8]**
- b) Compare between DES and AES. **[8]**
- Q3)** a) What are the different types of attacks on Digital Signature? **[8]**
- b) Perform the RSA algorithm on the given data and explain how encryption and decryption are performed on the message: $p = 7$, $q = 11$, $e = 17$ and $M = 8$. **[8]**

P.T.O.

- Q4)** a) Explain buffer overflow attack with an example. [8]
 b) Discuss about the measures that are used for Intrusion Detection? [8]
- Q5)** a) Why security policies are important? How Security can be achieved with the help of setting of the data integrity policy. [8]
 b) What do you mean by security association? Specify the parameters that identify the security association? [8]

SECTION - II

- Q6)** a) What is need of calculating multiplicative inverse in RSA algorithm? [8]
 If $\text{gcd}(550, 1759) = 1$, find multiplicative inverse of 550.
 b) Write a short note on DOS attacks in Wireless Network. [8]
- Q7)** a) User A & B exchange the key using Diffie Hellman algorithm. Assume $a = 5$, $q = 11$, $X_A = 2$, $X_B = 3$. Find Y_A , Y_B , K . [10]
 b) How do you establish an e-mail and Web Surfing Policy? [8]
- Q8)** a) Define key Cyber-law terms. Integrate concepts of Cyber-law into everyday business practices by reviewing Cyber-law Internet security issues. [8]
 b) Describe the five principle services that PGP provides. [8]
- Q9)** a) Describe in detail the system security levels defined in Orange Book? Which are the primary requirements of C2 standard? [8]
 b) How are the secure keys distributed in IPSec? [8]
- Q10)** a) List and explain different types of viruses. [8]
 b) Draw a simple, Internet base consumer to business e-commerce system that has a one supplier server and many local customers. List and explain all the security risks you can think off. [8]



Total No. of Questions : 8]

[Total No. of Pages : 2

P1383

[4065]-850

M.E. CSE (IT)

ADVANCED TRENDS IN DATABASE SYSTEMS

(2008 Course) (Semester - II) (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 answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Make suitable assumptions whenever necessary.*

SECTION - I

- Q1)** a) Explain the difference between a remote SQL statement and a distributed SQL statement. [8]
b) What is meant by recursive relationship type? Give three examples. [8]
- Q2)** a) How is OLTP (Online Transaction Processing) different from DSS (Decision Support System). How can DBMS meet the challenges of the principally different requirements of these two systems? [8]
b) What is the role of Meta data repository in a data warehouse? How does it differ from a catalogue in a relational DBMS? [8]
- Q3)** a) Explain classification trees concept in data mining in brief. Why is tree pruning useful in such tree models? [8]
b) Discuss Apriori algorithm for discovering frequent itemsets for mining multilevel association rules. [8]
- Q4)** Write short notes on: [18]
a) Multimedia Database
b) Query parallelism (intra, inter, inter operation...)
c) Dashboards
d) Normalization of databases.

P.T.O.

SECTION - II

- Q5)** a) Discuss the design and implementation issues of active database. [8]
b) How is active DB different from normal/passive databases? Explain with example. [8]
- Q6)** a) Compare relational database, Object Oriented database, and Object relational database with respect to their strength, applications and limitations. [8]
b) With a diagram explain the architecture of a TP system. What are the functions of TP monitor. [8]
- Q7)** a) What a Web crawler is. Describe the characteristics and the crawling policies. [8]
b) Describe the web crawler architecture with the help of a case study. [8]
- Q8)** Write short notes on: [18]
a) Failures, Recovery, Availability of databases
b) Information retrieval techniques for exploring data in databases
c) Applications of Active database
d) Unsupervised learning.



Total No. of Questions :8]

[Total No. of Pages :3

P1390

[4065] - 883

M.E. (Instrumentation & Control) (Process Instru. & Bio-Medical Instru.)

MATHEMATICAL METHODS IN INSTRUMENTATION

(2008 Course) (5061102) (Sem. - I)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Define vector space. State axioms of vector space. **[4]**
b) Define Basis vector with suitable example. **[4]**
c) Test the following polynomial for linear dependence. **[8]**
 $x^2 + 2x + 1 ; 2x + 1 ; 2x^2 - 2x - 1$

- Q2)** a) Find orthonormal vectors of the following set of vectors. **[12]**

$$\begin{bmatrix} 1 & 0 & 0 \\ 1 & 1 & 0 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}.$$

- b) Explain singular value decomposition. **[6]**

- Q3)** a) State the properties of orthogonal transformation & orthogonal matrix. **[8]**

- b) Explain orthogonal projection operators with suitable examples. **[8]**

P.T.O.

Q4) a) Find by Newton Raphson method, the roof of the equation $3x = \cos x + 1$. [8]

b) Solve:- [8]

$$10x - 7y + 3z + 5u = 6$$

$$-6x + 8y - z - 4u = 5$$

$$3x + y + 4z + 11u = 2$$

$$5x + 4u - 9y - 2z = 7$$

By Gauss elimination method.

SECTION - II

Q5) a) Explain with suitable examples: [8]

i) Random experiments.

ii) Sample spaces.

b) Following data base is given from University in year 2010 - 11. [10]

	B.E.	M.E.	Ph.D.	M.B.A.	Total
Male	616	194	16	30	856
Female	529	171	26	44	770
Total	1145	365	42	74	1626

Find i) $P(\text{Male} / \text{B.E.})$ Use Bayes' Rule.

ii) $P(\text{M.E.} / \text{Female})$

iii) $P(\text{Ph.D.} / \text{Male})$

iv) $P(\text{Female} / \text{M.B.A.})$ Use Baye's Rule.

Q6) a) Define probability Distribution function with suitable example. [6]

b) A box contains 2 red balls out of 7. A ball is drawn randomly, its color noted, the ball is again placed & box shaken. If 50 balls are drawn, find the expectation of the number of red balls & their standard deviation.

[10]

- Q7)** a) List important properties of the Gaussian distribution with mathematical expression. [8]
b) Find the probability that in tossing a fair coin three times, there will appear [8]
i) 3 heads ii) 2 tails & 1 head.
- Q8)** a) Define following: [8]
i) Mean ii) Standard deviation.
iii) Skewness iv) Kurtosis.
b) Explain [8]
i) Uniform Distribution
ii) Poisson Distribution
with suitable examples.



Total No. of Questions :8]

[Total No. of Pages :2

P1392

[4065] - 885

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

ANALYTICAL INSTRUMENTATION

(Sem. - I) (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.*

SECTION - I

- Q1)** a) Discuss importance of Chemical Analysis and Chemical Analytical Instrumentation. **[10]**
- b) With examples explain Classical and Instrumental methods of chemical analysis? How do you classify Instrumental methods? **[8]**
- Q2)** Explain with a block diagram working of a typical double beam UV – VIS Spectrophotometer. Also compare single beam instrument and double beam instrument. **[16]**
- Q3)** Explain Atomic Emission Spectrometry with various types of excitations. And explain inductively coupled plasma torch. **[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 Geiger-Muller Counter. **[8]**

P.T.O.

SECTION - II

- Q5)** Explain with neat diagram working of Atomic Absorption Spectrometer. Also explain Back-ground correction in AAS. **[17]**
- Q6)** a) Explain working of GC with neat diagram. Also enlist various GC detectors and Explain any one detector in detail. **[10]**
b) Write a short note on “Pumps used in HPLC”. **[7]**
- 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 0.15 nm with linear reciprocal dispersion of 1.9 nm/mm. **[4]**



Total No. of Questions :8]

[Total No. of Pages :2

P1393

[4065] - 886

M.E. Instrumentation & Control
(Process & Biomedical Instrumentation)
INDUSTRIAL AUTOMATION
(2008 Course) (5061105(a)) (Elective - I)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Explain with suitable example SCADA. **[8]**
b) Explain with suitable block diagram architecture of DCS. **[8]**
- Q2)** a) Explain the PLC programming methods as per IEC 1131-3 standards. **[8]**
b) Discuss in brief with suitable block diagram any four major components of the DCS. **[8]**
- Q3)** What is OPC? Explain with an example, How OPC is actually used in the field? **[16]**
- Q4)** a) List and explain the basic functions of DCS system. **[8]**
b) Develop programmable ladder diagram for stirred tank heater. Assume suitable sequence. **[10]**

P.T.O.

SECTION - II

- Q5)** a) Explain the role of ANN to enhance performance of process. [8]
b) With the help of block schematic explain the working of 'Fuzzy Logic Controller'. [8]
- Q6)** a) Explain with an example 'Sequential Function Chart'. [8]
b) Draw a famous automation hierarchy for an industrial application. Explain the function of each level. [8]
- Q7)** a) With suitable diagram explain Predictive control. [8]
b) Discuss the various selection criteria that must be considered for selection of a suitable PLC for a specific process control. [8]
- Q8)** What is the significance of SPC in Process plants? Elaborate with different types of charts used. Also list its applications. [18]



P1397

[4065] - 907

M.E. (Polymer Engineering)
PRINCIPLES OF MANAGEMENT
(2008 Course) (Sem. - I) (509116)

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. Attempt any other two questions from section I and any other two questions from section II.*
- 2) Figures to the right indicate full marks.*
- 3) Answers to the two sections must be written in separate answer books.*
- 4) Use of pocket calculator, log paper, log-log paper is allowed.*
- 5) Assume suitable design data, if required.*

SECTION - I

- Q1)** Discuss any four of the following concepts in short. **[20]**
- a) Sales Promotion.
 - b) Concept of customer value.
 - c) Consumer buying behaviour.
 - d) Data warehousing and Data mining.
 - e) Mark up pricing.
- Q2)** Discuss in detail different strategies for product positioning. **[15]**
- Q3)** What is customer relationship management? What are its benefits? Discuss main components of CRM programme. **[15]**
- Q4)** a) Write in short about product mix and product line. **[7]**
- b) Write in short about pricing strategies for new products. **[8]**

P.T.O.

Q5) Write short notes on (Any three):

[15]

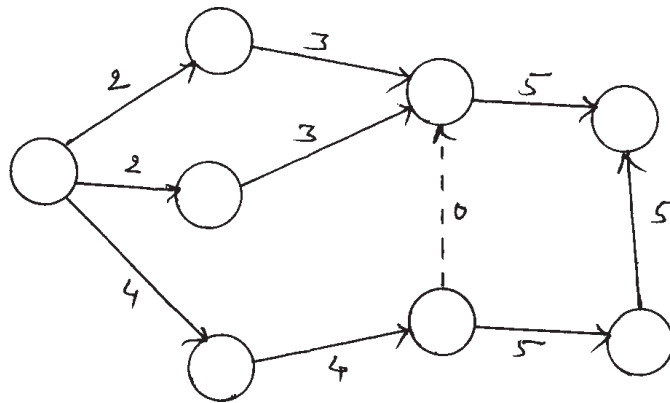
- a) Need for market segmentation.
- b) Marketing channels.
- c) Issues related to introduction of new product.
- d) Brand Equity.

SECTION - II

Q6) Attempt any four:

[20]

- a) Find critical path for the network given below. Activity times are given on arrow. Number the nodes.



- b) Determine the sequence in which jobs should be processed (turning and threading operations) in order to minimise total time required to turn art all the jobs. Time in minutes is given in the table below. Find also total processing time and idle times for turning and threading operations.

Job	Time for turning (minutes)	Time for threading (minutes)
1	3	8
2	12	10
3	5	9
4	2	6
5	9	3
6	11	1

- c) Write in short about profit and loss account.
- d) Write in short about following terminology pertaining to game theory.
 - i) Value of the game.
 - ii) Pure and mixed strategy.
 - iii) Two person zero sum game.
- e) Define the terms - pertaining to PERT / CPM.
 - i) Free float.
 - ii) Independent float.

Q7) a) Solve the assignment problem represented by the matrix. **[8]**

	1	2	3	4	5	6
A	9	22	58	11	19	27
B	43	78	72	50	63	48
C	41	28	91	37	45	33
D	74	42	27	49	39	32
E	36	11	57	22	25	18
F	3	56	53	31	17	28

- b) Babies are born in sparsely populated state at the rate of one birth every 12 minutes. The time between the births follows an exponential distribution. Find. **[7]**
 - i) Average number of births per year.
 - ii) The probability that no births will occur in any one day.
 - iii) The probability of issuing 50 birth certificates in 3 hours given that 40 certificates were issued during the first two hours of the three hour period.

Q8) a) A computer company purchase a component of which it has steady usage of 1000 units per year. The ordering cost is Rs 50 per order. The estimated cost of money invested is 25% per year. Unit cost of component is Rs 40. Calculate the optimal ordering policy and total cost of inventory system including purchase cost of the components. If the component supplier agrees to offer price discounts of minimum 10/- supplies as per schedule given below, re-assess the decision on optimal ordering policy and the total cost as before. **[8]**

b) Solve the game whose pay off matrix is given by : [7]

	B ₁	B ₂	B ₃	B ₄	B ₅
B ₁	9	3	1	8	0
B ₂	6	5	4	6	7
B ₃	2	4	3	3	8
B ₄	5	6	2	2	1

Q9) a) A company has manufacturing capacity at Mumbai & Kolkata with capacity of 200. The company supplies goods to four show rooms numbered 1, 2, 3 & 4 at different places. The demand at these units is 75, 100, 100 and 30 units respectively. The profit per unit differs and is given in the table below: [8]

	1	2	3	4
Mumbai	90	90	100	100
Kolkata	50	70	130	85

Plan production plan so as to maximize profit. The company may have production capacity at both plants partly or wholly un-used.

b) The arrival rate telephone calls at a telephone booth is according to poisson distribution, with an average time of 9 minutes between the two arrivals. The length of telephone call is assumed to be exponentially distributed with mean 3 minutes. [7]

- i) Determine the probability that the person arriving at booth will have to wait.
- ii) Find average queue length that forms from time to time.
- iii) The company will install second booth if an arrival would have to wait at least 4 minutes for the phone. Find the increase in flow of arrivals which will justify second booth.

- Q10) a)** Find the optimal order quantity for a product when the annual demand for the product, is 500 units, the cost of storage per unit per year is 10% of the unit cost and ordering cost per order is Rs 180. The unit costs are given below: **[5]**

Quantity	Unit cost
$0 \leq q_1 < 500$	Rs. 25.00
$500 \leq q_2 < 1,500$	Rs. 24.80
$1,500 \leq q_3 < 3000$	Rs. 24.60
$3000 \leq q_4$	Rs. 24.40

- b) Write in short about any two profitability ratio's. **[5]**
- c) Write in short about marginal costing. **[5]**



Total No. of Questions : 8]

[Total No. of Pages : 2

P1399

[4065] - 911

M.E. (Polymer Engineering)

SYNTHESIS AND CHEMISTRY OF POLYMERS

(509118 (C)) (2008 Course) (Elective - I)

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 books.*
- 3) Figures to the right indicate full marks.*

SECTION - I

- Q1)** a) Define degradation. Explain ultrasonic degradation in detail. [9]
b) Discuss process of polymer dissolution in detail. [8]
- Q2)** a) Discuss bulk polymerization process. Explain autoacceleration. [9]
b) Explain solution polymerization in detail. [8]
- Q3)** a) Discuss any one polymerization technique for polycondensation in detail. [8]
b) Explain the concept of various average molecular weights in polymers. [8]
- Q4)** a) Explain ionic polymerization mechanism. [8]
b) Discuss plasma polymerization. [8]

P.T.O.

SECTION II

- Q5)** a) Write a note on polymer supported reactions. [9]
b) Write a note on chemistry of amino resins. [8]
- Q6)** a) Explain hydrogenation reactions in polymer and its importance. [9]
b) Discuss the reactions of aldehyde and ketone groups in polymer modification. [8]
- Q7)** a) Write the reactions involved in ring opening polymerization. [8]
b) Discuss chemistry of silicone resins. [8]
- Q8)** a) Discuss oxidative polymerization. [8]
b) Explain viscometric technique to determine molecular weight. [8]



P1400

[4065] - 912

M.E. (Polymer Engg.)

POLYMER RHEOLOGY

(2008 Course) (Elective - II) (509119)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) *Q. No. 1 from section I and Q. No. 6 from section II is compulsory. Attempt any two other questions from section I and any two other questions from section II.*
- 2) *Figures to the right indicate full marks.*
- 3) *Answers to the two sections should be written in separate answer books.*
- 4) *Use of log paper, log-log paper scientific calculator is allowed.*
- 5) *Assume suitable data, if required.*

SECTION - I**Q1)** Attempt any four :

- a) Write in short about 'TOM's EFFECT'. [20]
- b) Write in short about 'Weissenberg effect'.
- c) Write in short about stability parameter defined by Hank.
- d) Explain at least one rheological model for extensional viscosity.
- e) Write in brief about 'Doi-Edword theory'.

Q2) a) Force measurements were made on 2mm^2 test surface around a print in a fluid. The vectors normal to these test surface correspond to co-ordinate directions \hat{x}_1 , \hat{x}_2 and \hat{x}_3 . The measured force vectors are

$$f_1 = 2\text{N in } \hat{x}_1 \text{ direction}$$

$$f_2 = 4\text{N in } \hat{x}_2 \text{ direction}$$

$$f_3 = 4\text{N in } \hat{x}_3 \text{ direction}$$

- i) What is the state of stress at the point.
 - ii) Calculate the invariants of the stress tensor. [7]
- b) Derive an expression for deformation tensor for uniaxial extensional flow and steady simple shear flow. [8]

Q3) a) Using zener model, explain creep and stress relaxation behaviour of polymers. [8]

P.T.O.

- b) Zero shear viscosity data for polyethylene has been calculated using correa model as follows :

Temperature (°C)	210	230	250
Viscosity (Pasec)	8850	6160	3871

Calculate glass transition temperature using WLF equation. Also calculate reference temperature. [7]

- Q4)** a) Explain creep compliance and stress relaxation. [5]
 b) A maxwell model with model constants 100 MN/m² & 1000 MNs/m², a zenner model with model constants 100 MN/m², 1000 MN sec/m² and 500 MN/m² are subjected to strain of 50% at a certain time interval. Calculate the time required to relax 50% stress. Comment on the result. [10]

- Q5)** a) Explain the time temperature superposition principle. [5]
 b) Write in short about non-linear viscoelasticity. [5]
 c) Write in short about free volume theory. [5]

SECTION - II

- Q6)** Attempt any four : [20]

- a) Explain the effect of pressure on viscosity of polymers.
 b) Explain the effect temperature on viscosity of polymers.
 c) Explain the wall slip phenominon and explain how it affects the output.
 d) Assuming isothermal situation, find out time taken to fill a center gated disc having 5 mm thickness and diameter of 300 mm using injection rate of 6×10^{-5} m³/sec.

Power law constants are given as

$$\eta_0 = 1 \times 10^4 \text{ N-sec/m}^2$$

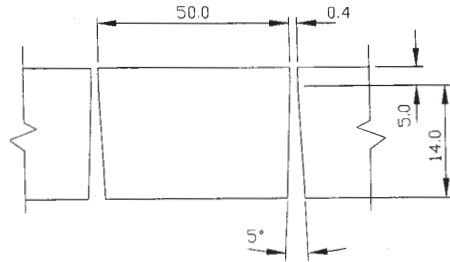
$$n = 0.3$$

- e) Derive the relation between the geometry angular velocity and shear rate for a cone and plate rheometer

$$\dot{\gamma} = 2D \phi \theta = 2D_{12}$$

- Q7)** a) Polyethylene melt at 200°C passes through the die gap as shown in fig No. 1 at a rate of 12×10^{-6} m³/sec. Assuming that polymer follows power law of the form $\tau = 1,20,100 \dot{\gamma}^{0.5}$ calculate the pressure drop through the die τ is in N/m² and $\dot{\gamma}$ is in sec⁻¹. [10]

- b) Derive the relation between torque T and shear stress τ_{12} for a cone and plate rheometer. Assume laminar, steady and isothermal flow with negligible gravity with no edge effects. Assume half angle of cone less than 0.1 rad. [5]



Note : All dimensions are in mm.

Fig No. 1

- Q8)** a) Derive an relation between power law index n , activation energy at constant shear rate $E \dot{\gamma}$ and activation energy at constant stress $E \tau$. [10]
- b) Develop a speed of rotation V vs torque plot for a cone and plate rheometer with plate of 10 cm and cone angle 1° . The fluid is non-newtonian obeying power law of the form $\tau = 50 \dot{\gamma}^{0.7}$ where τ is in N/m^2 and $\dot{\gamma}$ in sec^{-1} . [5]
- Q9)** a) Derive [12]
- Shear rate relation
 - Shear stress relation
- for a capillary rheometer in terms of capillary geometry.
- b) Explain the Bagley correction. [3]
- Q10)** Write in short about following parameters influencing polymer rheology. [15]
- Effect of fillers.
 - Effect of molecular weight and molecular weight distribution.
 - Molecular branching.



Total No. of Questions : 8]

[Total No. of Pages : 2

P1402

[4065]-916

M.E. (Polymer Engineering)

POLYMER STRUCTURE AND PROPERTIES

(2008 Course) (509123) (Sem. - II)

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 answer books.*
- 3) *figures to the right indicate full marks.*

SECTION - I

- Q1)** a) Discuss how chemical composition affects the mechanical properties of a polymer. [9]
b) Write a note on effect of molecular weight on various transitions in polymer. [8]
- Q2)** a) Discuss the factors affecting barrier properties of the polymer. [9]
b) Explain how orientation of chains affects the properties of the polymer. [8]
- Q3)** a) Write a note on effect of submolecular Factors on transition. [8]
b) Explain how the processing parameters affect the morphology of polymer. [8]
- Q4)** a) Write a note on effect of chemical groups on adhesion. [8]
b) Explain structural developments during rotational molding. [8]

P.T.O.

SECTION - II

- Q5)** a) Explain the role of influence forces and molecular flexibility on rheology. [9]
b) Write a note difference between orientation and crystallinity. [8]
- Q6)** a) Explain how spherulites are formed. How do they affect the properties? [9]
b) Differentiate the properties of amorphous and crystalline regions in polymer. [8]
- Q7)** a) Explain various factors affecting optical properties of polymers. [8]
b) Discuss Thermodynamics and Kinetic forces affecting polymer properties. [8]
- Q8)** a) With suitable examples explain how fillers and additives affect the transitions in polymer. [8]
b) Write a note on structural development during injection molding processing techniques. [8]



P1408**[4065] - 925****M.E. (Printing Engineering & Graphic Communication)****PRINTING TECHNOLOGY MANAGEMENT****(Sem. - I) (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 separate answer books .*
- 3) *Assume suitable data, if necessary.*
- 4) *Figures to the right indicate full marks.*

SECTION - I**Q1)** Answer the following :

- a) Explain functions of production planning department in Gravure printing industry. **[8]**
- b) The forecast & the actual demand for the 6 months is given below compute the various forecast errors & tracking signal & comment on the forecast accuracy. **[9]**

Month	Actual Demand (Dt)	Fore casted Demand (ft)	Deviation Dt - ft	Camdeviation $\Sigma (D_t - F_t)$
1	71	78	-7	-7
2	80	75	5	-2
3	101	83	18	16
4	84	84	0	16
5	60	88	-28	-12
6	73	85	-12	-24

- c) Compare production planning & production control. **[8]**

Q2) Answer the following : **[8]**

- a) What are principle steeges in the design of an engineering product. Discuss them briefly.
- b) Three basic principles mentioned below are basic & integral part of the product development. **[9]**
 - i) Simplification.
 - ii) Standardisation.
 - iii) Specialisation

Discuss them in brief.
- c) Discuss the relationship between “product design” & “product costs” what cost are affected by the product design? **[8]**

P.T.O.

Q3) Answer the following :

- a) Using the method of least squares compute a straight line equation of the trend & also find the corresponding trend values for the following observation [8]

Year	2001	2002	2003	2004	2005
Sale of Printing m/c in (000)	25	28	33	35	39

- b) A company manufacturing washing machine establishes a fact that there is a relationship between sale of washing machine & population of the city. The market research carried out reveals the following information fit a linear regression equation & estimate the demand for washing machines for a city with a population of 45 million. [9]

Population (million)	5	7	15	22	27	36
No. of washing m/c demanded (000)	28	40	65	80	96	130

- c) The demand for different weeks of November & December month of Blue Herald company is given below. Assume the initial forecast ie for first week of Nov. as 600 & carries ponding initial trend is zero. Assume $\alpha = 0.1$ & $\beta = 0.2$. [8]

	November				December			
Week	1	2	3	4	1	2	3	4
Demand	650	600	550	650	650	625	700	710

SECTION - II

Q4) Answer the following :

- a) What is meant by ABC classification? Why is it necessary? Explain the use of ABC classification in inventory control. [8]
- b) Derive the deterministic Economic order quantity with instantaneous stock replenishment. [9]
- c) The demand for an item is 18,000/- per year. Production rate is 3000 units/month. The carrying cost is Rs. 0.15/ unit / month & the set up cost is Rs. 500 per set up. The shortage cost is Rs. 20.00 per unit per year. Find the following parameter [8]
- i) Economic Batch Quantity.
 - ii) Maximum Inventory.
 - iii) Maximum Stock out.
 - iv) Cycle time.

Q5) Answer the following :

- a) Define quality & state its objectives. Explain in detail, Quality Specification & Quality Assurance. [12]
- b) Explain the concept of six sigma with respect to printing industry. [13]

Q6) Answer the following :

- a) Calculate sample size & AOQ for single sampling plan using following data. [12]
 - i) Probability of acceptance of 0.5% defectives in a lot is 0.525.
 - ii) Lot size 10,000 units.
 - iii) Acceptance sampling number = 1.
 - iv) $np = 1.6$
 - v) Defectives found in the sample are not to be replaced.
- b) The Average percentage of defectives in 27 sample of size 1500 was found to be 13.7% construct a suitable control chart for this situation explain, how the control chart can be used to control quality. [13]



Total No. of Questions :6]

[Total No. of Pages :2

P1409

[4065] - 928

M.E. (Printing Engineering & Graphic Communication)

PRINTING & PACKAGING MATERIALS

(Elective - I) (2008 Course) (508104) (B)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) Answer any two questions from each section.*
- 2) Answers to the two sections must be written in separate books.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) All question carry equal marks.*

SECTION - I

- Q1)** a) State and explain merits and demerits of various CTP systems. [15]
b) Comment on light sources used for surface preparation. [10]
- Q2)** a) What tests will you use to assess print quality of a publication job? [9]
b) Mention the properties and applications of the following: (Any Four) [16]
i) PVC
ii) HDPE
iii) Kraft paper
iv) Polypropylene
v) Metalized films
- Q3)** a) Explain the identification tests for PVC. [15]
b) Explain the tearing, burning and solubility tests for Polyethylene. [10]

P.T.O.

SECTION - II

- Q4)** a) Mention following tests for a substrate: (Any Four) **[16]**
- i) COF test
 - ii) Modulus of elasticity
 - iii) Tensile test
 - iv) Rub resistance
 - v) Puncture resistance
- b) Write note on material testing for printing. **[9]**
-
- Q5)** a) Explain the properties and applications of solvent and water based inks. **[9]**
- b) Describe good and bad wetting conditions in printing of nonporous substrates such as OPP, LDPE, HDPE and the main defects caused by poor ink formulation. **[16]**
-
- Q6)** a) Explain the effect of ink rheology on print quality. **[9]**
- b) State the causes and remedies of the following: (Any Four) **[16]**
- i) Misting
 - ii) Print Mottle
 - iii) Drying in
 - iv) Haze
 - v) Fisheye



Total No. of Questions :6]

[Total No. of Pages :2

P1410

[4065] - 929

M.E. (Printing Engineering & Graphics Communication)
DESIGN OF EXPERIMENTS & RESEARCH METHODOLOGY
(2008 Course) (508104 (C)) (Elective - I)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

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

SECTION - I

Q1) Answer the following:

- a) What is Research? What are the characteristics & objectives of Research. [8]
- b) Distinguish between Research methods & Research methodology. [8]
- c) Explain in brief the concept of Design of Experiment. [9]

Q2) Answer the following:

- a) What is hypothesis? What are desirable qualities of good hypothesis. [10]
- b) How do you define research problem? Give one example to illustrate your answer. [15]

Q3) Answer the following:

- a) Explain concept of mathematical modelling along with its components & advantages? [13]
- b) Find the diameter & height of a gravure cylinder of max volume which can be cut from a sphere of radius 12cm. [12]

P.T.O.

SECTION - II

Q4) Answer the following:

- a) Describe feature of response surface design. **[8]**
- b) What do you mean by full factorial & fractional factorial design? **[8]**
- c) Describe **[9]**
 - i) Randomized Block design.
 - ii) Latin Square design.
 - iii) Informal Experimental design.

Q5) Answer the following:

- a) Explain the term data? & What precaution one has to take while collecting data. **[12]**
- b) A product rating organisation tested battery life for four comparable makes of portable radios. Six radios of each make were purchased off the shelf from local retail stores & identical fully charged batteries were inserted on random basis. The observations on battery playing hours at high volume as follows. **[13]**

Observation	Treatment			
(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

Q6) Answer the following:

- a) Discuss in brief various types of research report. **[8]**
- b) What precaution one has to take while writing the research report. **[8]**
- c) Explain general format of research report. **[9]**



Total No. of Questions : 6]

[Total No. of Pages : 2

P1411

[4065] - 930

M.E. (Printing Engg. & 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 Section - I and any 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) Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) State and Explain various components which must be considered as a part of Prepress at one. **[15]**
- b) Compare the following : **[10]**
- i) LED and LASER Printers.
 - ii) Passive and Active Thermography.
- Q2)** a) Justify 'Direct-imaging (DI) and computer-to-plate (CTP) technology can help Printers to address Staying state-of-the-art and Shortage of skilled production Personnel concerns'. **[15]**
- b) Explain the following non-impact Printing Process in brief : **[10]**
- i) Ionography.
 - ii) Magnetography.
- Q3)** a) What is PDF/X? List and Explain PDF/X Standards. **[15]**
- b) Explain the following in brief : **[10]**
- i) Work flow Integration.
 - ii) Ghost script.

P.T.O.

SECTION - II

- Q4)** a) Justify that ‘Profits from print on demand publishing are on a per-sale basis and Royalties vary’ with proper examples. [15]
- b) Explain the following in brief : [10]
- i) Calorimetric Assessment of Inkjet print.
 - ii) Visual Assessment of Inkjet print.
- Q5)** a) What are the future trends in Printing Industry? Explain in detail. [15]
- b) Explain the following in brief : [10]
- i) Variable Data Printing.
 - ii) Web2 Print.
- Q6)** a) State and explain in the main Image quality attributes. List different tools Used for verification and explain one tool in detail. [15]
- b) Explain the following in brief : [10]
- i) Eco-friendly Approach in Printing.
 - ii) Color Management.



Total No. of Questions : 6]

[Total No. of Pages : 1

P1412

[4065] - 931

M.E. (Printing Engg. & Graphic Communication)
ENTREPRENEURSHIP IN PRINTING & ALLIED FIELDS
(2008 Course) (508105 (B)) (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, if necessary.*
- 5) Figures to the right indicates full marks.*

SECTION - I

Q1) Explain supervisory structure used in Printing Industry. **[25]**

Q2) Explain elements of computing production and evaluation norms for printing Industry. **[25]**

Q3) How cost estimation is done in Printing Industry? Explain with example. **[25]**

SECTION - II

Q4) Explain Production standards and Budgeted hour rates for printing. **[25]**

Q5) a) Explain issues related to sourcing. **[15]**
b) How to deal with finance payments and receivables? **[10]**

Q6) Explain Excise structure, Sales Tax structure. **[25]**



Total No. of Questions : 6]

[Total No. of Pages : 1

P1413

[4065] - 932

M.E. (Printing Engg. & Graphic Communication)
QUALITY CONTROL SYSTEM AND PRODUCTIVITY
(2008 Course) (508105 (C)) (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 answer books .*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Assume suitable data, if necessary.*
- 5) Figures to the right indicate full marks.*

SECTION - I

- Q1)** a) Explain the role of Pre-Press operations in Printing Industry. [13]
b) Explain chemicals used for processing of printing plates. [12]
- Q2)** a) What is caliberation and standerdisation of press activity? [13]
b) What is GRACOL standard? [12]
- Q3)** a) What is Gamut & volume in printing Industry? [13]
b) Give details of Auto Registration control. [12]

SECTION - II

- Q4)** a) What is quality specification and Quality Assurance. [15]
b) Write notes on : [10]
i) Bond strength.
ii) Rub Resistance.
- Q5)** What are the control charts used in printing Industry. [25]
- Q6)** What is the analysis of Variance concept. [25]



P1423

[4065] - 36

M.E. (Civil) (Structure)

ADVANCED DESIGN OF STEEL STRUCTURES

(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) Use of electronic pocket calculator IS 800, 801, 875, 1915, 1761 is allowed.*
- 4) Assume suitable data if required.*

SECTION - I

- Q1)** For a single broad gauge track a through type plate girder is provided. Spacing of cross girders is 3m apart. Span of girder between bearings is 30m. Design the maximum section for plate girder for EUDLL for bending moment is 2800 kN per track and for shear is 2900 KN per track. Impact factor is 0.476. Main girders are 5m c/c. Stringer beams provided at 2m spacing between centreline concrete sleepers are 1000 mm c/c. Stock rail load is 0.6 kN/m check rails are 0.4 kN/m.
- Q2)** a) Draw various schematic arrangements for lateral load resisting systems in moment resisting frames.
b) Explain concentrically braced frames illustrate with suitable sketches.
c) Write a brief note on response of moment resisting frame with shear wall and structural stability.
d) Design welded framed connection for beam - column junction to carry 100 kNm moment and shear of 80 kN. The beam is ISMB 400 and column is ISSC 250. Illustrate design by neat sketch.
- Q3)** a) Explain stiffened, unstiffened, multiple stiffened element in light gauge sections.
b) Discuss failure pattern of rolled section and light gauge steel section in compression.

P.T.O.

- c) What is shape factor of a light gauge section.
- d) Explain manufacturing process, shapes & behaviour of light gauge sections.

SECTION - II

- Q4)** A deck type N truss bridge has 8 panels of 4m length each. The depth of truss is 4m. The live load on truss is 35 kN/m Impact factor is 0.4.
Design top one chord member, one bottom tie member, one inclined member.
- Q5)** Design the form work using tubular members to support R.C.C. slab having total loads of 120 kN /m². The length of props required is 4.1 m.
The slab dimension is 9.4 m × 4.4 m. Draw sketch to illustrate design give appropriate check as per code.
- Q6)** a) Find shape factor of I section, flange width 100 mm, depth 150 mm & thickness of flange and web 20 mm.
b) Analyse the beam A B C D, find the collapse load.
AB = CD = 5 m, moment of resistance of AB = M_p while for CD = 1.5 M_p . end A is hinged, B is roller, D is hinged. Span AB is loaded with 10 kN/m, span CD is loaded with 13 kN/m, uniformly distributed load.

TABLE A
GRADEWISE PERMISSIBLE STRESSES (IN N/mm²) IN TUBE SECTIONS

<u>SLENDERNESS</u>	<u>GRADE Y_{st} 22</u>	<u>GRADE Y_{st} 25</u>	<u>GRADE Y_{st} 32</u>
<u>RATIO λ</u>	<u>IN COMPRESSION (AXIAL)</u>		
0	<u>125</u>	<u>150</u>	<u>190</u>
10	122	145	182
20	118	140	175
30	113	135	168
40	109	130	161
<u>50</u>	<u>105</u>	<u>126</u>	<u>154</u>
60	100	121	147
70	97	116	138
80	93	109	126
90	88	100	113
<u>100</u>	<u>81</u>	<u>91</u>	<u>99</u>
110	75	81	87
120	67	72	76
130	60	64	67
140	54	57	58
<u>150</u>	<u>49</u>	<u>50</u>	<u>52</u>
160	43	44	45
170	38	40	40
180	34	35	35
190	30	31	32
<u>200</u>	<u>27</u>	<u>28</u>	<u>28</u>
210	24	25	25
220	22	23	23
230	20	20	21
240	18	19	19
<u>250</u>	<u>16</u>	<u>17</u>	<u>17</u>
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



Total No. of Questions : 6]

[Total No. of Pages : 2

P1426

[4065]-134

M.E. (E&TC) (VLSI & Embedded System)

FAULT TOLERANT SYSTEM DESIGN

(2002 Course)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) What is Binary Decision Diagram. Construct a binary decision diagram for the exclusive- OR function of two variables. **[8]**
- b) Define unknown logic value. Construct a Truth table of NAND and not gate using 6-value logic. **[8]**
- Q2)** a) Define fault detection and fault Redundancy. Prove the theorem.
- b) Define fault dominance of a combinational circuits. Prove the theorem.
- c) Define fault equivalence of a combinational circuit. Prove the theorem.
- d) Explain step by step process for testing of a sequential CKT using state table. **[18]**
- Q3)** Write a short note on (any two) **[16]**
- a) Parallel fault simulation.
 - b) Logical fault models.
 - c) Zoom table.

P.T.O.

SECTION - II

- Q4)** a) Explain the following terms: **[8]**
- i) Controllability
 - ii) Observability
 - iii) Predictability
 - iv) Reliability
- b) Explain in detail Generic Scan-Based DFT technique for external Testing. **[8]**
-
- Q5)** a) Explain Transition-Count Compression Technique in detail. **[8]**
- b) Classify pseudo exhaustive Test pattern generator. Explain cyclic LFSR in detail. **[8]**
-
- Q6)** Write short note on: **[18]**
- a) Self checking system
 - b) PLA Testing
 - c) Fault Dictionary



Total No. of Questions : 8]

[Total No. of Pages :2

P1428

[4065]-144

M.E. (Electronics - Digital Systems)

MULTIMEDIA TECHNIQUES

(2002 Course) (504307)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer any three questions from each section.*
- 2) *All questions carry equal marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of electronic pocket calculator is allowed.*
- 6) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) What are the hardware & software components of a multimedia platform? Draw a neat block diagram of MM development system & explain function of each block. **[8]**
- b) Explain the MM authoring tools. State the different functions of MM authoring software. **[8]**
- Q2)** a) State the objectives of MPEG-2 standard & explain the term 'bit stream scalability'. **[8]**
- b) Explain the factors which determines the size of file & quality of sound for audio capture & playback. What are the different chunks present in a sound file stored as wave format. **[8]**
- Q3)** a) With the help of block diagram explain the working of SECAM encoder. **[8]**
- b) A frame in HDTV has resolution of 1920 x 1152 with a frame rate of 30 frames/sec. Calculate computational complexity for motion estimation when the following algorithms are used: **[8]**
- i) Full search
 - ii) 2D logarithmic search
- Comment on the result.

P.T.O.

Q4) Write detailed notes on: (any three)

- a) Arithmetic coding
- b) ADPCM
- c) JPEG-2000
- d) Digital scanner. [18]

SECTION - II

Q5) a) Explain in detail Huffman coding of quantized DCT coefficients in baseline JPEG. Also comment on compression efficiency of it. [8]

b) The optimum 4-level non-uniform quantizer for a signal results in the four levels x_1, x_2, x_3, x_4 with corresponding probabilities of occurrence $p_1 = p_2 = 0.3365$ & $p_3 = p_4 = 0.1635$.

- i) Design a Huffman code that encodes a single level at a time & determine the average bit rate.
- ii) Design a Huffman code that encodes two o/p levels at a time & determine the average bit rate. Comment on the result. [10]

Q6) a) With respect to motion compensation in MPEG standard explain the following terms:

- i) Search region
- ii) Cost function
- iii) Local smoothness constraint,
- iv) Motion vector [8]

b) Discuss the different types of pictures defined in MPEG-1 [8]

Q7) a) Explain the terms hypertext, hypermedia & multimedia & comment on their inter-relation. [8]

b) Justify:

- i) G-Y signal is not transmitted in case of color TV system.
- ii) Fast search algorithms gives poorer compression performance than full search. [8]

Q8) Write detailed notes on:

- a) Storage for MM system.
- b) HTML
- c) HSI
- d) OS support to MM system. [16]



Total No. of Questions :8]

[Total No. of Pages :2

P1429

[4065] - 147

M.E. (Electronics) Digital System
IMAGE PROCESSING AND PATTERN RECOGNITION
(2002 Course) (Elective - I) (504309)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Explain run length coding with suitable example. What are topological data structures? Draw the region adjacency graph for a sample image and explain it. **[8]**
- b) Draw any 3 gray scale transformation functions and explain its operation. **[8]**
- Q2)** a) Draw the prewitt edge operator for horizontal vertical and diagonal edge detection. How will you find the direction of the gradient? **[8]**
- b) Draw 1-D edge profiles to find zero crossings of the second derivative and explain it. Can you derive a Laplacian operator? **[8]**
- Q3)** a) Write 3 criteria for optimality for canny edge detector. Explain what is non-maximal supression. **[9]**
- b) Explain basic thresholding algorithm for image segmentation. Explain a bi-modal histogram method for threshold detection. **[9]**

P.T.O.

- Q4)** a) Explain 'A' algorithm graph search. Explain heuristic search for image borders. [8]
b) Explain split and merge algorithm for region based segmentation. [8]

SECTION II

- Q5)** a) Explain the algorithm for 4-neighbourhood and 8-neighbourhood region identification. [8]
b) Explain how will you find a signature for a circle and a triangle. Explain the method to find Fourier transforms of boundaries. [8]
- Q6)** a) Explain simple polygon convex hull detection. [8]
b) Explain the use of fuzzy logic for object recognition. [8]
- Q7)** a) Explain object recognition using a Hopfield net. [8]
b) Explain syntactic pattern Recognition. [8]
- Q8)** a) Explain the use of active contour models for image understanding. Explain the algorithm for snake growing. [9]
b) Explain the algorithm for semantic region merging. [9]



P1443

[4065] - 236

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

ADVANCED ELECTRONIC INSTRUMENTATION

(2002 Course) (506103)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) Answer any two questions from each section.*
- 2) Answer to the two sections should be written in separate books.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Figures to the right indicate full marks.*
- 5) 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)** Explain working principle of dual slope ADC with the help of internal blocks. Why does it have variable conversion time? What are the constrains for selection of clock frequency? **[25]**
- Q2)** How the internal blocks of universal does connected for time Interval measurement? Explain an application of the mode with block schematic. **[25]**
- Q3)** Explain following controls of the cathode ray oscilloscope with an application of each : **[25]**
- a) Variable hold-off.
 - b) Slope selection.
 - c) Add mode.
 - d) Scope coupling (AC, DC, GND)

SECTION - II

- Q4)** What are the different functions provided with a Data Acquisition System? Explain DAS for multi point temperature indicator. **[25]**
- Q5)** Explain principle of working of sound level meter with the help of Internal hardware. Comment on its utility by discussing a case study. **[25]**
- Q6)** Write shrot notes on : **[25]**
- a) Attenuation probe for CRO.
 - b) Strip-chart recorder.



Total No. of Questions :10]

[Total No. of Pages :2

P1447

[4065] - 266

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) Answer 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) What is RAD model? Explain the need for it in current industry scenario. What are major issues with this model? [8]
- b) What is change control? Explain the procedure of change control process? [8]
- Q2)** 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 is software architecture? Enlist important characteristics of the model of your choice with a suitable diagram. [8]
- Q3)** a) What product, hardware, personnel, and project factors does the project have that should be taken into account as adjustment factors (cost drivers) when computing the final effort estimate? [8]
- b) Explain the meaning of reliability or technical metrics and discuss any two metrics in detail that help in the assessment of system performance. [8]
- Q4)** a) State and explain different organizational paradigms for software Engineering teams. [8]
- b) Explain in detail function point metric. List all the values adjustment factor. What are the metrics for specification quality? [8]

P.T.O.

- Q5)** a) What do you mean by process maturity? With the help of neat labeled diagram explain Capability Maturity Model? [10]
b) What is PERT / CPM technique? How is this technique useful in software project planning? Explain it with suitable example. [8]

SECTION - II

- Q6)** a) Define dependability of a Computer System. What are the four principle dimensions of dependability? [8]
b) Explain how CMM encourages continuous improvement of software process. [8]
- Q7)** a) What are design Patterns? What are different elements of design pattern? [8]
b) Explain the following design patterns
i) Observer and ii) Proxy, [8]
- Q8)** a) Describe Object Oriented Software life cycle model with the help of diagram. State the advantages and disadvantages. [8]
b) With suitable example, explain fault free analysis in critical system. [8]
- Q9)** a) Explain why an object oriented approach to software development may not be suitable for real time systems. [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]
- Q10)** Write a short note on : [18]
a) Software Version and Software Release.
b) Reference Architecture.
c) Software Configuration Control Process.



Total No. of Questions :8]

[Total No. of Pages :2

P1448

[4065] - 291

M.E. (Chemical)

ADVANCED THERMODYNAMICS

(2002 Course) (109102)

Time : 3 Hours]

[Max. Marks :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) Derive the barometric formula. [8]
b) Derive an equation for surface internal energy. [8]
c) Define Gibb's free energy, entropy and enthalpy. [2]
- Q2)** a) In which cases are 'λ' shaped transitions encountered, Explain. [8]
b) How many types of a fluid? Fluid-phase diagrams are known in systems of type I? [8]
- Q3)** a) Explain the term LCST and UCST and their application. [8]
b) Explain the different types of order-disorder transitions. [8]
- Q4)** Explain in detail the complete glucose cycle. [16]

P.T.O.

SECTION - II

- Q5)** a) Compare statistical & classical Thermodynamics, from point of view of their approach. [8]
b) Give the statistical analog of entropy. [10]
- Q6)** a) State the Debye Huckel theory and derive relevant equations. [10]
b) Differentiate between weak and strong electrolytes. [6]
- Q7)** a) Compare open and closed systems. [4]
b) Explain in detail the enthalpy changes in open systems, using relevant equations. [12]
- Q8)** a) Define canonical ensemble, degeneracy, Boltzmann distribution. [8]
b) Explain De Donder's inequality & un compensated heat. [8]



Total No. of Questions : 8]

[Total No. of Pages : 2

P1452

[4065]-560

M.E. (Mechanical) (Automotive Engineering)

AUTOMOTIVE MATERIALS

(2008 Course) (Elective - III) (502309 (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 Electronic pocket calculator is allowed.*
- 6) *Assume suitable data. if necessary.*

SECTION - I

- Q1)** a) Explain the effects of alloying elements on titanium? What do you mean by β -isomorphous system and β -eutectoid system of titanium alloys? [8]
- b) Explain in detail the classification of steels and cast irons with a neat Fe-C diagram? [8]
- Q2)** a) Why is aluminum commonly used as the matrix of a metal-matrix composite whereas magnesium is not commonly used as the matrix of a metal matrix composite? Explain? [10]
- b) Why is fiber bridging attractive for a brittle matrix composite? [6]
- Q3)** a) Explain with neat diagrams the following manufacturing methods of plastics: [10]
- i) Blow moulding
 - ii) Compression moulding
- b) Explain with an example the applications of following types of commodity thermoplastics? [6]
- i) Polyethylene
 - ii) Polystyrene

P.T.O.

Q4) Write a short note on the following: [18]

- a) Hardening and tempering of steel
- b) Steel melting practices
- c) Weldability characteristics of Aluminum

SECTION - II

Q5) a) What are adhesives? How the adhesives are classified? Explain in brief the properties and applications of adhesive materials? [8]

b) Explain the material selection criteria for the following auto components along with the material required: [8]

- i) Piston rings
- ii) Cam shaft
- iii) Propeller shaft

Q6) a) Explain the effect of following automotive fluids on vehicle performance: [9]

- i) Brake fluids
- ii) Transmission fluids
- iii) Gear oils

b) Discuss briefly on protective coating materials used in auto applications? [7]

Q7) a) A plate of brittle material contains a crack of length 1mm. It fractures under a tensile stress, applied normal to the crack, of 600MPa. Estimate the apparent surface energy of the material and comment on the magnitude of your result. (Young's modulus of the material=200GPa). [6]

b) Explain different types of metallurgical failures with an example for each? [10]

Q8) Write a short note on the following: [18]

- a) Testing and validation of materials
- b) Types of fracture mechanisms
- c) Sound insulating materials



P1455

[4065] - 566

M.E. (Electrical Engineering) (Control System)

PROCESS CONTROL MANAGEMENT

(Sem. - I) (2008 Course) (503102)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

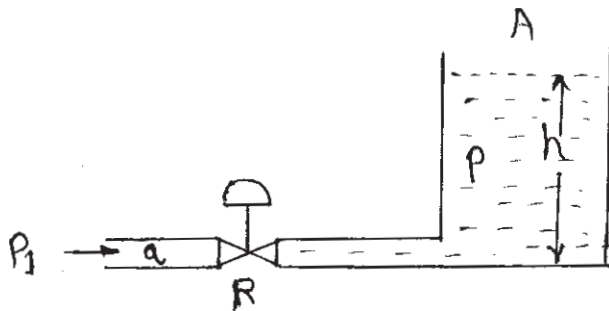
- 1) Answer any two questions from each section.
- 2) Answers to the two sections should be written in separate answer books .
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Figures to the right indicate full marks.
- 5) Assume suitable data, if necessary.

SECTION - I

Q1) Solve any three :

- a) What are the various forms of formal Group? Distinguish between formal & Informal groups. [9]
- b) Explain with suitable examples, different types of motives. [8]
- c) Describe Behavioural Approach to leadership, considering its significance to various studies performed. [8]
- d) Discuss the various conflict handling modes & tactics? Explain the usefulness of each mode in the typical situation. [8]

- Q2) a) Describe your views about requirements of process control in Industry regarding operational constraints & production specifications. [10]
- b) Develop the mathematical model of valve tank system shown in figure.[15]



Given :

h = height of liquid tank

A = Area of cross section
of the tank.R = Turbulant resistance of
valve. P_1 = pressure in the pipe.

P = pressure in the tank.

q = flow rate in pipe.

 ρ = mass density in the pipe.

P.T.O.

- Q3) a)** Which main approaches are used for ‘Tunning a controller? Explain Empirical Tuning method developed by cohen and coon with proper block diagram. [15]
- b)** Discuss the effect of gain on the closed-loop response of first-order systems with PID control. [10]

SECTION - II

- Q4) a)** Why we need to convert continuous - to discrete time signals & vice versa? Give physical ex.for this need. [10]
- b)** What is the effect of sampling on the response of a closed-loop system? What happens to the process response as the sampling period increases? [15]
- Q5) a)** What are the main advantages & disadvantages of a cascade control? For what kind of processes can you employ cascade control? [10]
- b)** Explain with a neat diagram Temp. control of jacketed CSTR by (i) conventional feed back & (ii) cascade control. [15]
- Q6) a)** What is one-way decoupling of two control loops? Why could it be acceptable? [10]
- b)** Following block diagram shows process with two controlled outputs and two mani pulations. Explain effect of input changes on outputs when (i) one loop is closed & other is open & (ii) when both loops are closed. [15]

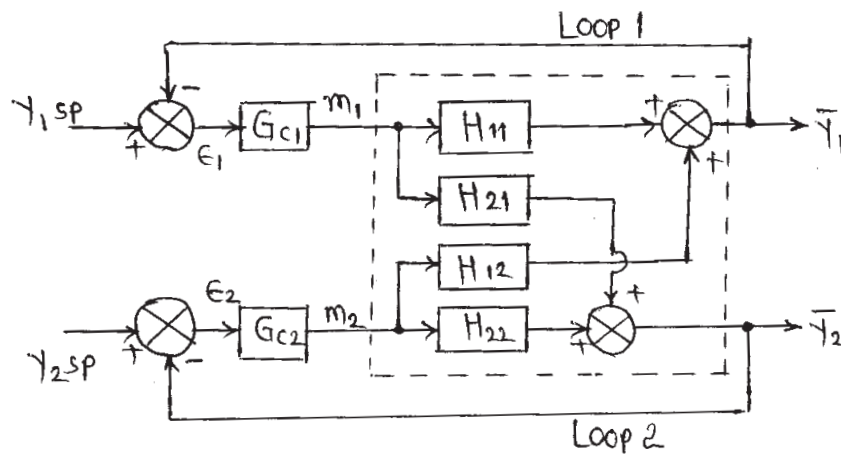


Fig.6 (b)



P1461**[4065]-578****M.E. (Electrial) (Control System)****LARGE SCALE SYSTEM****(2008 Course) (Elective - III) (503111 (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 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.

SECTION - I

- Q1)** a) What are large scale systems? Explain hierarchial structure and Decentralized control. [12]
 b) Explain the reduced order model using Davison technique. [13]

- Q2)** Find the eigen values retained and ISE of the third order system [25]

$$\dot{X} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -10 & -17 & -8 \end{bmatrix} X + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u \text{ and } Y = [1 \ 0 \ 0]X$$

- Q3)** a) Write and explain the properties of aggregated system matrix. [12]
 b) Find the third order aggregated model. [13]

$$\dot{X} = \begin{bmatrix} -1 & 0 & 0.01 & 0.05 & 0.25 \\ 0 & -4 & 0 & 0.45 & 0.1 \\ -0.088 & 0.2 & -10 & 0 & 0.22 \\ 1 & 0 & 0.075 & -4 & 0.05 \\ 0.11 & 0.2 & 0.999 & 0.44 & -3 \end{bmatrix} X + \begin{bmatrix} 1 & 0.5 \\ 0 & 1 \\ 0.5 & 0.9 \\ 2 & 0.75 \\ 1 & 1 \end{bmatrix} u$$

SECTION - II

Q4) Find the reduced order model aggregation for a third order system [25]

$$\dot{x} = \begin{bmatrix} 0.5 & 0.5 & 0 \\ 0 & 1 & 0 \\ 0.833 & -2.11 & -0.333 \end{bmatrix} x + \begin{bmatrix} 1 \\ 1 \\ 2 \end{bmatrix} u$$

Q5) a) Explain the concept of aggregation by continued fraction. [13]

b) Explain the pade approximation method for SISO system for model reduction [12]

Q6) Explain the first cauer form, second cauer form and third cauer form for model reduction. [25]



Total No. of Questions :8]

[Total No. of Pages :2

P1464

[4065] - 48

**M.E. (Mechanical) (Heat Power & Design Engg.)
INSTRUMENTATION & AUTOMATIC CONTROL
(2002 Course) (502102)**

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

SECTION - I

- Q1)** a) Explain with block diagram the generalised measurement system. [8]
b) Explain transfer function and its characteristics. [8]
- Q2)** a) Discuss the response of ramp input for first and second order system.[10]
b) Explain static characteristics of instruments. [8]
- Q3)** a) Explain the principle, working of acceleration measuring device. [8]
b) Explain electromagnetic flow meter with merits and demerits. [8]
- Q4)** a) Explain signal flow graph. [8]
b) Explain with one example of following : [8]
i) Feed forward system.
ii) Feed back control system.

P.T.O.

SECTION - II

- Q5)** a) Explain the architecture of a PLC system. [10]
b) The temperature range of temperature controller is 250°C to 550°C. The set point is kept at 400°C Find the percent of span error when the temperature is. [6]
i) 395°C
ii) 400°C
iii) 410°C
- Q6)** a) Explain P+I+D action for pneumatic system. [10]
b) Explain different methods of frequency response analysis. [8]
- Q7)** a) Explain Mcleod gauge for measurement of very low pressure. [8]
b) Explain difference between electronic controllers & other types of controllers. [8]
- Q8)** a) Explain stability of a control system. [8]
b) Discuss control system for heat exchangers. [8]



Total No. of Questions :8]

[Total No. of Pages :2

P1466

[4065] - 204

M.E. (Computer Engineering)

DISTRIBUTED OPERATING SYSTEM

(Revised Course 2002) (510102)

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 role of middleware in a distributed system? **[10]**
b) State the differences between implicit and explicit binding with the help of an example. **[8]**
- Q2)** a) What is a logical clock? Describe Lamport's theorem? **[8]**
b) What is the necessity of group communication? How is it implemented in distributed systems? **[8]**
- Q3)** a) Describe any algorithm to implement mutual exclusion in a distributed system. **[8]**
b) Describe two phase locking? Explain the difference between two phase locking and strict two phase locking? **[8]**
- Q4)** a) Discuss the relative advantages and disadvantages of implementing a thread package in user space and in the kernel. **[8]**
b) Explain with the help of a neat diagram how threads of a process are synchronized in Mach. **[8]**

P.T.O.

SECTION - II

- Q5)** a) 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]
- b) Describe the system architecture of Amoeba. State in brief the design goals of Amoeba. [8]
- Q6)** a) Describe with a neat diagram the distribution of processes in the Andrew File system. What features of the AFS design make it more scalable than NFS? [8]
- b) Describe the Gifford quorum consensus method for file replication. [8]
- Q7)** a) Describe the message passing architecture of Mach OS. [8]
- b) Describe the significance of consistency models. Which consistency model is more suitable for distributed systems? [8]
- Q8)** Write short notes on: (any three) [18]
- a) RMI.
 - b) Edge chasing.
 - c) Group communication in Chorus.
 - d) Replication and caching.



Total No. of Questions : 8]

[Total No. of Pages : 2

P1467

[4065]-267

M.E. CSE (Information Technology)

MOBILE COMPUTING

(2002-Course Revised) (510125)

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 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) List the major parameters need to consider for calculating performance of Cellular Networks. Explain the significance of parameter. [8]
- b) Compare the Macro, Micro and Pico Cells with respect to size, transmission power, antenna height, location, path loss exponent, signal characteristics and RMS delay. [8]
- Q2)** a) Describe the system architecture of GSM technology. What is the difference between rod shape and dish shape antennas? [8]
- b) Explain the different frequencies used between MS, BTS, BSC, MSC and Gateway MSC in GSM cellular network. [8]
- Q3)** a) Give the comparison among AMPS, GSM, DAMPS and CDMA mobile technologies with respect to band allocated, multiplexing technique, base station slots and speech coding rate. [8]
- b) Describe the GSM speech encoding mechanism by giving speech encoder block diagrams and manual calculations. [8]
- Q4)** Write short notes on (Any Three)
- a) FHSS
 - b) DSSS
 - c) MMS
 - d) WAP [18]

P.T.O.

SECTION - II

- Q5)** a) What happens if there are insufficient resources at new AP? What are the methods available to overcome these problems? [8]
b) Explain the pros and cons of smaller cells in Cellular Networks. [8]
- Q6)** a) Describe the algorithm to locate the destination mobile station from PSTN. [8]
b) What is broadband? Is it possible to carry out telephone conversation while surfing the net with broadband technology? If yes, Justify your answer. [8]
- Q7)** a) Who makes the handoff decision in CDMA cellular network? How it is different in GSM cellular networks? [8]
b) What is the need of GPRS support in GSM and CDMA mobiles? Explain the building blocks in GPRS system. [8]
- Q8)** a) How Personal Communication Services Network (PCS) is different from traditional wired and wireless networks? Draw the PCS architecture diagram and explain its components in short. [10]
b) What is SIM? What kind of support it provides to mobile equipment as well to mobile users. [8]



P1468

[4065]-465

M.E. (Civil) (Structures)

FINITE ELEMENT METHOD

(2008 Course) (501409) (Sem. - II)

Time : 4 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

Q1) a) Explain direct method and variational method used for formulation of element stiffness matrix with suitable examples. [8]

b) For a plane truss shown in fig.1 determine the horizontal and vertical displacements of node 1 and the stresses in each element.

All elements have $E=210 \text{ GPa}$ and $A=4.0 \times 10^{-4} \text{ m}^2$.

[17]

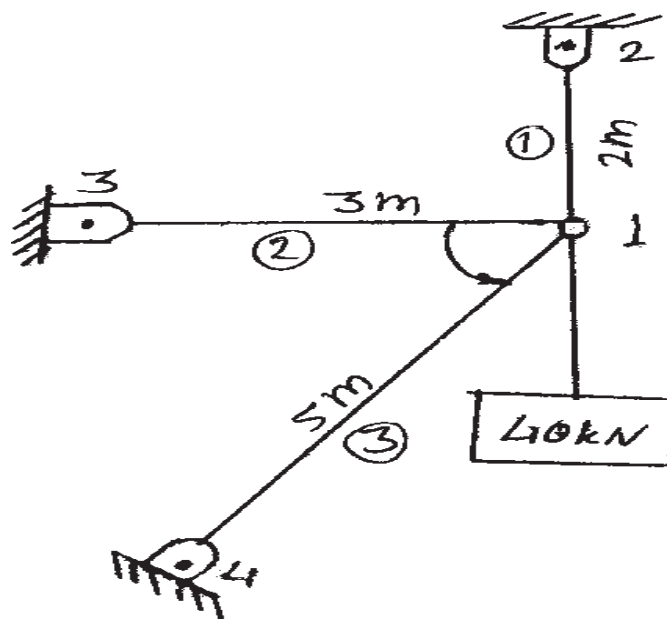


Fig.1 (a.1b)

P.T.O.

- Q2)** a) Write stress-strain matrices in case of plane stress and plane strain formulations. [8]
- b) Develop from first principles the element stiffness matrix for one dimensional bar element with axial displacement as degree of freedom using [17]
- i) Direct approach
- ii) Displacement function in polynomial form
- iii) Shape function in natural coordinates.
- Q3)** a) What is 'Lagrange Interpolation Functions'? State its characteristics. Using this function, obtain the shape functions for a three noded onedimensional element. Hence write the shape functions for a nine noded two dimensional rectangular element. [12]
- b) Explain Jacobian matrix in case of four noded isoparametric quadrilateral element. Obtain strain displacement matrix. [13]

SECTION - II

- Q4)** a) Explain Pascal's Pyramid and its use in selecting terms in displacement function polynomials for 3D tetrahedron element. [10]
- b) Obtain element stiffness matrix of axisymmetric ring element with a triangular cross section using cylindrical coordinates. [15]
- Q5)** a) Write displacement functions for both ACM and BFS elements. Verify conformity of both the elements. [17]
- b) What is Midlin's theory of plate bending? [8]
- Q6)** a) What is the difference between plate element and shell element. [5]
- b) Explain with neat sketches the various three dimensional elements used in the analysis of shells. [8]
- c) Explain membrane and bending actions in shell elements. How these two states of stresses are considered in formulating [K] for shell element. [12]



Total No. of Questions : 10]

[Total No. of Pages : 2

P1471

[4065]-485

M.E. Civil (Environmental Engg.)

ENVIRONMENTAL CHEMISTRY & MICROBIOLOGY

(2008 Course) (501509) (Sem. - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) State various methods of analysis used in environmental engineering. [9]
b) What is Zeta Potential? Explain how it can be used to assess the effectiveness of various coagulation strategies. [9]
- Q2)** What is nuclear chemistry? Explain the nature of radiation, its impact of human health and uses of isotopes and tracers widely used in environmental engineering? [16]
- Q3)** State the principle Flame Photometer with sketch and explain Spectro-Photometry and its application in environmental analysis. [16]
- Q4)** Explain in detail High Performance Liquid Chromatography and give its limitations. How this limitation been overcome by Gas Chromatography? [16]
- Q5)** Give basic concept of Ion Chromatography with sketch. Explain difference between Gas Chromatography, liquid Chromatography? [16]

SECTION - II

- Q6)** List out the various enzymes and their role in the field of environmental microbiology? Also explain the facultative respiration in wastewater treatment? [16]

P.T.O.

- Q7)** Explain principle and application of Compound Microscopy and Micrometry used in Environmental Engineering? Explain measurement and isolation of microorganisms. **[16]**
- Q8)** Explain Media and Techniques of Staining and Enumeration of microorganism? **[16]**
- Q9)** What is 'Bioremediation of contaminated soil' and explain its principle, microbiology and application with suitable example? **[16]**
- Q10)** Explain principle, design of Sequencing Batch Reactor Process and explain industrial microbiology and how its knowledge can be used to treat industrial wastewater? **[18]**



P1473

[4065] - 520

M.E. (Mechanical) (Design Engineering)**VIBRATIONS & NOISE CONTROL****(Sem. - II) (2008 Course) (502208) (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) *Use of logarithmic tables, electronic pocket calculator is allowed.*
- 4) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** For the system shown in fig No.1. Obtain natural frequencies and corresponding mode shapes, sketch all modes. Assume $k_1 = 2$ and $m_1 = 5$. **[16]**

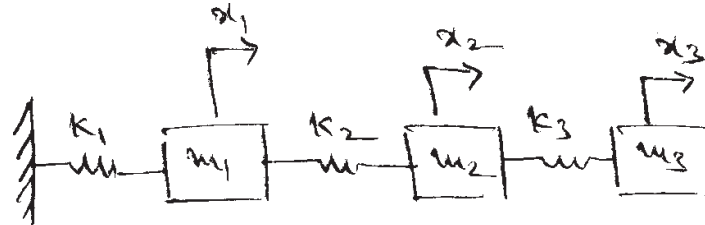


Fig NO. 1 .

- Q2)** Find frequency equation of a uniform beam fixed at one end and free at the other for transverse vibrations. **[16]**
- Q3)** Derive expressions for dimensionless displacements in un damped dynamic vibration absorber in terms of the parameters of the system and explain its working. For tuned absorber show. **[16]**
- a) The relationship between response speed and mass ratio and
 - b) Frequency response curves for main system and absorber.

P.T.O.

- Q4)** a) Determine the forced response of the un damped single degree of freedom system to the forcing function shown in fig. [10]

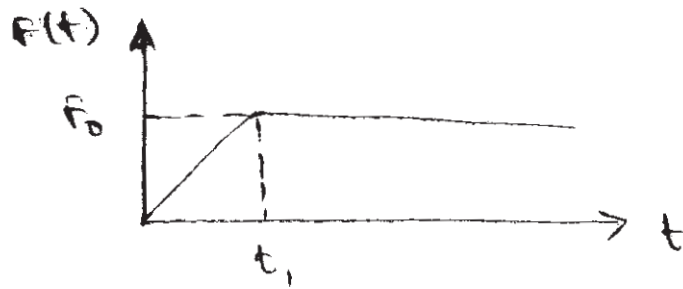


Fig NO. 2.

- b) What is the maximum acceleration of mass 'm' and spring stiffness 'k' if it is dropped on a hard surface through height 'h'? [6]
- Q5)** Write short notes of the following (any three): [18]
- Rayleigh - Ritz method.
 - Eigen values and Eigen vectors.
 - Convolution integral.
 - In-situ balancing of rotors.

SECTION - II

- Q6)** a) Explain how time domain and frequency domain techniques are used for conditions monitoring. [8]
- b) Explain FFT analyser with a block diagram. [8]
- Q7)** 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 20 cps and 1200 cps and that is zero outside this frequency range. It's mean value is 2.0 cm. Determine its runs value and its standard deviation. [12]

- Q8)** a) What are self - excited vibrations? Give two examples. [4]
 b) A system with dry friction damping has its differential equation of motion given by [12]

$$\ddot{x} + \phi(\dot{x}) + x = 0$$

$$\text{where } \phi(\dot{x}) = F$$

$$= -F$$

where \dot{x} is +ve

where \dot{x} is -ve

Obtain the trajectory of motion when the system is given an initial displacement and released

- Q9)** a) Explain with neat diagram the working of human hearing mechanism. [6]
 b) Explain in brief the following terms. [4]
 i) Sound power level.
 ii) Sound pressure level.
 iii) Sound absorption coefficient.
 iv) Acoustic intensity.
 c) Add the noise of six machines, which individually make a noise level of 78, 81, 81, 79, 72 and 65 dB respectively. [6]

- Q10)** Write short notes of the following (Any three) : [18]
 a) Octane and 1/3 octane analysis of sound.
 b) Cross correlation function.
 c) Experimental model analysis.
 d) Differentiate a linear and non linear system for their behaviour and analysis.



Total No. of Questions : 8]

[Total No. of Pages : 2

P1474

[4065]-538

M.E. (Mechanical) (Mechatronics)

MICROCONTROLLERS

(2008 Course) (502808) (Sem. - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Attempt any three questions from each section.*
- 2) *Figures to the right indicate full marks.*
- 3) *Assume suitable data. if necessary.*

SECTION - I

- Q1)** a) Compare different types of microcontroller. [8]
b) Explain in detail the architecture of 8051 micro controller. [10]
- Q2)** a) Explain in short timer logic. Also explain in detail all special function registers for timer. [8]
b) Write down steps to transfer data serially. Explain in short the special function registers for serial data transfer. [8]
- Q3)** a) What is function of linker, loader, simulator and emulator? [8]
b) Write and explain the program for interfacing stepper motor to 8051 microcontroller. [8]
- Q4)** a) Write a program for interfacing 7 segment display to 8051 microcontroller and explain it. [8]
b) Explain power down mode 8051 with suitable example. [8]

SECTION - II

- Q5)** a) Explain the architecture of PIC Microcontroller. [8]
b) Explain different modes of operation of ARM processor, along with its advantage and disadvantages. [8]

P.T.O.

- Q6)** a) List the features of 12C bus protocol. Explain how peripherals are addressed in 12C. [8]
- b) Write a program that continuously gets data from P1 and sends it to P2, while simultaneously creating a square wave of 100 us period on p 1.5. Use timer 1 to create square wave. Assume that XTAL=11.0592MHz.[8]
- Q7)** Write an ALP or C code for serial data transfer in 8051 with following consideration [16]
- a) Baud rate:4800
- b) Data bit:8
- c) Parity:odd
- d) Stop Bit:1
- e) You should send complimentary data byte as replay to the external device after receiving the byte from ext. device along with end character as \$.
- Q8)** Write a short note on: [18]
- a) SPI
- b) Logic Analyzer
- c) MODBUS



P1475**[4065]-574****M.E. (Electrical) (Control Systems)****SYSTEM IDENTIFICATION & ADAPTIVE CONTROL****(2008 Course) (Sem. - II) (503109)***Time : 3 Hours]**[Max. Marks : 100**Instructions to the candidates:*

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

SECTION - I

Q1) a) What is system identification? Explain how identification experiment is performed. **[8]**

b) Consider the estimate $\hat{\theta} = (\phi^T \phi)^{-1} \phi^T y$. **[8]**

Assume that the data satisfy $y(t) = \phi^T(t) \theta_0 + e(t)$

Where $e(t)$ is the stochastic variable with zero mean and variance λ^2 .

Prove that the covariance matrix of $\hat{\theta}$ is given by $\text{cov}(\hat{\theta}) = \lambda^2 (\phi^T \phi)^{-1}$.

OR

Q2) a) Classify the different technique of identification of a system. **[6]**

b) Consider the FIR model $y(t) = b_0 u(t) + b_1 u(t-1) + e(t); t = 1, 2, \dots, N$.

Where $e(t)$ is a sequence of independent normal variables with zero mean and standard deviation σ . Assume an input signal is a unit step, defined by $u(t) = 0$ for $t \leq 0$ and $u(t) = 1$ for $t > 0$. Determine the least square estimate of the parameters b_0 and b_1 . **[10]**

Q3) a) What conditions must be imposed on input signal for uniqueness of least square estimates? **[9]**

b) Justify whether the following signals are persistently exciting signals: **[9]**

P.T.O.

- i) Pulse,
- ii) Step and
- iii) Sinusoid.

OR

- Q4)** a) Explain how an appropriate model structure is chosen for estimation of the parameters. Draw the relation-ship between the loss function and the model structure. [8]
- b) An ARX model is given by $y(t)+a y(t-1)=b u(t-1)+e(t)$ with usual notations. Data collected from this ARX model is as given below: [10]

Sample t	1	2	3	4	5
Input u(t)	1	0	1	1	0
Output y(t)	0	1	-0.5	1.25	0.375

Estimate the parameter vector $\hat{\theta}$ from the available data using least square estimation method.

- Q5)** Write detailed notes on any Two of the followings:
- a) Graphical method for model validation. [8]
 - b) Recursive Estimation Method. [8]
 - c) Prediction Error Method. [8]

OR

- Q6)** Write detailed notes on any Two of the followings:
- a) Parametric and nonparametric Training Methods. [8]
 - b) Bayesian Learning. [8]
 - c) Image Processing. [8]

SECTION - II

- Q7)** a) Give proof of matrix Inversion Lemma, [8]
- $$(A + BCD)^{-1} = A^{-1} - A^{-1}B(C^{-1} + DA^{-1}B)^{-1}DA^{-1}.$$
- b) Define and explain the term “Adaptive Controller” and discuss the various adaptive schemes. [8]

OR

- Q8)** a) Explain the term “Gain scheduling”. Explain the working principle of gain scheduling adaptive control scheme with neat diagram. State advantages and drawbacks of the gain scheduling. [10]
- b) Explain the ship steering dynamics. [6]

- Q9)** a) Explain the PID controller and discuss the closed loop method of tuning of PID controller. [8]
 b) An ideal relay with saturation level ± 1 unit, is connected in series with a linear transfer function [8]

$$G(s) = \frac{50}{s(s+1)(s+10)}$$

in a unity feedback control system. Calculate the ultimate gain K_u and ultimate period T_u , using the method of Describing Function.

OR

Q10) Write detailed notes on any Two of the followings:

- a) Self Tuning Regulator (STR). [8]
 b) Design of MRAS using Lyapunov Theory. [8]
 c) Applications of Adaptive Control. [8]

Q11) a) Explain, with neat diagrams, the model reference adaptive scheme (MRAS). [8]

- b) Consider a linear system described by $\frac{dy}{dt} = -ay + bu$. [10]

Find Lyapunov function and use it to derive parameter updating law such that the error goes to zero.

Assume control law for the system as:

$$V(e, \theta_1, \theta_2) = \frac{1}{2} \left(e^2 + \frac{1}{b\gamma} (b\theta_2 + a - a_m)^2 + \frac{1}{b\gamma} (b\theta_1 - b_m)^2 \right)$$

OR

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

- b) Consider the system $G(s) = G_1(s) \cdot G_2(s)$, where [10]

$$G_1(s) = \frac{b}{s+a} \quad \text{and} \quad G_2(s) = \frac{c}{s+d}$$

Where a and b are unknown parameters and c and d are known. Discuss how to make an MRAS on gradient approach. Let the desired model be described by

$$G_m(s) = \frac{w^2}{s^2 + 2\xi ws + w^2}$$



P1476**[4065]-614****M.E. E & TC (Microwave)****MICROWAVE INTEGRATED CIRCUITS****(2008 Course) (Sem. - II) (504228)***Time : 3 Hours]**[Max. Marks : 100**Instructions to the candidates:*

- 1) Solve any two questions from each section.
- 2) Figure to right indicates full marks.
- 3) Assume suitable data, wherever necessary.

SECTION - I

- Q1)** a) Explain uncertainty and confidence in measurement. [8]
 b) Discuss Impedance and admittance parameters. [7]
 c) Design a coupled line band pass filter with $N=3$ and a 0.3 dB equal-ripple response. The center frequency is 3.0GHz, the bandwidth is 5% and Z_0 is 50Ω . What is the attenuation at 1.8GHz? [10]
- Q2)** a) What are microwave discontinuous? Discuss in detail. [15]
 b) Calculate the various parameters for the design of co-plainer transmission line at 100MHz. [10]
- Q3)** a) How the calibration of network analyzer is achieved? [5]
 b) A four port network has the scattering matrix shown below. [5]

$$[S] = \begin{bmatrix} 0.2 \angle 90^\circ & 0.8 \angle -45^\circ & 0.1 \angle -45^\circ & 0 \\ 0.8 \angle -45^\circ & 0 & 0 & 0.4 \angle 45^\circ \\ 0.3 \angle -45^\circ & 0 & 0 & 0.5 \angle -45^\circ \\ 0 & 0.4 \angle 45^\circ & 0.5 \angle -45^\circ & 0 \end{bmatrix}$$

- i) Is this network lossless?
- ii) Is this network reciprocal?
- iii) What is the return loss at port 1 when all other ports are terminated with a matched load? [15]

SECTION - II

- Q4)** a) Explain uncertainty and confidence in measurement. [8]
b) Discuss Impedance and admittance parameters. [7]
c) Design 12.5 to 14.5 GHz Ku-Band Monolithic analog frequency divider. [10]
- Q5)** a) Discuss non-linear MIC synthesis methods. [15]
b) Design Chebyshev band pass filter with following specification. [10]
Cut off frequency 100 MHz, number of order=3 and Impedance=50 Ω .
- Q6)** a) Explain power measurement technique. [7]
b) Explain in brief power splitter, coupler and reflector meter. [8]
c) Design 12.5 to 14.5 GHz Ku-Band Monolithic analog frequency divider. [10]



Total No. of Questions :8]

[Total No. of Pages :2

P1485

[4065] - 849

M.E. CSE (Information Technology)

NET CENTRIC COMPUTING

(Sem. - II) (2008 Course) (514426)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) Answer any three questions from Section I and three question from Section II.*
- 2) Answers to the both sections should be written in separate answer books.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Figures to the right indicate full marks.*
- 5) Use of non-programmable calculator is allowed.*

SECTION - I

- Q1)** a) As the DTR increases, the length of the network diameter decreases. Why? Justify your answer with manual calculations. **[8]**
b) Calculate the minimum frame size for **[8]**
i) 10BASE5 Ethernet network.
ii) 1000BASE-T if maximum cable length is 2.5 km.
- Q2)** a) How the overheads in call control and multiplexing are eliminated in Frame Relay networks? **[8]**
b) Why distributed data networks are more popular as compared to centralized data network for Internet based applications? **[8]**
- Q3)** a) How the drawbacks of FIFO queuing are eliminated in Fair Queuing methods? **[8]**
b) How full duplex transmission over subscriber loop is implemented in ISDN networks? **[8]**
- Q4)** Write short notes on (Any Three) : **[18]**
a) Switching
b) DSL
c) DWDM
d) Fault Diagnosis

P.T.O.

SECTION - II

- Q5)** a) Is the H.245 signaling protocol better than H.225 used in VOIP? Justify. [8]
b) “The Esau- Williams algorithm pays more attention to nodes that are far from the center.” Why? [8]
- Q6)** a) “The backbone of Internet uses ATM with WDM.” Give reasons to justify or nullify the statement. [8]
b) How is the utilization of Server calculated by using queuing theory? [8]
- Q7)** a) What types of attacks are carried out on on-line banking applications to steal the user’s information? What security mechanisms are available to prevent these attacks? [8]
b) Why RAID consists of different levels to store the data? [8]
- Q8)** Write short notes on (Any Three) : [18]
a) Security in OSI Architecture
b) Bin Packing Algorithm
c) CIFS
d) String Matching Algorithms



P1494

[4065] - 62

M.E. (Mechanical Design Engineering)

DESIGN ENGINEERING

(2002 Course)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Based on correction aspect how gearing is classified, explain So gearing and S gearing. **[6]**
- b) Two 20 full depth gear of 20 and 30 teeth are to be designed on the extended centre distance system using the recommended values for q . clearance $f = (0.25/P_d)$. Make the calculations for $P_d = 1$. Find the following.
- i) The values of q_1 and q_2 .
 - ii) The actual pressure angle ϕ .
 - iii) The radii of the actual pitch circles and centre distance.
 - iv) The tooth thickness on the actual pitch circles. **[10]**
- Q2)** a) Explain modified Goodman diagram for bending stresses? **[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 $F_e E 400$ ($S_{ut} = 540 \text{ N/mm}^2$ and $S_{yt} = 400 \text{ N/mm}^2$). The corrected endurance limit is 200 N/mm^2 . Determine diameter of shaft. Use FOS = 2. **[10]**

P.T.O.

- Q3)** a) What is the importance of the reliability in the modern engineering design? How it differs from the factor of safety? [6]
- b) A mechanical component is subjected to a mean stress of 100 N/mm^2 and a standard deviation of 10 N/mm^2 . The material of the component has a mean strength of 130 N/mm^2 and a standard deviation of 15 N/mm^2 .
- Find the probability of failure for the component.
 - If better manufacturing control reduces the standard deviation of material strength to 10 N/mm^2 . Find the probability of failure.
 - If we consider only mean values of the data in design, find out the factor of safety. [12]

- Q4)** a) Explain the following terms in context with creep.
- Estimated time to rupture.
 - Stress relaxation. [8]
- b) An 18% Cr and 8% Ni steel at 1500°F had the following creep rates.
- $$S_1 = 20.97 \text{ N/mm}^2 \quad \dot{\epsilon}_1 = 0.128\% \text{ per } 1000 \text{ hrs.}$$
- $$S_2 = 27.96 \text{ N/mm}^2 \quad \dot{\epsilon}_2 = 0.644\% \text{ per } 1000 \text{ hrs.}$$
- Determine the constants of the hyperbolic sine law and the creep rate for a stress of 10.48 N/mm^2 . [8]

- Q5)** Explain the following : [16]
- Novikov's gear
 - Cumulative fatigue damage.

SECTION - II

- Q6)** a) Suggest simple method of handling multiple objectives in an optimization problem. [6]
- b) A uniform column of rectangular cross section is to be constructed for supporting a water tank of mass 'M' shown in fig.1. It is required.
- to minimize the mass of the column for economy and
 - 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 permissible compressive stress to be r_{\max} . [10]

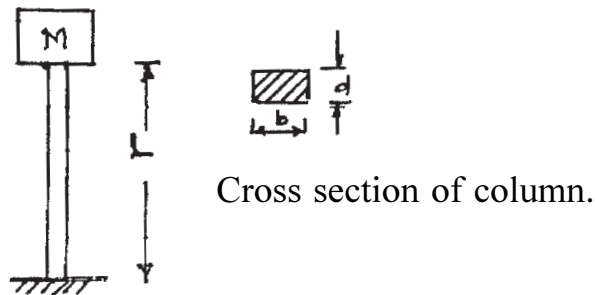


Fig . 1 Q. 6 (b), Water tank on a column

- Q7)** a) Derive an expression for maximum space efficiency of helical spring. [8]
 b) A helical compression spring made of oil hardened and tempered steel wire is subjected to a load which varies from 400 N to 1200 N. The wire diameter is 10mm while the mean coil diameter is 60 mm. The ultimate tensile strength of the spring wire is 1250 N/mm². Determine the factor of safety available. [8]
- Q8)** a) What do you understand by ramp of cam? How it is taken into account while designing the cam profile? [6]
 b) A cylindrical cam has a rise of 25.4 mm in 80° angle. The prime circle radius is 50.8 mm and the follower radius is 20 mm. Find the follower force 'P' for $x = 0.6$. The work load $F_w = 135\text{N}$. The initial spring force is 110N. The weight of the follower is 9N. Spring constant 0.8 N/mm and cam rotates at 600 rpm. [12]
- Q9)** a) Explain the use of composite material in mechanical Engineering giving examples of such use, state reasons for a preference in favour of such materials. [8]
 b) A unidirectionally composite of 'Toray' filament and 'Nameo' resin has following moduli and poisson's ratio
 $E_{xx} = 181 \text{ GPa}; E_{yy} = 10.3 \text{ GPa}; \nu_{xy} = 0.0159$
 $G_{xy} = 7.17 \text{ GPa}, (1 - \nu_{xy} \nu_{yx})^{-1} = 1.0045.$
 Estimate the components of moduli for an off ; axis orientation of
 i) $\theta = +30^\circ$ and ii) $\theta = +45^\circ$. [8]
- Q10)** Write short notes on (Any two) [16]
 a) Polydyne cam.
 b) Belleville Springs.
 c) Different methods of optimization.



P1496

[4065]-556

M.E. (Mechanical) (Automotive Engineering)

AUTOMOTIVE FUELS AND EMISSIONS

(2008 Course) (502306) (Sem. - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Explain the importance of hydrogen as an alternative fuel. Why is it termed as freedom fuel? Elaborate at least two production methods for hydrogen. **[10]**
- b) Describe the changes required to be made in diesel engine to run on CNG fuel. **[6]**
- Q2)** a) Discuss some additives required for Gasoline. **[4]**
- b) Discuss the combustion stages for conventional diesel engine. **[8]**
- c) What is detonation? Why is it undesirable? **[4]**
- Q3)** a) State the first law for reacting systems. **[4]**
- b) Explain the concept of enthalpy of formation. **[4]**
- c) Write the combustion reaction for methane with 50% excess air. **[4]**
- d) What is significance of adiabatic flame temperature? **[4]**
- Q4)** Write short notes on: (any three)
- a) Enthalpy of combustion
 - b) Octane and Cetane rating
 - c) Fugacity and Activity
 - d) Need for alternative fuels
 - e) Biodiesel production by transesterification **[18]**

SECTION - II

- Q5)** a) What are the main constituents of exhaust emission from petrol engines?
What is the effect of the following factors on the exhaust emission? [8]
i) Air fuel ratio
ii) Surface volume ratio
iii) Engine speed
b) What are the bad effects of CO,HC,NO_x,Ozone, Particulates on human health, animals and crops? [8]
- Q6)** a) Discuss the emissions from diesel engines and explain briefly the EGR device for the control of NO_x. [8]
b) What is smoke and diesel odour? Explain the effect of different factors on the formation of smoke and odour in C.I. engines. [8]
- Q7)** a) What measures are taken to control the green house effect particularly CO₂ emission from automobiles. [8]
b) Explain and compare electronic catalytic converter and conventional exhaust catalytic converter. [8]
- Q8)** Write notes on:
a) Euro III and Bharat norms
b) Positive crank case ventilation system
c) Ambient air quality monitoring [18]



Total No. of Questions : 8]

[Total No. of Pages : 2

P1499

[4065]-780

M.E. (Chemical)

**MANAGEMENT OF RESEARCH AND DEVELOPMENT IN
CHEMICAL INDUSTRIES**

(2008 Course) (509102) (Semester - I)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Solve any three questions from each section.*
- 2) Every answer shall be explained by taking a proper case study from chemical/ ancillary chemical industry.*

SECTION - I

Q1) What are the developments in research to decrease the level of sulphur(or for that matter any other air polluting component) compounds in the vehicular exhaustions? **[17]**

Q2) What are the typical financial needs of a research project on (any) product development? How the financial resources for such a project can be optimized well? Explain with a typical example in practice. **[17]**

Q3) “The future of Chemical Engineering Research lies in Biotechnology”. Discuss at length. **[17]**

Q4) Discuss steps involved in the risk analysis of success of an R&D project in typical Chemical industry. **[16]**

P.T.O.

SECTION - II

- Q5)** Explain the use of PERT & CPM techniques in financial control of an R & D project by taking suitable example from Chemical process industry. [17]
- Q6)** Draw an organizational chart for a typical R & D project in chemical industry. Explain the role of each functional management position and their interdependence. [17]
- Q7)** What is GDP? How it is related to growth of R & D sector in general. And discuss it with respect to a particular sector (for example fertilizers) in chemical industry. [17]
- Q8)** Write short notes on:(Any Three)
- a) Role of mathematical modeling in the advancement of engineering research.
 - b) Creativity in research
 - c) Industrial Research Vs Academic Research
 - d) Microreactor Technology Development [16]



P1500

[4065] - 437

M.E. (Civil) (Hydraulic Engineering)**COMPUTATIONAL METHODS IN HYDRAULIC ENGINEERING****(501301) (2008 Course) (Sem. - I)***Time : 3 Hours]**[Max. Marks :100**Instructions to the candidates:*

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

SECTION - I**Q1) a) Explain initial boundary value problems with the help of examples. [8]**

b) Discuss the application of finite difference method in Hydraulic Engineering. [8]

Q2) a) What is the classification of second order partial differential equations.Classify the equation $(1 + x^2) \frac{\partial^2 u}{\partial x^2} + (5 + 2x^2) \frac{\partial^2 y}{\partial x \partial t} + (4 + x^2) \frac{\partial^2 u}{\partial t^2} = 0$ [6]b) Solve the poisson's equation $\nabla^2 u = -10(x^2 + y^2 + 10)$. Over the square with sides $x = 0 = y$, $x = 3 = y$ with $u = 0$ on the boundary and mesh length = 1 using gauss – seidal iteration method. [12]**Q3) a) Explain how you would test the goodness of fit of a distribution to the observed data by chi-square test. [8]****P.T.O.**

- b) Develop a regression equation of the form $Q = aG^b$ between the discharge in the river, 'Q' and the corresponding stage, 'G' using the data given below: [8]

Q, m ³ /s	1688	1470	1589	1481	1535	1419	1625
G, m	4.72	4.30	4.54	4.31	4.30	4.11	4.43
Q	1317	1232	1178	1226	1249	1267	640
G	3.95	3.84	3.72	3.80	3.83	3.86	2.69
Q	578	1093	1053	1028	875	968	937
G	2.53	3.57	3.47	3.44	3.14	3.32	3.26
Q	818	731	640	515			
G	3.07	2.89	2.68	2.37			

Q4) Explain: [16]

- a) Correlation coefficient b) Normal distribution
 c) Pearson distribution and d) Multiple regression.

SECTION - II

Q5) a) Use trapezoidal rule to evaluate $\int_0^1 x^3 dx$ considering five sub-intervals. [6]

b) Explain conformal transformation with neat sketches. [6]

c) What is schwarz - Christoffel transformation. Explain with the help of neat sketches. [4]

Q6) a) Discuss first order auto - regressive process in detail. [8]

b) Use Simpson's 1/3 rule to find $\int_0^{0.6} e^{-x^2} dx$ by taking seven co-ordinates. [8]

- Q7)** a) Discuss different methods of numerical integration. [8]
b) Solve the following system of simultaneous equations by relaxation method. [8]

$$8x - 2y + 3z = 50$$

$$x + 3y - 4z = 16$$

$$2x - 2y + 5z = 27$$

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

- a) Solution of Laplace equation.
- b) Kutta - Jukowski equation.
- c) Gamma distribution.
- d) Reliability of finite difference method.



P1515**[4065]-521**

M.E. (Mechanical) (Design Engineering)
ADVANCED MACHINE DESIGN
(2008 Course) (502209) (Sem. - II)

*Time : 3 Hours]**[Max. Marks : 100**Instructions to the candidates:*

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

SECTION - I

Q1) a) What is true stress and true strain? Assuming exponential relation for true stress and true strain, derive the expression to estimate time of rupture. **[8]**

b) Following creep data at a certain temperature is known. **[8]**

$$s_1 = 10.5 \text{ MPa} \quad \dot{\epsilon}_1 = 0.012 \text{ percent per 1000 hrs}$$

$$s_2 = 14 \text{ MPa} \quad \dot{\epsilon}_2 = 0.025 \text{ percent per 1000 hrs}$$

Determine the constants of the hyperbolic sine law and calculate the creep rates for stresses 20 MPa and 28 MPa.

Q2) a) What is 'profile modification' in gears? **[6]**

b) Two 10 teeth gears are to mesh without undercutting. The gears are generated using standard hob with 20° pressure angle. Module is 4 mm while clearance is 0.2 mm. Using extended centre distance method, Find
 i) Hob shift ii) Blank diameter and depth of cutter setting iii) Actual pressure angle. **[10]**

Take usual notations.

$$\theta = \text{inv}\phi$$

$$\phi = \nu - \frac{2}{15}\nu^3 + \frac{3}{175}\nu^5 \text{ Where } \nu = \sqrt[3]{3\theta}$$

θ and ϕ are in radians.

Q3) a) What are different search methods used in optimization? Explain any

P.T.O.

- two methods in detail. [8]
- b) There are two different sites, each with four possible depths to drill an oil well. The preparation cost for each site and the cost of drilling at site 'i' to target 'j' are given below: [8]

Site 'i'	Drilling cost to target 'j'				Preparation cost
	1	2	3	4	
1	4	1	9	7	11
2	7	9	5	2	13

Formulate the problem of determining best site for each target so as to minimize the total cost.

- Q4)** a) Discuss the loading and deflection of rubber springs used for simple and cylindrical shear loads. [8]
- b) Explain cumulative fatigue damage analysis with Miner's equation. [8]
- Q5)** Write short notes on the following: [18]
- a) Stress concentration around cut outs in composite laminates.
- b) Load deflection characteristics of Belleville spring.
- c) Design considerations of cylinder and piston in I.C. Engines.

SECTION - II

- Q6)** a) What are fatigue strength improvement techniques in composites? [8]
- b) What is fault tree analysis? Explain with an example. [8]
- Q7)** a) Consider a graphite-epoxy laminate, whose elastic constants along and perpendicular to the fibres are as follows,
 $E_{xx} = 181 \text{ GPa}$; $E_{yy} = 10.3 \text{ GPa}$; $G_{xy} = 7.17 \text{ GPa}$; $\nu_{xx} = 0.28$; $\nu_{xy} = 0.01594$
 Obtain the compliance coefficients appropriate to $x^1 y^1$ axes which are at
 i) $+ 30^\circ$ (counter-clockwise) to xy axes and
 ii) $+ 9^\circ$ to xy axes. [8]
- b) What is 'regression analysis'? Give applications. [8]

- Q8)** a) Explain stresses and strains in short-fibre composites. [8]
b) Discuss the stresses induced in the connecting rod of I.C. engines and design procedure for the same. [8]
- Q9)** a) What are Hybrid materials? Discuss their applications. [8]
b) Explain S_0 and S gearing. [8]

Q10) Write short notes on:

- a) Design for fatigue failure [18]
b) Design for different machining processes.
c) Classical lamination theory of composite materials.



P1519

[4065] - 591

**M.E. (Electrical) (Power Systems)
HIGH VOLTAGE POWER TRANSMISSION
(2008 Course) (503210) (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) 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 layout of a typical HVDC station with important components marked therein. State the function of each component. **[10]**
- b) Derive the expression for the d.c. current of a HVDC bridge rectifier in terms of a.c. line voltage, overlap angle, delay angle, a.c. line frequency and source reactance. State clearly all the assumptions made. **[10]**
- c) A bridge connected rectifier is fed from a 230 kV/120 kV transformer from a 3-phase, 50Hz, 230kV supply. It operates with $\alpha = 30^\circ$ and $\mu = 15^\circ$ and delivers 800A d.c. Calculate the value of commutation reactance. **[5]**
- Q2)** a) Draw the schematic diagram of control of a HVDC system. Explain the method of control of d.c. link with voltage current characteristics of converters with compounding. **[12]**
- b) Discuss the advantages of multi-terminal HVDC systems with specific configurations mentioned in the literature. **[8]**
- c) The a.c. line voltage of a 3-phase, HVDC bridge inverter is 165kV with an extinction angle of 20° and an overlap angle of 15° . Calculate the d.c. voltage at the inverter terminals and fundamental p.f. at the inverter side. **[5]**

P.T.O.

Q3) Write short notes on any THREE of the following:-

- a) D.C. circuit breaker. [8]
- b) Types of HVDC links. [8]
- c) Twelve pulse operation of HVDC converters. [9]
- d) Hierarchical levels of control in HVDC systems. [8]

SECTION - II

Q4) a) Derive the expressions for the voltage and current at a distance 'x' metres from the receiving end of a loss-less, long 3-phase transmission line. [10]

b) A long transmission line is loss-less and is open-circuited. If a sinusoidal voltage is suddenly applied, determine the response of the line. [10]

c) An overhead line with $Z_o = 400 \Omega$ continues into a cable with a surge impedance $Z_c = 100 \Omega$. A surge with a crest value of 1200 kV is coming towards the junction from the over head line. Calculate the voltage in the cable. [5]

Q5) a) With reference to EHVAC transmission lines, describe the effects of corona on [12]

- i) Power loss.
- ii) Audible noise, and
- iii) Radio interference.

b) Discuss the biological effects of electric fields due to EHVAC lines on human beings and animals. State the measures of safety to be taken. [13]

Q6) Write short notes on any THREE of the following:-

- a) Shunt compensation in EHVAC lines. [9]
- b) Over voltages in EHVAC lines. [8]
- c) Tower footing resistance, and [8]
- d) Insulation coordination. [8]



Total No. of Questions :8]

[Total No. of Pages :2

P1521

[4065] - 636

M.E. (E & TC) (VLSI & Embedded System)

RF IC DESIGN

(2008 Course) (Sem. - II) (504190)

Time : 3 Hours]

[Max. Marks :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 is Open CKT Time constant method? Explore with example & mathematical analysis in detail. What are its limitations? [8]
- b) What is subthreshold operating region? Explain the effects of short channel. [8]
- Q2)** a) List the sources of RFI/EMI & cross talk. [8]
- b) Explain the causes of cross talk. What are the mitigation techniques? How to achieve them? [8]
- Q3)** a) Design CMOS amplifier for voltage gain of 60dB & bandwidth of 200 MHz. Assume suitable data. [8]
- b) With the help of incremental model of MOSFET based tuned amplifier, explain unilateralization & neutralization techniques in detail. [8]

P.T.O.

- Q4)** Write short notes on: (any three) **[18]**
- a) Power match versus noise match.
 - b) Back gate bias effect
 - c) RF sensitive MOSFET parasitics.
 - d) MOSFET capacitors in various operating regions.

SECTION - II

- Q5)** a) Explain ASIC design flow. At what stage will you care for cross talk. **[8]**
b) Why S parameters are needed to analyse RF amplifiers? Give S matrix of two port RF amplifier & its meaning. **[8]**
- Q6)** a) Differentiate single ended & differential LNA. Draw the schematics. **[8]**
b) Design LNA to operate at 650 MHz. Design suitable bias. Compute device width degenerating inductance, noise figure & Lg. Assume suitable data. **[8]**
- Q7)** a) Explain different types of mixers with the concepts & mathematical expressions. **[8]**
b) What is noise model? Explain any one noise optimization technique in detail. **[8]**
- Q8)** Write short notes on: (any three) **[18]**
- a) Series and shunt peaking amplifier.
 - b) Requirements of LNA.
 - c) AM - PM Conversion.
 - d) Linearity & isolation.



Total No. of Questions : 8]

[Total No. of Pages : 2

P1523

[4065]-710

M.E. (Production)

MANUFACTURING MANAGEMENT

(2008 Course) (511109) (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 calculator is allowed.*
- 6) *Assume suitable data, if necessary.*

SECTION - I

- Q1) a)** How will you achieve manufacturing competence in a modern manufacturing environment? **[8]**
- b) Enlist the contributions of the following manufacturing management scientists. **[8]**
- i) Prof. C.K. Pralhad ii) Mr. Shigeo Shingo

- Q2) a)** A small project is composed of activities whose time estimates are listed in the table below. Activities are identified by beginning (i) and ending (j) node numbers: **[8]**

Activity (i - j)	Estimated duration (in days)		
	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
3 - 6	2	4	8
4 - 6	2	5	8
5 - 6	3	6	15

- i) Draw the project network
- ii) Find the expected duration and variance of each activity and expected project length
- iii) What is the probability that it would take 2 days more than the expected duration?

P.T.O.

- b) Explain the need for close cooperation between product design engineering and manufacturing engineering. What will be effect if organization decides to implement concurrent engineering? [8]

- Q3)** a) Describe various types of wastes identified in lean management for a manufacturing industry. What tools and techniques do you suggest to eliminate/minimize the same? [8]
b) What is Toyota Production System? What are the steps for implementing it in an organization? [8]

Q4) Write short notes on: (any three)

- a) Relationship between Design engineering and R&D department [18]
b) Effective Production Planning
c) Value engineering
d) Just in time

SECTION - II

- Q5)** a) What are the implications of Hawthorne studies in the organizational behavior point of view? [8]
b) Describe the four dimensions of MBTI(Mayers Briggs Type Indicator) that yield 16 types. How these can be used effectively? [8]

- Q6)** a) What are the four leadership styles? Which leadership style is more suited for work environment as presently exist in any manufacturing industry in India? [8]
b) Describe any two theories of motivation. Still why these theories cannot motivate all the people? [8]

- Q7)** a) Job satisfaction can have behavioral effects. Give an example of each and cite some research findings on the relationship between job profile and job satisfaction. [8]
b) Enumerate some characteristics of the Gallup path. How do you measure the effectiveness in it? [8]

Q8) Write short notes on:(any three)

- a) The team effectiveness
b) Sources of interpersonal conflicts and their resolution
c) Contributions of Elton Mayo in group behavior
d) Importance of Organizational Behavior [18]



P1524

[4065] - 755

M.E. (Computer Engineering)

NETWORK DESIGN, MODELING AND ANALYSIS

(2008 Course) (Sem. - II) (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) Explain in brief Gaussian Probability Density Function. **[8]**
b) Discuss in details the probability of failure in establishing a connection in a network. **[8]**
- Q2)** a) What is meant by delay in communication subnet? Describe components of delay. **[8]**
b) Analyse M / M / 1 queueing system using state transition diagram. **[8]**
- Q3)** a) Discuss a General Heuristic Algorithm for a multipoint system connectivity between a concentrator and neighbouring terminals. **[8]**
b) Three systems with 56 kbps lines and 50 percent utilization are available. The first has constant 1400 bits message length. In the second system half of the messages are 400 bits long and other half are 2400 bits long. The third system has exponentially distributed message length. Average message length for each system is 1400 bits. Compare the performance of these systems with respect to waiting time. **[8]**

P.T.O.

- Q4)** Write short notes on: (any three) **[18]**
- a) Random Variables. b) PSN node.
 c) Network Design tools. d) Priority Queueing.

SECTION - II

- Q5)** a) With the help of an example explain. Add algorithm for deciding terminal concentrator location. **[8]**
- b) Given a set of nodes and the distances between them, in terms of lengths of the links. Determine a spanning tree with minimum total length of the links using Kruskal's Algorithm Node. **[8]**

	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	-	-

- Q6)** a) With the help of neat diagram, explain the architecture of a network node. **[8]**
- b) There are 6 terminals in a city with weights 7, 9, 14, 5, 17 and 8. What are the best possible solutions, using in packing Algorithm, for capacities 30 and 20? **[8]**
- Q7)** a) Explain duties and responsibilities of network Administrator. **[8]**
- b) Internet connectivity of 8 mbps is to be distributed to 6 different networks. What parameters will you consider and suggest a way to distribute. **[8]**

- Q8)** Write short notes on: (any three) **[18]**
- a) Security Audit. b) Subnetting.
 c) Network virtualization. d) I P multicast in Internet.
 e) Router.



P1527**[4065]-821****M.E. (Petroleum Engineering)****HORIZONTAL MULTILATERAL AND INTELLIGENT WELLS****(2008 Course) (Semester - I) (512103)***Time : 3 Hours]**[Max. Marks : 100**Instructions to the candidates:*

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

SECTION - I

Q1) Casing size = 9.625 inch drift diameter = 8.55 inch, depth of casing is 9800 ft, maximum surface pressure = 6400 psi fracture gradient at 9800 ft = 17.8 ppg maximum anticipated mud weight = 13.1 ppg mud weight set = 10.7 ppg. Cement top = 7000 ft from surface, cement slurry weight = 16.4 ppg casing pipe selected as

Weight = 43.5 ppf P110

Burst pressure = 8700 psi

Collapse pressure = 4430 psi

Plot burst load line, and collapse line check selected casing pipe with respect to collapse, Burst and tension. Take Buoyancy factor = 0.875 **[18]****Q2)** a) What is neutral point in a casing? Show that using wood's analysis, at

$$\text{neutral point } \frac{\sigma_r + \sigma_t}{2} = \frac{\rho_i A_i - \rho_e A_e}{A_e - A_i} \quad [8]$$

b) Discuss importance of geotechnical order while drilling multilateral wells. **[8]**

Q3) a) A 'S' type profile is planned for the well having $V_t = 10,000$ ft $H_t = 4000$ ft BUR = 2° per 100 ft and DOR = 2° per 100 ft. Inclination at the end of the drop off section is to be zero at TVD = 9000 ft. If inclination over tangential section is not exceed 50° . What is the deepest kick off point that will meet the requirements of the well? **[10]**

b) What are different types of multilateral and horizontal wells? **[6]**

P.T.O.

- Q4)** a) Discuss different types of deflection methods used in directional/horizontal wells. [4]
 b) Discuss different survey tools used in horizontal and multilateral wells. [4]
 c) Discuss minimum curvature method widely used in oil industry to measure well path. Find increments $\Delta V, \Delta N$ and ΔE using following data. [8]
- | Measure depth(ft) | inclination(α) | Azimuth(β) |
|-------------------|-------------------------|--------------------|
| 2000 | 2.0 | 45 |
| 2090 | 4.5 | 50 |
- Dog leg angle = 1.03°

SECTION - II

- Q5)** a) A drill string consist of 600 ft of 8.25" x 2-13/16" drill collar and rest is 5" drill pipe, 19.5 ppf X-95 grade drill pipe. If required MOP is 100000 lb and mud weight 10 ppg. Calculate maximum depth of the hole that can be drilled when a) using new drill pipe $p_t = 501090$ lb Steel density = 489.5 ppf and B.F. = 0.847 [8]
 b) Write short note on any one of the following: [10]
 i) PDM (Positive displacement motor)
 ii) Bottom hole assemblies for build hold and drop the angle.
- Q6)** a) Discuss in brief primary cementation process in horizontal well with suitable sketch. [8]
 b) Calculate slurry weight and water required for a slurry contents class H cement, 18% salt, and 46% water. [8]
 Absolute volume of salt = 0.412
 Weight of class H cement = 94 lb/sack
 Absolute volume of class H cement = 3.60 gal/sack
 Water weight = 8.33 lb/gal at room temperature.
- Q7)** a) Discuss the importance of optimum hydraulics for hole cleaning and rate of penetration. [8]
 b) While drilling 8.5" hole following parameters are observed. [8]
 Pump pressure = 2300 psi
 Bit pressure loss = 1300 psi
 Mud weight = 10.16 ppg
 Calculate
 i) B.H.H.P. ii) BHHP/ sq. in hole she iii) HSI iv) Jet impact force
- Q8)** a) Write short note on: [10]
 i) Under balance drilling
 ii) Well control method-weight and wait.
 b) Discuss different types of horizontal well completion and use of optical fiber sensors in intelligent well completion. [6]



Total No. of Questions : 6]

[Total No. of Pages : 2

P1530

[4065]-45

M.E. (Civil/Structures)

ADVANCES IN CONCRETE COMPOSITES

(2002 Course) (501510) (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 answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of electronic pocket calculator and IS code is allowed.*
- 6) *Assume suitable data if necessary.*

SECTION - I

- Q1)** a) Discuss the classifications in various fibers used in concrete composites. **[10]**
- b) Explain fiber interaction in cracked matrix with fiber pull out test results. **[15]**
- Q2)** a) Explain the stress-strain behaviour of composite with less than 2% fiber content by volume. with the help of stress-strain curve. comment on ductility of FRC. Compare stress-strain response of FRC w.r.t. plain concrete. **[10]**
- b) Explain the concept of strong brittle fibers in ductile matrix and strong ductile fibers in brittle matrix. **[15]**
- Q3)** a) What do you understand by flexural toughness. **[4]**
- b) Compare metallic fibers with polymeric fibers. **[6]**
- c) Write the effect of fiber type and volume fraction on toughness of concrete composites. Also discuss new techniques for the measurement of toughness. **[15]**

P.T.O.

SECTION - II

- Q4)** a) State and explain two basic processes used for fabricating GFRC. [10]
b) Discuss instrumented impact tests to evaluate impact resistance of concrete composites. [15]
- Q5)** a) Briefly describe the application of GFRC. [4]
b) Compare the properties and behaviour of asbestos cement corrugated sheet with cement sheets reinforced with poly propylene film. [6]
c) Discuss various non-linear fracture mechanics models. [15]
- Q6)** a) Write a note on Alkali-resistant glass fibers. [4]
b) Enlist and explain various quality control tests on GFRC. [6]
c) Explain in general the behaviour of FRC under combined bonding shear and Torsion. [7]
d) Explain the behaviour of SIFCON fibers in compression and tension. [8]



P1532

[4065]-69
M.E. (Mechanical) (Design Engg.)
PROCESS EQUIPMENT DESIGN
(2002 Course) (Elective - I) (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 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) Give classification of different types of stainless steels? Give applications of stainless steel in process industry? **[4]**
- b) A storage tank 6 m in diameter and 7.5 m in height has to be provided with self supported conical roof. The slope of self supported conical roof is 1 in 5. Roof is subjected to a superimposed load of 100 kg/m². Density of plate material is 7800 kg/m³. $E = 2 \times 10^6$ kg/cm². Calculate minimum thickness required for fabrication of self supported conical roof. **[6]**
- c) Explain various types of roofs used for storage vessels. **[6]**
- Q2)** 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) Define pressure vessel and explain general design considerations for the design of unfired pressure vessel. **[8]**
- Q3)** a) Explain testing and inspection of pressure vessels. **[6]**
- b) What are causes for loss of liquid in fixed volume tanks? **[2]**
- c) List the types of nozzles and explain Reinforcement of nozzles. **[8]**

P.T.O.

- Q4)** a) Explain method for calculating thickness of torispherical head subjected to i. internal pressure II/external pressure. [8]
 b) List the types of supports used for process equipments. What are the design consideration in skirt support design? [8]

Q5) Explain with neat sketches (any three) [18]

- a) Various forms of corrosion.
 b) Protective coatings and their applications.
 c) Design of saddle support.
 d) Various types of roofs for storage vessels.
 e) Types of constructions for high pressure vessels.

SECTION - II

- Q6)** a) How filters are classified? State their advantages and disadvantages. [6]
 b) A pressure vessel is to be designed fro an internal pressure of 0.3 N mm². The vessel has nominal diameter of 1.2 m. The vessel is made up of stainless steel with permissible stress 130 N/mm². If the weight of vessel and content is 32000 Kg and torques due to offset piping is 50 Kg.m. Find the stresses due to combined loading. Also suggest suitable head. [10]

- Q7)** a) A pressure vessel has inside diameter of 1200 mm and a plate of 5 mm. inside diameter of flange is 1212 mm. a gasket is provided over the flange face. Gasket factor is 2. and gasket seating stress is 100 kg/cm². Inside diameter of gasket is 1215 mm. Pressure inside vessel is 2.5 kg/cm². Permissible stress in bolts under atmospheric condition is 600 kg/cm². Permissible stress in bolt under operating condition is 550 kg/cm². Diameter of bolt is 20 mm.
 Calculate : [10]

- i) Bolt load.
 ii) Bolt area.
 iii) Flange thickness.

- b) Differentiate between Double pipe heat exchanger and Shell and tube heat exchanger. [6]

- Q8)** a) Explain important features of Plate columns or packed columns. [8]
 b) Explain determination of power requirements of agitator. [4]
 c) What is duralumin? Give it's application in process industries? [2]
 d) What is "Hastelloy D" alloy and its advantages? [2]

P1535

[4065] - 195

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

SECTION - I**Q1) a)** Solve the following problem by Potter's scheme.**[10]**

$$\begin{bmatrix} 4 & 2 & 1 & 1 \\ 2 & 10 & 2 & 1 \\ 1 & 2 & 4 & 2 \\ 1 & 2 & 4 & 8 \end{bmatrix} \begin{Bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{Bmatrix} = \begin{Bmatrix} 10 \\ 20 \\ 30 \\ 40 \end{Bmatrix}$$

- b) Explain procedure for generating tool path through interactive graphics for a CNC machine. **[6]**

Q2) a) Solve the problem given below by cholesky's factorisation and variable band width. **[10]**

$$\begin{bmatrix} 5 & -4 & 1 & 0 & 0 \\ -4 & 6 & -4 & 1 & 0 \\ 1 & -4 & 6 & -4 & 1 \\ 0 & 1 & -4 & 6 & -4 \\ 0 & 0 & 1 & 4 & 5 \end{bmatrix} \begin{Bmatrix} s_1 \\ s_2 \\ s_3 \\ s_4 \\ s_5 \end{Bmatrix} = \begin{Bmatrix} 1 \\ 2 \\ 3 \\ 2 \\ 1 \end{Bmatrix}$$

- b) Explain with suitable example, role of expert system in manufacturing. **[6]**

Q3) a) Tridiagonalise the given matrix [A] by House holder’s method. [6]

$$[A] = \begin{bmatrix} 4 & 3 & 2 & 1 \\ 3 & 8 & 6 & 2 \\ 2 & 6 & 8 & 3 \\ 1 & 2 & 3 & 4 \end{bmatrix}.$$

- b) Explain the grouping of components to go to a specific group of machine in Group Technology based on “cluster analysis”. [5]
 c) Describe the different element types used in FEA technique. [5]

Q4) An electric motor running at 1440 rpm produces power of 15 kw. The diameter of motor shaft is 40 mm and the shaft extends 76 mm beyond the motor bearing. Assume that permissible shear and crushing stresses for the key are 55 N/mm² and 110 N/mm² respectively. Motor pull out torque is 3 times its average torque and shock load factor is 2.4. Write a program in Auto lisp to design and draw the keyway in the shaft extension. Also sketch the keyway.[18]

SECTION - II

Q5) a) Apply the Rank Order Clustering (ROC) technique to arrange the parts and machines into groups from the following Part-Machine incidence matrix. [10]

		Parts							
		J ₁	J ₂	J ₃	J ₄	J ₅	J ₆	J ₇	J ₈
Machines	M ₁	1		1			1		
	M ₂		1		1	1			
	M ₃				1		1	1	1
	M ₄		1		1	1	1		
	M ₅			1				1	1

b) Describe various methods of work and tool probing in FMS. State their benefits. [6]

Q6) a) A cell computer having two machining centers connected with it through P.C, is in operation using pallet pool and two AGVs. Analyse the various transition stages critically to explore any possibility of deadlock in the working of the system. [10]

b) Describe various types of tool magazines used in FMS. [6]

- Q7)** a) Explain the various functions done by AGV in a flexible manufacturing system and discuss the types of guidance technologies commonly used in operating AGV. With a neat sketch, show the path of AGV in FMS arrangement connected to AGV controller. What are the equipments and accessories commonly used in AGV guidance and control? [10]
- b) What do you mean by modular design concept? How it can be used for setting of intelligent machines? [6]

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

- a) Opitz and MICLASS classification and coding systems.
- b) Adaptive control system in FMS.
- c) Application of Neural Networks in manufacturing.
- d) Expert system for Process Planning.
- e) Classification of FMS.



Total No. of Questions : 8]

[Total No. of Pages : 2

P1538

[4065]-233

M.E. (Petroleum)

OFFSHORE TECHNOLOGY

(2002 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 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) Classify different types of wells and platforms used in offshore field development. Explain one each. **[9]**
- b) What is concrete gravity platform? Write the principle of its operation. Also draw the neat schematic sketch and explain the construction and working of this platform. **[9]**
- Q2)** a) Draw the typical graph or chart for a typical repeat formation testing operation. Indicate all the features of it. **[4]**
- b) Define the following: **[2]**
- i) Mud weight
 - ii) Cement consistency
- c) For a seven inch production casing, explain the procedure involved in drilling a hole required, it's lowering and cementing operation from a floating offshore platform. **[10]**
- Q3)** Explain in detail reservoir aspect of vertical and horizontal wells. Write their merits and demerits. **[16]**
- Q4)** Write short notes on: **[16]**
- a) HPHT well
 - b) Riser pipe
 - c) ROV
 - d) Jack up rig

P.T.O.

SECTION - II

- Q5)** a) Write the various types of cement. What is the basis for selection and design of cement used in deep water casing cementation? Explain in brief. [9]
- b) Explain Weymouth and Panhandle equations along with their assumptions and use. [9]
- Q6)** a) Name and explain the working of equipment used for stable forces during drilling. [8]
- b) Draw the neat schematic sketch of a floating offshore drilling vessel? [8]
- Q7)** Describe in detail one case study to explain offshore field development application. Explain the use of a particular drilling / completion / production / EOR technique used in it for field development. Draw the free-body diagram, graph along with mathematical expressions, if any to elaborate the merits of technology. [16]
- Q8)** Write short notes on: [16]
- a) Type of bits
 - b) Separation of oil and gas
 - c) Offshore well control
 - d) Sub sea completion



Total No. of Questions :8]

[Total No. of Pages :2

P1539

[4065] - 270

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

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 must be written in separate answer books.*
- 3) Draw sketches wherever necessary.*
- 4) Figures to the right indicate full marks.*
- 5) Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Explain the avalanche effect. How much effect of changing 1-bit occurs in DES? Would this effect remain same for two and three key DES? **[8]**
- b) What is the transposition cipher? Explain the Columnar and Vernam algorithms. **[8]**
- Q2)** a) What is the difference between packet filtering router and stateful inspection of firewall? Which one would be the best solution from security point of view? **[8]**
- b) What is confusion and diffusion? How Shannon's (S-P) networks provide confusion and diffusion? **[8]**
- Q3)** a) What is the man-in-the-middle attack? Illustrate with example. **[8]**
- b) Explain in detail different attacks on RSA? **[8]**
- Q4)** Write short notes on (Any 3) : **[18]**
- a) PEM
 - b) Secure RTP
 - c) Cyber Pornography
 - d) Privacy Regulations

P.T.O.

SECTION - II

- Q5)** a) Compare between Kerberos 4.0 and 5.0? [8]
b) Explain SNMP Proxy with diagram? What is necessity of Proxy? [8]
- Q6)** a) Is it possible to combine Link and end to end encryption to achieve better security solution? Justify. [8]
b) What problem was Kerberos designed to address? How are the addressed by Kerberos? [8]
- Q7)** a) Explain DDOS by giving two examples. [8]
b) List and explain the security weakness in SMTP and Telnet services which are merely helpful to the hackers. Suggest a solution to secure each one. [8]
- Q8)** Write short notes on (Any 3) : [18]
a) ARP Cache Poisoning
b) Secure RSVP
c) Blind key cryptosystems
d) DMZ Networks



P1541

[4065] - 458

M.E. (Civil-Structures)

DESIGN OF COMPOSITE CONSTRUCTION

(Sem.- I) (501404 (C)) (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 answer 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) What is composite construction? Explain the IS, BS and Euro codal provisions for the same. **[10]**
- b) For full interaction case, determine the slip and slip strain values at mid span and support. Also draw the typical deflection, slip strain and slip for above conditions. **[15]**
- Q2)** a) Explain the term composite floors and its structural elements. Also, state and explain the terms of the equation for neutral axis within the sheeting and full shear connection. **[10]**
- b) Compare the stress block for concrete strength as per Eurocode and IS 456-2000 using figures and equations. **[15]**
- Q3)** A composite column of 350mm X 350mm X 3000mm is cast with M30 grade of concrete and ISHB 250 steel section. It consists of 4 bars of 16mm dia of Fe 415. If the design axial load is 1500 kN and the design moment about XX axis is 150 kN.m, check the adequacy of concrete encased composite section for uniaxial bending. For ISHB 250, $f_y = 250$ Mpa and $E_a = 200$ kN/mm². For M30, $E_m = 31220$ N/mm². Assume suitable partial safety factors. **[25]**

P.T.O.

SECTION - II

Q4) A composite truss has following parameters. **[25]**

- a) Span = 12m.
- b) Truss spacing = 4m.
- c) Slab thickness = 150mm.
- d) Profile depth = 75mm.
- e) Self weight of deck slab = 2.80 kN/m².
- f) Max. laterally un-restrained length in top chord = 1.5m.
- g) Concrete grade = M25.
 - i) Evaluate the pre composite stage loading.
 - ii) Design the top chord member.
 - iii) Design the bottom chord of composite stage.
 - iv) Determine the capacity of the composite section in compression.

Q5) Explain the design steps of multistoried residential building for following components - **[25]**

- a) Slabs with profile deck.
- 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 : 8]

[Total No. of Pages : 2

P1544

[4065]-508

M.E. (Mechanical) (Heat Power)

**HEAT EXCHANGER SYSTEM DESIGN AND
PERFORMANCE**

(2008 Course) (Elective - IV) (502112(a))

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of calculator Log tables and electronic calculator is allowed.*

SECTION - I

- Q1)** a) Explain the detailed classification of heat exchanger. [8]
b) What are the various standards used in heat exchanger design? [8]
- Q2)** a) Explain the steps involved Designing the shell and tube heat exchanger. [8]
b) What are the various methods used in heat exchanger for increasing the overall heat transfer methods in the heat exchangers? [8]
- Q3)** a) Draw the temperature distribution in heat exchanger for following configuration [8]
i) Evaporator
ii) Condenser
iii) One shell pass two tube pass
iv) Cross flow with both fluid unmixed
- b) Find the surface area required in the counter flow steam super heater in which the steam enters at 180° C in dry and saturated condition and leaves at 250° C with an increase of enthalpy of 159 kJ/kg. The hot combustion gases ($C_p = 1.05$ kJ/kg.K) enters the super heater at 510° C. the steam flow rate is 1000 kg/hr, the hot gas flow rate is 2000 kg/hr and overall heat transfer coefficient is 26 W/m².K [8]

P.T.O.

Q4) Write a short notes on (Any three):

- a) Points considered in selection of heat exchanger for application.
- b) Requirements of good heat exchanger.
- c) Sizing of heat Exchanger.
- d) Practical Applications of heat exchanger. [18]

SECTION - II

Q5) a) What is fouling? Explain its effects exchanger heat transfer and pressure drop. Discuss the fouling mechanisms. What are the sequential events in fouling? How fouling is considered in calculation of overall heat transfer coefficient? Give a typical values of fouling factors. [12]

- b) Sea water below 50° C is passed through the cooling coils of a large electromagnet. Calculate the heat transfer coefficient on the seawater side including the effects of fouling, if the heat transfer coefficient with

clean coil is $1000 \frac{\text{W}}{\text{m}^2 - \text{K}}$. Assume fouling factor for seawater below

$$50^\circ \text{C} = 0.0001 \frac{\text{m}^2 - \text{K}}{\text{W}} \quad [4]$$

Q6) Explain with neat sketches the following recently developed heat exchangers.

- a) Twisted tube bundle-sheel & Tube Heat Exchanger.
- b) Helical baffle heat exchanger.
- c) Spiral plate heat exchanger.
- d) Lamella heat exchanger. [16]

Q7) a) Explain the working of Regenerators-matrix storage type and rotary storage type. Discuss the working of Ljung strom air pre heaters and heat wheels. [8]

- b) Discuss the working of a typical heat pipe heat exchanger for heat recovery application. [8]

Q8) Write notes on (any Three):

- a) Furnaces and Radiative heat exchangers
- b) Power Plant Condensers
- c) Maintenance of heat exchangers
- d) Selection of heat exchangers. [18]



Total No. of Questions : 8]

[Total No. of Pages : 2

P1545

[4065]-509

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

COMPUTATIONAL FLUID DYNAMICS

(2008 Course) (Elective - IV) (502112-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) *Assume suitable data, if necessary and mention it clearly.*

SECTION - I

- Q1)** a) For a moving fluid element, derive the expression for substantial derivative of velocity and explain its physical meaning. [8]
- b) Discuss the various types of boundary conditions with examples of each. [8]
- Q2)** a) For one dimensional transient conduction, formulate the finite difference equations in explicit form and Crank-Nicholson form. [8]
- b) Compare Finite element method with Finite volume method. [8]
- Q3)** Consider Navier-Stokes equations for compressible flow, Present the numerical algorithm for the solution. [16]
- Q4)** Consider the continuity equation for compressible flow, Show how the density is updated using MacCormack scheme. What is stability condition? [18]

P.T.O.

SECTION - II

- Q5)** For two dimensional transient heat conduction, for constant thermal diffusivity. **[18]**
- a) Write discretised form of equation.
 - b) Outline the procedure to obtain numerical solution by ADI technique.
 - c) State the advantages of ADI technique.
- Q6)** Consider quasi-one dimensional compressible flow in nozzle. **[16]**
- a) Write the simplified governing equations for this case.
 - b) Solve the continuity equation using suitable numerical technique.
- Q7)** For a developing flow in a channel, show how the pressure is updated using SIMPLE method. **[16]**
- Q8)** Describe the Lax-Wendroff technique for evaluating x-component of velocity at node (i,j) at time step of $(t + \Delta t)$. **[16]**



Total No. of Questions : 10]

[Total No. of Pages : 2

P1550

[4065]-528

M.E. (Mechanical) (Design Engineering)

COMPUTER AIDED ENGINEERING

(2008 Course) (SELF STUDY)(502212 (c)) (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 answer books.*
- 3) *Figures to the right indicate full marks.*
- 4) *Neat diagrams must be drawn wherever necessary.*

SECTION - I

- Q1)** a) Explain generalized procedure for analysis and simulation of Thermo mechanical systems. [10]
b) Explain the role of CAE in thermal system design. [6]
- Q2)** a) Enlist surface modeling features available in commercial modeling software and explain any one feature in detail. [10]
b) Explain how to reduce ideal time of modeling and analysis using CAE software. [6]
- Q3)** a) Describe in detail feature based solid modeling technique. [10]
b) Explain the importance and need of stiffness matrix in finite element analysis. [6]
- Q4)** a) Explain briefly types of 2D elements used for meshing along with their applications. [10]
b) Explain STEP data exchange format. [6]
- Q5)** Write short notes on:
a) Comparison between Mass and Gap elements used for Meshing. [6]
b) Top down assembly modeling approach. [6]
c) Comparison between Tetra and Brick type Meshing. [6]

P.T.O.

SECTION - II

- Q6)** Explain in detail the sources of nonlinearities in FEA. [16]
- Q7)** a) Describe the procedure for analysis of steady state conduction using FEA software. [10]
b) Explain Tetra meshing techniques used in FEA. [6]
- Q8)** a) Differentiate between static and dynamic analysis. [8]
b) Explain 'p' and 'h' version of mesh refinement methods. [8]
- Q9)** a) Differentiate between meshes used in computational structural mechanics and CFD. [8]
b) State and explain three fundamental physical principals used in CFD.[8]
- Q10)** Write short notes on
- a) Features of CFD modeling for steady state incompressible flow. [6]
b) Typical issues in contact analysis used in FEA. [6]
c) CFD as a design and research tool. [6]



P1551

[4065] - 532

M.E. (Mechanical) (Mechatronics)
DESIGN OF MACHINE ELEMENTS
(2008 Course) (502804(a)) (Elective - I)

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 is weighted point method? Write the different steps involved in this method. **[8]**
 b) Write short notes on aesthetics in design? What are the major guidelines in the designing a product from an aesthetic view? **[8]**
- Q2)** a) What is factor of safety? Why it is necessary to use factor of safety?[4]
 b) A link of 400mm length and of rectangular cross section ($h = 2t$) is subjected to a force of 30 kN. If the maximum elongation is 0.13 mm, determine the thickness 't' and height 'h' of the section. Allowable strength of the material is 300 N/mm². **[6]**
 c) Define endurance limit. Differentiate between failure due to static load and fatigue load. **[6]**
- Q3)** a) Define equivalent torsional moment and equivalent bending moment. State when these two terms are used in the design of shafts. **[6]**
 b) A transmission shaft supporting a helical gear B and an overhung bevel gear D as shown in figure1. It is mounted on two bearings A and C. The pitch circle diameter of the helical gear is 450 mm and diameter of bevel gear at large end is 450 mm. The power is transmitted from helical gear to the bevel gear. The gears are keyed to the shaft. The material for shaft is steel 45C8 ($S_{ut} = 600\text{N/mm}^2$ and $S_{yt} = 380\text{N/mm}^2$). Determine the shaft diameter using ASME code if $k_b = 2$ and $k_t = 1.5$ **[10]**

P.T.O.

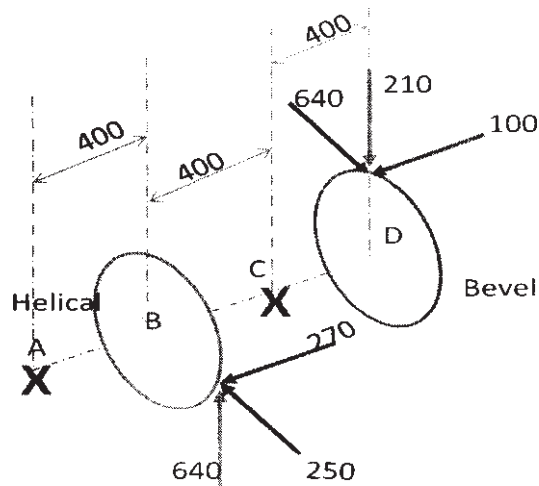


Figure 1

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

- a) Maximum shear stress theory of failure.
- b) Design procedure of Bushed - pin flexible coupling.
- c) ASME code of shaft design.
- d) criteria for selecting the material for a particular application.

SECTION - II

Q5) a) Explain the following terms used for helical spring : **[4]**

- i) Wahl's factor,
- ii) Spring index,
- iii) Spring stiffness,
- iv) Active coils

b) Design a helical compression spring for a spring operated pressure relief valve with the following data. **[8]**

Operating pressure = 1.25 N/mm²

- i) Valve lift = 3.5 mm at 10 % pressure rise over operating pressure.
 - ii) Diameter of valve - 25mm.
 - iii) Limiting mean coil diameter - 40 mm.
 - iv) Permissible shear stress for spring = 500 N/mm².
 - v) Modulus of rigidity for spring material = 834 Pa.
 - vi) The available standard spring wire diameter are 2,3,4,5,6,7,8, 10mm.
- c) Draw the constructional details of leaf spring with a neat sketch and explain briefly function of each components. State its materials. **[4]**

- Q6) a)** Explain the various types of failures in rolling contact bearings. How rolling contact bearings are designated? [6]
- b)** A single row deep groove ball bearing operates with following work cycle. [10]

Type of load	Thrust load(N)	Radial load(N)	Service factor	Speed RPM	Fraction of cycle
Heavy shocks	1200	2000	3	400	1/10
Light shocks	1000	1500	1.5	500	1/10
Moderate shocks	1500	1000	2	600	1/5
No shocks	2000	1200	1	800	Remaining

Assume radial and axial load factors to be 1 and 1.5 respectively and inner race rotates. If the expected life of the bearing is 15000 hours with reliability of 95%. Select the bearing from SKF's manufacturer's catalogue based on 90% reliability. If there are 8 such bearings in the system, what is the probability that all bearings will survive for 15000 hours. Data for bearing selection

SKF Bearing No	6015	6215	6315	6415
Dynamic load capacity (KN)	31	52	90	120

$$\text{Use } L/L_{10} = 4.48 (\ln (1/R))^{1/1.5}$$

- Q7) a)** State and explain, factors to be considered while selecting the type of gear drive for given application. [4]
- b)** A pair of spur gear with 20° pressure angles consists of 25 teeth pinion meshing with 60 teeth gear. The module is 5 mm while the face width is 45 mm. The pinion rotates 500 rpm. The gear pair is made 0 steel ($S_{ut} = 600 \text{ N/mm}^2$) and heat treated to a surface hardness 220 BHN. Assume dynamic load accounted by velocity factor. The service factor and factor of safety are 1.75 and 2.0 respectively while load deformation factor is unity. Calculate [12]
- Beam strength.
 - Wear strength.
 - Static load that the gear can transmit.
 - Rated power that can be transmitted by gear.

Use following data : Velocity factor – $C_v = \frac{3}{3+V}$

- Lewis form factor – $Y = 0.484 - \frac{2.87}{Z}$

- Load stress factor – $K = 0.16 \left[\frac{BHN}{100} \right]^2 \frac{N}{mm^2}$

Q8) Write short note on the following (Any three) :

[18]

- a) Nipping of leaf spring
- b) Preloading in rolling contact bearings
- c) Pitting failure its causes and remedies
- d) Optimum design of helical spring



Total No. of Questions :8]

[Total No. of Pages :2

P1554

[4065] - 544

M.E. (Mechanical) (Mechatronics)

EMBEDDED SYSTEMS

(2008 Course) (Elective - IV) (502812 (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 must be written in separate answer books.*
- 3) Figures to the right indicate full marks.*

SECTION - I

- Q1)** a) Explain the 802. 11 architecture. **[8]**
b) Explain and compare are different types of memories. **[8]**
- Q2)** a) Explain the protocol architecture of Bluetooth. **[8]**
b) Differentiate between an embedded operating system and conventional operating system. **[8]**
- Q3)** a) Explain different types of processors. How selection of processor plays an important role in design of embedded system. **[8]**
b) Explain the necessity of EDA tools for embedded system development. Explain with example how commercial development tools are used for design. **[8]**
- Q4)** Write short notes on: **[18]**
a) Design Metrics
b) CAN
c) MODBUS.

P.T.O.

SECTION - II

- Q5)** a) Differentiate between General Purpose Operating System(GPOS) and real time operating system(RTOS). [8]
b) Explain interrupt routines in an RTOS environment. [8]
- Q6)** a) Explain round robin architecture. What are its disadvantages? [8]
b) Explain the objects of an operating system kernel. [8]
- Q7)** a) Explain with a neat diagram of an Adaptive Cruise Control system in a car. [8]
b) With the help of block diagram explain design of digital camera. [8]
- Q8)** Write short notes on: [18]
a) RFID
b) smart Card
c) Symbain Operating System



P1555

[4065] - 551

M.E. (Mechanical) (Automotive Engineering)

FINITE ELEMENT METHOD

(2010 Course) (502302(b)) (Elective - I)

Time : 3 Hours]

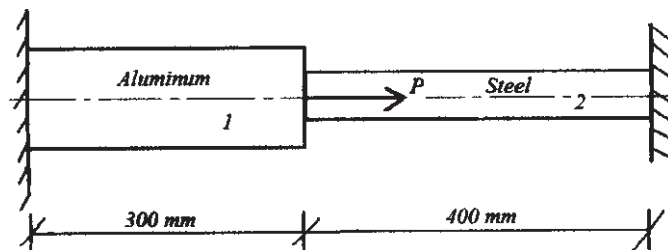
[Max. Marks :100

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) Figures to the right indicate full marks.
- 4) Use of electronic calculator is allowed.
- 5) Assume suitable data, if necessary.

SECTION - I

- Q1)** a) What is shape function? Explain it with respect to a typical three node quadratic element with figure. [8]
- b) Explain the following methods for finding an approximate solution to the engineering problems : [8]
- i) Rayleigh-Ritz
 - ii) Galerkin
- Q2)** a) Explain, with suitable examples, the plane stress and plane strain condition. [6]
- b) Consider the bar as shown in the figure. An axial load of $P = 200$ kN is applied as shown. Determine : [10]
- i) The nodal displacement
 - ii) The stresses in each element
 - iii) The Reaction Forces.



$$A_1 = 2400 \text{ mm}^2$$

$$A_2 = 600 \text{ mm}^2$$

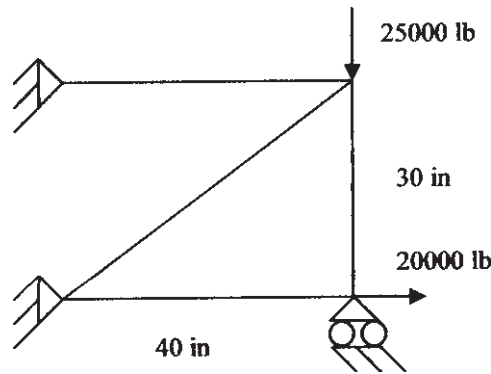
$$E_1 = 70 \times 10^9 \text{ N/m}^2$$

$$E_2 = 200 \times 10^9 \text{ N/m}^2$$

P.T.O.

- Q3)** a) What is degree of freedom? Draw following elements with their dof :**[8]**
 i) Quad 4 ii) Tetra 10 iii) Beam element.
 b) Discuss the Problem Modeling and Boundary Conditions for the following cases :
 i) A seating chair when a person is seating on it.
 ii) A pressure vessel just kept freely on the ground and subjected to internal pressure.
 iii) A simply supported beam. **[8]**

- Q4)** a) What are various quality checks for meshing and why are they needed?**[6]**
 b) Consider the four bar truss shown in the figure. It is given that $E = 29.5 \times 10^6$ psi and $A = 1$ in² for all elements. **[12]**
 i) Using elimination approach, solve for the global displacement vectro.
 ii) Evaluate stress in each element.
 iii) Determine the reaction force at support.



SECTION - II

- Q5)** a) What are symmetric boundary conditions? Can we use it for dynamic analysis? **[4]**
 b) How to reduce meshing time when project time is very short. **[6]**
 c) State the properties of the global stiffness matrix. **[6]**
- Q6)** a) Explain elimination approach and penalty approach with reference to Finite Element Method. **[8]**
 b) Consider the truss element having nodes at (10, 10) and (50, 40), $E = 30 \times 10^6$ psi, and $A = 2.1$ in². If $q = [1.5, 1.0, 2.1, 4.3] \times 10^2$, determine the following : **[8]**
 i) The vector q'
 ii) The stress in the element
 iii) The k matrix and
 iv) The strain energy in the element

- Q7)** a) What is the transformation matrix? Obtain the transformation matrix for the two dimensional plane truss element. [6]
b) A constant strain triangle element is defined by three nodes at (1.5, 2), (7, 3.5) and (4, 7). Evaluate the shape functions N_1 , N_2 and N_3 at the interior point P (3.85, 4.8). Also determine the Jacobian of the transformation J. [10]
- Q8)** a) Sketch and explain the Quadrilateral element in x-y and ξ - η space. [4]
b) How effect of temperature is taken care in Finite Element Analysis in a spar or link element. [6]
c) The triangular element is defined by three nodes located at (1, 1), (4, 2) and (3, 5). For a point P located inside the element, the shape functions are $N_1 = 0.15$ and $N_2 = 0.25$. Determine the x and y-coordinates of point P. [6]
- Q9)** Write a short note on [18]
a) Difference in Average and Unaverage stress.
b) Applications of FEA
c) Properties of stiffness matrix



P1559

[4065] - 569

**M.E. (Electrical) (Control Systems)
MODELLING OF DYNAMIC SYSTEM
(2008 Course) (Elective - I) (503104(b))**

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

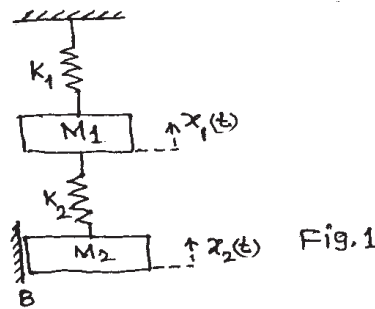
- 1) Answer any two questions from each section.*
- 2) Answers to the two sections should be written in separate answer books .*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Figures to the right indicate full marks.*
- 5) Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) What are dynamic systems? Explain with suitable example any dynamic system and define the terms associated with the dynamic system. [9]
- b) Give the classification of models of Dynamic system. What are the techniques used for system modelling? [8]
- c) State the D'Alembert's principle and explain its application in the system modelling and analysis. [8]
- Q2)** a) Explain in detail the effect of following properties of fluids on the dynamics of the fluid system : [8]
- i) Viscosity
 - ii) Density
 - iii) Propagation of speed, and
 - iv) Temperature (thermal properties).
- b) Explain clearly any one static thermal system. How to carry out the circuit analysis of such a system? [9]
- c) Explain in detail the following concepts : [8]
- i) Thermal Resistance.
 - ii) Thermal Capacitance.
- Q3)** a) Explain with suitable example the analogy between the mechanical system and corresponding analogous electrical system. [8]

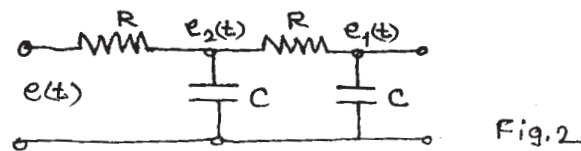
P.T.O.

- b) Consider the mechanical system shown in fig. 1. Derive the differential equation for the mechanical system relating the initial conditions (which are initial spring displacements) to the displacement $x_1(t)$ and $x_2(t)$. Where K = spring constant; B = coefficient of viscous friction; and M = mass. [8]



- c) Consider the electrical system shown in Fig. 2. Write the differential equation relating $e_1(t)$ to input $e(t)$. [9]

Assume $R = 1 \text{ M } \Omega$ and $C = 1 \text{ } \mu\text{F}$.



SECTION - II

- Q4)** a) What are the limitations of analog simulation methods? State the advantages of analog simulation. [8]
 b) State the various digital simulation techniques. Explain any one specific digital simulation technique for finding the generalised response. [8]
 c) Define convolution integral. Outline the procedure for obtaining response to arbitrary inputs with known impulse response. [9]
- Q5)** a) Explain in detail any one multiple regression and Least Square Method for modelling. [9]
 b) Explain with suitable example the method of subsystem coupling. [8]
 c) Discuss the following generalised modelling methods. [8]
 i) Parameter Tracking method.
 ii) Random signal testing method.
- Q6)** a) Explain magnetic levitation system for an experimental rail vehicle considering it as distribution parameter model. [9]
 b) Obtain the distributed parameter model in case of heat translation by conduction in an Insulated Bar. [8]
 c) Discuss in detail the Lumped parameter approximations for vibrations of a rod. [8]



P1561**[4065] - 600****M.E. (Electrical) (Power Electronics & Drives)****DSP AND ITS APPLICATIONS IN ELECTRICAL DRIVES****(2008 Course) (503304(a)) (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) Explain continuous time and discrete time signal. Also give the detail classification of discrete time signals. **[8]**
- b) Determine the response of the system whose input $x(n)$ and unit sample response $h(n)$ is given as follows

$$x(n) = \begin{cases} \frac{1}{3}n & \text{for } 0 \leq n \leq 6 \\ 0 & \text{elsewhere} \end{cases}$$

$$h(n) = \begin{cases} 1 & \text{for } -2 \leq n \leq 2 \\ 0 & \text{elsewhere} \end{cases} \quad \mathbf{[8]}$$

- c) What is z-transform and its ROC? Explain any three properties of z-transform. **[9]**

- Q2)** a) Explain sampling theorem, Nyquist rate and anti aliasing filter. **[8]**
- b) Compute circular convolution of following sequences using matrix approach

$$x_1(n) = \{2, 1, 2, 1\} \text{ and } x_2(n) = \{1, 2, 3, 4\} \quad \mathbf{[8]}$$

- c) Determine z-transform of causal cosine sequence which is given as

$$x(n) = \cos(\omega_0 n) \cdot u(n)$$

Hence also find z-transform of

$$x(n) = a^n \cos(\omega_0 n) \cdot u(n) \quad \mathbf{[9]}$$

P.T.O.

Q3) a) Determine inverse z-transform of following function [8]

$$X(z) = \frac{1}{1 - \frac{3}{2}z^{-1} + \frac{1}{2}z^{-2}}$$

Given that ROC $|z| > 1$.

- b) Compute 4-point DFT of following sequence $x(n) = \{0, 1, 2, 3\}$. [8]
c) Explain radix-2 DIT-FFT algorithm in detail. [9]

SECTION - II

- Q4) a)** Explain direct form-I and direct form-II for realization of IIR filter. [8]
b) Write short note on : [9]
i) DAC incompact Hi-Fi system.
ii) MultiMate narrow band digital filter.
iii) High resolution narrow band spectrum analysis.

c) If $H_a(s) = \frac{1}{(s+1)(s+2)}$. Find corresponding $H(z)$ using Impulse Invariance method for sampling frequency 5 samples/sec. [8]

- Q5) a)** Give difference between FIR and IIR digital filters. [8]
b) Design symmetric FIR low-pass filter whose desired frequency response is given as

$$H_d(\omega) = \begin{cases} e^{-j3\omega} & \text{for } |\omega| \leq \omega_c \\ 0 & \text{otherwise} \end{cases}$$

The length of filter should be and $\omega_c = 1$ rad/sample. Use rectangular window. [9]

c) Give difference between DSP and general purpose microprocessor. [8]

Q6) Write short note on (any Four) : [25]

- a) Application of DSP in transformer protection.
b) MAC and DAG.
c) Standard architectures of DSP.
d) Application of DSP in induction motor control.
e) Application of DSP in digital over-current relay.



Total No. of Questions :8]

[Total No. of Pages :2

P1562

[4065] - 610

**M.E. (E&TC) (Microwave)
COMMUNICATION NETWORKS
(2008 Course) (504224(C)) (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) *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 different Network performance parameters Cost, Delay & Utilization. Also explain the relationship between them briefly. [4]
b) Explain the structure of Network Design tool briefly. [4]
c) Explain the different Layers of 802.15 Standard. [4]
d) Explain Piconet and Scatternet in Bluetooth System. [4]
- Q2)** a) A 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 9600bps channel. A character is 8 bits long. [4]
Calculate i) average service time T_s
ii) What is arrival rate A
iii) What is Service rate D
iv) What is utilization of server U
- b) Explain POISSON-(MOLINA) function. [4]
c) What are the different routing algorithms and explain anyone of them. [8]
- Q3)** a) Explain the Frame relay layers and Frame relay Frame format in detail. [8]
b) What are the different Features of Frame Relay. [4]
c) What is concept of CELL in A TM networks? [4]

P.T.O.

- Q4)** Write short note on any three : **[18]**
- a) TP, VPs and VCs in ATM Networks.
 - b) DCF and PCF in 802.11 standard.
 - c) IPV -6 header.
 - d) Erlang-B function.

SECTION - II

- Q5)** a) Explain the different DNS component. **[4]**
b) Explain IP Fragmentation with typical example. **[6]**
c) Explain streaming stored Audio/Video communication approaches. **[6]**

- Q6)** a) Draw and Explain RTP packet format. **[8]**
b) 24 terminals share a 9600 bps line. Each terminal sends an average of 10msg/min over the line. The message lengths are exponentially distributed with an average length of 2000 bits. **[4]**
Calculate i) A verage time that a message spends in system Ts
 ii) What is arrival rate A
 iii) Total time in the system T
 iv) What is utilization of server U
c) Write a short note on SNMP management components. **[4]**

- Q7)** a) Explain Triple DES algorithm briefly. **[4]**
b) We are given three system. All have 50% utilizations. All have average message lengths of 1400 bits. The first has exponentially distributed message lengths. The second has constant 1400 bits message length. In the third, half the messages are 400 bits long and the other half are 2400 bits long. **[4]**
Calculate i) What is arrival rate A
 ii) The mean service time E(S)
 iii) The waiting time Tw for first case
 iv) The waiting time Tw for second case
c) Explain the different Network Design Issues. **[8]**

- Q8)** Write short note on any three : **[18]**
- a) SIP (Session initiation protocol).
 - b) Network monitoring & Protocol Analyzer.
 - c) Firewall.
 - d) Video Conferencing.



Total No. of Questions : 8]

[Total No. of Pages :2

P1569

[4065] - 696

M.E. (Electronics & Telecommunication) Communication Networks

NEURAL NETWORKS IN COMMUNICATION

(2008 Course) (Elective - IV) (504611)

Time : 3 Hours]

[Max. Marks :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) Explain in detail the architecture of neural networks. [8]
b) Derive the Hebbian and Perceptron learning rule. [8]
- Q2)** a) State and explain activation functions which are used in single layer and multilayer net to calculate the output. [8]
b) Generate the output of Exclusive-OR logic function using McCulloch-Pitts neuron. [8]
- Q3)** a) Explain the architecture of single layer perceptron network. Describe the algorithm used for training of the perceptron net. [8]
b) Develop a perceptron for the AND function with bipolar inputs and targets. [10]
- Q4)** a) Describe in detail the problem of congestion control in packet switching networks. How this problem can be solved using the neural networks? [8]
b) Explain in detail how the static and dynamic channel assignment can be done using simulated annealing. [8]

P.T.O.

SECTION - II

Q5) a) Draw the architecture of a Bi-directional Associative Memory (BAM) network and discuss in detail the training algorithm. [8]

b) A hetero associative net is trained by Hebb outer product rule. Find the weight matrix. [8]

$$S_1 = (1 \ 1 \ 0 \ 0) \quad t_1 = (1 \ 0)$$

$$S_2 = (0 \ 1 \ 0 \ 0) \quad t_2 = (1 \ 0)$$

$$S_3 = (0 \ 0 \ 1 \ 1) \quad t_3 = (0 \ 1)$$

$$S_4 = (0 \ 0 \ 1 \ 0) \quad t_4 = (0 \ 1)$$

Q6) a) Define feedback networks. Explain the discrete Hopfield network with its architecture. [8]

b) What is back propagation network? Describe in detail the training algorithm used in the back propagation network. Comment on the selection of parameters used in training. [8]

Q7) a) How is competition performed using neural networks? With architecture, explain the training algorithm used in Kohonen self organizing feature map. [8]

b) What is the basic concept of switching theory? Describe the different neural approaches to switching. [8]

Q8) Write short notes on (ANY THREE): [18]

a) Neocognitron

b) Neural Network channel equalization

c) Applications of neural network in Telecommunication

d) Adaptive resonance theory

e) Optical neural networks



Total No. of Questions :6]

[Total No. of Pages :2

P1570

[4065] - 718

M.E. (Production Engineering)

INTELLECTUAL PROPERTY RIGHTS & PRODUCT DESIGN

(2008 Course) (51112 (c)) (Elective - IV)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Figures to the right indicate full marks.*
- 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) Explain with suitable example the need to imbibe intellectual property rights for design of any product. [8]
- b) Explain the difference of purposes for Patents, Designs, Trademarks and Copyright. [8]

OR

Explain Process of Patenting and Development in india. [16]

- Q2)** Which is the appropriate office in India in relation to international applications for patenting? What are the other advantages of joining the Paris Convention? [16]

OR

What is patent cooperation treaty (PCT)? What is the need for PCT ? How are patent applications under PCT handled? What is the cost of filing a PCT application? [16]

P.T.O.

Q3) Is a patent granted in one country enforceable in other countries? What do you understand by the right of priority and what is its significance with regards to patenting rights? **[18]**

OR

What is the nature of information needed while consulting a patent attorney? Explain Novelty Inventiveness (Non-obviousness) Usefulness to be satisfied by an invention to be patentable? **[18]**

SECTION - II

Q4) What are the legislations covering IPRs in India? Who are responsible for administration of IPRs in the country? Provide suitable examples of manufacturing. **[16]**

OR

What does the term 'Geographical Indications (GI)' stand for? Who is a registered proprietor of a geographical indication? **[16]**

Q5) Explain Principal requirements of good product design along with Factors and considerations affecting product design. **[16]**

OR

Explain Ergonomic factor in product design for Product design methodology and techniques. **[16]**

Q6) Write details for Standards related to Materials, forms, functions, color, graphics, product development and testing. **[18]**

OR

Explain following for Product Design Standards **[18]**

- a) Packaging materials their characteristics and applications.
- b) Packaging design considerations.



Total No. of Questions :6]

[Total No. of Pages :2

P1571

[4065] - 719

M.E. (Production)

ENERGY MANAGEMENT

(2008 Course) (51112 (d)) (Elective - IV)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) Solve section I & section II in separate answer books.*
- 2) All questions are compulsory.*
- 3) Figures to the right indicate full marks.*

SECTION - I

- Q1)** a) Write a short note on energy scenario of India and discuss load management. **[9]**
- b) Explain the following terms: **[9]**
- i) Net Present value
 - ii) Time value of money
 - iii) Return on investment
- Q2)** a) Describe portable and online instruments used in energy audit. **[8]**
- b) Write a note on insulation giving examples. Discuss the concept of economic thickness of insulation with example. **[8]**
- Q3)** a) Write an expression for calculating boiler efficiency by direct and indirect method for a coal fired boiler explaining the terms involved. **[8]**
- b) With neat labeled diagram any mechanical type steam trap. **[8]**

P.T.O.

SECTION - II

- Q4)** a) Write a note on energy efficient illumination. [9]
b) Discuss the losses in electrical motors. How do energy efficient motors overcome them? [9]
- Q5)** a) List the energy saving opportunities in pumping systems. [8]
b) Discuss the energy saving opportunities in refrigeration and air-conditioning systems. [8]
- Q6)** Discuss the following cogeneration options with sketches and applications.
a) Steam turbine based cogeneration system. [8]
b) Gas turbine based cogeneration system. [8]



Total No. of Questions :8]

[Total No. of Pages :2

P1572

[4065] - 739

**M.E. (Production) (CAD/CAM)
TECHNOLOGY MANAGEMENT
(2008 Course) (Elective - IV) (511212)**

Time : 3 Hours]

[Max. Marks :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 in brief Concept of Technology Management. How is it interdisciplinary? **[8]**
b) Discuss the key principles for developing technology strategy. **[8]**
- Q2)** a) Explain in brief various types of organizational structure for promotion of creativity & innovation. **[8]**
b) Explain the following: **[8]**
i) Process technology and product technology.
ii) Role of government in technology management
- Q3)** a) What are the various channels of technology transfer? **[8]**
b) Explain in detail steps used to adopt an appropriate technology. Justify with suitable example. **[8]**
- Q4)** Write short notes on any three: **[18]**
a) Models of management of technology
b) Challenges of commercialization of research
c) Success and failure factors in technology transfer
d) Integration of technology strategy and business strategy

P.T.O.

SECTION - II

- Q5)** a) What are broad steps to be followed in procedure for world patenting? [8]
b) Describe the role of WTO in international business. [8]
- Q6)** a) Differentiate between innovation and research. What are the objectives of innovation foundation? [8]
b) Explain various government schemes for development of science & technology infrastructure? [8]
- Q7)** a) Discuss co-relations for functional capability and level of innovation in technology assessment. [8]
b) Explain the procedural steps followed in Analytical Hierarchical Process (AHP). How weightings are decided? [8]
- Q8)** Write short notes on any three: [18]
a) IPR
b) Items which cannot be patented
c) Technological leadership
d) Limitations of AHP



P1573

[4065] - 748

M.E. (Computer Engg.)

MOBILE COMPUTING

(510104(d)) (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 answer books.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Figures to the right indicate full marks.*
- 5) Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) What are the steps in the establishment of a MS (Mobile Station) to MS call Within the same BSC (Base Station Controller). Explain the call set up drawing a suitable signal and response diagram.
- b) Define the functions performed within the following procedures:
- i) IMSI attach IMSI detach
 - ii) Location Update **[16]**
- Q2)** Draw the basic reference architecture of 3GPP-R99 network. Show the architecture of the core network in it. Give a concise meaning of 3GPP-R99 and discuss the basic network architecture and the key network elements and interfaces. Particularly state in short the functions of Um interface to access GSM Bcc and Un interface to access UTRAN.
State functions of Authentication Center, Equipment Identity Register, SGSN,GMSC, GGSN and MSC **[16]**
- Q3)** a) Draw and explain the functions of various layers of protocol stack in Bluetooth.
- b) Illustrate the following application specific protocol stacks with suitable diagrams.
- i) protocol stack for implementing cordless telephone over Bluetooth.
 - ii) Protocol stack for implementing FTP over Bluetooth. **[18]**

P.T.O.

- Q4)** 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]

SECTION - II

Q5) Write short notes on the following : [18]

- a) Access Router
- b) Mobile Adhoc Network
- c) Mobile IP

Q6) a) Draw a diagram showing the expansion 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]

Q7) a) Describe an appropriate frequency hopping algorithm

b) State the reason for the use of frequency hopping in GSM systems. [16]

Q8) With respect to a MS explain the meaning of the following terms : [16]

- a) IMSI attached
- b) Roaming
- c) Location updating
- d) Handover
- e) Locating



P1578

[4065] - 760

M.E. (Computer)

SOFTWARE PROJECT MANAGEMENT

(2008 Course) (510112 (A))

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) *Answer three questions from section I and three questions from section II.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams 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 peer reviews.
b) What are the advantages of peer reviews.
c) Explain the process of peer reviews
d) What are the roles and responsibilities of various participants of peer reviews.

[16]

- Q2)** 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]

- Q3)** With respect to the task of organizing a project team identify the basic requirements of the following subtasks:

[16]

- a) Accessing internal skills
- b) Create roles and responsibility matrix
- c) Creating a team
- d) Defining project manager power
- e) Managing team issues

P.T.O.

- Q4)** Write short notes on the following: **[18]**
- a) Project Planning best practices
 - b) Proposals and Contracts
 - c) Work breakdown structure

SECTION - II

- Q5)** 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]**

- Q6)** Write short notes on the following: **[18]**
- a) Project risk management
 - b) Configuration Management
 - c) Client Management Issues.

- Q7)** a) A leader must recognize how teams form in order to lead them properly. Describe a well known model of team formation. Give details of the five stages of the team formation model.
b) Give flow chart of a typical functional organization and state its advantages. **[16]**

- Q8)** Discuss the use of critical path network and precedence network to obtain an ideal activity plan which tells us the order in which we should execute activities and the earliest and latest we can start and finish them. **[16]**



Total No. of Questions :8]

[Total No. of Pages :2

P1579

[4065] - 761

**M.E. (Computer Engineering)
INFRASTRUCTURE MANAGEMENT
(2008 Course) (510112 (B)) (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) Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) State why organizations implement ITIL best practices. What are the benefits of these practices?
b) What is the ROI (Return on Investment) of implementing ITIL? [16]
- Q2)** a) What are the issues in the design of a corporate security policy? Distinguish between physical and logical security controls?
b) What are the characteristics of traffic in an organization? How will you ensure that traffic on your network is valid? [16]
- Q3)** Describe in detail the following process steps of change management and factors critical to its success: [18]
a) Procedures for handling changes
b) Roles and responsibilities of the IT support staff
c) Measurements for change management
- Q4)** “Internet Protocol (IP) is such that anyone can ‘sniff’ or read your email.” Comment on the above statement taking into account Internet Service Providers using LANs. What precautions a service provider and a user of internet has to take for ensuring security of their mail? [16]

P.T.O.

SECTION - II

- Q5)** a) Draw schematic diagram of the following types of service providers:
Type I - Internal Service Provider
Type II - Shared service unit
Type III - External Service Provider
- b) Discuss the advantages and disadvantages of the various types of service providers mentioned in (a). **[16]**
- Q6)** List various steps necessary for implementing an effective production acceptance process. Out of these give details of the following steps: **[16]**
- a) Identify and prioritize requirements.
b) Nominate and execute the pilot system.
c) Formulate marketing strategy.
- Q7)** State what is meant by ITIL service level management.
State five of the various service level management activities.
What are the immediate benefits of implementing SLM processes. How is the right balance of service and associated cost to provision it are obtained? **[16]**
- Q8)** a) State what is meant by an incident in the context of IT services.
b) How do the service level workers respond to each incident reported by customers and users? What are the various applications used by service level workers while searching solutions to incidents?
c) State and explain various desirable features (at least FIVE) of an incident management system. **[18]**



Total No. of Questions :8]

[Total No. of Pages :2

P1599

[4065] - 496

M.E. (Mechanical-Heat Power)

ENERGY CONSERVATION AND MANAGEMENT

(502104(c)) (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 answer books.*
- 3) Neat diagram must be drawn wherever necessary.*
- 4) Figures to the right indicate full marks.*
- 5) Use of calculator Log tables and electronic calculator is allowed.*

SECTION - I

- Q1)** a) Explain the steps involved in energy planning in of the Energy Management system. **[8]**
b) What is the significance of energy conservation act 2003? Enlist the various steps involved in implementation of the energy management in an organization. **[8]**
- Q2)** a) Explain the role of training and awareness in energy management program. **[8]**
b) What are the roles of Energy Manager and Energy Auditor in energy management program? **[8]**
- Q3)** a) With the help of example explain payback period and life cycle costing. **[8]**
b) Write in short the steps involved in energy audit of Steam Power Plant. **[8]**
- Q4)** Write a short note on (Any three) : **[18]**
a) Conventional and non conventional Sources of Energy.
b) Energy audit of air compressor.
c) Energy analysis of furnace system.
d) Energy audit (Types and Methodology).
e) Instruments used in energy audit.

P.T.O.

SECTION - II

- Q5)** Explain briefly any four of the following : **[18]**
- a) Electricity Act 2003.
 - b) Energy efficient motors.
 - c) Demand side management.
 - d) Efficiency Testing of electric motors.
 - e) Power factor improvement and benefits.
- Q6)**
- a) Explain the following basic terms used in lighting systems. Incandescent lamps, Reflector lamps, Gas discharge lamps, Luminaire, Ballasts & Ignitons, Illuminance, Luminous efficacy and colour Rendering Index. **[8]**
 - b) Work out the energy saving achieved and simple pay back period when 20 incandscnt lamps (40w) are replaced by gw cfis. Cfis offer the same lamen output. Assume 10 hrs of daily use and energy charge is Rs. 4.00/ kWh. Investment required for this Rs. 2000. **[4]**
 - c) Explain : Day lighting and energy efficient windows. **[4]**
- Q7)**
- a) Write notes on (any two) : **[8]**
 - i) Heat wheels.
 - ii) Heat pumps.
 - iii) Waste heat recovery.
 - b) Discuss the energy saving opportunities in **[8]**
 - i) HVAC and refrigeration systems.
 - ii) Compressed air systems.
- Q8)** Explain the Topping cycle and Bottoming cycle of cogeneration. Discuss the steam turbine cogeneration systems. List the advantages and disadvantages of cogeneration systems. Discuss the scope of cogeneration in solving present energy problem in out state. **[16]**



Total No. of Questions :8]

[Total No. of Pages :2

P1601

[4065] - 812

M.E. (Chemical) (Environmental Engineering)

SOLID WASTE MANAGEMENT

(Sem. - II) (2008 Course) (509139)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) What are the objectives and functional elements of solid waste management? [8]
b) Explain the hierarchy of integrated solid waste management. [8]
- Q2)** a) Discuss the factors affecting storage and collection of solid wastes. [8]
b) What are the means and methods for transportation of solid waste? [8]
- Q3)** Discuss the following in details : [16]
a) Typical material recovery facility for commingled solid waste.
b) Performance characteristics of size reduction equipments used for solid waste.
- Q4)** Explain the principle, construction and working of the following with neat diagrams : [18]
a) Waste Heat Boilers.
b) Biomethanation.
c) Incineration.

P.T.O.

SECTION - II

- Q5)** a) What are the types of landfills? Explain the site selection and methods of landfilling. [8]
b) Discuss the leachate and landfill gas management. [8]

Q6) What are the various elements of financial management plan for solid waste system. [16]

Q7) For solid waste disposal site, the avg.-speed data obtained is : [16]

Distance X, km/trip	5	10	15	20	25	30
Avg. Haul speed, Y, km/hr	15	20	25	32	36	40
Total Time, hr.	0.33	0.5	0.6	0.625	0.7	0.75

Find the haul speed constants “a” and “b” and the total time for site located at 22 km away.

- Q8)** Write short notes on : [18]
a) Fluidized bed combustion.
b) Vermicomposting.
c) Pyrolysis.



Total No. of Questions :8]

[Total No. of Pages :2

P1602

[4065] - 672

M.E. (Electronics) (Digital Systems)
COMMUNICATION NETWORK AND SECURITY
(Sem. - II) (2008 Course) (504202)

Time : 3 Hours]

[Max. Marks :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) Compare and contrast passive and active security attacks and security threats. **[4]**
- b) Briefly explain: **[8]**
- i) Caesar Cipher
 - ii) Mono alphabetic Cipher
 - iii) Playfair Cipher
 - iv) Transposition Cipher
- c) What is the difference between confusion and diffusion? **[4]**
- Q2)** a) What is the difference between the AES decryption algorithm and the equivalent? inverse cipher? **[4]**
- b) List important design considerations for a stream cipher. **[8]**
- c) What are the principle elements of a public key cryptosystem? Hence explain the roles of public and private key. **[4]**
- Q3)** a) Demonstrate RSA public key encryption and decryption algorithm with suitable example. **[8]**
- b) Describe Diffie-Hellman key exchange algorithm is secured against man-in-the-middle attack? Justify your answer. **[8]**

P.T.O.

- Q4)** a) What is the difference between MAC and a one-way hash function? [4]
b) In a public key system using RSA, you intercept the cipher text $C = 10$ sent to a user whose public key is $e = 5$, $n = 35$. What is plain text M ? [4]
c) Describe message digest generation using SHA-512. [4]
d) Enlist the requirements for a digital signature. What is Direct and Arbitrated digital signature? [6]

SECTION - II

- Q5)** a) How mobility is restricted using WLANs? What additional elements are needed for roaming between networks, how and where can WLAN support roaming? In your answer, think of the capabilities of layer 2 where WLANs reside. [9]
b) Compare IEEE 802.11, HiperLAN2 and Bluetooth with regard to their ad-hoc capabilities. [9]
- Q6)** a) Explain packet flow if two mobile nodes communicate and both are in foreign networks. [4]
b) What additional routes do packets take if reverse tunneling is required? [4]
c) List the entities of mobile IP and describe data transfer from a mobile node to a fixed node and vice versa. Why and where is encapsulation needed? [8]
- Q7)** a) Explain MIME. What is S/MIME? [4]
b) Explain X.509 authentication service. [4]
c) Define and explain coverage and exposure problem in quality of a sensor network. What are the techniques used to solve these problems? [8]
- Q8)** Write short note on: [16]
a) MAC protocol for sensor networks.
b) Self organizing MAC
c) Hybrid TDMA/CDMA
d) CSMA based MAC



Total No. of Questions : 10]

[Total No. of Pages : 2

P1604

[4065]-557

M.E. (Mechanical) (Automotive Engineering)

AUTOTRONICS

(2008 Course) (502307) (Sem. - II)

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) *Figures to the right indicate full marks.*
- 3) *Draw neat sketches figures wherever necessary.*

SECTION - I

- Q1)** a) Write a short note on Microprocessor applications in automobiles. [8]
b) Describe four main components of engine management system. [8]
- Q2)** a) Explain Crank angle position sensor and throttle position sensor with important specifications. [8]
b) Define Open loop and Closed loop system with suitable example in automobiles. [8]
- Q3)** a) Explain with a neat block diagram Multi Point Fuel Injection System. [8]
b) Explain fuel metering, vehicle speed sensors and detonation sensors. [8]
- Q4)** a) Explain the electronic management of chassis system. [10]
b) Write a short note on electronic governors. [8]
- Q5)** a) Describe in brief basic sensor arrangement in Engine Management System. [8]
b) Explain electronic spark timing control in petrol engines. [8]

P.T.O.

SECTION - II

- Q6)** a) Explain the recent trends in Wipers. [8]
b) Discuss in brief Engine cooling and Warm-up control. [8]
- Q7)** a) Discuss the comfort aspects of Seats in luxury cars. [8]
b) Explain the recent trends in central locking and electronic windows. [8]
- Q8)** a) acceleration, deceleration and idle speed. [8]
b) Write a short note on Batteries and regulation for charging. [8]
- Q9)** a) What are the aspects of Onboard diagnosis system. [8]
b) Discuss in brief dashboard instruments with respect to warning system and safety devices. [10]
- Q10)** a) Explain with neat block diagram the Common Rail Diesel injection system. [8]
b) Discuss the safety and comfort features of Airbag and Belt tensioners. [8]



P1607

[4065] - 50

**M.E. (Mechanical Heat Power Engg.)
ADVANCED THERMODYNAMICS
(2002 Course) (502103)**

Time : 3 Hours]

[Max. Marks :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) Explain the Vander waal's equation of state. Obtain this equation in reduced form. **[8]**
- b) Explain the generalized compressibility chart. Also discuss its use with suitable examples. **[8]**
- Q2)** a) Explain availability, irreversibility & entropy production during thermodynamic processes. **[6]**
- b) An adiabatic turbine is supplied with air at 5 bar, 400 k & 100 m/s. Air is exhausted at 1 bar and 27°C with a velocity of 50 m/s.
- Calculate : -
- i) actual work done per kg of air.
 - ii) Irreversibility. **[10]**
- Q3)** a) Discuss the following :
- i) Triple point of water.
 - ii) Slope of fusion curve for water and other substance, with a suitable p-T curve. **[6]**
- b) State the utility of claypeyron's equation. Discuss with suitable examples. **[10]**

P.T.O.

- Q4)** Write short notes on (any three) : **[18]**
- a) Inversion curve.
 - b) Gibb's phase rule.
 - c) Third law of thermodynamics.
 - d) Clausius In equality.

SECTION - II

- Q5)** a) What is adiabatic flame temperature? Discuss the effect of air fuel ratio on the same. **[7]**
- b) Explain :
- i) Mass fraction & mole fraction.
 - ii) Fugacity & activity.
 - iii) Enthalpy of formation. **[9]**
- Q6)** a) 6.4 kg oxygen and 22.4 kg of nitrogen are mixed adiabatically. Find :
- i) Mass fraction & mole fraction of oxygen and nitrogen.
 - ii) Irreversibility due to mixing. **[8]**
- b) Explain :
- i) Amagat's law
 - ii) Kay's rule
 - iii) Dalton's law of partial pressure. **[8]**
- Q7)** a) Octane (C_8H_{18}) liquid fuel is burned with 50% excess air. Calculate :
- i) Volumetric and gravimetric composition of flue gases.
 - ii) Dew point temperature of water vapour in the flue gases. **[10]**
- b) Describe the concept of heat of reaction when it is positive and negative? **[6]**
- Q8)** Write notes on (any three) : **[18]**
- a) Equilibrium constant.
 - b) Gibb's function & Helmholtz function.
 - c) Bose-Einstein Statistics.
 - d) Fermi-Dirac Statistics.



P1609

[4065] - 404

**M.E. (Civil) (Construction Mgmt.)
NEW CONSTRUCTION MATERIALS
(2008 Course) (501104(a)) (Elective - I)**

Time : 4 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) Answer three questions from Section - I and three questions from Section - II.*
- 2) Answers to the two sections should be written in separate 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)** With a case study, explain the conventional as well as the modern methods used for testing and characterization of flyash. Discuss advantages of using modern methods. Enlist the norms suggested by the Government of Maharashtra as regards effective utilisation of flyash. **[18]**
- Q2)** With respect to CMRB and GFRC explain the following : **[16]**
- a) Manufacturing process.
 - b) Advantages
 - c) Tests to be performed and the expected performance parameters.
 - d) Major applications.
- Q3)** a) What are smart materials? Explain different types and application areas for each. **[10]**
- b) Explain properties in brief of any 3 construction chemicals. **[6]**
- Q4)** a) Which additional properties are required for the materials used for constructing nuclear reactors as compared with conventional materials? Why these properties are necessary? Which materials have a good Performance in the above aspects? Why? **[6]**
- b) With a neat labelled sketch, explain the experimental procedure of testing suitability of serpentine marble aggregate as a radiation shield material. **[6]**
- c) Explain why the use of Glenium, based on nano-technology, gives a TQC concept in concrete. **[4]**

P.T.O.

SECTION - II

- Q5)** a) With a neat labelled sketch, explain the production process of silica fume concrete. Write the chemical reaction and explain physical properties of silica fume. **[10]**
- b) Explain any 2 practical applications using silica fume concrete, covering aspects of mix design as well as the expected end results and whether these expectations were fulfilled. **[8]**
- Q6)** a) Define self compacting concrete. Explain how it differs from conventional concrete w.r.t. **[9]**
- i) Mix design
ii) Properties
iii) Constructability aspects
iv) Applications
- b) With a neat labelled sketch explain how the L box test is conducted on SCC. What is the purpose of this test? **[7]**
- Q7)** a) Explain the components of the patented material useful for soil stabilisation, presented at the Indo- U.S. International Conference held at IIT Kharagpur in 2009. Compare its properties with other conventional materials. Discuss advantages with help of case study. **[10]**
- b) Compare and contrast between steel fibers and carbon fibers as regards their use in FRC. **[6]**
- Q8)** a) What are eco-friendly materials? Explain in brief any 4 such materials used in building construction. **[9]**
- b) What is HPC? Where is it used? What are its advantages? **[7]**



Total No. of Questions :12]

[Total No. of Pages :2

P1610

[4065] - 568

M.E. (Electrical) (Control System)

AUTOMATION AND ROBOTICS

(2008 Course) (503104 (a)) (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 answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) Explain Exoskelton and telecheries. [8]

b) Explain various specification of robot. [8]

OR

Q2) a) Explain concept of Automation and their types. [8]

b) Explain Arm prostheses and Hand prostheses. [8]

Q3) a) Write the concept of Yaw, Pitch and Roll. [8]

b) Explain in detail robot classification according to coordinate system. [9]

OR

Q4) a) Explain various types of joints and various types of links. [8]

b) Explain in detail robot classification according to control methods. [9]

Q5) a) Explain in detail about Robot arc welding sensors. [10]

b) Write concept of online and offline programming. [7]

OR

Q6) a) Give selection criteria of robot, sensor used selection of drives and actuators and method of control for spray painting purpose. [10]

b) Classify robot specific languages on the basis of point to point level. [7]

P.T.O.

SECTION - II

- Q7)** a) Derive Euler-Lagrange equation for single link manipulator with gear ratio $n : L$. [10]
b) Explain how end effector rotary motion about an arbitrary axis can be achieved? [8]

OR

- Q8)** a) Write concept of 'Hand Matrix' and effect of pre and post multiplication of a hand matrix by basic matrix operator. [10]
b) Give the general procedure for formulation of Robot dynamics. For given forces and torques can we find the joint angle history? Justify your answer. [8]

- Q9)** a) Let a point $P_i = (0.5, 0.5, 0.5)^T$ is rotated along x, y, z axis simultaneously by an angle 30° , 45° and 60° respectively. Find the co-ordinates of final point p_f after rotation. [10]
b) Explain Translational Transformation for 2R manipulator. [6]

OR

- Q10)** a) For 2R Manipulator end effector moves from initial position to final position in 1 sec. Length of both links $l_1 = l_2 = 1\text{m}$. Initial and final coordinates are $P_i = (1.366, 1.366)$, $P_f = (-1.366, 1.366)$. Develop trajectory equations for Q_1 and Q_2 . [10]
b) Explain Rotational Transformation for 2R manipulator. [6]

- Q11)** a) Explain Torque and Force control of Robotic manipulator. [8]
b) What is Adoptive control. Draw a block diagram of Adoptive controller for a robot system. [8]

OR

- Q12)** a) How to control Robot manipulator using joint position control? [8]
b) How to control Robot manipulator using resolved motion rate control? [8]



P1613

[4065]-683

M.E. (E & TC) (Communication Networks)

MICROWAVE & ANTENNA THEORY

(2008 Course) (504603 (a)) (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 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) Explain with necessary diagram the principle of operation of two cavity Klystron. Draw applegate diagram & state typical applications of Klystron Amplifier. **[8]**
- b) Discuss the various modes of operation of Gunn diode. **[8]**
- Q2)** a) A Traveling wave tube (TWT) operates under the following parameters:
Beam voltage: $V_o = 3KV$. **[10]**
Beam current: $I_o = 30MA$
Characteristic impedance of helix: $Z_o = 10\Omega$
Circuit length: $N = 50$
Frequency: $F = 10GHz$
Determine:
i) gain parameter 'C'
ii) o/p power gain A_p in dB
iii) all four propagation constants.
- b) Justify, why solid state devices like BJT, FET, diodes cannot be used at microwave frequencies? **[6]**
- Q3)** a) Explain with neat sketches, constructional features of PIN diode & state applications of PIN diode? **[8]**
- b) Discuss the principle of operation of Magnetron. What is π mode of operation? **[8]**

P.T.O.

- Q4)** a) Explain the working of Microwave circulator using directional coupler. Write S matrix for circulator. [8]
 b) Explain the working of four port directional coupler. Define coupling factor & Directivity. [8]
- Q5)** a) Digital Telemetry Microwave Link has following parameters (Link used for 8 Mbps video data transmission)
 i) Distance: 30 Km
 ii) Frequency: 7 GHz.
 iii) FSK Receiver sensitivity: -88.88 dBm.
 iv) Total atmospheric loss: 0.052 dB/Km
 v) Connector / cable losses : 5dB (total)
 vi) Gain of Transmitting patch Antenna : 3 dB
 vii) Gain of Receiving Horn Antenna: 16 dB
 Calculate:
 i) Path loss
 ii) Transmitted power in watts & dBm. [12]
 Draw the block diagram for entire link & suggest typical dimensions required for patch Antenna & Horn Antenna. Assume suitable data if necessary.
- b) Discuss the role of MMIC's in microwave circuits. [6]

SECTION - II

- Q6)** a) Define the terms related to antennas [10]
 i) Antenna efficiency
 ii) Beam width
 iii) Directivity
 iv) Radiation resistance
 v) Gain.
 Write mathematical expressions for these parameters.
- b) A parabolic reflector antenna has diameter of 2 meter. Find gain & half power beamwidth at 6 GHz. Assume spillover efficiency (η) 80%. [6]
- Q7)** a) Design the rectangular micro strip antenna using substrate with dielectric constant of 2.2, $h = 0.1558$ cm. Frequency of operation at 10 GHz. Give the design procedure. [10]
 b) State various applications of microwaves. [6]

Q8) Discuss with constructional details. the following microwave devices.(Anytwo)

- a) MESFET [16]
- b) HBT
- c) HEMT

Q9) a) Design an optimum gain x-band (8.2-12.4 GHz) pyramidal horn so that its gain (above isotropic) at $f = 11$ GHz is 22.6 dB. The horn is fed by WR 90 rectangular waveguide with inner dimensions of $a = 2.286$ cm & $b = 1.016$ cm. [10]

- b) Explain in brief, concept of adaptive antenna array. [6]

Q10) Write notes on following antennas explaining, frequency of operation, constructional details, features, advantages, disadvantages applications & radiation pattern. [18]

- a) Cassegrain Antenna
- b) Microstrip Patch Antenna
- c) Lens Antenna.



P1618

[4065] - 67

M.E. (Mechanical) (Design Engineering)
MECHANICAL VIBRATIONS
(2002 Course) (502202)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) Answer three question from each section.
- 2) Answers 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 spring mass system shown in fig. 1 which is subjected to harmonic force $F \cos \omega t$. [17]

Given $x(0) = 0.01\text{m}$, $dx/dt(0) = 0.04\text{m/sec}$; $F = 1200\text{N}$; $m = 10\text{kg}$, $k = 350\text{N/m}$.

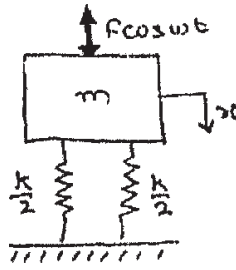


Fig.1

- Q2)** a) Explain Dynamic vibration absorber. [6]
 b) A bar fixed at one end is fig 2 pulled by force F at other end. The force is suddenly released. Investigate vibration of the bar. [11]

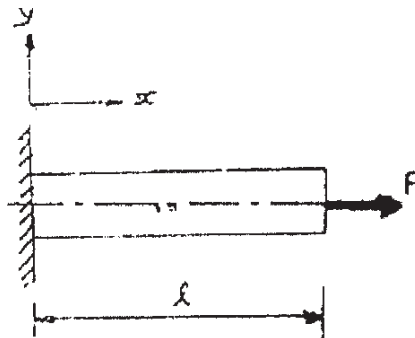


Fig 2

P.T.O.

Q3) A eccentric cam of eccentricity 'e' rotating with uniform angular velocity ' ω ' operated by follower of mass 'm' and length 'L', cross sectional area 'A' and youngs modulus of material 'E'. The push rod which acts as a spring has been compressed by an amount ' X_0 ' before assembly. Determine. [16]

- Equation of motion of follower.
- Force exerted on the follower by cam.
- Condition under which follower loses contact with cam.

Q4) The system shown in fig 3 subjected to a random input base motion which can be considered as a white noise of spectral density find spectraldensity of mass m_2 . [16]

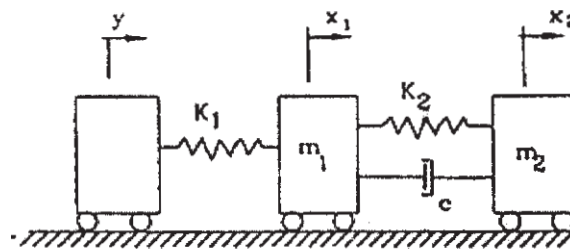


Fig 3

Q5) Explain any two: [16]

- Influence coefficient.
- Eigen values and eigen vector.
- Duhamels Integral.

SECTION - II

Q6) What are self excited vibrations. Compare self excited vibrations with forced vibrations. Give the example of self excited vibrations for mechanical system. Write down equation of motion and determine natural frequency of the system. [16]

Q7) Using duffings equation explain jump phenomenon for damped and undamped non linear system. [16]

Q8) For double pendulum system shown in fig. 4 formulate equation of motion applying Lagrange's Equation. Formulate equation in matrix form. Hence find the natural frequency and mode shapes through the method of matrix iteration. [16]

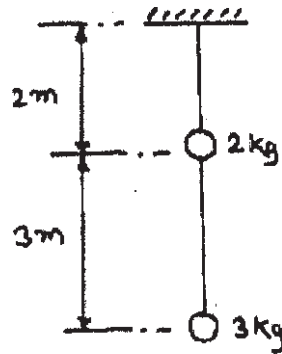


Fig.4

- Q9)** a) Define and sketch 'Autocorrelation' function. How is it useful in random vibrational analysis. [8]
- b) Two random processes are given as: [8]
- i) $x = A \cos \omega t$
 - ii) $y = B \cos(\omega t + \phi)$

The phase angle between the two processes is a random variable having uniform probability between 0 to 2π . Calculate correlation between x & y.

- Q10)** Write note on following (any three) : [18]
- a) Tool Chatter.
 - b) Centrifugal pendulum.
 - c) Principle coordinates.
 - d) Galerkins method.

Laplace Transform Pairs

$f(t)$	$L[f(t)]$
1. $f(t)$	$\int_0^{\infty} e^{-st} f(t) dt = F(s)$
2. $x(t) \pm y(t)$	$X(s) + Y(s)$
3. $K f(t)$	$KF(s)$
4. $u(t)$ or 1	$1/s$
5. $\delta(t)$	1
6. t	$1/s^2$
7. t^n	$n!/s^{n+1}$
8. $\sin \omega t$	$\frac{\omega}{s^2 + \omega^2}$
9. $\cos \omega t$	$s/s^2 + \omega^2$
10. e^{-at}	$1/s + a$
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. $\left[\begin{array}{l} 0 \text{ when } t < a \\ f(t-a) \text{ when } t > a \end{array} \right] = f(t-a)u(t-a)$	$e^{-as} F(s)$
17. $\frac{df(t)}{dt}$	$sF(s) - f(0)$
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 : 8]

[Total No. of Pages : 2

P1620

[4065]-15

M.E. (Civil) (Construction & Management)
INFRASTRUCTURE DEVELOPMENT & INTERNAL
CONTRACTING

(2002 Course) (501110 (b)) (Elective - II)

Time : 4 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** Explain with practical examples the recent projects being executed in maharashtra associated with Infrastructure development. Give important details of the same. **[18]**
- Q2)** Explain advantages and limitations of the (PPP) projects being executed in India stating practical examples. Explain the various mechanisms in which (PPP) can be achieved. **[8+8]**
- Q3)** Explain the various initiatives taken by the Indian Government by way of providing budgetary support and by other mechanisms in order to boost up the infrastructure development by 2015. What hurdles need to be overcome? **[16]**
- Q4)** Explain the various projects being executed under **[16]**
- a) JNNURM scheme
 - b) NHDP project
 - c) Indira Gandhi Awas Vikas Yojana
 - d) SPV

P.T.O.

SECTION - II

- Q5)** Explain the various risks associated with the basrah Housing International project. Explain how these risks affected the project performance. Explain the remedial action adopted by the various parties to the contract on order to control the effects of the risks. **[8+4+6]**
- Q6)** Explain CIDC-SIAC institutionalized arbitration in detail. Discuss advantages of this system over conventional arbitration. **[12+4]**
- Q7)** With flow diagrams, explain macro, market, project level approach used in ICRAM-1. Compare the results obtained through implementation of the above system, with a case study. **[8+8]**
- Q8)** Explain the provisions made in GCC as applied for EPC contracts in the FIDIC document. Consider any 8 conditions. **[16]**



Total No. of Questions : 10]

[Total No. of Pages : 2

P1623

[4065]-73

M.E. (Mechanical) (Design Engineering)

TRIBOLOGY

(2002 Course) (Elective - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Draw neat sketches wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Describe Adhesion theory of friction in detail. [8]
b) Discuss the factors that affect the boundary friction. [8]
- Q2)** a) Discuss any four means of wear prevention. [8]
b) Explain the stick-slip phenomenon in friction. [8]
- Q3)** a) Derive Petroff's equation for power loss in lightly loaded infinitely long journal bearings. Also give the assumptions made. [10]
b) Sketch different positions of a journal inside the bearing as it starts from rest and attains full speed. [6]
- Q4)** a) Explain the mechanism of pressure development in a hydrodynamic bearing. [8]
b) Derive Reynold's equation for 2 dimensional flow in hydrodynamic bearings. [10]
- Q5)** Write short note on any Two from below: [16]
a) Solution of Reynold's equation & sommerfield conditions.
b) Factors affecting wear.
c) Typical hydrostatic bearing system, its components and different configurations of hydrostatic bearings based on fluid supply.

P.T.O.

SECTION - II

- Q6)** a) Derive an equation for pressure distribution in a foot step bearing having recess. [8]
b) A rectangular plate having 50mm length & an infinite width is approaching a fixed plane surface. Initially oil film thickness is 0.035mm. & viscosity of oil is 75cp load supported per unit width of plate is 30KN/m
Calculate
i) The time required to squeeze the film to 0.008mm.
ii) The maximum pressure
iii) Average pressure. [8]
- Q7)** a) Derive an equation for the load carrying capacity of a squeeze film under a circular plate approaching a flat surface. [8]
b) Explain use of squeeze film lubrication in industrial & real life applications. [8]
- Q8)** a) Derive Reynold's equation with pressure viscosity terms. [8]
b) Explain the theory of EHD lubrication. [8]
- Q9)** a) Discuss merits & demerits of gas lubricated bearings. [8]
b) From generalized Reynold's equation obtain Reynold's equation for gas lubricated bearings following isothermal process where $n=1$. [10]
- Q10)** Write short notes on any two from below: [16]
a) Tribological aspects during drawing & extrusion.
b) Rolling friction.
c) Tribological aspects of wheel on rail contact.



P1624

[4065] - 200

M.E. (Production)

RELIABILITY ENGINEERING

(2002 Course) (Elective - II)

Time : 3 Hours]

[Max. Marks :100

Instructions to 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) Calculate the reliability for the system shown in Fig. 1 .The values in the block shows the reliability of each element. [8]

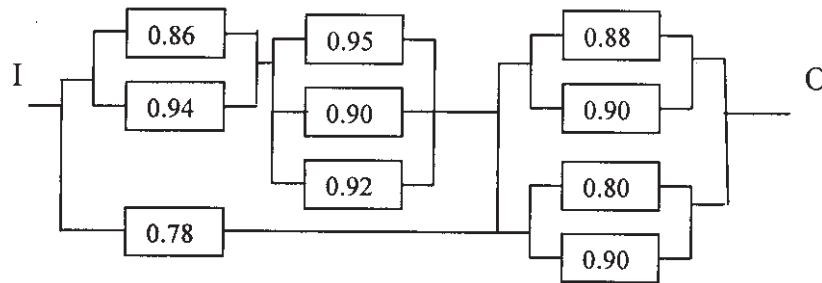


Fig. 1

b) Following table shows the results of life tests carried out on 100 components simultaneously. Evaluate failure density, hazard rate and reliability. Plot these functions against time. [8]

Operating Hrs	0	10	20	30	40	50	60	70	80	90	100
No. of surviving components	100	90	81	75	68	62	56	52	46	40	35

- Q2) a)** Define Mean Time To Failure and Mean time to repair. Show that MTTF for n components in series is given by [8]

$$MTTF = \frac{1}{\sum_{i=1}^n \lambda_i}$$

- b) Explain the features of Bath-tub curve. [8]

- 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 0.98 using AGREE method. The data being given below. [10]

Sr. No. Components	No. of Component Modules (n_i)	Operating. Time (t_i)	Prob. of system due to failure of subsystem (w_i)
1	18	12	0.10
2	16	10	0.20
3	9	10	0.25
4	12	15	0.25
5	10	10	0.20

- b) A filter system is composed of 20 elements, each with a failure rate of 3×10^{-4} (hr^{-1}). The system will operate satisfactorily with two elements failed. What is the probability that the system will operate satisfactorily for 1000 hours? [6]

- Q4) a)** Three identical components are connected having reliability 0.98. It is assumed that system functions successfully if at least two components are working. Construct an event tree and find out the reliability of the system for given condition. [8]

- b) In a truncated time test of 40 hours has been taken as the time limit. Assuming three parameter Weibull distribution with a location factor as 10 hour and scale factor 20. Find out the variation of reliability against time if shape factor is taken as 1. [8]

- Q5) Write Short Notes on (any three) :** [18]

- Weibull distribution for reliability assessment.
- ARINC method of Reliability Allocation.
- Star Delta Method of Reliability Assessment.
- Conditional Probability Method.

SECTION - II

- Q6) a)** Fig.2 Shows the fault tree diagram. The failure probabilities of each basic fault is given. Find out the reliability of the system. **[8]**

$P(A) = 0.0015$
 $P(B) = 0.002$
 $P(C) = 0.012$

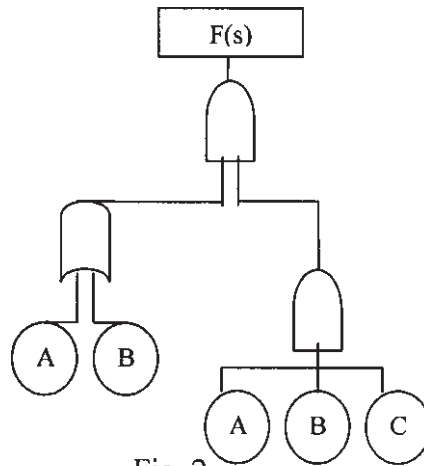


Fig. 2

- b) Explain Risk Priority Number in FMECA taking suitable example. **[8]**

- Q7) a)** The following data refer to predicted reliability of Eight components in series. If the total reliability of the system is not less than 85%, What should be the reliability goal for individual components? **[8]**

Components	1	2	3	4	5	6	7	8
Predicted reliability	0.994	0.998	0.95	0.996	0.990	0.980	0.985	0.960

- b) Explain the following : **[8]**
- i) Condition Monitoring Techniques
 - ii) Reliability Centered Maintenance

- Q8) a)** Derive an expression for Load Strength interaction method for finding reliability. **[8]**

- b) What do you understand by the term ‘Operational Availability’ and ‘Inherent Availability’? **[8]**

The following data have been collected at the plant: -

Mean time before failure = 20 hours

Mean time to repair = 10 hours

Administrative logistics time is 50% of Mean Down Time (MDT).

Calculate the operational availability and inherent availability of the plant.

- Q9)** a) Discuss the methods of accelerated tests for reliability assessment. [8]
b) Explain Tie set or Cut set theory for finding System Reliability. [8]

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

- a) Steps in FMEA Analysis
- b) Inherent and Operational Availability
- c) Event Tree Diagram
- d) Life Cycle Costing



P1625

[4065] - 417

M.E. Civil (Construction & Management)

INTERNATIONAL CONTRACTING

(2008 Course) (Elective - III) (501111 (c))

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) Assume suitable data, if necessary.*

SECTION - I

- Q1)** Explain the various risks associated with the Basrah Housing International Project. Explain how these risks affected the project performance. Explain the remedial action adopted by the various parties to the contract in order to control the effects of the risks. **[18]**
- Q2)** Explain CIDC-SIAC institutionalized arbitration in detail. Discuss advantages of this system over conventional arbitration. **[16]**
- Q3)** With flow diagrams, explain macro, market, project level approach used in ICRAM-1. Compare the results obtained through implementation of the above system, with a case study. **[16]**
- Q4)** Explain the provisions made in GCC as applied for EPC contracts in the FIDIC document. Consider any 8 conditions. **[16]**

P.T.O.

SECTION - II

- Q5)** a) As a Planning Engineer, if you have to go for 'International Contracts', which are the three important areas you will study, before you take final decision, for submitting your quotation to the clients? [8]
- b) Select any one of the above, list out and discuss important areas which you will give most importance, in taking the final decision [8]
- Q6)** a) List out the important action the buyers should never forget and explain in detail importance of any one of these aspects. [8]
- b) Give various reasons and problems you will face any while executing such contracts. [8]
- Q7)** a) Draw a Flow Diagram showing BIMS components in implementing BIMS in a Firms operation. [8]
- b) List out and Explain in details 'Integrity Review Check list' in anyone of the following: [8]
- i) Marketing
 - ii) Contracting
 - iii) Project Execution
- Q8)** a) Explain the sequence of activities involved in project authority and bidder, for pre-qualification and up to submission of bid for international contract? [9]
- b) What are the guidelines in the procurement policy by World Bank in financing the huge project? [9]



Total No. of Questions : 8]

[Total No. of Pages : 2

P1628

[4065]-545

M.E. (Mechanical) (Mechatronics)

FUZZY LOGIC & NEURAL NETWORKS

(2008 Course) (Elective - IV) (502812 (b))

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Solve any three questions from Section-I and any three from Section-II.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw neat sketches wherever necessary.*

SECTION - I

- Q1)** a) Explain Single Layer and Multi Layer Feed forward Networks. [8]
b) Enlist the characteristics of Neural Networks. [8]
- Q2)** a) Discuss the schemes of Neuro Controllers. [8]
b) Explain in brief the concept of Adaptive Neuro Controllers. [8]
- Q3)** a) Enlist the Guidelines of membership function design with suitable example. [4]
b) Write a comment on structure of Fuzzy Rules, The Antecedent of Fuzzy Rules and Consequent of Fuzzy Rules. [12]
- Q4)** a) What are Semiformal Aspects of Design Process. [10]
b) What are the issues in Fuzzy Logic Based Design process. [8]

P.T.O.

SECTION - II

- Q5)** a) Explain the process of Optimization of membership function using Neural Networks. [8]
b) Explain in brief Rules base of Fuzzy logic controller with neural networks. [8]
- Q6)** a) Write a short note on Linguistic variables. [8]
b) Explain in brief Decompositions and De-fuzzification. [8]
- Q7)** a) Explain in brief supervised & unsupervised learning. [8]
b) Discuss in brief learning & training with respect to Neural controllers. [8]
- Q8)** a) Explain in brief Generic algorithm, Fuzzy neuron and Adaptive Fuzzy systems. [10]
b) Write a short note on Fuzzy sets and Fuzzy set Operators. [8]



Total No. of Questions :6]

[Total No. of Pages :2

P1630

[4065] - 611

M.E. (E & TC) (Microwave)

SMART ANTENNAS

(2008 Course) (504225 (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 answer books.*
- 3) Figures to the right indicate full marks.*
- 4) Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Explain the trends in Mobile communications and the demand on spectrum capacity? **[7]**
- b) What are the different configurations involving satellite for wireless communications? Explain. **[6]**
- c) Draw the Diagram showing the concept of cell overlaying and explain how do this concept help the use of spectrum efficiently. **[6]**
- d) How power is controlled in mobile radio receivers and what is its significance? **[6]**
- Q2)** Explain the following antenna terminology relevant to antenna arrays in mobile communications. **[25]**
- a) Steering vector
 - b) Null beam forming
 - c) Diversity Combining
 - d) Beam Steering and Switching
 - e) Conventional Beam forming

P.T.O.

- Q3)** Draw the block diagram of the following antenna array beam forming techniques and explain with mathematical expression and algorithms. [25]
- a) Beam Space Processing
 - b) Broad band beam forming
 - c) Narrowband beam forming

SECTION - II

- Q4)** What are the different modes in which the antenna arrays can be used in mobile communications systems? Discuss with illustrative diagrams. [25]
- Q5)** Explain the following smart antenna techniques with relevant block diagrams and mathematical support. [25]
- a) Non-Coherent CDMA Spatial Processors and the Spatial.
 - b) Coherent CDMA Spatial Processors.
 - c) Processing Rake Receiver.
 - d) Multi-User Spatial Processing.
- Q6)**
- a) Discuss the digital radio receiver and software defined radio receiver techniques for smart antennas. [10]
 - b) Explain the range extension in CDMA. [8]
 - c) Explain the Reverse Channel Performance of Multi-cell Systems. [7]



Total No. of Questions :10]

[Total No. of Pages :2

P1633

[4065] - 716

M.E. (Production Engineering)
OPTIMIZATION TECHNIQUES
(2008 Course) (51112 (a)) (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 answer books.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Assume suitable data, if necessary.*
- 5) Figures to the right indicate full marks.*
- 6) Use non-programmable electronic calculators is allowed.*

SECTION - I

- Q1)** a) What is meant by optimization. Why it is necessary? [8]
b) Give classification of optimization techniques. [8]
- Q2)** a) Explain the methodology of Fibbonci search analysis. [8]
b) What are the significant charactreistics of Newton-Raphson Method? [8]
- Q3)** a) Explain the Golden section search methods. [8]
b) Explain the evaluationary optimization method. [8]
- Q4)** a) Explain Steepest Descent method of optimization. [8]
b) What is meant by multi-variable optimization? State the methods of it. [8]

P.T.O.

- Q5)** Write short note on following (Any two): **[18]**
- a) Secant Method.
 - b) Optimization in Engineering Applications.
 - c) Powell's Conjugate direction method.
 - d) Newton's Gradient based method.

SECTION - II

- Q6)** a) What is meant by constraint handling? Explain any one method of constrained optimization. **[8]**
- b) Explain gradient projection method with its characteristics. **[8]**
- Q7)** a) Explain the method of geometric programming. **[8]**
- b) Explain the specialized algorithms for integer programming. **[8]**
- Q8)** a) Explain the generalized reduced gradient method. **[8]**
- b) Explain the various gradient based methods. **[8]**
- Q9)** a) Explain the steps involved in genetic algorithm. **[8]**
- b) Explain the differences and similarities between Genetic Algorithm and traditional methods. **[8]**
- Q10)** Write Short notes on (Any two): **[18]**
- a) Method of feasible direction.
 - b) Simulated Annealing method.
 - c) GA for constrained optimization.



Total No. of Questions :8]

[Total No. of Pages :2

P1641

[4065] - 505

M.E. (Mechanical - Heat Power)

**INTERNAL COMBUSTION ENGINES – FUELS AND COMBUSTION
(2008 Course) (502111(a)) (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 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 are the desirable properties of fuels for I.C. engines. [8]
b) Explain in brief : [8]
i) Octane Number
ii) Cetane Number
- Q2)** a) List the additives used to improve the antiknock tendency of engines and explain how it helps in achieving this. [8]
b) Write short note on alternate fuels for I.C. Engines. [8]
- Q3)** a) Enlist different factors affecting on the flame propagation of SI engine. [8]
b) What is the difference in detonation and knocking with respect to SI and CI engines. [8]
- Q4)** a) Explain how biodiesel is produced from oils. What are its advantages and disadvantages? [10]
b) Write down different principles of combustion chamber designing. [8]

P.T.O.

SECTION - II

- Q5)** a) Explain in detail ignition lag or delay period in combustion of CI engine. Also list down the various factors affecting the same. [8]
b) Draw sketches of combustion chambers suitable for CI engines. [8]
- Q6)** a) Write note on methods of supercharging. [8]
b) Compare Swirl and turbulence with reference to SI and CI engines. [8]
- Q7)** a) With sketch explain the mixture requirements of a petrol driven vehicle. [8]
b) List the various methods of turbo-charging. Explain pulse method of turbo charging. What are its merits and demerits? [8]
- Q8)** Write short note on : [18]
a) Stages of combustion in CI engine.
b) CRDI
c) MPFI system.



Total No. of Questions :8]

[Total No. of Pages :3

P1642

[4065] - 737

M.E. (Production Engineering) (CAD/CAM)
QUALITY AND RELIABILITY ENGINEERING
(511211 (d)) (2008 Course) (Elective - III)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) Answer three questions from section I and three questions from section II.*
- 2) Neat diagrams must be drawn wherever necessary.*
- 3) Figures to the right indicate full marks.*

SECTION - I

Q1) Attempt any four: [16]

- a) Describe graph of quality characteristic versus loss to society.
- b) Differentiate between on line and off line quality control.
- c) Explain terms-system design, Parameter Design, Tolerance Design.
- d) List Causes of Variation in manufacturing a product.
- e) Show by graphs, variations of the quadratic loss function.

Q2) Attempt any four: [16]

- a) Comment on parameter design strategy in the Taguchi design.
- b) What is the meaning of terms – SIGNAL and NOISE?
- c) Explain situations on which signal to noise ratio is dependent.
- d) Customer tolerances for the height of a steering mechanism are 1.5 ± 0.020 m. For a product that just exceeds these limits, the cost to the customer for getting it fixed is Rs 300/-. Ten products are randomly selected and yield following heights in meters. 1.53, 1.49, 1.50, 1.49, 1.48, 1.52, 1.54, 1.53, 1.51, 1.52. Find the average loss per product item.
- e) What do you understand by Robust Design?

P.T.O.

Q3) Attempt the following: **[16]**
Discuss matrix experiment for a chemical vapour deposition process.

Q4) Attempt any four: **[18]**

- a) Draw and explain p-diagram.
- b) Write note on ANOVA.
- c) Write note on Response Surface Methodology.
- d) Write note on First-order and Second-order Models.
- e) Write note on Crossed Array Experiments.

SECTION - II

Q5) Attempt any four: **[16]**

- a) Describe term Quality policy, giving examples of statement of quality policy. What is its importance in quality function in organization?
- b) Describe impact of reliability on cost of product.
- c) Given the following PDF for random variable T, the time to failure of a compressor, what is reliability for 90 hrs operating life?

$$f(t) = \frac{0.001}{(0.001t + 1)^2} \quad \text{for } t \geq 0$$
$$= 0 \quad \text{otherwise}$$

- d) Draw graphs of reliability function, CDF and PDF for failure and discuss their significance.
- e) A hard plastic box designed to house a multimeter is tested for its impact strength by dropping it from a fixed height and observing for any damage. A total of 500 boxes were tested and the results are as follows:

No. of boxes 10 12 13 15 17 20 21 23 25

No. of boxes 30 50 30 110 90 130 17 35 8

Damaged.

- Find i) Probability that a box can withstand at least 15 drops
- ii) Failure density.

Q6) Attempt any four: **[16]**

- a) Comment on Juran's contribution in Quality Management.
- b) What is quality function & assurance of quality?
- c) Describe chance failure phase (useful life) of bath tub curve and suggest suitable model for estimation of failures in this phase. Write expression for reliability and MTTF for this distribution.
- d) A factory manufactures electric bulbs has an average output of 1 million bulbs every year. Over 5 years period inspection dept. rejects 15000 bulbs. If dept. detects only 95% of all substandard bulbs, what is the probability that any bulb bought by the customer will be defective?
- e) An amplifier has an exponential time to failure distribution with a failure rate of 7% per 1000 hrs. What is reliability of amplifier at 6000h? Find also MTTF.

Q7) Attempt any four: **[16]**

- a) State different costs related to the quality.
- b) Derive expression for reliability of systems having components in series. What is MTTF if all the components in series have an identical failure rate λ .
- c) Describe with flow chart double sampling plan.
- d) Components A, B, C are connected in parallel in a system. Determine system reliability for 2000 h of operation and find MTTF. All components have identical exponential time to failure distribution with failure rate of 0.0005/h.
- e) Describe standby system and comment on its reliability.

Q8) Attempt any four: **[18]**

- a) What are various elements of maintenance down time?
- b) An equipment is subjected to maintenance time constraint of 30 min. What is the probability that it will meet specification if MTTR is 0.262.
- c) Define
 - i) Maintainability
 - ii) Inherent availability
 - iii) Achieved availability
 - iv) Operational availability
- d) Write note on reliability centered maintenance.
- e) Comment on allocation of reliability.



Total No. of Questions : 8]

[Total No. of Pages : 2

P1645

[4065]-451

M.E. (Civil) (Hydraulic)

WATER MANAGEMENT AND CONVEYANCE SYSTEMS

(2008 Course) (501311(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 answer 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 electronic pocket calculator is allowed.*
- 7) *Assume suitable data if necessary.*

SECTION - I

- Q1)** a) Discuss in detail about River flow and diffusion and dispersion regime. [9]
b) Discuss in detail about nature of waste inputs to water systems. Classify the difference between point source and non-point source of loading system. Give two examples for each. [9]
- Q2)** a) Discuss in detail about eutrophication reduction. [8]
b) Describe in detail about the pollutant transport mechanisms. [8]
- Q3)** a) Discuss in brief about toxic substances and heat management in water management. [8]
b) Discuss in brief about dissolve oxygen model. [8]
- Q4)** Write short notes on any four.
- a) Various Water Distribution Systems.
 - b) Reservoir analysis.
 - c) Urban Drainage
 - d) Run-off Control.
 - e) Contaminant Decay Modelling [16]

P.T.O.

SECTION - II

- Q5)** a) Discuss in detail about Water Tariff Structures along with examples. [9]
b) Determine quantity of bed load transported through a trapezoidal channel, by using M-P-M equation with the following data. [9]
- i) Depth of flow = 2.4m
 - ii) Width of channel = 3.0m
 - iii) Bed Slope = 1:4500
 - iv) Uniform size of the bed material = 0.30mm
 - v) Side Slope = 0.5 (H): 1.0 (V)
- Manning's 'n' = 0.02
- Q6)** a) Discuss in detail about the effect of hydraulic structures on river surface profiles. [8]
b) What are the challenges involved with urban drainage systems? How much can be achieved by applying the present day technology? Is it a function of the city to be considered for control of urban drainage? [8]
- Q7)** a) Discuss at length about national water problems and global water problems. [8]
b) What do you mean by 'Diversion Head Works'? Draw a sketch of a 'Diversion Head Works' and label all the parts. [8]
- Q8)** a) Draw the neat sketch of a Hydroelectric Power plant and label all the parts. [8]
b) Discuss in brief about Thermal Power Generation. What do you mean by low flow augmentation? [8]



Total No. of Questions : 8]

[Total No. of Pages : 2

P1648

[4065]-725

M.E. Production(CAD/CAM)

INDUSTRIAL ROBOTICS & ARTIFICIAL INTELLIGENCE

(2008 Course) (511204) (Elective - I)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer any three questions from each section.*
- 2) *Answer to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Use of calculator is allowed.*
- 5) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) Describe various characteristics used to specify Industrial Robot. [10]

b) Describe the following applications of robot stating their configurations.[8]

- i) Spray painting
- ii) Machine loading & unloading.

Q2) a) Define and explain [8]

- i) Stability
- ii) Compliance
- iii) Control resolution
- iv) Spatial resolution.

b) In a Robot, a twisting joint Wrist assembly can rotate through 10 full revolutions and is required to have a resolution of 0.2 degrees. Find out the required bit storage capacity for achieving this resolution. [8]

Q3) a) With neat sketch explain proximity and range sensors used in robot.[8]

b) Classify various types of grippers used in robots. Describe vacuum type of gripper in detail. [8]

P.T.O.

- Q4)** a) Explain various programming methods used in robots. [8]
b) Explain methods of defining positions in space. [8]

SECTION - II

- Q5)** a) How intelligence can be incorporated in robots? [10]
b) Explain problem formulation in A.I. [8]
- Q6)** a) Explain any two search strategies used in artificial intelligence? [8]
b) Explain with block diagram local search algorithms. [8]
- Q7)** a) Explain the terms knowledge, information and intelligence. [8]
b) Define the term knowledge representation? What are different ways of knowledge representation? [8]
- Q8)** a) Explain forward and backward chaining. [8]
b) Explain first order predicate logic with suitable examples? [8]



Total No. of Questions : 8]

[Total No. of Pages : 2

P1651

[4065]-799

M.E. (Chemical Engg.)

FUEL CELLS TECHNOLOGY

(2008 Course) (509112 (c)) (Elective - IV)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Solve any three questions from each section.*
- 2) *Figures to the right indicate full marks.*

SECTION - I

Q1) Derive Butler Volmer equation used to predict current generated in a fuel cell, when mass transfer limitations are overcome. **[16]**

Q2) Explain in details the principle on which a fuel cell is designed. Give details of general electrode reactions and emf generated in such a cell. **[16]**

Q3) Compare polymer electrolyte membrane fuel cell and solid oxide fuel cell. Describe the construction and working of any one of them. **[16]**

Q4) Write short notes on any three:

- a) Nernst equations.
- b) Faraday's Law.
- c) Tafel plot.
- d) Application of Fick's Law in Electrochemistry. **[18]**

SECTION - II

Q5) Describe improvements in the fuel cell performance of present day hydrogen & oxygen based fuel cell over coal derived fuel gas based fuel cell at premature stages of development of fuel cells. **[16]**

P.T.O.

Q6) For diffusion controlled unidirectional process the current generated in a fuel cell is calculated using Cottrell equation. Using Cottrell equation find out the variation of the current in the external circuit with time for following cell. Given : $n=1$, $D_{AB} = 6.1 \times 10^{-5} \text{ cm}^2/\text{sec}$, $A = \text{Cross Sectional area} = 0.2 \text{ cm}^2$, $\delta = \text{Film thickness} = 15 \mu\text{m}$. **[16]**

Q7) What are various applications of fuel cells? What are the problems in commercializing them for onshore applications? **[16]**

Q8) Write short notes on any three:

- a) Military Applications of fuel cells.
- b) Ohmic Polarization.
- c) Anodic reactions.
- d) Half Cell Potential.

[18]



P1656

[4065] - 895

**M.E. (Instrumentation & Control)
(Process Instru. & Biomedical Instru.)
MECHATRONICS
(2008 Course) (5061111(b)) (Elective - II)**

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) When using a trim pot in a circuit, it is usually placed in series with another fixed value resistor. Why it is not placed in parallel instead? Support your conclusions with analysis. **[8]**
- b) A circuit designer needs to choose an appropriate size resistor to be used in series with a light emitting diode (LED). The LED manufacturer claims that the LED requires 2 V to keep it on and 10 mA to generate bright light. Also, the current should not exceed 100 mA. Assuming that a 5 V source is being used to drive the LED circuit, what range of resistance values would be appropriate for the job? Also, what resistor power rating would be required? **[8]**
- Q2)** a) What are the certain conditions must be satisfied to accomplish adequate reproduction of the input in measurement system with time-varying inputs? explain any one in detail. **[8]**
- b) How will you interface a stepper motor with microcontroller? Explain the interfacing circuit and draw the flow-chart. **[8]**
- Q3)** a) Develop a PLC program of a circuit that could be used with a domestic washing machine to switch on a pump to pump water for 100s into the machine, then switch off and switch on a heater for 50s to heat the water. The heater is then switched off and another pump is to empty the water from the machine for 100s. **[9]**

P.T.O.

- b) Identify the sensor, signal conditioner and display elements in the Bourdon pressure gauge. Justify your Choices. [9]

Q4) Discuss about the following actuation systems: [16]

- a) Self-excited wound field shunt configuration dc motor.
- b) Self-excited wound field series configuration dc motor.
- c) Stepper motor.
- d) Induction motor.

SECTION - II

Q5) a) Compare and contrast the control system for the domestic central heating system involving a bimetallic thermostat and that involving a microcontroller. [8]

- b) Compare the traditional design and mechatronics design with suitable example. [8]

Q6) a) Devise a system, using a PLC that could be used with a conveyor belt which is used to move an item to 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 a photosensor. There it stops for 100sec for an operation to be carried out and then starts moving. The motor for the belt is started by a normally open start switch and stopped by a normally closed switch. [12]

- b) Why is it not possible to connect sensors such as thermocouples, strain gages, and accelerometers directly to a digital computer or microprocessor? How they can be interfaced? Explain. [6]

Q7) Explain in detail how data handling is carried out in PLC. What is role of Watch dog timer in PLC? [16]

Q8) a) As a mechatronic designer moves progressively from an 8-bit to 10-bit to 12-bit A/D converter, what problems might be incurred in the design of the data acquisition system? Explain. [8]

- b) What is Lead wire desensitization? Draw a schematic diagram illustrating the wiring of a Wheatstone bridge circuit that takes advantage of both three-wire lead connections and dummy gage temperature compensation. Explain the same. [8]



Total No. of Questions :8]

[Total No. of Pages :2

P1657

[4065] - 674

**M.E. (Electronics) (Digital System Design)
DIGITAL SYSTEM DESIGN USING PLD's
(2008 Course) (Elective - III) (504204 (a))**

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) Answer any THREE questions from each section.*
- 2) Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Compare the architecture of FPGA, General purpose processor and ASIC w.r. to functional capacity, Functional diversity and data density. **[8]**
- b) Give the typical characteristics of multicontext FPGA, also give its merits. **[8]**
- Q2)** a) Compare SRAM and DRAM. **[8]**
- b) What are the various parameters to be consider while designing SRAM'S. **[8]**
- Q3)** a) Describe the construction of the micro cell within the functional block of CPLD XC9 500 XV. **[8]**
- b) What at is selection criteria of CPLD & FPGA. **[8]**
- Q4)** Write short notes on: **[18]**
- a) Testing of semiconductor memory.
 - b) Selection of DSP processors.
 - c) Conventional interconnects used in FPGA'S.

P.T.O.

SECTION - II

- Q5)** a) Write VHDL code with FSM diagram for three step lift controller, give proper interface diagram. [10]
b) Discuss about the spartan – 3 FPGA. [6]
- Q6)** a) What are the different FPGA programming techniques? Discuss any one in detail. [8]
b) Draw and explain about the architecture of FPGA in detail. [8]
- Q7)** a) Explain about the coll Runner - II CPLD family, List its feature and give the specific application of the device in short. [10]
b) Comment on area and power optimization of CPLD and FPGA. [8]
- Q8)** a) Explain in detail the Built in self testing architecture in a sequential circuit. [8]
b) Explain about the limitation of current FPGA'S in detail. [8]



P1659

[4065]-559

M.E. (Mechanical Engineering- Automotive Engineering)

NOISE, VIBRATION AND HARSHNESS

(2008 Course) (502309(a)) (Elective - III)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer any three questions from each section.*
- 2) *Answers to the each 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 required.*

SECTION - I

- Q1)** a) Explain following terms [6]
i) Sound Waves and Noise Levels (ISO Standards)
ii) Sound Power
b) What is meant by Weighted Average and Running Average Method in Sound level Measurement? [10]
- Q2)** a) Derive equation of motion of single degree freedom damped vibration of cantilever beam. [8]
b) What is meant by Eigen Values and Eigen Vectors for two degree freedom system and derive relations. [8]
- Q3)** a) Assume a room temperature 21.4°C with volume of 200 m^3 a surface area $S = 210\text{ m}^2$ and reverberation time at 100 Hz of 3 s . The space averaged sound pressure level (L_p) in diffuse field with a given machine operating is 100dB . Find the sound power level for this machine. Assume a discrete frequency spectrum and an atmospheric pressure of 100mbars . [10]
b) Explain different Corrective Methods used for control of Noise and Vibration in Machine Shop. [6]
- Q4)** a) What is the use of FFT Analyzer for Noise and Vibration analyzer? [8]
b) Explain working of Laser Doppler Vibro-meter. [8]

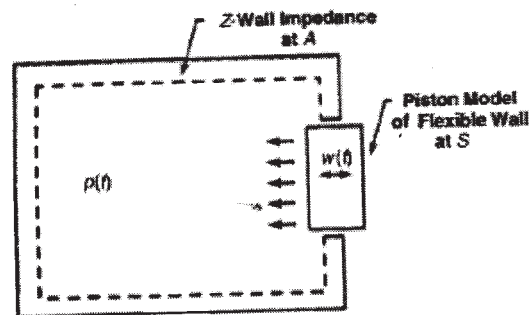
P.T.O.

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

- a) Structural Vibration and Noise
- b) Passenger Comfort Noise levels
- c) Accelerometers used for vibration measurement
- d) Root Cause Analysis method for Noise Control

SECTION - II

Q6) a) The piston of figure shown below has an area of 1 cm^2 and is driven harmonically with peak to peak displacement of 4 mm at the frequency of 100 Hz the volume of the cavity is 0.0125 m^3 and it has rigid walls. What is sound pressure level in the cavity. **[8]**



b) Explain physical characteristics of porous material and their measurement. **[8]**

Q7) a) What is meant by Maxwell's reciprocity theorem? Explain with suitable example. **[8]**

b) Explain sound attenuation by straight duct and duct division. **[8]**

Q8) a) Explain control of Aliasing Effect in Measurement of Sound and vibration. **[8]**

b) Explain working of Active Noise Control System. **[8]**

Q9) a) Effect of temperature on sound absorbers or silencer design. **[8]**

b) Explain following terms with reference to acoustic material characterization. **[8]**

i) Sound transmission

ii) Sound absorption

Further explain different types of sound absorbers.

Q10) Attempt any three

[18]

- a) Pass by Noise Measurement in Automobile
- b) Damage risk criteria for auditory range
- c)
 - i) Note on environmental corrections and determination of sound power level.
 - ii) A sound source radiates an A-weighted sound power of 3W. Find A weighted sound power level in decibels.
- d) Write a Note on Sound Absorption coefficients
- e) Silencer Performance Metrics.



P1661

[4065] - 183

M.E. (Electrical) (Power System)

SPECIAL TOPICS IN HIGH VOLTAGE ENGINEERING

(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) Define Townsend's first and second ionization coefficients. How is the condition for breakdown obtained in a Townsend discharge? [8]
- b) Explain the various theories that explain breakdown in commercial liquid dielectrics. [8]
- c) How do the temperature and moisture affect the breakdown strength of solid dielectrics? [9]
- Q2)** a) Explain one method of controlled tripping of impulse generators. Why is controlled tripping necessary? [12]
- b) What is a Tesla coil? How are damped high frequency oscillations obtained from a Tesla coil? [13]
- Q3)** Write short notes on any THREE of following :
- a) Voltage doubler circuit. [8]
- b) Van - de Graff generator. [9]
- c) Marx circuit. [8]
- d) Impulse current generator. [8]
- e) Impulse voltage measurement. [8]

P.T.O.

SECTION - II

- Q4)** a) Why is earthing very important in high voltage laboratories? Describe a typical earthing system used. [12]
- b) List out the common test facilities available in high voltage laboratories. [4]
- c) Explain the necessity of power supply, safety circuits, high voltage resistors and sphere gaps used in high voltage testing laboratories. [9]
- Q5)** a) Describe a typical partial discharge test set up along with various components. [12]
- b) Explain the importance of RIV measurements for EHV power apparatus. [13]
- Q6)** Write short notes on :
- a) Capacitance and dielectric loss measurement. [12]
- b) Artificial pollution tests on high voltage insulators. [13]



P1664

[4065] - 687

**M.E. (E & TC) (Communication Networks)
NETWORK ARCHITECTURE AND DESIGN
(2008 Course) (504604 (b)) (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 electronic pocket calculator is allowed.*
- 6) Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Explain Network's architecture and design using an analogy of home's architecture and design. **[8]**
- b) Explain how the following characteristics can be used as performance characteristics: **[8]**
- | | |
|-------------|--------------------------|
| i) Capacity | ii) Delay |
| iii) RMA | iv) Performance Envelope |
- Q2)** a) Service metrics are used to monitor, measure and verify services in the network and determine if performance requirements are being met. Therefore, service metrics must be meaningful to the network operators, managers, users and staff. For each performance requirement below, describe a service metric that could be used to measure and verify the requirement. **[9]**
- i) Reliability of a T1 link between an enterprise network and its ISP, with IP routers on each end of T1.
 - ii) Round trip delay between devices on network A and servers on server LAN B.
 - iii) Average traffic rate in and out of a computer server, measured across all four of its LAN interfaces over 15 minutes interval.

P.T.O.

- b) Consider a network project where you can talk to users. What resources can you use to gather user, application, device and network requirements? Briefly outline a method for gathering and deriving requirements in the absence of user involvement. [9]
- Q3)** a) Which flow models apply to each set of flows described below [8]
- i) Users on internet accessing the same web server.
 - ii) Forty workstations processing batch jobs overnight, managed by a central mainframe.
 - iii) Email use across the internet.
 - iv) A transaction-processing application, authorizing credit card transactions between a company's retail stores and its headquarters.
- b) Devices can act as both data sources and sinks, depending on the application and flow. Which of the following devices (for the application given) are data sinks and data sources? [8]
- i) A storage device receiving streaming video from a camera.
 - ii) A video editing unit, using video from the storage device in (i).
 - iii) A web server and its clients.
 - iv) A storage disk farm.
- Q4)** a) Give examples of external relationships between each of the following component architectures; addressing/routing, network management, performance and security. [8]
- b) A network's architecture differs from its design, in terms of its scope, level of detail, description and location information. Describe how an architecture design differ in each characteristic. [8]
- Q5)** a) Explain any two flow models in detail. [8]
- b) Describe two ways to make an uptime requirement of 99.999% more precise. [4]
- c) A user requires capacity of upto 512 kbps but may not exceed 1.5 Mbps. a track needs to be kept of how much time the user's capacity is between 512 kbps and 1.5 kbps. Show how performance boundaries and thresholds could be used in the following scenarios. [4]

SECTION - II

- Q6)** a) Define the terms: **[10]**
- i) Hard boundary
 - ii) Soft boundary
 - iii) Rout filler,
 - iv) Rout aggregation
 - v) Routing flows.
- b) How to choose and apply routing protocols? Give different recommendation for it. **[6]**
-
- Q7)** a) For each of the following address/prefix length pairs, give its natural mask (in dotted-decimal notation), its subnet/supernet mask (also in dotted-decimal notation), and the range of networks or subnets permitted by the mask. Also describe any problems and limitations with the address/mask pairs, if any. **[10]**
- i) 129.99.0.0/16
 - ii) 136.178.0.0/22
 - iii) 198.9.9.0/28
 - iv) 192.92.240.0/20
 - v) 192.92.243/20
- b) How to evaluate the degrees of hierarchy and interconnectivity? Explain with suitable example. **[8]**
-
- Q8)** a) Write short notes: **[8]**
- i) Prioritisation
 - ii) Traffic Management
 - iii) Scheduling
 - iv) Queuing
- b) Explain in detail Trade-offs for network management techniques. **[8]**
-
- Q9)** a) What are the layers of network management? Give an example of management at each layer(what is managed, how it is managed). **[8]**
- b) Explain Threat Analysis with example. **[8]**
-
- Q10)** a) Which policies and procedures one should adopt for security of network? **[8]**
- b) Which common design goals include for networks Design? **[8]**



Total No. of Questions : 8]

[Total No. of Pages : 2

P1665

[4065]-741

M.E. Production (CAD/CAM)

COMPUTATIONAL FLUID DYNAMICS

(2008 Course) (511212) (Elective - IV)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Solve any three questions from each section.*
- 2) *Solve Section-I and Section-II in separate answer books.*
- 3) *Figures to the right indicate full marks.*

SECTION - I

- Q1)** a) Explain the concept of CFD as third dimension of fluid dynamics. [6]
b) What is Numerical Discretization? Explain any one method of numerical discretization. [10]
- Q2)** a) What are basic equations of fluid dynamics? Assuming properties of the medium to be continuous functions of space and time, state and explain Navier-stokes equations in Differential form. [10]
b) Explain natural boundary condition and artificial boundary condition for Navier-Stokes equations in the context of CFD. [6]
- Q3)** a) What is Courant number? Explain stability condition in terms of Courant number. [8]
b) Explain Upwinding and central difference schemes in diffusion equations for convection. [8]
- Q4)** Write short notes on any three of the following [18]
a) FVM in CFD
b) Nonlinear Potential flow, Inviscid flows and viscous flows
c) Primitive variable vs. conservation form
d) Dimensional form vs. Non dimensional form.

P.T.O.

SECTION - II

- Q5)** a) Explain Explicit and implicit time stepping scheme for Inviscid Compressible flow. [8]
b) Explain characteristic form of governing equations in two dimensions, for Inviscid Compressible flow. [8]
- Q6)** a) Explain the continuity equation and divergence constraint for Incompressible flows. [8]
b) State and explain Poisson equation for pressure for Incompressible flows. [8]
- Q7)** a) Explain in brief how standard codes are used to predict fluid flow and heat transfer. [10]
b) Explain the standard and High and Low Reynolds number, turbulence model. [6]
- Q8)** Write short notes on any three of the following [18]
a) Numerical methods for Inviscid flows
b) Patankar and Spalding SIMPLE Scheme
c) K-I turbulence model
d) One equation Algebraic turbulence model



P1666

[4065] - 677

M.E. (Electronics)

RECONFIGURABLE COMPUTING

(2008 Course) (Elective - IV) (504205)

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 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 are the research challenges in the design and development of Reconfigurable Devices? **[8]**
b) Explain the terms functional density, functional diversity and data density with reference to reconfigurable devices. **[8]**
- Q2)** a) Compare the architectures of ASIC, PDSP, GPP, FPGA, and memory. **[10]**
b) Explain Reconfigurable ALUs in detail. **[6]**
- Q3)** a) Why is multiplier considered as test operation? Compare different architectures based on their performances for multiplication. **[8]**
b) What are the effects of Interconnect Granularity? **[8]**
- Q4)** Write short notes on any three : **[18]**
a) Instruction growth versus interconnect growth.
b) General-Purpose Computing Issues.
c) Partial Reconfiguration.
d) Configurable, Programmable, and Fixed-Function Devices.

SECTION - II

- Q5)** a) What are the techniques used for compressing Instruction stream? [8]
b) Explain hierarchical interconnects in detail. What are its effects on the performance of the reconfigurable device? [8]
- Q6)** a) What are the advantages of MATRIX architecture over general purpose architecture. Draw the block diagram and briefly explain the function of each block. [10]
b) What are the problems with simple networks? [6]
- Q7)** a) Draw neat block diagram of DPGA architecture and explain the prototype implementation of DPGA in detail. [10]
b) What is peak performance density? Explain with the help of determining parameters. [6]
- Q8)** Write short notes on any three : [18]
a) Bus-based Communication.
b) Contexts.
c) Granularity.
d) Direct Communication.



Total No. of Questions : 6]

[Total No. of Pages : 2

P1668

[4065]-463

M.E. (Civil) (Structures)

DESIGN OF INDUSTRIAL STEEL STRUCTURES

(2008 Course) (Elective - II) (501405)

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) *Figure to the right indicates full marks.*
- 5) *Assume suitable data, if necessary.*
- 6) *Use of cell phone is prohibited in the examination hall.*
- 7) *Use of electronic pocket calculator, IS codes and steel table are allowed.*

SECTION - I

Q1) A knee braced industrial shed has following data: **[25]**

- a) Span of truss = 20 m and rise of truss = 4m
- b) Length of shed 40 m and spacing of truss = 4m
- c) Type of truss: 8 panel fink truss
- d) The designed wind pressure = 1.5 kN/m².
- e) A knee braced is parallel to principal rafter which connects panel point of tie member next to support.
- f) Column bases are fixed.
- g) The height of eaves above ground level is 8 m.

Determine the loads at the various panel points due to dead load, live load and wind load. Determine the reaction also.

Q2) Taking data of Q. 1. analyze and design a column in a knee braced shed for a case of wind normal to ridge with internal suction. Reaction due to dead load and live load on roof truss transferred to column top are 25 kN and 40 kN respectively. State the loading combination for the design. **[25]**

P.T.O.

Q3) A gable portal frame is having span of 20 m. height up to eaves level is 8 m and apex is at 12 m above bases. Wind pressure intensity is 1.5 kN/m^2 . Column ends are hinged. The gable rafter is supported by five columns. The spacing between the roof trusses is 5 m. Design the gable rafter, side rails and gable wind girder. [25]

SECTION - II

Q4) Design a castellated beam for a span of 16 m. The dead weight of the roofing is 750 N/m^2 and the live load on the roof is 2000 N/m^2 . Cut the selected I-section at 45° and adjust the section such the overall depth of section should not exceed 900 mm. Assume $f_y = 250 \text{ MPa}$. [25]

Q5) Design a trussed purlin to carry a uniformly distributed load of 40 kN/m over a simply supported span of 10 m. Use double angles for chord and solid rod for web members. Select suitable geometry for truss purlin and draw its cross section. [25]

Q6) Explain the significance of bracing system in industrial shed. Describe neatly for which forces bracing systems are designed in industrial shed. Explain various bracing system with neat sketches. [25]



P1670

[4065]-818

M.E. (Chemical) (Environmental Engineering)

GROUND WATER CONTAMINATION &

POLLUTION CONTROL

(2008 Course) (509142) (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 the characteristics of water bearing formation? Explain the various ground water formations with neat sketch. [8]
- b) What do you understand by groundwater pollution? Discuss briefly the various factors that contribute to groundwater pollution. [6]
- c) Explain how groundwater serves as a major source in supplementing the total water resources of a country. [4]

- Q2)** a) Discuss the effect precipitation on groundwater? [6]
- b) What are the functions of aquifer? List out the various typical types of opening that permit the movement of groundwater. [4]
- c) Derive the equation for steady flow of groundwater in a confined aquifer & unconfined aquifer. [6]

- Q3)** a) What are assumptions in deriving the differential equation for groundwater flow? Derive the Dupit-Forchheimer continuity equation for ground water. [8]
- b) What are the utility of water table contour maps & how are they constructed?

From an flow net analysis of a pumping well at a rate of 200 m³/mint, the

P.T.O.

following data is obtained

- i) No of flow channel = 40
- ii) Head developed between successive piezometric contour = 10
- iii) Aquifer thickness = 50m

Find the transmissibility and permeability of the aquifer [8]

- Q4)** a) Derive the Laplace equation for steady, 2D groundwater flow through homogenous & isotropic media. What are the necessary conditions for drawing flow net? [8]
- b) Explain in brief any two of the following:
- i) Hydraulic characteristics of alluvial aquifer
 - ii) Graphical method of drawing flow net.
 - iii) Falling head permeameter [8]

SECTION - II

- Q5)** a) Explain the underground travel of groundwater contaminant & discuss the changes in groundwater quality due to presence of organic matter in sub soil. [8]
- b) Differentiate between dispersion & diffusion. With neat sketch explain mass balance for dispersion. [6]
- c) How does adsorption help organic chemical transport into soil? [4]
- Q6)** a) What are the different types of groundwater plumes? Explain Gaussian plume model for Ground water contamination. [6]
- b) What are water quality plots, explain any two methods with appropriate sketch? [6]
- c) Discuss briefly hydro chemical facies in groundwater contamination and explain its utility. [4]
- Q7)** a) How are model studies advantageous in assessment of groundwater flow? Discuss dipole pumping test for measurement of flow rate. [8]
- b) What are the utility of groundwater investigation? Explain seismic refraction & reflection method for groundwater investigation. [8]
- Q8)** a) Explain briefly the role of pressure gradient on diffusion of pollutants. [6]
- b) What are the various factors affecting selection of an artificial recharge system? Explain, Recharge pit & shaft techniques of artificial recharge of groundwater. [6]
- c) Explain salt and fresh water interface and discuss any one method for control of intrusion. [4]



P1225

[4065]-403

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

CONSTRUCTION TECHNOLOGY

(2008 Course) (501103) (Sem. - I)

Time : 4 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

Q1) List out locations of Electronic Sensors provided in a 'Ready Mix Concrete Plant' to measure moisture, for different materials. List out the conditions under which you can make use of an R.M.C. Plant effectively on the site. Prepare the 'Check List' for the ordering information, you need to provide to R.M.C. Supplier. **[18]**

Q2) a) Explain with adequate sketches the sequence of construction of a micro pile. What is Tube-e-Manchet? What is TAM pipe? Explain Tube-e-Manchet process of grouting in construction of micro piles. **[8]**
b) Show with a sketch and explain the use of micro piles for underpinning works for any one of the following works: **[8]**
i) Bridge pier foundation in a river.
ii) Foundations for additional 2 storeys for an existing building.
iii) Strengthening of existing foundations of a multi-storey building.

Q3) Explain step by step the Process of Pneumatic sinking of Caissons used in a Bridge pier in a creek by adopting any of the following method : **[16]**
a) Pre-casting and lowering in to the water done by using 'Submersible Barges'.
b) Pre-casting and lowering in to the water done by using 'Inclined Ramps/ Slipways'.

P.T.O.

- Q4)** Write short notes on (**any four**): [16]
- a) Discontinuity of concrete in the pile shaft at various levels-precautions.
 - b) Collapse of the reinforcement cage in the pile shaft precautions.
 - c) Mound type of Cofferdam.
 - d) Colgrout technique.
 - e) Shotcreting.
 - f) Load Test on a pile using Reaction piles.

SECTION - II

- Q5)** For a bridge foundation Steel sheet pile coffer dam is to be constructed. Explain with sketches the sequence of construction of the coffer dam using Larsen 23 section steel sheet piles in completing the pier foundation and removal of the coffer dam in stages after completion of the Foundation?

List out areas on which Design of Cofferdam depends. What are the advantages of Steel Sheet Piles over the other type of piles used in construction of the Cofferdams? [18]

- Q6)** a) For a cross section of 6m diameter tunnel, work out the number of drill holes for blasting, that you would provide. Give details of sequence of blasting using 'Burn Cut method' by providing dynamite with electric delay caps, in each cycle of operation. [8]
- b) Explain in details the following operations in carrying the work in item (a) above. [8]
- i) Mucking and Dewatering.
 - ii) Smoke Clearance and Ventilation.
 - iii) Provision of Concrete lining.

- Q7)** a) List out and explain different properties of the "Asphalt Mix" used in road construction. [8]
- b) Explain purpose and function of "Two stage Grouting" done in construction of tunnel through fragmented rock. [8]

- Q8)** Write short notes on (**any four**) : [16]
- a) Use of Concrete Pumps in High Rise Buildings.
 - b) Belt Conveyors in Aggregate Crushing Plants.
 - c) Chemical Grouting and its applications.
 - d) Col grouting Technique
 - e) Tilting of caissons and its remedial measures.
 - f) Roller Compacted Concrete.



P1231

[4065] - 414

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

OPERATIONS RESEARCH

(2008 and 2002 Course) (Sem. - II) (501110)

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 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) Solve by Big M or Two phase method, [12]

Maximize $Z = 2x_1 + 3x_2 + x_3$

Subject to,

$$2x_1 + x_2 + x_3 \leq 10$$

$$x_1 + 3x_2 + x_3 = 12$$

$$x_1 + x_2 + x_3 = 6$$

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

b) What are slack variables and artificial variables? [4]

Q2) Material is to be transported from 3 sources to 4 destinations. The supply and demand conditions as well as unit cost of transportation are given below

Source	Destination				Supply
	1	2	3	4	
A	11	20	7	8	50
B	21	16	10	12	40
C	8	12	18	9	70
Demand	30	25	35	40	

Find the initial feasible solution by VAM. Using the solution obtained by VAM, find the minimum cost of transportation. [16]

P.T.O

- Q3)** a) Explain the Hungarian method of solving an assignment model. [6]
 b) Compare N-W corner method and least cost method of solving a Transportation model. [6]
 c) Explain convex and concave functions. [4]

- Q4)** a) Use Fibonacci method to maximize the function $Z = x(6 - 0.1x)$ with in 1% of the exact value, in the range 0 to 100. Carry out the first 4 iterations only. [9]
 b) Use steepest descent method to minimize $Z = x_1^2 + 4x_2^2 - 2x_1 x_2$. Take the starting point as (1, 1). Carry out first two iterations only. [9]

SECTION - II

- Q5)** a) Explain 'state and 'stage' in dynamic programming [4]
 b) It is proposed to develop hydropower by taking up 3 different rivervalley projects. The total budget available is 6 money units. The returns depending upon the level of investment are given in the following table.[14]

Investment	Returns from projects		
	A	B	C
0	0	0	0
1	5	15	12
2	10	20	24
3	30	22	25
4	31	23	26
5	32	24	27
6	33	25	28

Use dynamic programming and determine the allocation policy for the budget so as to maximize the total returns.

- Q6)** a) What are the applications of Queueing theory in civil engineering? [6]
 b) Explain the characteristics of queueing models. [6]
 c) Explain the Monte carlo method of simulation. [4]

Q7) a) Explain the various factors affecting the choice of a project from amongst various alternatives. [8]

b) What is a sequencing problem? Explain the method for solving 'M' stations, 'n' jobs and no passing. [8]

Q8) a) A proposal for investment of Rs 10 lakh is under consideration. It generates the following net cash inflows. [8]

Period (years)	1	2	3	4
Cash inflows	2,50,000	2,50,000	5,00,000	5,00,000

If the discount rate is 10%, is the proposal acceptable?

b) Explain the concept of dominance in Games theory. [4]

c) What are the different types of replacement models? [4]



Total No. of Questions : 8]

[Total No. of Pages : 2

P1233

[4065] - 418

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

THRUST AREAS IN PROJECT MANAGEMENT

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

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) Assume suitable data, if necessary.*

SECTION - I

Q1) Perform SWOT analysis of the Indian construction sector and recommend various measures in order to convert each weakness into a strength and each threat into an opportunity. **[18]**

Q2) Explain the various sub-phases involved in project pre-planning with a neat diagram and discuss advantages of project pre-planning with statistical information. Elaborate the role of PDRI in the same. **[8+8]**

Q3) With case studies explain :

- a) Formation of project partnering charter. **[3]**
- b) Methodology of project partnering execution. **[7]**
- c) Advantages of project partnering. **[2]**
- d) Pre-requisites necessary for effective results from partnered projects.**[4]**

Q4) Explain the following in detail :

- a) “SCM” applications in construction. **[8]**
- b) Fast track methods in construction. **[8]**

P.T.O.

SECTION - II

Q5) With respect to the ISO 9000 series, explain following concepts with flow diagrams for each :

- a) Quality and its management. [6]
- b) Conformities and Non-conformities including defects. [6]
- c) Organisation for quality effectiveness. [6]

Q6) With reference to HRD and HRM explain the following : [4+4+4+4]

- a) Training needs assessment (TNA).
- b) Management by objectives (MBO).
- c) Competency mapping (CM).
- d) Motivation - Types and effects.

Q7) a) Explain with field examples how the principle centered leadership can be developed by project managers of the construction sector, through the 7 -covey habits. [9]

- b) Explain how the John mullion's 7 point idea evaluation test is conducted in the process of generation of a 'B' - plan. [7]

Q8) Explain the following :

- a) Leadership styles. [4]
- b) Strategic planning in construction. [6]
- c) Labour stabilized matrix. [3]
- d) Six sigma applications in construction. [3]



Total No. of Questions : 8]

[Total No. of Pages : 2

P1235 [4065] - 448

M.E. (Civil - Hydraulic Engineering)

SEDIMENT TRANSPORT AND RIVER MECHANICS

(2008 Course) (501310) (Sem. - II)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) *Answer any Three questions from each section.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn whenever 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) Briefly explain the significant sediment properties. [6]
b) State the various theories of initiation of sediment motion. Explain shields' analysis in detail. [6]
c) For a 4mm diameter sediment particle, what is the critical tractive stress at 20°C? [4]
- Q2)** a) Describe the various regimes of flow in alluvial channels, stating the bed and water surface configurations in each of the regimes. Also state the empirical conditions of occurrence of respective configurations. [10]
b) Explain the effect of bed and bank friction on the resistance to the flow in alluvial channels. [6]
- Q3)** a) State the various factors considered and the assumptions made by Einstein in his bed load functions state the final relationship derived by him. [6]
b) Using meyer-peter and muller method, estimate the bed load transport of sediment in an alluvial channel 100m wide carrying a discharge of 250 m³/sec. with 3 m depth of water. The bed slope of the channel is 1 in 3600 and the mean size of sediment particles is 0.3 mm. [8]
c) How is remote sensing technique used in estimating the rate of sediment transport? [4]

P.T.O

- Q4)** a) State and explain the various regime approaches to the design of stable channels in alluvial soil. [8]
- b) Design a stable channel in alluvial soil to carry a discharge of $45\text{m}^3/\text{sec}$. The mean size of sediment particles is 0.3 mm. Use Lacey's Regime Theory. Take the side slopes of the channel as $0.5H = 1V$. [8]

SECTION - II

- Q5)** a) Explain microscopic and macroscopic methods for the measurement of bed load sediment and suspended load sediment. [8]
- b) An alluvial stream flows with a depth of flow of 3.0m. The bed slope of the stream is 1 in 2500. If the concentration of sediment at an elevation of 8mm above the bed is 800 ppm, determine the concentration at a height of 2.0m above the river bed. The median sediment size is 0.2 mm and the fall velocity is 20 mm/sec. [8]
- Q6)** a) What are the causes of stream bed variations in the form of aggradation and degradation? [8]
- b) Explain short term and long term measures for controlling the sedimentation of reservoirs. Indicate the practicability and efficacy of each of them. [8]
- Q7)** a) How are shapes of alluvial streams in plan classified? Briefly discuss their origin and peculiarities. [8]
- b) State the different methods of river gauging and explain with sketches the automatic river gauging system. [8]
- Q8)** a) Explain the different ways of classification of river training works based on various criteria. [9]
- b) Briefly explain the following:
- i) Groynes;
 - ii) Deflectors;
 - iii) Launching aprons. [9]



P1239**[4065]-455**

M.E. (Civil) (Structures)
STRUCTURAL DYNAMICS
(2008 Course) (501403) (Sem. I)

*Time : 4 Hours]**[Max. Marks : 100**Instructions to the candidates:*

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

SECTION - I

- Q1)** a) What are the main causes of seismic loading? Describe the approaches of analysis of structural response to dynamic loading? [7]
- b) Determine the equivalent stiffness of a spring for the system shown in figure 1.1 [8]

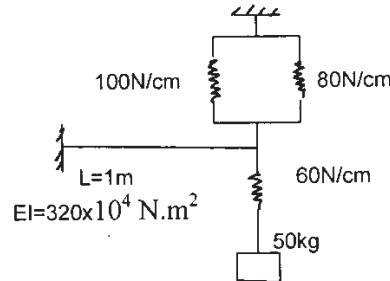


Figure 1.1

- c) Determine natural frequency and natural period of system consisting of a mass of 100 kg attached to free end of a horizontal cantilever beam through a linear spring of constant 10 kg/cm. The cantilever beam has thickness of 0.80 cm and width 1.2 cm. Take $E = 2.1 \times 10^6 \text{ kg/cm}^2$ and length of 70 cm. [10]
- Q2)** a) Obtain steady state and transient response of SDOF un-damped system subjected to harmonic excitation? [10]
- b) A vibrating system consists of weight 1000 kN and spring of stiffness 80 kN/m is viscously damped so that the ratio of two consecutive amplitudes is 1: 0.85. Determine [15]

P.T.O.

- i) Logarithmic Decrement.
- ii) Natural Frequency.
- iii) Damping Ratio.
- iv) Damping Coefficient.
- v) Damped natural frequency.

- Q3)** a) Explain Linear Acceleration Method for non-linear analysis by step by step method? [7]
- b) Write down the expression for Dynamic Load Factor? Plot DLF as function of frequency of forcing function for various damping ratio? What conclusions can be drawn from frequency response curves? [8]
- c) A body of mass 70 kg is suspended from a spring of constant 35 N/m. It is subjected to damping effect adjusted to a value of 0.23 times of that required for critical damping. If the body is subjected to a periodic disturbing force 700 N and frequency equal to 0.78 times the natural undamped frequency, find the amplitude of forced vibrations and the phase difference w.r.t. disturbing force. [10]

SECTION - II

- Q4)** a) Explain the concept of Shear Building. [5]
- b) Verify that the two normal modes of the system shown in figure 4.1 are orthogonal? [20]

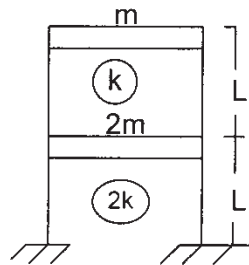


Figure 4.1

- Q5)** a) Explain Rayleigh's Method to determine frequency in fundamental mode of vibrations? [10]
- b) Obtain the equation of motion for the continuous system subjected to vibrations? Also obtain natural frequency of vibrations for uniform cantilever shear beam? [15]
- Q6)** a) Write notes in brief : [10]
- i) Power and Stodola Method.
 - ii) Tuned Mass Damper.
 - iii) Mode Super Position Technique.
 - iv) Orthogonality Principle of Normal Modes.

- b) Obtain equivalent mass, equivalent stiffness and equivalent load for a three storey frame subjected to unbalanced force of 5 kN at 2nd and 3rd floor slab for the following data – **[15]**

Mass of each floor = 300 kN, $\omega_1 = 3.88$ rad/s, $\omega_2 = 5.91$ rad/s, $\omega_3 = 15.31$ rad/s.

$$\Phi_1^T = [0.198, 0.548, 1], \Phi_2^T = [-0.872, -1.582, 1], \Phi_3^T = [12.1, -6.26, 1].$$



P1241

[4065] - 457

M.E. (Civil) (Structures)

STRUCTURAL DESIGN OF CONCRETE BRIDGES

(501404 (b)) (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 codes, IS1343, IS 456-2000 & non programmable calculator is allowed.*
- 5) *Neat diagrams must be drawn wherever necessary.*
- 6) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Classification of bridges. **[8]**
- b) What are the factors affecting the span of bridge, Derive the conditions for 'Economical span' of bridge stating the assumptions made. **[9]**
- c) Loading for railway bridges. **[8]**
-
- Q2)** a) Compare simply supported RCC girder with balanced cantilever PSC girder in following respect : **[10]**
- i) Ease of construction.
 - ii) Launching.
 - iii) Economy.
- b) Design the culvert with the data : **[15]**
- Clear span of the culvert = 6 m
- Clear carriage way width = 7.4 m
- Size of kerb = 300 mm x 600 mm
- Average thickness of wearing coat 80 mm
- Use material M25, Fe 415
- Culvert is on the national high way.
- Draw the cross section showing details of reinforcement at mid-span and at junction of the slab and kerb.

P.T.O.

- Q3)** 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 Fig. 1. 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]**

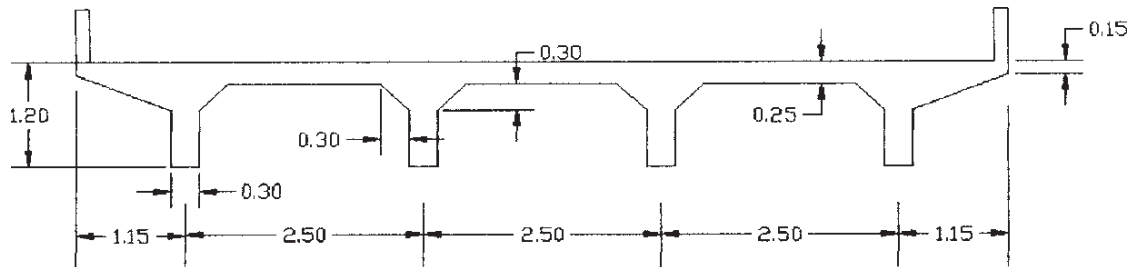


Fig1 (All dimensions are in meters)

Size of RCC kerb = 150 mm x 600 mm

Effective span of longitudinal girder = 12m

Live load = IRC-Class AA

Thickness of wearing coat = 80 mm.

Spacing of cross-girders = 4m 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.

SECTION - II

- Q4)** a) Describe different types of bridge foundations mentioning the situations for particular type are used stating merits and demerits of each type. **[9]**
- b) Design criteria for rigid frame bridges. **[8]**
- c) Draw detailed cross section of typical box section PCS girder Name all components. **[8]**
- Q5)** a) Check the stability of the abutment for the following : **[15]**
- Top width of abutment = 1m
- Height of abutment = 5m
- 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 15m, Type of loading : IRC class AA.

- b) List the steps involved in the of simply supported deck type post tensioned prestressed concrete bridges. [10]

Q6) a) Write a detailed note on metallic bearing showing sketches. [8]

- b) Design a reinforced elastomeric bearing at a pinned end of a plate girder of a bridge with following data.

Maximum vertical load = 1200 kN

Dynamic vertical load = 90 kN

Transverse lateral load = 35 kN

Longitudinal load = 60 kN

Longitudinal total translation 12 mm

Rotation at support 0.003°

Shear modulus of elastomeric bearing = 1.2 N/mm^2

Allowable comp. stress for concrete = 8 N/mm^2

Allowable comp. stress for elastomer = 10 N/mm^2

[17]



Total No. of Questions : 6]

[Total No. of Pages : 2

P1245

[4065]-470

M.E. (Civil) (Structures)

NONLINEAR ANALYSIS OF STRUCTURES

(2008 Course) (Elective - III) (501411 (d))

Time : 4 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer any two questions from each section.*
- 2) *Figures to the right indicate full marks.*
- 3) *Assume suitable data if required.*
- 4) *Use of non-programmable pocket calculator and stability coefficient table is permitted.*

SECTION - I

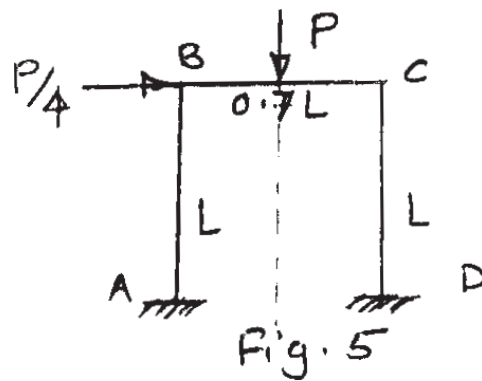
- Q1)** a) Explain types of structural non-linearities, give suitable example for each. **[8]**
- b) With the help of stress-strain relation explain phases of linear and non linear behaviour of structure. **[8]**
- c) Explain moment-curvature relation in nonlinearity for a cantilever beam subjected to tip load. **[9]**
- Q2)** a) State from basic principles the governing equation for non linear behaviour of plate. **[15]**
- b) Assuming suitable solution for in plane displacement (u, v) and transverse displacement (w), obtain load-deflection relationship for nonlinear analysis of orthotropic rectangular plate. **[10]**
- Q3)** a) From basic principles develop constitutive relation for plates with material nonlinearity. **[10]**
- b) Explain steps for analysis of rectangular plate with large deflections (nonlinear analysis). **[15]**

SECTION - II

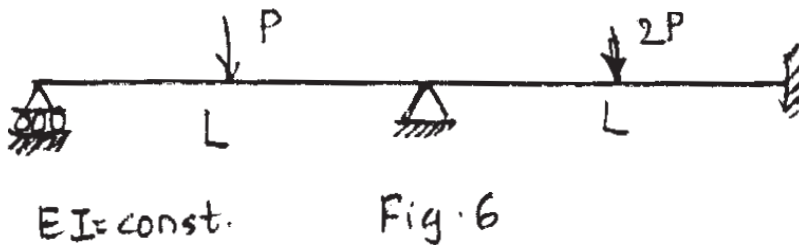
- Q4)** a) Explain load factor-deflection curve for the members of elastic frame subjected to axial and non axial loads. **[12]**
- b) Derive stiffness matrix for members of rigid jointed plane frame subjected to axial forces, bending moments and shear at its end. **[13]**

P.T.O.

- Q5) Calculate elastic plastic failure load of a portal frame as shown in fig.5. Take the effect of axial loads in to consideration. What is the order of plastic hinge formation. [25]



- Q6) Calculate failure load for a beam as shown in fig.6. [25]



XXXXX

P1246

[4065] - 472

M.E. (Civil) (Structures)

MECHANICS OF MODERN MATERIALS

(2008 Course) (Elective - IV) (501412(b))

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 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.*
- 7) *All questions carry equal marks.*

SECTION - I

- Q1)** a) Explain procedures to obtain carbon based fibers, PAN derived fibers and pitch derived fibers. **[8]**
- b) Define “thermosets” and “thermoplastics”. **[7]**
- c) Why fiber surface treatments are necessary? Write down in detail the treatment necessary for graphite-fibers. **[10]**

- Q2)** A 50 mm. cube of graphite-reinforced material is subjected to 125 kN compressive force perpendicular to the fiber direction, specifically in the 2-direction the cube is free to expand and contract. Find changes in 50 mm. dimension. Find force required to provide the constraint if cube is constrained against expansion in the 3 direction **[25]**

$$E_1 = 155 \text{ GPa}, E_2 = 12-10 \text{ GPa}, E_3 = 12.10 \text{ GPa}$$

$$G_{2,3} = 2.30 \text{ GPa}, G_{1,3} = 4.40 \text{ GPa}$$

$$G_{1,2} = 4.40 \text{ GPa}, \nu_{1,2} = .248$$

$$\nu_{1,3} = .248, \nu_{2,3} = .458$$

P.T.O.

- Q3)** a) Explain failure theories for fiber reinforced material using maxi. Stress criterion. [10]
- b) Explain failure theories using T_{sai} - W_u criterion. [10]
- c) What is the difference in theories mentioned in (a) and (b) of question 3. [5]

SECTION - II

- Q4)** a) Discuss the laminate configuration for following laminates with neat sketches (any four) : [16]
- i) Symmetric cross ply laminates.
- ii) Anti-symmetric Angle ply laminates.
- iii) Quassi-Isotropic laminates.
- iv) Hybrid laminates.
- v) Uni-directional laminates.
- b) Explain stress-strain relationship of a lamina subjected to moisture and thermal loading in plane stress condition. [9]
- Q5)** a) Explain Environmental Effect on Composite Material. [8]
- b) Explain layerwise theory for the analysis of composite laminate. [8]
- c) Explain Residual stresses in composite laminates. [5]
- d) Write short note on manufacturing defects in composites. [4]
- Q6)** a) Explain in detail bi-Axial testing and inter laminar fracture toughness of composite material. [8]
- b) Explain CTE and CME of laminates. [5]
- c) Explain in detail Auto-clave curing for processing of High performance composite materials. [8]
- d) Write detail note on optimization concept of composite material. [4]



P1247

[4065]-477

M.E. (Civil) (Environmental Engineering)

**PHYSICO-CHEMICAL PROCESS FOR WATER & WASTE WATER
TREATMENT**

(Sem. - I) (2010 Course) (501503)

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) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Why can coliform bacteria be used as indicators of drinking water quality? Discuss the limitations of coliform as an indicator. Why is a positive test for coliforms in a public water supply considered more serious than a positive test for total coliforms? [8]
- b) Explain the significance of effluent standards in controlling the water pollution problems. Mention the effluent standards of BOD, COD, TSS, Temperature, oil and grease. [8]
- Q2)** a) Draw a detailed flow sheet for a waste water treatment plant with primary, secondary, and tertiary treatment units into it. Mention the significance of each unit. [8]
- b) Compare unit operation and unit processes. [8]
- Q3)** a) Waste water treatment plant has two primary clarifiers, each 20 m in diameter with a 2 m side water depth. The effluent weirs are inboard channels set on a diameter of 18 m. For a flow of 12900 m³/d, calculate the overflow rate, detention time and weir loading. [8]
- b) Explain – Destabilisation of colloids. [8]
- Q4)** a) Explain with reactions the coagulation - flocculation process with alum. [8]
- b) Explain the different methods of aeration in water and waste water treatment. [8]

P.T.O.

- Q5)** Write short notes (Any Three) : **[18]**
- a) Water quality Indices.
 - b) Clariflocculation.
 - c) Compare chemical and biological processes in waste water treatment.
 - d) Necessity of tertiary waste water treatment.
 - e) Drinking water quality standards.

SECTION - II

- Q6)** a) Design a rapid sand filter to treat 10 million liters of raw water per day allowing 0.5% of filtered water for backwashing. Half hour per day is used for backwashing. Rate of filtration be 5000 l/h/m² of bed. Assume necessary data. **[10]**
- b) Explain with illustrative diagram **[8]**
- i) Negative head.
 - ii) Air binding.
- Q7)** Explain modes of operation and the operational problems of filtration. **[16]**
- Q8)** a) What are the different factors affecting disinfection. **[8]**
- b) Explain disinfection with ozone and UV radiation. **[8]**
- Q9)** a) Give applications of Ion Exchange process and of Membrane process. **[8]**
- b) Differentiate between Nano-filtration and Micro-filtration. **[8]**
- Q10)** Write short note on : **[4 × 4]**
- a) Back Washing.
 - b) Principal of working and design of filtration.
 - c) Reverse Osmosis.
 - d) Ultrafiltration.



P1251**[4065]-493****M.E. (Mechanical Engineering)****(Common to Design, Heat Power, Mechatronics and Automotive Engg.)****TECHNOLOGY AND FINANCIAL MANAGEMENT****(2008 Course) (502803) (Sem. I)***Time : 3 Hours]**[Max. Marks : 100**Instructions to the candidates:*

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

SECTION - I**Unit - I**

- Q1)** a) Define 'budget' and 'budgetary control'. What are the main steps in budgetary control? **[6]**
- b) The following data are available in a manufacturing company for a yearly period :

	<i>Rs. (lakhs)</i>
<i>Fixed expenses</i>	
Wages and salaries	9.5
Rent and taxes	6.6
Depreciation	7.4
Sundry administrative expenses	6.5
<i>Semi variable expenses at 50% of capacity</i>	
Maintenance and repairs	3.5
Indirect labour	7.9
Sales department salaries	3.8
Sundry administrative salaries	2.8
<i>Variable expenses at 50% of capacity</i>	
Materials	21.7
Labour	20.4
Other expenses	7.9
<i>Total cost</i>	98.0

P.T.O.

Assume that the fixed expenses remain constant for all levels of Production, semi variable expenses remain constant between 45% and 65% capacity, increasing by 10% between 65% and 80% capacity.

<i>Sales at various levels are :</i>	<i>Rs. (laks)</i>
50% capacity	100
60% capacity	120
75% capacity	150

Prepare a flexible budget for the year and forecast the profit at 60% and 75% capacity. **[10]**

OR

- Q2)** a) Explain in brief the functions of finance? What are the sources of long term and short term finance? **[8]**
- b) Outline a plan for and utility of ‘sales budget’ and ‘Materials budget’ with an example of your choice. **[8]**

Unit - II

- Q3)** a) Product X is obtained after it passes through three distinct processes. The following information is obtained from the accounts for the week ending May 12, 2010. The total production overhead cost of the processes is Rs. 9,000.

Items	Total Rs.	Process I Rs.	Process II Rs.	Process III Rs.
Direct material	7,542	2,600	1,980	2,962
Direct wages	9,000	2,000	3,000	4,000

A total of 1000 units @ Rs. 3 each were introduced in process I. There was no work in process at the beginning or end of the period. The output of each process pass direct to the next process and finally to the finished stores. Production overhead is recovered on 100% of direct wages. The following additional data are obtained :

	Output during the week (units)	Percentage of normal loss to input	Value of scrap per unit (Rs.)
Process I	950	5%	2
Process II	840	10%	4
Process III	750	15%	5

Prepare the three process cost accounts along with abnormal loss/gain account. **[12]**

- b) Discuss the nature of contract costing and explain how costs are recorded in contracts? [6]

OR

- Q4)** a) What is break even chart? Discuss the limitations and uses of break even chart? [8]

- b) The following cost information relates to a factory X for two years:

	<u>2008</u>	<u>2009</u>
Installed capacity (units)	10,000	10,000
Opening stock (units)	Nil	1,000
Closing stock (units)	1,000	Nil
Output (units)	10,000	9,000
Selling price per unit (Rs.)	14	14
Fixed costs for the year (Rs.)	85,000	85,000
Variable costs per unit (Rs.)	2.90	2.90

Calculate the profit under absorption costing and marginal costing for the two years. [10]

Unit - III

- Q5)** a) Explain the theory of consumer's demand with the help of indifference curve analysis? Also explain Income effect and substitution effect? [10]
- b) Distinguish between micro economics and macro economics? [6]

OR

- Q6)** Explain the following in brief: [16]
- a) Components of balance of payments.
- b) Methods to protect domestic trade.
- c) Measures of inflation.

SECTION - II

Unit - IV

- Q7)** a) Explain in brief the purpose of quality standards? What are the quality management principles defined in ISO 9001 - 2000 series? [9]
- b) What is Juran trilogy diagram? Explain its importance in quality management? [7]

OR

- Q8)** a) Define Total Quality Management (TQM)? What are the elements and principles of TQM? [8]
- b) Distinguish between *push* and *pull* system? Explain the role of Kanban cards in JIT cycle with the help of a neat line diagram? [8]

Unit - V

- Q9)** a) What are the application areas of PERT/CPM techniques? [5]
- b) The time and cost estimates and precedence relationship of the different activities constituting a project are given below :

Activity	Predecessor activity	Time (in weeks)		Cost (in Rs.)	
		Normal	Crash	Normal	Crash
A	-	3	2	8000	9000
B	-	8	6	600	1000
C	B	6	4	10000	12000
D	B	5	2	4000	10000
E	A	13	10	3000	9000
F	A	4	4	5000	5000
G	F	2	1	1200	1400
H	C,E,G	6	4	3500	4500
I	F	2	1	700	800

- i) Draw a project network diagram and find the critical path. [6]
- ii) If a deadline of 17 weeks is imposed for the completion of the project, what activities will be crashed along with additional cost. [7]

OR

- Q10)** a) What are the rules for and errors in drawing network diagrams? [6]
- b) A project is composed of time activities whose time estimates in days are given below :

Activity	A	B	C	D	E	F	G	H	I
Optimistic time	2	2	4	2	2	3	2	5	3
Most likely time	2	5	4	2	5	6	5	8	6
Pessimistic time	8	8	10	2	14	15	8	11	15

Activities A, B and C can start simultaneously. Activity D follows activity

A while E follows B. Activity D and E are followed by activity G while F is dependent on C, H depends on D and E, while I depends on F and G.

- i) Construct the PERT network. [4]
- ii) Find the expected duration, total float and variance of each activity. [5]
- iii) What is the critical path and expected duration of the project. [3]

Unit - VI

- Q11)** a) How does training differ from development? Discuss the role of training and development in the present business environment? [8]
- b) Discuss the process of organizing human resource functions. How can this process be completed effectively? [8]

OR

- Q12)** a) Distinguish between autocratic and supportive models of organizational behavior? [6]
- b) Discuss the following in brief: [10]
- i) Management by Objectives.
 - ii) Any two methods of merit rating practices.

* * *

P1252

[4065] - 494

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

PERFORMANCE ASSESSMENT OF MECHANICAL EQUIPMENTS

(Elective - I) (2008 Course) (502104 (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) Explain the energy conservation opportunities in boiler and fired systems. [8]

b) With a neat schematic explain the various steam system components used in an industrial plant. [8]

Q2) a) Estimate the thermal efficiency of boiler using indirect method with the following data. [18]

Fuel consumption : 500 kg/h

Steam generation rate : 1800 kg/h

Calorific value : 41500 kJ/kg

Steam generation pressure : 1MPa at saturated

Chemically correct air-fuel ratio : 15.5 : 1

Excess air supplied : 26%

Exhaust gas temperature & its specific heat : 300°C & 1.05 kJ/kgK

Boiler surface temperature : 60°C

Boiler surface area : 50 m²

Ambient temperature : 30°C

Feed water temperature : 80°C

Heat transfer coefficient from outer surface of boiler : 8 W/m²K

Ultimate analysis of fuel : C = 84%, H = 12%, S = 3%, O₂ = 1%.

You may assume additional data if necessary.

- Q3)** a) Classify the cogeneration systems in details and state its applications. [8]
b) Discuss the various waste heat qualities with its applications. [8]
- Q4)** Write a short note on any two : [16]
a) Types of steam traps and their selection.
b) Gas turbine cogeneration system.
c) Heat wheels.

SECTION - II

- Q5)** a) Discuss the various factors that affect the efficiency of compressed air system. [10]
b) Describe the method to estimate free air delivery of compressor using nozzle method. [8]
- Q6)** a) State the various types of fans used in ventilation systems. Explain its characteristics with applications. [8]
b) Explain the step by step procedure of energy performance assessment of DG sets. [8]
- Q7)** a) Discuss the energy conservation opportunities in fans and blowers. [8]
b) Explain : Heat pipe as a waste heat recovery device. [8]
- Q8)** Write a short note on any two of the followings : [16]
a) Field testing of Fans.
b) Energy conservation opportunities in pumping system.
c) Fuel economy measures in Furnaces.



P1253

[4065] - 497

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

CONVECTIVE HEAT TRANSFER ANALYSIS

(2008 Course) (Elective - I) (502104 (d))

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

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

SECTION - I

Q1) Discuss the convection problems involved in the following applications with neat sketches **[18]**

- a) House hold refrigerator.
- b) Split air conditioner.
- c) Power plant furnace or boiler.

Q2) a) Define any three dimensionless terms : Prandtl number, Stanton number, Grashoff number, Reynolds number. **[6]**

- b) Air at pressure of 6 kN/m² and a temperature of 300°C flows with a velocity of 10 m/s over a flat plate 0.5 m long. Estimate the cooling rate per unit width of the plate needed to maintain it at a surface temperature of 27°C. For air $T_f = 437$ K, $p = 1$ atm, $\gamma = 30.84 \times 10^{-6}$ m²/s, $k = 36.4 \times 10^{-3}$ W/m, $Pr = 0.687$.

Properties such as k , Pr , μ may be assumed to be independent of pressure and γ depends on density and pressure. Approximate correlation is given

$$\text{as } \bar{N}_u = 0.664 R_e^{1/2} P_r^{1/3} \quad \text{[10]}$$

Q3) Write down the governing equations for 2D, constant fluid property, turbulent boundary layer flow. Explain the concept of eddy viscosity. Explain mixing length theory. **[16]**

P.T.O.

- Q4)** a) Derive the generalized differential equation of convection in cylindrical co-ordinates. [6]
b) Explain the problem of laminar flow with heat transfer in a circular pipe and derive the equation of Nusselt number. [10]

SECTION - II

- Q5)** Discuss in detail the problem of Natural Convection Heat Transfer from a heated vertical plate. Using either the exact solution approach or Integral Method approach, obtain the expression for local and average Nusselt number. List the assumptions made. [18]
- Q6)** a) Discuss the problem of turbulent flow over a flat plate and associated heat transfer problem. [8]
b) Discuss any four correlations for turbulent flow heat transfer problems. [8]
- Q7)** Write detailed notes on : [16]
a) Combined Convection.
b) Convective heat transfer through porous media.
- Q8)** a) Explain with neat sketches, three typical practical examples of condensation heat transfer. [9]
b) Discuss the classical problem of film condensation on a vertical plate. List the assumptions made and derive the expression for average heat transfer coefficient. [7]



P1254

[4065]-500

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

CONVENTIONAL POWER PLANTS

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

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

Q1) a) In a cogeneration plant, the power load is 5.6 MW and heating load is 1.163 MW. Steam is generated at 40 bar and 500° C and is expanded isentropically through a turbine to a condenser pressure of 0.06 bar. The heating load is supplied by extracting steam from the turbine at 2 bar, which condenses in the process heater to saturated liquid at 2 bar & then pumped back to the boiler

Compute:

- i) Steam generation capacity in t/h.
- ii) The heat input in the boiler in kw.
- iii) Fuel burning rate if the calorific value of coal is 25 MJ/kg and boiler efficiency is 88%.

[12]

b) Write a note on regeneration cycle.

[4]

Q2) a) Draw a modern steam power plant & explain fuel circuit. **[8]**

b) What do you understand by FBC? Explain with a neat sketch. State the advantages of the same. **[8]**

P.T.O.

Q3) a) In a combined gas turbine - steam turbine power plant, the exhaust gases from the open cycle gas turbine are used to generate steam for the steam cycle in which additional fuel is burned. The pressure ratio of gas turbine is 7.5, the inlet air temp. is 15° C & the maximum cycle temperature is 750° C. Combustion of additional fuel raises the gas temp. to 750°C and the gas and the gas leaves the steam generator at 100°C. The steam is supplied to the turbine at 50 bar and 600° C. The condenser pressure is 0.1 bar. The total power output of the plant is 200 MW. Neglecting the fuel - mass flow rate.

Determine :

- i) Flow rates of air & steam required in kg per hour.
- ii) Power output of steam & gas turbines.
- iii) Thermal efficiency of the combined plant.
- iv) Air-fuel ratio.

Take Calorific value of fuel as 43 MJ/kg.

$C_{p_g} = 1.11 \text{ KJ/kg K}$ & γ for gases is 1.33. **[12]**

- b) Explain the functions of the followings in a steam turbine: **[4]**
- i) Labyrinth glands.
 - ii) Turning gear.

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

- a) "CANDU" reactors.
- b) Boiling Water Reactor.
- c) Flexible & rigid shaft for steam turbines.
- d) Governing of steam turbines.

SECTION - II

- Q5) a)** Explain the importance of mini and micro Hydal plant and give a typical layout of such a plant. What is their total potential in our country. **[8]**
- b) What are the constraints of hydro power plant? Explain their social and environmental impacts. **[8]**

- Q6)** a) Explain in detail how economic feasibility of power plants is worked out. [8]
b) Discuss in detail the safety measures and arrangements in different power plants. [8]
- Q7)** Write notes on: [18]
a) Compressed air storage system.
b) Latent heat storage system.
c) Fuel cell - working principle, types and applications.
- Q8)** Explain the following: [16]
a) Instrumentation system for thermal power plants.
b) Clean energy technology.
c) Planning of different power plants.



P1256**[4065]-503****M.E. (Mechanical) (Heat Power Engineering)****Measurement Techniques & Data Analysis****(2008 Course) (Semester - II) (502109)***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 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 different types of correlations. [8]
 b) Explain stages of measurement system in Measurement system. [8]

- Q2)** a) Quotations of index numbers of security prices of a certain stock company are given below. Using Ranu correlation method, determine the relationship between debenture prices and share prices. [8]

Year	Debenture price	Share price
1	97.8	73.2
2	99.2	85.8
3	98.8	78.9
4	98.3	75.8
5	98.4	77.2
6	96.7	87.2
7	97.1	83.8

- b) Differentiate between correlation and regression analysis. [8]

P.T.O.

- Q3)** a) Enumerate various thermophysical properties of a substance. [4]
 b) Explain the working of Vortex shedding flow meter. [8]
 c) Explain the applications of correlation analysis. [6]

- Q4)** a) Explain Beer Lambert's Law. [6]
 b) Explain with a neat sketch the working of infrared spectrophotometer. [10]

SECTION - II

- Q5)** a) Explain torque measurement on rotating shaft. [6]
 b) Explain principle, construction and working of monochromatic-brightness radiation thermometers. [6]
 c) Discuss in detail about thermistor characteristics. [4]

- Q6)** a) Explain in detail with example about adaptive control. [4]
 b) Explain method of measuring acceleration in physical processes. [6]
 c) Explain servo and proportional control value use for finite positioning. [6]

- Q7)** a) An integral controller is used for speed control with a setpoint of 12rpm with in a range of 10 and 15rpm. The controller output is 22% inially. The constant $K_i = -0.15\%$ controller output per second per percentage error. If the speed jumps to 13.5rpm, calculate the controller output after 2 seconds for a constant e_p . [10]
 b) Explain how to measure thermal diffusivity of a substance. [6]

- Q8)** Write short notes on any three: [18]
 a) Force measurement using load cell.
 b) Applications of spectroscopy.
 c) Tachogenerator.
 d) Hall effect sensors.
 e) Piezoelectric sensor.



P1258

[4065] - 514

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

INSTRUMENTATION & AUTOMATIC CONTROL

(2008 Course) (Elective - I) (502204(a))

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) Answer any three questions from each section.
- 2) Answers three questions from Section I and three questions from Section II.
- 3) Answer 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 the various stages of measurement system. [10]

b) Explain the properties of correlation co-efficient. [6]

Q2) a) The following table gives the distribution of items of production and also the relatively defective items among them, according to size groups. Find the correlation co-efficient between size and defect in quality and its probable error. [12]

Size group	15-16	16-17	17-18	18-19	19-20	20-21
No. of items	200	270	340	360	400	300
No. of defective items :	150	162	170	180	180	114

b) Explain the uses of regression Analysis. [6]

Q3) a) Explain the Laser Doppler anemometer with a neat sketch. [10]

b) A copper resistor at 20°C is used to indicate the temperature of bearings of machine. What resistance should not be exceeded if the maximum bearing temperature is not to exceed 150°C. The resistance temperature co-efficient of copper is 0.00393/°C at 20°C. [6]

- Q4)** a) In a partially destroyed laboratory record of an analysis of correlation data, the following results are only legible. [10]
Variance of X = 9
Regression equations $8X - 10Y + 66 = 0$
 $40X - 18Y = 214$
Find
i) The mean value of X & Y.
ii) Co-efficient of correlation between X & Y.
iii) Standard deviation of Y.
b) Explain Total radiation Pyrometer with a neat sketch. [6]

SECTION - II

- Q5)** a) While measuring speed of a turbine with stroboscope, single images were observed for stroboscope. Setting of 3000, 4000 & 5230 rpm. Determine the speed of machine. [6]
b) Explain the method of measurement of speed using stroboscope. Mention various methods of speed measurement. [10]
- Q6)** a) The standard measured indication range of a transducer is 4-20 mA. If the set point value is 11 mA and a measurement of 11.5 mA, find the error expressed as percent of span. [6]
b) Explain the construction and working of electromagnetic flow meter. Mention its merits and demerits. [10]
- Q7)** a) Explain the working of measurement of low pressure of order of 0.0001 mm of Hg. [8]
b) Explain the calibration of thermocouples. [8]
- Q8)** Write short notes on any three : [18]
a) Measurement of humidity.
b) UV - Spectrophotometer.
c) Applications of Chromatography.
d) Measurement of torque.



P1259
[4065] - 515
M.E. (Mechanical) (Design Engineering)
ADVANCED MATERIAL SCIENCE
(2008 Course) (Elective - I) (502204 (B))

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Explain the concepts of lattice, basis and crystal structure. How are they related? [8]
b) List and sketch five possible Bravais lattices in two dimensions. [8]

OR

- Q2)** a) Determine the relationship between the lattice parameter a and the atomic radius r for monoatomic, SC, BCC and FCC structures. [8]
b) Draw the following planes and directions in the case of a FCC structure : (112), (001) and (101). [8]

- Q3)** a) Explain applications of Phase Diagrams. [8]
b) List important micro-constituents of Fe-C system and explain their mechanical properties. [8]

OR

- Q4)** a) Explain the method used for hardening non-ferrous alloys. [8]
b) Explain spheroidizing annealing process used in heat treatment of tool steel. [8]

- Q5)** Write short notes on : [18]
a) Maraging Steel.
b) Haste steel.
c) Mg alloy.

SECTION - II

- Q6)** a) Explain commonly used materials in orthodontal applications. [8]
b) What is superconductivity? Mention important property changes that occur in materials when they undergo phase change from normal to the superconducting state. [8]

OR

- Q7)** A continuous and aligned glass fibre-reinforced composite consists of 40 Vol% of glass fibres having a modulus of elasticity 69 GPa and 60 Vol% of a polyester resin that, when hardened, displays a modulus of 3.4 GPa. Calculate the modulus of elasticity of this composite in the longitudinal directions and in perpendicular to the direction of the fibre alignment. [16]

- Q8)** a) Explain the process of surface coating by vapour deposition. [8]
b) What are carbon nanotubes? Mention important technological applications. [8]

OR

- Q9)** a) Explain the process of surface modification with high-energy beams. [8]
b) Discuss typical applications of glass-ceramics. [8]

- Q10)** Write short notes : [18]
a) Metallic surface coatings.
b) Cermets.
c) Shape memory alloys.



P1260

[4065] - 516

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

OPTIMIZATION TECHNIQUES

(2008 Course) (Elective - I) (502204 (c))

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

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

SECTION - I**Q1)** Explain the ways of classifying optimization problem. **[16]**

OR

Q2) 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

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

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 the 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. **[16]**

Q3) A beam of uniform rectangular cross section is to be cut from a log having a circular cross section of diameter $2a$. The beam has to be used as a cantilever beam (the length is fixed) to carry a concentrated load at the free end. Find the dimensions of the beam that correspond to the maximum tensile (bending) stress carrying capacity. **[16]**

OR

P.T.O.

Q4) A research laboratory has two melts of Cu and Ni alloy (composition by parts mentioned below) to make new alloy

Composition Parts		
Melt	Cu	Ni
I	2	1
II	1	1

To make new alloy at least 10 kg of Cu and 6 kg of Ni is needed. Melt I cost 25/kg and melt II cost 30/kg. Formulate LP problem to minimize cost and solve using simplex algorithm. **[16]**

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

- Engineering applications of optimization.
- Theorem of necessary condition and sufficient condition.
- Simplex algorithm.

SECTION - II

Q6) Determine minimum of the following function using the golden section search
 $f = 2 - 4x + e$

Compute the minimum with $x = 0$, step size of 0.5 and tolerance = 0.01. **[16]**

OR

Q7) Find the minimum of $f(x) = (100 - x)^2$ over the interval $60 \leq x \leq 150$ using interval halving method to within 10% of exact value. **[16]**

Q8) Find the minimum of $f(x) = 2x_1^3 + 4x_1x_2^3 - 10x_1x_2 + x_2^2$ from the starting point $x^{(0)} = [5, 2]^T$, where $f(x^{(0)}) = 314$ using Powell's conjugate direction method. **[16]**

OR

Q9) 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 secant method with an initial step size of $t_0 = 0.1$, $\lambda_1 = 0.0$ and $\epsilon = 0.01$. **[16]**

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

- Characteristics of a constrained optimization problem.
- Random Search methods to solve a constrained optimization problem.
- Geometric interpretation of Sequential Linear Programming.



P1261

[4065] - 518

M.E. (Mechanical) (Design Engineering)

PROCESS EQUIPMENT DESIGN

(2008 Course) (Elective - II) (502205)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Explain importance of design pressure, factor of safety, weld joint efficiency, corrosion allowance, design loading in relation to process equipment design. **[8]**
- b) A pressure vessel is to be designed for an internal pressure of 0.5 N/mm^2 . The vessel has nominal diameter of 1.4m. The vessel is made up of stainless steel with permissible stress of 125 N/mm^2 . If the weight of vessel and content is 3000 kg and torque due to offset piping is 550 Nm. Find stresses due to combined loading. **[8]**
- Q2)** a) A tall vertical vessel of diameter 1.25 m in diameter and 10 m in height is to be provided with skirt support. The weight of vessel with attachments is 800 kN. Skirt diameter is equal to diameter of vessel and height is 2 m. Wind pressure on the vessel is 1.1 kN/m^3 Seismic coefficient is 0.08. Permissible stress in skirt material is 9 kN/cm^2 and permissible compressive stress is 8 kN/cm^2 Estimate thickness of support. **[10]**
- b) Describe in detail testing and inspection of Pressure Vessels. **[6]**
- Q3)** Draw a neat sketch of floating roof storage tank and name the different parts. Discuss design considerations of this tank with necessary formulae. **[16]**

P.T.O

P1263**[4065] - 526****M.E. (Mechanical) (Design Engineering)****VEHICLE DYNAMICS****(2008 Course) (Elective - IV) (502212(a))***Time : 3 Hours]**[Max. Marks : 100**Instructions to the candidates:*

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

SECTION - I

- Q1) a)** Find equivalent vibration exposure, a_{eq} from following three events and also find 4 hour energy equivalent acceleration. **[8]**

Event	a_n m/s ²	Effective Time Hours
1	5.6	0.7
2	10.3	0.5
3	2.5	1.0

- b) The sprung parts of a passenger car weigh 1115 N and the un-sprung parts weigh 1050 N. The combined stiffness of the suspension springs is 73 kN/m and that of the tires is 855 kN/m. Determine the two natural frequencies of the bounce motions of the sprung and un-sprung mass. **[8]**

OR

- Q2)** The sprung mass of a vehicle is 1600 kg, its center of gravity is 1.5 m behind the front axle, and the wheelbase is 2.3 m. Front ride is 35 kN/m and the rear ride rate is 40 kN/m. The radius of gyration of the sprung parts about a horizontal transverse axis through the center of gravity is 1.2 m. Calculate the natural frequencies of the pitch and bounce motions of the vehicle body. Also determine the locations of the oscillation centers and plot mode shapes. Comment on the result and mention which design parameters can be varied to increase the stability of vehicle. **[16]**

P.T.O.

Q3) A sports car weighs 10 kN and has a wheelbase of 2.25 m. The center of gravity is 1.23 m behind the front axle. The cornering stiffness of each front tire is 60 kN/rad and that of each rear tire is 71 kN/rad. The steering gear ratio is 20:1. Determine the steady-state yaw velocity gain and lateral acceleration gain of the vehicle in the forward speed range of 0 to 200 km/h with step of 40. [16]

OR

Q4) a) Derive an expression for the steer angle δ_f required to negotiate a given turn with usual notations. [8]
b) Explain the procedure to find steady state response to steering input. [8]

Q5) Explain how constant speed, constant radius test and constant steer angle tests are conducted and their significance. Which parameters of vehicle design can be refined based on the test results. [18]

SECTION - II

Q6) A passenger car weighing 21 kN has a wheelbase of 2.8 m and CG 1.2 m behind the front axle and 0.5 m above ground. The car is moving on horizontal plane and the drag and rolling resistance are negligible. Determine the maximum braking force, maximum deceleration and distribution factor to achieve them when i) co-efficient of friction is 0.75 and ii) co-efficient of friction = 0.25. [16]

OR

Q7) Describe with neat sketch steering mechanisms for tracked vehicles. [16]

Q8) Draw neat sketch of idealized automobile suspension (single dof) system approaching half sine speed bump. Write governing differential equation, base input displacement, velocity and acceleration function when vehicle is on the speed bump. Obtain a general solution for response of the vehicle in terms of the relative displacement using Laplace transform. [16]

OR

Q9) A vehicle weighs 21 kN and has a wheelbase of 2.6m. The center of gravity is 1.2m behind the front axle and 55 cm above ground level. The frontal area of the vehicle is 2.5 m² and the aerodynamic drag coefficient is 0.35. The coefficient of rolling resistance is given by $f_r = 0.014 + 0.4 \times 10^{-7} V^2$, where V is the speed of the vehicle in kilometers per hour. The rolling radius of the tires is 32 cm. The coefficient of road adhesion is 0.9. Estimate the possible maximum speed of the vehicle on level ground as determined by the maximum tractive effort that the tire-road contact can support if the vehicle is (a) rear-wheel drive, and (b) front-wheel-drive. Plot the resultant resistance versus vehicle speed, and show the maximum thrust of the vehicle with the two types of drive. [16]

Q10) Write short notes :

[18]

- a) Handling of multi-axle vehicle.
- b) Frequency Response of road vehicle in yaw.
- c) Locking of wheels during braking.



P1264**[4065]-529****M.E. (Mechanical) (Mechatronics)****Applied Numerical Methods and Computational Techniques****(Part I) (2008 Course) (502801) (Sem. - I)***Time : 3 Hours]**[Max. Marks : 100**Instructions to the candidates:*

- 1) *Attempt any three questions from Section-I and Three from Section-II..*
- 2) *Answers to each Section should be written in separate answer books.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data wherever necessary but mention it clearly.*
- 5) *Use of scientific calculator is allowed.*

SECTION - I

Q1) Find approximate value of y at $x = 4$. The governing differential equation is

$$\frac{dy}{dx} = 1 + xy \text{ with } y(0) = 2$$

Using RK 4th order method find $y(0.1), y(0.2)$ **[16]**

Q2) Solve the following set of differential equations using improved polygon (Modified Euler's) method. Given $x = 0, y_1 = 4$ and $y_2 = 6$. Integrate to $x = 2$ with step size $h = 1$ **[16]**

$$\frac{dy_1}{dx} = 0.5 y_1 \text{ and } \frac{dy_2}{dx} = 4 - 0.3 y_2 - 0.1 y_1$$

Q3) a) Compute L and U matrices for the following matrix. **[8]**

$$\begin{bmatrix} 2.00 & -1.00 & 0.00 \\ -1.00 & 2.00 & -1.00 \\ 0.00 & -1.00 & 2.00 \end{bmatrix}.$$

b) Calculate inverse of the matrix in Q.3 (a) using suitable numerical method. [8]

Q4) a) Fit a straight line to the points (1,0.5), (2,2.5), (3,2), (4,4), (5,3.5), (6,6) and (7,5.5) using linear regression. [8]

b) Apply Lagrange's interpolation formula to find a polynomial which passes through the points (0,-20), (1,-12), (3,-20) and (4,-24). [10]

SECTION - II

Q5) Evaluate $I = \int_1^2 \int_1^2 \frac{1}{x+y} dx dy$ using Trapezoidal rule with $h = k = 0.25$. [16]

Q6) a)
$$\begin{bmatrix} 2.00 & -1.00 & 0.00 \\ -1.00 & 2.00 & -1.00 \\ 0.00 & -1.00 & 2.00 \end{bmatrix}$$
 [10]

Compute the eigen value and eigen vector using power method.

b) Applications of Fourier Transforms in Vibration Analysis. [8]

Q7) a) Use Predictor Corrector Method to calculate y at $x = 4$ with step size $h=2$ and initial conditions as $y = 0$ at $x = 0$ for the differential equation [10]

$$\frac{dy}{dx} = 12x^2 - 20x + y^2$$

b) Discuss Shooting Method with algorithm. [8]

Q8) a) Discuss Finite Element method in brief. [8]

b) Compare Interpolation with regression analysis. [8]



P1266

[4065] - 533

M.E. (Mechanical) (Mechatronics)

DIGITAL SIGNAL PROCESSING

(502804(B)) (2008 Course) (Elective - I)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) *Answers any three questions from each section.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *You are advised to attempt not more than 3 questions.*
- 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) a) $x(t) = 3 \cos 600\pi t + 2 \cos 1800\pi t$

The link is operated at 10,000 bits/sec and each input sample is quantized into 1024 different voltage levels.

- i) What is the sampling frequency and folding frequency in Hz.
 - ii) What is Nyquist rate of sampling for $x(t)$ in Hz.
 - iii) Discretize the signal $x(t)$ with sampling frequency as in (i). [10]
- b) State and explain sampling theorem for band limited signal. What is aliasing effects. [6]

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

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

- b) The impulse response of LTI system is $h(n) = \{3, -2, 4, 5\}$. Determine the response of system to input signal $x(n) = \{2, 3, 6\}$. [8]

- Q3)** a) Give the comparison between (at least 2 points) [8]
- Energy and power signals.
 - Deterministic and random signals.
 - Periodic and non periodic signals.
 - Symmetric and antisymmetric signals.
- b) State and explain significance of ROC. For finite and infinite duration sequences Find out ROC and explain it neatly. [8]

- Q4)** a) Determine the 4 point DFT of the following $x(n) = \{0, 1, 2, 3\}$. [8]
- b) State and explain any four properties of DFT. [8]

- Q5)** Write short notes on (Any Three) : [18]
- Properties of convolution.
 - Comparison between IIR and FIR.
 - Block diagram of Basic DSP system with brief explanation.
 - Barrel Shifter.
 - Applications of DSP in mechatronics.

SECTION - II

- Q6)** a) Determine inverse 'z' transform of $x(z)$
- $$x(z) = \frac{1}{1 - 1.5z^{-1} + 0.5z^{-2}}$$
- For ROC
- $|z| > 1$
 - $|z| < 0.5$
 - $0.5 < |z| < 1$ [10]
- b) Explain the following windows for the design of FIR filters
- Rectangular window.
 - Hamming window. [6]

- Q7)** a) Perform the circular convolution of the following two sequences
- $$x_1(n) = \{2, 1, 2, 1\}$$
- $$x_2(n) = \{1, 2, 3, 4\}$$
- [8]
- b) Distinguish between microprocessor and Digital Signal Processor. [8]

Q8) a) Establish the system transfer function for the system defined by

$$y(n) - \frac{2}{5}y(n-1) + \frac{3}{5}y(n-2) = x(n) - \frac{2}{3}x(n-1) - \frac{1}{5}x(n-2)$$

Also realise the same using DF-I and DF-II method. **[8]**

b) Explain the following in brief :

i) Data Address Generator (DAG).

ii) Multiplier - Accumulator Unit (MAC). **[8]**

Q9) a) With the help of frequency response explain HPF and BPF in detail. **[8]**

b) Explain various applications of DSP. **[8]**

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

a) Selection criteria for DSP for particular applications.

b) IIR filter design methods.

c) Spectral Analysis.

d) DTMF.

e) Filter realization techniques.



P1267

[4065] - 535

M.E. Mechanical (Mechatronics)

CONTROL SYSTEMS

(2008 Course) (502805) (Elective - II)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

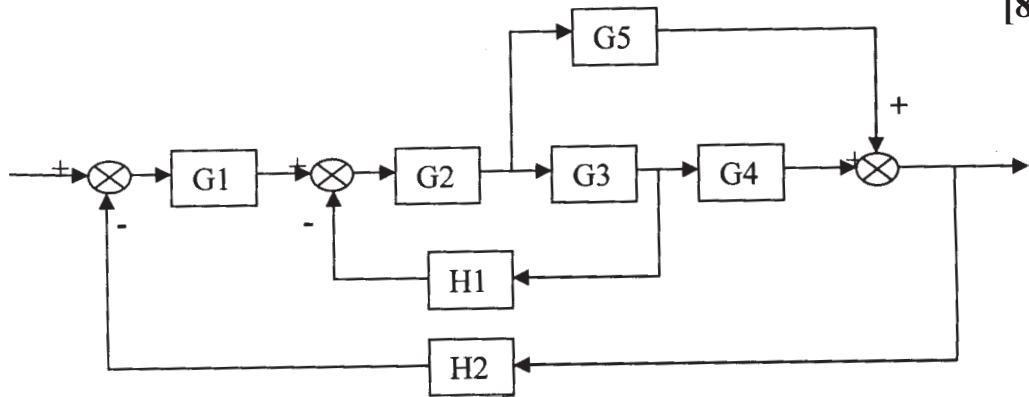
- 1) Answer any three questions from each Section.
- 2) Answers to the two sections should be written in separate answer books.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Figures to the right indicate full marks.
- 5) Assume suitable data, if necessary.

SECTION - I

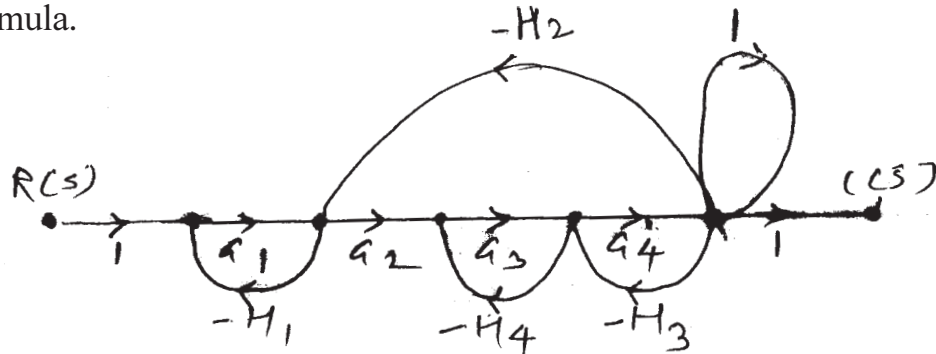
Q1) a) Distinguish between the following. [8]

- i) Linear and nonlinear control systems.
- ii) Time variant and Time invariant control systems.

b) Reduce the following block diagram of the system shown in following figure into a single equivalent block by block diagram reduction technique. [8]

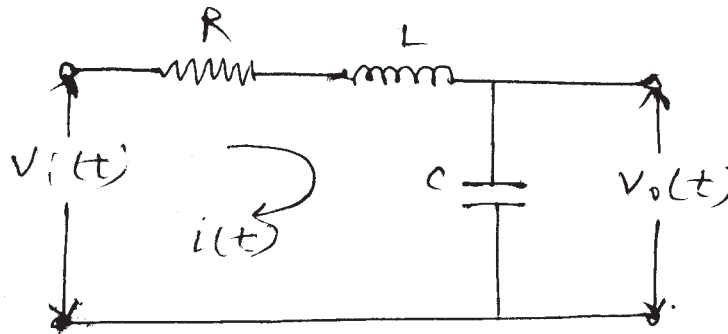


Q2) a) Obtain the closed loop transfer function $C(S) / R(S)$ using Mason's gain formula. [8]



P.T.O.

- Q7) a)** What are adaptive control systems? With neat block diagram explain its operation. What are its application areas? [8]
- b)** Obtain the state model of the given electrical network in standard form. Given at $t = t_0$, $i(t) = i(t_0)$ and $v_0(t) = v_0(t_0)$ [8]



- Q8) a)** Give the classification of controllers and explain the characteristics of on-off, P, I, D, PID controllers. With a suitable example explain how proportional controller produces offset? Which control action can eliminate this? [10]
- b)** Sketch and comment on the outputs of P, PI, PD and PID controllers for a ramp input. [8]



[4065] - 536
P1268
M.E. (Mechanical - Mechatronics)
THEORY OF MACHINES AND MECHANISMS
(2008 Course) (Elective - II) (502805 (b))

Time : 3 Hours]

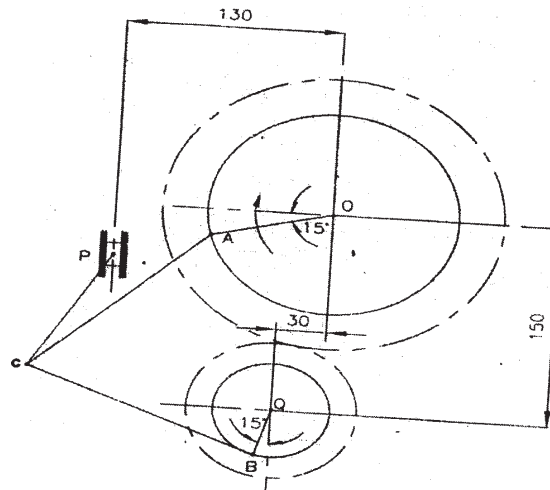
[Max. Marks :100

Instructions to the candidates:

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

SECTION - I

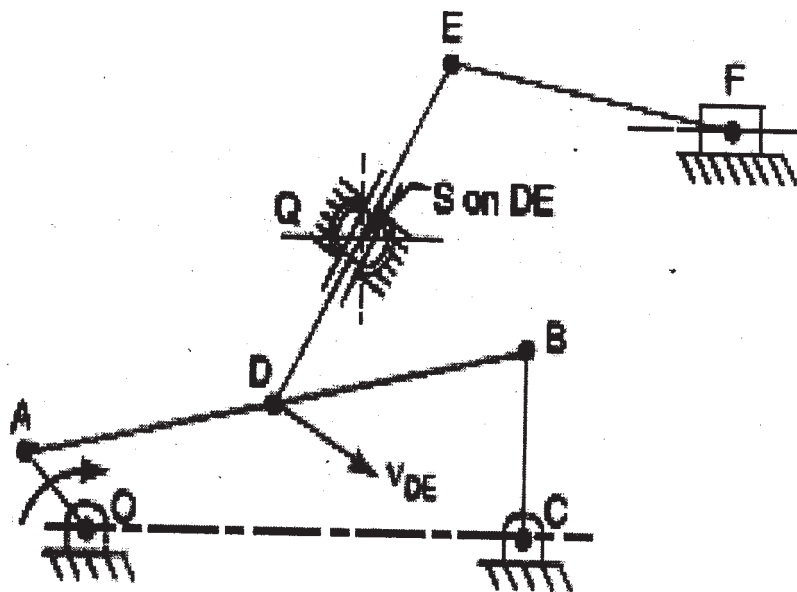
- Q1)** a) What do you understand by kinematic pair? With the help of neat sketches explain different type of kinematic pair. [6]
- b) Define Inversion of a Mechanism? Explain with the help of neat sketches inversions of Double slider crank chain? Give their applications? [6]
- c) Write short notes on the following: [4]
Hart's straight line mechanism.
- Q2)** a) State and prove Kennedy's theorem of three centre in line. [4]
- b) The dimensions of the differential stroke engine are shown in the following figure. $OA = 75$ mm, $QB = 35$ mm, $AC = BC = 150$ mm and $CP = 100$ mm. OQ and QB are geared together so that QB turns at twice the speed of OA and in opposite direction of OA . Find for given configuration, velocity of piston and angular velocity of link CP if OA turns with a speed of 800 rpm in clockwise direction. [12]

**P.T.O.**

Q3) a) In a slider crank mechanism, the crank is 225 mm long and connecting rod 900 mm long. Find analytically the velocity and acceleration of the piston and angular velocity and angular acceleration of connecting rod when the crank is turned through 60° from inner dead centre. The angular velocity of the crank is 25 rad/sec. and is increasing at a rate of 12 rad / s^2 . [6]

b) In a swiveling joint mechanism, as shown in fig., the driving crank OA is rotating clockwise at 125 rpm. The lengths of various links are, OA = 50 mm, AB = 350 mm, AD = DB, DE = EF = 250mm and CB = 125 mm. The horizontal distance between the points O and C is 300 mm and between O and Q is 180 mm. Vertical distance between F and C is 250 mm and between C and Q is 150 mm. For the given configuration determine, [12]

- i) velocity of slider block F,
- ii) Angular velocity of the link DE.,
- iii) velocity of sliding of the link DE in the swivel block and
- iv) Acceleration of sliding of the link DE in the trunnion.



Q4) a) In an I.C. engine mechanism, the radius is 100 mm and the length of the connecting rod is 450 mm. The crank is rotating in anticlockwise direction with the angular velocity of 10 rad / sec. Using vector algebra method, determine the velocity of piston and the angular velocity of connecting rod when the crank is at 45° from the inner dead centre. [8]

b) In a slider crank mechanism, the crank radius is 150 mm and the length of the connecting rod is 600 mm. The crank is rotating counter - clockwise at an angular velocity of 47.12 rad / sec. Using complex number method, determine the velocity of piston and angular velocity of the connecting rod when the crank is a 60° from the inner dead centre. [8]

SECTION - II

- Q5)** a) Explain overlay method for synthesis of function generation. [4]
b) Using freudenstein equation, design a four bar mechanism to generate the function $y = x^{1.4}$ for an interval in x from 1 to 4. The input link is to start from 30° and is to have a range of 90° , the output link is to start from 90° and is to have a range of 90° . Use three point chebychev spacing. Take the length of fixed link AD as 50 mm. [12]
- Q6)** a) Explain the terms free vibrations, forced vibrations and damped vibrations. [6]
b) A vertical shaft 25 mm diameter and 0.75 m long is mounted in long bearings and carries a pulley of mass of 10 kg midway between the bearings. The centre of pulley is 0.5 mm from the axis of the shaft. Find
i) The whirling speed and
ii) the bending stress in the shaft, when it is rotating at 1700 rpm.
Neglect the mass of the shaft and $E = 200 \text{ GN/m}^2$. [10]
- Q7)** a) Write short note on advanced cam curves. [4]
b) The following data relate to a cam operating an oscillating roller follower:-
Minimum radius of cam = 30 mm, Radius of roller = 10 mm, Length of follower arm = 45 mm, Distance of fulcrum centre from cam centre = 55 mm, Angle of ascent = 80° , Angle of descent = 100° , Angle of dwell between ascent and descent = 60° , Angle of oscillation of follower = 30° . Draw profile of the cam if the follower moves with SHM and returns with uniform acceleration and retardation. [12]
- Q8)** a) Explain Freudenstein's method of three point synthesis of mechanisms. [6]
b) Deduce an expression for the natural frequency of free transverse vibration for a simply supported shaft carrying uniformly distributed mass of m kg per unit length. [6]
c) Derive equations for displacement velocity and acceleration for Circular arc cam operating a flat faced follower when the contact is on the circular flank. [6]



P1272

[4065] - 550

M.E. (Mechanical) (Automotive Engg.)

ADVANCED HEAT TRANSFER

(2008 Course) (502302 (a)) (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) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 6) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) Explain in brief :

- i) Thermal diffusivity.
 - ii) Steady state & unsteady state heat conduction.
 - iii) Variable thermal conductivity.
 - iv) Thermal contact resistance. [8]
- b) What are the various methods for finding the solution of multidimensional heat conduction problems? Explain any one of them. [8]

Q2) a) What is transient heat conduction? Explain lumped capacitance analysis. [8]

- b) Write notes on : [8]
- i) Critical radius of insulation.
 - ii) An isotropic materials.

Q3) a) A thermocouple junction may be approximated as a sphere. It is to be used for temperature measurement in a gas stream with heat transfer coefficient of $400 \text{ W/m}^2\text{k}$. Determine the diameter of thermocouple junction needed for a time constant of 1 second.

If the junction is initially at 25°C & placed in a gas stream of 200°C , how long it will take for the junction to reach 199°C ?

P.T.O.

Take the following properties of thermo couple junction $K = 20 \text{ W/mK}$,
 $C_p = 400 \text{ J/kgK}$, $\rho = 8500 \text{ Kg/m}^3$. [10]

- b) Distinguish between :
- Grashoff number and Reynolds number.
 - Biot no. & Nussult no. [6]

Q4) a) In a long annulus (3.5 cm ID and 5 cm OD), the water is heated by maintaining the outer surface of inner tube at 60°C . The water enters at 20°C and leaves at 34°C . Water flow of velocity is 2 m/sec. Estimate the heat transfer coefficient.

Properties of water :

$$C_p = 4.180 \frac{\text{kJ}}{\text{kgK}}; \nu_f = 1.003 \times 10^{-3} \text{ m}^3/\text{kg}, \mu = 855 \times 10^{-6} \text{ N-s/m}^2,$$
$$k_f = 0.613 \text{ W/mK}. \quad [8]$$

- b) Write notes on :
- Mixed convection.
 - Active & passive techniques of heat transfer enhancement. [10]

SECTION - II

Q5) a) A horizontal 40W fluorescent tube which 38 mm in diameter & 1.2 meter long stands in still air at 1 atm and 20°C . If the surface temperature is 40°C , what percentage of power is being dissipated by convection. Neglect radiation properties of air : $K_f = 0.0265 \text{ W/m.K}$, $P_r = 0.706$, $\nu = 16.19 \times 10^{-6} \text{ m}^2/\text{S}$.

Use the relation, $\text{Nu} = 0.53 (\text{Ra})^{1/4}$. [8]

- b) Discuss laminar film condensation on a vertical plate. [8]

Q6) Write short notes on (any three) :- [18]

- Two phase flow.
- Film wise & drop wise condensation.
- Cooling of PCs.
- Ablative & high speed cooling.

Q7) a) Explain : [8]

- View factor with suitable examples.
- Gaseous emission and absorption.

- b) A cubical room, 4m by 4m by 4m, is heated through ceiling by maintaining it at a uniform temperature of 350 K while the walls & the floor are at 27°C. Determine the rate of heat loss from ceiling by radiation if the emissivity of all the surfaces is 0.6. [8]

Q8) a) Write notes on : [9]

- i) Classification of heat exchangers.
- ii) Fouling factors.
- iii) Radiators for automobiles.

- b) A concentric tube heat exchanger uses water available at 15°C to cool ethylene glycol from 100°C to 60°C. The water & glycol flow rates are each 0.5 Kg/sec. What is the maximum possible heat transfer rate & effectiveness of the heat exchanger.

Take (C_p) of glycol = 2637 J/kg K and (C_p) water = 4180 J/kg K. [7]



P1275

[4065] - 558

M.E. (Mechanical) (Automotive Engineering)

FUNDAMENTALS OF VEHICLE DYNAMICS

(2008 Course) (502308) (Sem. - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) How the human response to the vibration is obtained from mechanical characteristics of the vibrating surface (time domain signal)? State the limitations of frequency weightings for whole-body vibration. [8]
- b) The sprung parts of a passenger car weigh 9 kN and the unsprung parts weigh 855 N. The combined stiffness of the suspension springs is 45 kN/m and that of the tires is 450 kN/m. Determine the two natural frequencies of bounce motion of the sprung and unsprung mass. [8]

OR

- Q2)** The mass of the vehicle is 1850 kg and its radius of gyration is 1.4 m. The stiffness of the front suspension is 155 kN/m and that of rear suspension is 210 kN/m. Center of gravity of the vehicle is 1.8 m from front and 1.5 m from rear wheel and 0.7 m above ground. Assuming the vehicle as two degree freedom system in bounce and pitch mode, find the natural frequencies and mode shapes. [16]

P.T.O.

- Q3)** a) Derive an expression for the steer angle δ_f required to negotiate a given turn with usual notations. [8]
- b) A passenger car has a mass of 2300 kg. The weight distribution on the front axle is 55% and that on rear axle is 45 % under static condition. If cornering stiffness each of the front tires is 32.43 kN/rad and that of rear tires is 32 kN/rad determine the steady state handling behavior of the vehicle. If the vehicle is to be designed for critical speed of 210 km/hr find the value of wheel base. [8]

OR

- Q4)** a) Explain characteristic speed and critical speed of vehicle. [8]
- b) Explain how the handling characteristics of vehicle is determined. [8]
- Q5)** Write short notes : [18]
- a) Steady state response to steering input.
- b) Wheel locking during braking.
- c) Effect of tractive forces on cornering.

SECTION - II

- Q6)** a) Following data is obtained after constant speed test of a vehicle at 110 km/hr to determine handling characteristics.

Steering Angle (deg)	Lateral Acceleration (g)
9	0.1
17	0.2
18	0.3
22	0.4
31	0.5
41	0.6
43	0.7
53	0.8

Estimate vehicle response if wheel base of the vehicle is 2.8 m. Comment on the result. [8]

- b) A passenger car weighs 21 kN and has a wheelbase of 2.8 m. The center of gravity is 1.2 m behind the front axle and 0.5 m above ground level. The braking effort distribution on the front axle is 65%. The coefficient of rolling resistance is 0.02. Determine which set of the tires will lock first on two road surfaces: one with a coefficient of road adhesion $\mu = 0.7$, and the other with $\mu = 0.3$. [8]

OR

Q7) A tracked vehicle weighs 150 kN and has a contact length of 300 cm and a tread of 200 cm. The vehicle has a uniform contact pressure and is equipped with a clutch/brake steering system. On a sandy terrain, the value of the coefficient of motion resistance is 0.15, and that of the coefficient of lateral resistance is 0.5. The angle of internal shearing resistance of the terrain ϕ is 30° .
a) determine the thrusts of the outside and inside tracks required to execute a steady state turn. b) If, during the turn, the sprocket of the outside track, with a radius of 0.3 m, is rotating at 10 rad/s, and the inside track is disconnected from the driveline by declutching and the brake is applied, determine the turning radius and yaw velocity of the vehicle during the turn. The slip of the running gear during the turn may be neglected in the calculations. **[16]**

Q8) A vehicle has a weight of 21 kN and a wheelbase of 2.8 m. The ratio of the distance between the center of gravity of the vehicle and the front axle to the wheelbase is 0.4. The cornering stiffness of each of the front tires is 39 kN/rad and that of the rear tires is 38 kN/rad. The average steering gear ratio is 20. Determine the yaw velocity gain and the lateral acceleration gain of the vehicle with respect to the steering wheel angle for speed upto 120 km/hr. **[16]**

OR

Q9) Each front wheel is loaded by 75 kg and each rear wheel is loaded by 175 kg. Suspension travel at front axle and rear axle should not exceed 0.04 m and 0.05 m respectively. Find lower bound of the spring rate at both axle. If chassis mass of quarter car model is 350 kg, find undamped natural frequency of each axle for the loaded and unloaded condition. **[16]**

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

- a) Wheel shimmy.
- b) Wheel wobble.
- c) Vehicle under the action of side forces.



P1277

[4065] - 582

M.E. (Electrical) (Power Systems)

COMPUTER APPLICATIONS IN POWER SYSTEMS

(2008 Course) (503201) (Sem. - I)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Explain the optimization problem based on : [10]
- i) Nature of design variables.
 - ii) Nature of equations involved.
- b) Explain multivariable optimization with equality constraints by Lagrange multiplier method. [10]
- c) By constrained variation method, find the solution of following optimization problem :
- Minimize $f(X) = 2x_1^2 + 4x_2 + 6$
- Subject to the constraint $g(X) = 2x_1 + 3x_2 - 5 = 0$. [5]
- Q2)** a) Explain Steepest Descent method. Draw its flowchart. [6]
- b) What are the different Random search methods of unconstrained minimization? Explain any one. [9]
- c) Explain algorithm for unrestricted search elimination method with a limited step size. [10]
- Q3)** a) Explain the Newton Raphson method of load flow analysis (Polar form). Draw its flow chart. [13]
- b) Explain the decoupled load flow method. State the assumptions. [12]

SECTION - II

- Q4)** a) Explain optimal power flow based on Gradient method. [12]
b) Explain Newton Raphson method of optimal power flow. [13]
- Q5)** a) Explain :
i) DC load flow.
ii) Power loss in a line and
iii) Generation shift distribution factors with reference to Loss coefficients using sensitivity factors. [13]
b) From the theory of symmetrical components derive the sequence impedance matrix in terms of self and mutual impedances. [12]
- Q6)** a) Elaborate AC-DC load flow with formulation of problem, D.C. System model, converter variables, Derivation of equations and Inverter operation. [13]
b) Explain three phase load flow analysis. [12]



P1284

[4065]-589

M.E. (Electrical) (Power Systems)

POWER SYSTEM DYNAMICS

(2008 Course) (503208) (Sem. - II)

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) *Use of electronic pocket calculator is allowed.*
- 7) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Explain in details analysis of steady state stability of a single machine. State the criterion for stability. What are the eigen values of the linearised system. Give your comments on stability criterion. **[15]**
- b) A 50 Hz Synchronous generator having an internal voltage 1.1 p.u. $H = 5.0$ MJ/MVA and reactance of 0.45 p.u. is connected to an infinite bus through a double circuit line. Each line has reactance 0.3 p.u. The generator is delivering 1.0 p.u. power and the infinite bus voltage is 1.0 p.u. Determine,
- i) Maximum power transfer.
 - ii) Steady state operating angle.
 - iii) Natural frequency of oscillation if damping is neglected. **[10]**
- Q2)** a) Derive the stator and rotor equations of synchronous generator represented by model 1.1. **[15]**
- b) Derive the expression for calculation of initial conditions. **[10]**
- Q3)** Write short notes on : **[25]**
- a) Equal area criterion and its applications.
 - b) Classical model of multimachine system useful for transient stability analysis.
 - c) Inclusion of SVC model in dynamics of SMIB.

P.T.O.

SECTION - II

- Q4)** Derive expressions for small signal analysis for the single machine represented by model 1.0 for (a) Rotor (b) Torque angle loop and (c) Flux decay. Draw appropriate block diagrams. **[25]**
- Q5)** a) Explain voltage instability and voltage collapse. What are the factors affecting these? How to control voltage instability? **[13]**
b) What is the necessity of islanding in Power System? Discuss methods of islanding. **[12]**
- Q6)** Explain necessity and objectives of Power System Stabilizers (PSS). Explain structure and tuning of PSS with the help of block diagram. Explain washout circuit. **[25]**



P1286

[4065]-592

**M.E. (Electrical) (Power System)
DIGITAL POWER SYSTEM PROTECTION
(2008 Course) (Elective - III) (503211 (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 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) Explain the consequences if a power system is not protected. [8]
b) State and explain sampling theorem. [7]
c) Explain in detail Least Error Squared Technique (LES) with all equations. [10]
- Q2)** a) Explain digital protection of EHV/UHV transmission line based upon travelling wave phenomenon. [8]
b) Explain software design of digital protection of transmission line. [9]
c) State salient features and limitations of different relays used for protection of transmission line. [8]
- Q3)** a) Name various faults that can occur in synchronous generator. [5]
b) Explain digital protection of synchronous generator by injection of sub-synchronous component method. [10]
c) Explain protection of synchronous generator by second harmonic current injection. [10]

SECTION - II

- Q4)** a) Explain working of relay which is used to protect power transformer against incipient faults. [8]
b) Explain digital protection of transformer using magnetising inrush current principle. [7]
c) In a differential scheme of transformer protection explain principle of operation and derive relay characteristics in complex β -plane. [10]

P.T.O.

- Q5)** a) Explain co-ordination of over-current relays. [8]
b) Explain man-machine interface system. [7]
c) Explain three-stepped distance protection. [10]
- Q6)** a) State assumptions made in short-circuit studies. [5]
b) Develop fundamental algorithm for short-circuit studies. [10]
c) With reference to (b) above, explain and derive equations for transformation to symmetrical components. [10]



[4065] - 597
P1288
M.E. (Electrical) (Power Electronics & Drives)
MODELING AND ANALYSIS OF ELECTRICAL MACHINES
(2008 Course) (Semester - I) (503301)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Draw necessary diagrams to explain the common essential features of rotating electrical machine. Relate your explanation with the constructional features of DC machine and induction machine. [6]
- b) With necessary sketches, explain Kron's primitive machine. How are the various windings of a machine represented by the primitive machine? [6]
- c) Write the voltage equations for Kron's primitive machine. Discuss on the observations that are made from the impedance matrix. [6]
- Q2)** a) Derive the expression for the electrical torque of the primitive machine. Explain significance of various terms of torque expression. [8]
- b) Draw the representation diagrams of basic two-pole machine and primitive machine for the following machines : Explain briefly the diagrams.
- i) Polyphase induction machine.
 - ii) Synchronous machine with amortisseurs.
 - iii) DC compound machines. [8]
- Q3)** a) Derive the transformations for currents between two-phase (α, β) rotating balanced winding and pseudo-stationary two-phase ($d-q$) winding. Also, show that the transpose of current transformation matrix is equal to its inverse. [8]
- b) Explain what is meant by 'power invariance' in transformation theory applied to Electrical machines. For given a current connection matrix as [C], how the new voltage matrix and transformed impedance matrix are developed? [8]

P.T.O.

- Q4)** a) Develop the transformation matrix for currents/voltages for rotating 3-phase (a, b, c) winding to a rotating 2-phase (α, β) winding transformations. Show that power invariance is achieved under this transformation. [8]
- b) A three-phase induction motor has following parameters referred to stator :
- Stator resistance per phase : 0.29 Ω
- Rotor resistance per phase : 0.52 Ω
- Stator and rotor leakage reactance per phase : 2.4 Ω each
- Magnetising reactance : 27 Ω
- Calculate the similar parameters for its equivalent 2-phase induction motor if its per phase winding turns are :
- i) Same as that of 3-phase induction motor.
- ii) 3/2 times that of 3-phase induction motor. [10]

SECTION - II

- Q5)** a) Write down the generalized mathematical model of polyphase induction machine and hence derive the steady state voltage equations in phasor form. [8]
- b) From the mathematical model of a three-phase induction motor, obtain an expression for the steady state torque. [10]
- Q6)** a) Discuss on 'Dynamic performance of 3-phase Induction motor' subjected to
- i) Sudden changes in load torque.
- ii) A 3-phase fault at the machine terminals. Draw the time response behavior for changes in speed, torque, voltages and currents for both the kind of disturbances. [8]
- b) Based on the derived steady state voltage equations in phasor form, draw the equivalent circuit for a polyphase induction machine. From the equivalent circuit derive an expression for the air-gap power in terms of rotor resistance, slip etc. [8]

Q7) a) Derive expressions for armature mutual inductance of salient pole synchronous machine from a consideration of its basic parameters. How this mutual inductance differs or modified for a cylindrical-rotor synchronous machine. **[10]**

b) A 3-phase 50 Hz cylindrical-rotor synchronous machine has the following parameters :

Self-inductance for phase a = 3.15 mH

Armature leakage inductance = 0.35 mH

For this machine calculate the mutual inductance between armature phases and its synchronous reactance. **[8]**

Q8) a) Discuss the small displacement stability and Eigen values of typical induction machine. **[8]**

b) Explain transformation of voltage and torque equations using interconnection matrix in interconnected machines, namely dc motor-dc generator machine. **[8]**



P1290**[4065]-599**

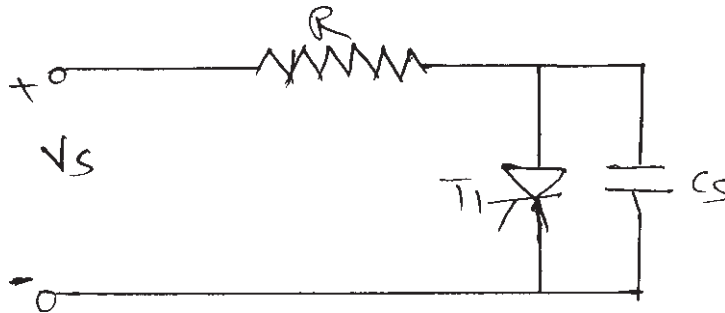
M.E. (Electrical) (Power Electronics & Drives)
POWER ELECTRONIC DEVICES AND CIRCUITS
(2008 Course) (503303) (Sem. - I)

*Time : 3 Hours]**[Max. Marks : 100**Instructions to the candidates:*

- 1) *Answer any three questions from section-I and three questions from section-II.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*

SECTION - I

- Q1)** a) Draw and explain static and dynamic characteristic of SCR. [6]
 b) Explain different protections required for SCR. [6]
 c) A thyristor circuit shown in fig. The junction capacitance of thyristor is $C_{j2} = 15\text{pF}$ and can be assumed to be independent of the off state voltage. The limiting value of charging current to turn on the thyristor is 5mA and the critical dv/dt is $2000\text{V}/\text{microsec}$. Determine the value of capacitance C_s so that thyristor cannot be turned on due to dv/dt . [6]

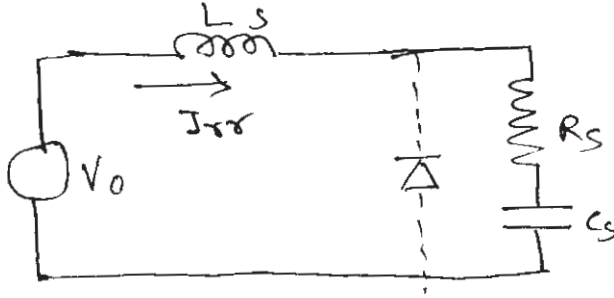


OR

- Q2)** a) Explain switching characteristic of IGBT. [6]
 b) What is SOA explain with reference to MOSFET. [6]
 c) Explain turn off characteristic of GTO. [6]
- Q3)** a) What is need of snubber to power semiconductor devices? Explain turn on snubber. [8]

P.T.O.

- b) Consider flyback converter circuit shown. The input voltage is 200V. Leakage inductance is 10 microH. The transistor is an ideal switch is driven by a square wave with 50% duty cycle. $R_s = 0$, diode has a reverse recovery time t_{rr} of 0.3 microsec. Find the value of snubber capacitance C_s that will limit the peak overvoltage to 2.5 times the input voltage. Find also R_s to be included in the circuit. [8]



OR

- Q4)** a) Explain drive circuit requirements and any one drive circuit for SCR. [8]
 b) Why isolation is required in drive circuit. Explain different isolation circuits. [8]
- Q5)** a) Derive an expression showing relation between open loop voltage ratio, duty cycle and critical inductance (L_c) of boost converter for $L \leq L_c$. Draw nature of variation of V/V_0 with duty cycle for $L/L_c = 1$ and $L/L_c = 0.1$. [8]
 b) A buck converter has an output voltage of 12V. The switching frequency is 10Khz. The load is a resistor of 6 ohm. The average load current is 1A. If the ripple current of the output inductor is limited to 0.1A and the ripple voltage of the output capacitor is 20mV. Determine the duty cycle, filter capacitance and the inductance. [8]

OR

- Q6)** a) Draw a circuit schematic of buck-boost converter in continuous mode. Sketch waveforms for voltage and current through inductor and capacitor over one switching period. [8]
 b) Explain commutation in chopper. Explain voltage commutated chopper. [8]

SECTION - II

- Q7)** a) Derive steady state equation for single phase converter for R and RL load. Explain effect of source inductance. [8]

- b) The single phase full converter has a R-L load having $L = 6.5\text{mH}$, $R = 5\text{ohm}$ and $E = 10\text{V}$. The input voltage is $V_s = 230\text{V}$ at 50Hz . Determine : [8]
- The load current I_0 at $\alpha = 60^\circ$.
 - Average thyristor current I_a .
 - The rms thyristor current I_R .
 - The rms output current I_{rms} .
 - The average output current I_{dc} .

OR

- Q8)** a) Three phase converter supplying balance R load. Draw output voltage, current, Thyristor current, voltage across thyristor, supply current. Derive voltage equation. [8]
- b) Explain dual converter and its mode of operation. [8]
- Q9)** a) A three phase thyristorised voltage source inverter is supplying a 3 phase balance load. Draw the complete circuit diagram of the inverter including commutating components. Mention the sequence of incoming as well as outgoing scr along with conducting SCR with reference to the output voltage waveform for RYB phase sequence. Explain the term switching frequency and output frequency of the inverter. [10]
- b) Compare operation and performance of VSI and CSI. [8]

OR

- Q10)** Write a detail note on : [18]
- McMurry Bedford inverter.
 - PWM inverter.
 - Series Inverter.
- Q11)** a) What is cyclo converter? Draw circuit diagram of three phase cycloconverter and explain its working with output waveform. [10]
- b) Draw and explain the control circuit block diagram for cycloconverter with noncirculating current mode. [6]

OR

- Q12)** a) What are advantages and disadvantages of bidirectional control. Explain single phase bi directional controller with R load. [8]
- b) Explain three phase controller with circuit diagram and waveforms. [8]



P1292

[4065] - 605

M.E. (E&TC) (Microwave)

ELECTROMAGNETICS AND ANTENNA THEORY

(Sem. - I) (2008 Revised Course) (504222)

Time : 3 Hours]

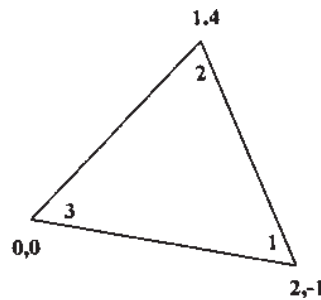
[Max. Marks :100

Instructions to the candidates:

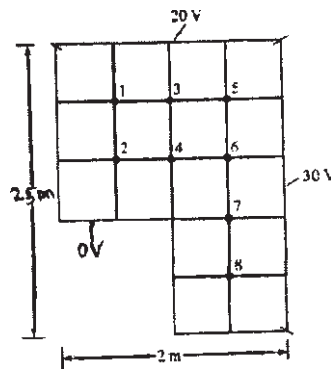
- 1) Answer any two questions from each section.
- 2) Answer to the two sections should be written in separate books.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

SECTION - I

- Q1)** a) Explain the method of moments in detail with a suitable example. [10]
 b) The triangular element shown in the following Figure is part of a finite element mesh. If $V_1 = 8V$, $V_2 = 12V$ and $V_3 = 10V$, find the potential at (a) (1, 2) and (b) the center of the element. [15]



- Q2)** a) Use FDM to calculate the potentials at free nodes in the potential system shown in the following figure. [15]



- b) Explain the typical electromagnetic problem solution flow, how computational electromagnetic help in solution, give qualitative comparison of computational electromagnetics. [10]

- Q3)** a) Define the terms effective length, effective area, directivity, radiation intensity, antenna gain, radiated power, radiation resistance and their significance. [10]
- b) Explain the near field, far near field and far field with suitable diagrams and also the significance of each. [7]
- c) Explain the polarization with suitable expressions and diagrams and also explain its relevance to antennas. [8]

SECTION - II

- Q4)** a) Illustrate how to construct the free space Green's function G corresponding to Partial Differential equation. [10]
- b) The field radiated by an dipole of length $(l \leq \lambda/2)$, and of sinusoidal

current distribution, is given by $\bar{E} = \hat{a}_\theta j\eta \frac{I_0}{2\pi r} e^{-jkr} \left[\frac{\cos\left(\frac{\pi}{2} \cos \theta\right)}{\sin \theta} \right]$ then

find the following

- i) Magnetic field.
 - ii) Power radiated.
 - iii) Radiation Resistance.
 - iv) Effective length. [15]
- Q5)** a) Explain the pattern multiplication and derive the array factor of two element array and also derive the condition on inter element phase shift for end fire and broad side array. [10]
- b) Design a broadside Dolph-Tschebyscheff array of 9 elements with spacing d between the elements and with a major to minor lobe ratio of 30dB. Find the excitation coefficient and form the array factor. [15]

- Q6)** a) What are the different feeding methods for micro strip antenna? Explain them with suitable diagrams, merits and demerits of each method. [8]
- b) Outline the design procedure of circular micro strip antenna with suitable expressions. Design a circular micro strip antenna using a substrate (RT/duroid 5880) with a dielectric constant of 2.2, $h = 0.17\text{cm}$ so as to resonate at 12 GHz. [7]
- c) Explain the constructional details, working, operating frequency, applications, merits, demerits, typical radiation pattern, different modes of operations of helix antenna. [10]



Total No. of Questions : 8]

[Total No. of Pages : 2

P1297

[4065] - 616

M.E. (E&TC) (Microwave)

MOBILE COMMUNICATION GSM & CDMA

(2008 Course) (504230) (Sem. - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) What are the advantages of the cellular approach of achieving mobile communications as compared to the earlier conventional approach?[8]
b) With the help of neat diagrams explain FDMA-FDD and TDMA-FDD systems in detail. [10]
- Q2)** a) If a Signal to Interference ratio of 15 dB is required for satisfactory forward channel performance of a cellular system, what is the frequency reuse factor and cluster size that should be used for maximum capacity if the path loss exponent is (i) 3, (ii) 4. Assume that there are six co-channel cells in the first tier and all of them are there at the same distance from the mobile. [8]
b) Explain how the use of Sectorization helps in reducing the Co-channel Interference problem. [8]
- Q3)** a) During a Busy Hour, the number of calls per hour for each of the 12 cells of a cellular cluster is 2200, 1900, 4000, 1100, 1000, 1200, 1800, 2100, 2000, 1580, 1800 & 900. Assuming that 75% of the mobile phones in this cluster are used and during this period one call is made per phone. Calculate the following : [10]
i) Number of customers in the system,
ii) Assuming an average holding time of 60 seconds, what is the traffic in the cluster in Erlangs?
iii) Find the reuse distance if $R = 5$ Kms.

P.T.O.

- b) Discuss the following : [6]
i) Erlang A formula.
ii) Erlang B formula.
iii) Erlang C formula.

- Q4)** a) Explain the typical call flow sequences in GSM for : [10]
i) Location updating.
ii) Mobile call origination.
iii) Mobile call termination.
iv) Authentication and encryption.
v) Inter MSC handoff.
b) Explain speech signal processing in GSM from transmitter to receiver using block diagram. [6]

SECTION - II

- Q5)** a) Discuss CDMA digital cellular standard with its features. [10]
b) Explain handoff procedure in IS 95 CDMS. [8]

- Q6)** a) Write a note on MSK with the help of modulator and detector blocks.[8]
b) How is localization, location update, roaming, etc done in GSM and reflected in the databases? What are the typical roaming scenarios?[8]

- Q7)** a) Why Spread Spectrum multiple access is more efficient for wireless communication? [8]
b) Explain OFDM. [8]

- Q8)** a) Explain the following performance criteria used to evaluate performance of mobile systems : [8]
i) Voice Quality.
ii) Service Quality.
b) Explain the following : [8]
i) EDGE.
ii) GPRS.



P1298

[4065]-617

**M.E. (E & TC) (Microwave)
FIBER OPTIC COMMUNICATION
(2008 Course) (Elective - III) (504231 (a))**

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) What are the types of fiber? Explain each type in detail. [8]
b) Write a note on signal degradation due to dispersion. [10]
- Q2)** a) Explain the terms : [12]
i) Total internal reflection.
ii) Numerical aperture.
iii) Relative index difference.
iv) Acceptance angle.
b) How much will a light pulse spread after traveling along 5km of a step index fiber whose NA = 0.275 and $n_1 = 1.487$. [4]
- Q3)** a) Write a note on OTDR. [8]
b) Explain various splicing techniques. [8]
- Q4)** a) Explain the working principle of PIN photo detector. [8]
b) Write a short note on : [8]
i) Photo detector noise.
ii) Avalanche multiplication noise.

SECTION - II

- Q5)** a) Explain electro optics Y-junction switch. [8]
b) Explain in detail surface emitting LED. Also define quantum efficiency and LED power. [10]

P.T.O.

- Q6)** a) Discuss the different power penalties in the optical link. [8]
b) An analog OFC system operating at a wavelength of 1 micrometer has post detection bandwidth of 5 MHz. Assume an ideal detector and considering only quantum noise on the signal, calculate the incident optical power necessary to achieve SNR of 50dB at the receiver. [8]
- Q7)** a) Explain the nonlinear effects on network performance. [6]
b) Write a note on WDM with its multiplexers and demultiplexers. [10]
- Q8)** a) Explain in detail EDF Amplifier. [10]
b) Write a note on : [6]
i) SRS.
ii) SBS.



P1299

[4065] - 624

**M.E. (E&T/C) (Microwave)
DIGITAL SIGNAL COMPRESSION
(2008 Course) (504232(e)) (Elective - IV)**

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Explain lossless and lossy compression with the help of example. [4]
b) Define self information associated with an event. [2]
c) Design a Huffman code for a source that puts out letters from an alphabet $A = \{a_1, a_2, a_3, a_4, a_5\}$ with
 $P(a_1) = P(a_3) = 0.2$
 $P(a_2) = 0.4$
 $P(a_4) = P(a_5) = 0.1$
The entropy of this source is 2.122 bits/symbol. Find out the redundancy of this code. [12]
- Q2)** a) Compare Huffman coding with arithmetic coding. [6]
b) Consider a source with symbol probabilities $P(a_1) = 0.8, P(a_2) = 0.02, P(a_3) = 0.18$ Find the tag using arithmetic coding for the sequence $a_1 a_3 a_2 a_1$. Assume that we are using the midpoint of the interval as the tag. [10]
- Q3)** a) What is companding? What is the advantage of logarithmic curve for companding? Explain A-law and μ -law quantizers. [8]
b) What are the methods of music compression? Explain MIDI. [8]

P.T.O.

- Q4)** a) What is adaptive Quantizer? Explain working of Backward adaptive Quantizer. [8]
- b) Explain DPCM coding of speech with the help of block schematic. What is the advantage of using differential coding? [8]

SECTION - II

- Q5)** a) Explain the use of wavelets for image coding. Explain the properties of mother wavelet. [8]
- b) Explain the meaning of zero tree. Explain the use of EZW charts for coding after wavelet decomposition. [8]
- Q6)** a) Explain any one motion estimation algorithm. [8]
- b) Explain MPEG1 video standard. [5]
- c) Consider a 2×2 image X given by [3]

$$X = \begin{bmatrix} 35 & 30 \\ 25 & 15 \end{bmatrix}$$

Find DCT coefficients.

- Q7)** a) Explain the use of DCT for image coding. How to quantize the DCT coefficients. Explain how it leads to compression of the data. [8]
- b) Compare the performance of DFT, DCT and KLT. Which is the optimal transform and why? [8]
- Q8)** Write short notes on (any three) : [18]
- a) Subband coding of speech signals.
- b) Pdf optimized Quantizer.
- c) SPIHT charts.
- d) Speech compression using LPC.



P1300

[4065]-627

M.E. (E&TC) (VLSI & EMBEDDED SYSTEM)

EMBEDDED SYSTEM DESIGN

(2008 Course) (504183) (Sem. - I)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) What are various design metrics used in Embedded System Design? State and justify the relevance of these metrics in system design. [12]
- b) What is the necessity of following processor sub-units in embedded system design? [6]
- i) I _ cache.
 - ii) FLPU.
 - iii) PFCU.
 - iv) MMU.
 - v) BT _ cache.
 - vi) AOÜ.
- Q2)** a) Describe the I/O block section of typical PLD and explain how various I/O options like slew rate etc. can be selected? [10]
- b) What are the different issues related with signal integrity? [6]
- Q3)** a) What are various cache mapping techniques? Describe merits and demerits of these mapping techniques. [10]
- b) What are the steps involved in simple design methodology? [6]
- Q4)** Write short notes on the following : [16]
- a) Significance of market window,
 - b) Design principles of RISC processor architecture,
 - c) Multiport memory,
 - d) Anti-fuse technology used in FPGA.

P.T.O.

SECTION - II

- Q5)** a) Describe the data flow model of the ARM processor. [10]
b) What are the roles of 'cpsr' and 'spsr' registers in ARM processor?[6]
- Q6)** a) What are the operations involved in switching from 'USER' mode to 'FIQ' mode of ARM-7 processor? Describe the status of each related register. [10]
b) Describe following ARM-7 instructions. [8]
i) BL,
ii) LDM,
iii) MLA,
iv) STM.
- Q7)** a) Draw and describe architecture of typical ARM-9 Microcontroller. [10]
b) Describe layered structure of CAN node. [6]
- Q8)** In designing of embedded hardware, describe the need and related issues of the following : [16]
a) Functional verification,
b) Optimization,
c) Boundary scan,
d) Built-in-self test.

☒☒☒☒

P1303

[4065]-634

M.E. (E & TC) (VLSI & Embedded Systems)

REAL TIME OPERATING SYSTEM

(2008 Course) (504188) (Sem. - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Shared data problem is inherent in multitasking pre-emptive RTOS, explain why? What are the solutions used to solve shared data problem? [12]
b) What are the OS requirements/features for embedded system? [6]
- Q2)** a) Define the term 'Context Switching'. What are the steps involved in context switching operation? Why it puts additional burden on OS? [8]
b) What are the techniques used for time delay generation in RTOS? Why accurate delay generation is difficult in RTOS? Explain. [8]
- Q3)** a) What are the rules used to define re-entrant function? What difficulties will occur if functions are non-re-entrant in multitasking OS? Justify the answer with suitable example. [8]
b) Describe round robin software architecture with its merits and demerits.[8]
- Q4)** Write short notes on the following : [16]
a) Deadlock/s in RTOS,
b) Priority inversion and inheritance,
c) Memory management in RTOS,
d) Inter Task Communication.

SECTION - II

- Q5)** a) Write μ COS-II initialization code. Using this code describe following aspects related with RTOS. **[10]**
- i) Architectural difference of RTOS as compared to Desktop OS.
 - ii) Creation of multiple task.
 - iii) Assigning Priority to task.
- b) Draw and describe state diagram of μ Cos-II OS? **[6]**
- Q6)** a) What are the μ COS-II functions used for inter task communication?[10]
- b) Write 'C' code for mailbox handling in μ COS-II. **[8]**
- Q7)** a) Define critical section of code. How it is handled in μ COS-II? **[10]**
- b) Describe rate monotonic scheduling algorithm. **[6]**
- Q8)** Write short notes on the following : **[16]**
- a) File manipulation functions in Linux/RT Linux,
 - b) Role of IDE in software development,
 - c) Foreground-background software architecture,
 - d) Structure of Kernel.



P1304

[4065] - 644

M.E. (E&TC) (Signal Processing)

LINEAR ALGEBRA AND RANDOM PROCESSING

(Sem. - I) (2008 Course) (504501)

Time : 3 Hours]

[Max. Marks :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) Prove that rank of product of two matrices can not exceed rank of either of matrix. [5]
- b) Show that matrix A satisfies Caley-Hamilton theorem. Hence find A^4 & A^{-1} .

$$A = \begin{bmatrix} 6 & -2 & 2 \\ -3 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix} \quad [8]$$

- c) Find inverse of the matrix $\begin{bmatrix} 1 & -2 & -1 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$ [5]

- Q2)** a) Find value of determinant $\begin{vmatrix} -a^2 & .ab & ac \\ ab & -b^2 & .bc \\ ac & bc & -c^2 \end{vmatrix}$ [8]

- b) Find rank of matrix $\begin{bmatrix} 1 & 2 & -4 & 5 \\ 2 & -1 & 3 & 6 \\ 8 & 1 & 9 & 7 \end{bmatrix}$ [5]

- c) Show value of determinant of matrix
$$\begin{bmatrix} -1 & 0 & 0 & a \\ 0 & -1 & 0 & b \\ 0 & 0 & -1 & c \\ x & y & z & -1 \end{bmatrix}$$
 is $1 - ax - by - cz$. [5]

- Q3)** a) Show that the following system of linear equations is consistent and find its solution
 $x + 3y - 2z = 0$
 $2x - y + 4z = 0$
 $x - 11y + 14z = 0$ [6]

- b) Find eigen values and eigen vectors of matrix
$$\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & 4 \\ 2 & -4 & 3 \end{bmatrix}$$
 [6]
- c) If A is nonsingular matrix and k is eigen value of A, then show that $1/k$ is eigen value of A^{-1} . [6]

- Q4)** a) Show that the vectors $x_1 = (1, 2, -1, 0)$, $x_2 = (1, 3, 1, 2)$, $x_3 = (4, 2, 1, 0)$, $x_4 = (6, 1, 0, 1)$, form a set of linearly independent vectors. [6]
- b) Reduce the following quadratic form to canonical form and find its rank, signature.
 $x^2 + 4y^2 + 9z^2 + t^2 - 12yz + 6zx + 4xy - 2xt - 6zt$. [6]
- c) Find orthonormal matrix P that will diagonalize symmetric matrix

$$\begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & -1 \\ 1 & -1 & 0 \end{bmatrix}$$
 [6]

SECTION - II

- Q5)** a) Explain Conditional Probability, Independent events, Byes theorem with examples. [6]
- b) There are 11 tickets in a box bearing numbers 1 to 11. Three tickets are drawn one after other without replacement. Find the probability that they are drawn in order bearing
 i) Even, odd, even number. ii) odd, odd, even number. [4]
- c) Let x be a continuous random variable with pdf $f_x(x) = kx(1-x)$, $0 \leq x \leq 1$. Find k , determine number b such that $P(x \leq b) = P(x \geq b)$. [6]

- Q6)** a) Calculate mean and variance of random variable X, if X denote the number obtained on a face of fair die. [4]
- b) Explain with illustrative examples, Discrete & continuous random variable. [6]
- c) A continuous R.V. has pdf $f_x(x) = kx^2$ $0 \leq x \leq 2$,
Find
- i) k
- ii) $P(0.2 \leq x \leq 0.5)$
- iii) $P(x \geq 3/4)$ [6]
- Q7)** a) Explain autocorrelation and autocovariance for a random processor. Derive relationship between them. [8]
- b) The autocorrelation function of stationary random process X(t) given by
- $$R_{X,X(t)} = 25 + \frac{6}{1 + 5t^2} \quad [8]$$
- Q8)** a) Distinguish between Ensemble, Ensemble average and Time average. [8]
- b) Find mean and variance of Poisson distribution. [8]



P1305**[4065]-646**

M.E. (E&TC) (Signal Processing)
SIGNAL PROCESSING TECHNIQUES
(2008 Course) (504502) (Sem. - 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.

SECTION - I

- Q1)** a) Using DIT-FFT, find DFT of following sequence $x(n) = \{1, 0, -1, 2, 3, 2, -1, 0\}$, show output at each and every stage. **[10]**
- b) Design band pass using fourier series method. **[8]**

$$H_d[f] = \begin{cases} 1 & 160 < f < 200\text{Hz} \quad f_s = 800\text{SPS} \\ 0 & \text{elsewhere} \end{cases}$$

$f_s = 8000$ SPS (sampling frequency). Duration of impulse response is 50m. sec.

- Q2)** a) Compare FIR and IIR filter for following characteristics. **[10]**

Characteristic
Number of necessary multiplications
Sensitivity to filter coefficient quantization
Probability of overflow errors.
Stability
Linear phase
Can simulate prototype analog filters
Required hardware memory
Hardware filter control complexity
Availability of design software
Ease of design or complexity of design software

- b) Find Z transform of : $n^2 - 2n + 3$ for $n \geq 0$. **[6]**

P.T.O.

Q3) a) Using final value theorem evaluate [8]

$$x[n] = \lim_{n \rightarrow \infty} a [1 - e^{-an}] \quad n \geq 0.$$

b) Plot pole zero pattern for $x[n] = \{1, 1, 1, 1\}$. [8]

↑

Q4) a) Find IZT of given $X[z]$. [8]

$$X[z] = \frac{1}{[1 - z^{-1}][1 - 1/2 z^{-1}]^3}$$

b) Determine IZT of $X[z]$ [8]

$$X[z] = \frac{z^2 - 6z - 18.5}{z^3 + 1.57z^2 - 8.5z - 15}$$

Case I : ROC $2.5 < |z| < 3$

Case II : ROC $|z| < 2$.

SECTION - II

Q5) State whether each of the following statement is true or false. Justify your answer in 4 to 5 lines. [18]

- a) Linear phase filters are always IIR.
- b) For a causal system $|h(n)|$ tends to zero, as n tends to infinity, the system is stable.
- c) A stable filter is always causal.
- d) A stable causal FIR filter has its poles lying anywhere inside the unit circle in Z plane.
- e) IIR filters have recursive realization always.

Q6) a) Given for low pass Butterworth filter : [8]

$$A_p = -1 \text{ db at } 0.2\pi.$$

$$A_s = -15 \text{ db at } 0.3\pi.$$

- i) Calculate N and pole location.
 - ii) Design digital filter using BZT method.
- b) Design digital filter using bilinear transformation for following analog

transfer function, $H(s) = \frac{1}{s^2 + \sqrt{2}s + 1}$ Obtain transfer function $H[z]$ of

digital filter assuming 3 db cut off frequency ω_p 150 Hz and sampling frequency 1.28 kHz. [8]

- Q7)** a) Determine digital filter for given analog filter using impulse invariance method. Draw filter structure. [8]

$$H(s) = \frac{s+a}{(s+a)^2 + b^2}$$

- b) Determine coefficients of linear phase FIR filter of length $N = 15$, which has symmetrical unit sample response and a frequency response that satisfies condition. [8]

$$H\left[\frac{2\pi k}{15}\right] = \begin{cases} 1 & k = 0, 1, 2, 3, \\ 0.4 & k = 4 \\ 0 & k = 5, 6, 7 \end{cases}$$

- Q8)** a) Obtain coefficient of FIR lowpass filter. [8]

Passband edge frequency 1.5kHz.

Transition width 0.5 kHz.

Stopband attenuation 750 db.

Sampling frequency 8 kHz

- b) For a given sequence $x(n) = \{1, -2, 3, -4\}$ and $h(n) = \{1, -1, 1, -1\}$, find: [8]

- i) Linear Convolution.
- ii) Linear Convolution using Circular Convolution without zero padding.
- iii) Linear Convolution using Circular Convolution with zero padding.
- iv) Show that answer in part ii is aliased in time domain.



P1308

[4065]-651

M.E. (E & TC) (Signal Processing)
WIRELESS AND MOBILE COMMUNICATION
(2008 Course) (Elective - II) (504504 (b))

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) What are the consequences of choosing? **[8]**
- i) A large Cell Reuse Pattern (Cluster Size) and
 - ii) Small Cell Reuse Pattern (Cluster) on the following parameters :
 - I) Spectrum Utilization Efficiency,
 - II) Carrier to Interference Ratio,
 - III) No. of calls per cell,
 - IV) No. of channels available per cell.
- b) What are the causes of co-channel Interference in Cellular Mobile communication? Why is this effect the most pre-dominant in Cellular communication? What are the limitations caused by this interference in cellular communications? **[8]**
- c) Explain how the use of Sectorization helps in reducing the Co-channel Interference problem. **[2]**
- Q2)** a) A certain city has an average area of 1300 km² and is covered by a cellular system using a 7 cell reuse pattern. Each cell has a radius of 4 miles and the city is allocated 40 MHz of spectrum with a full duplex channel bandwidth of 60 kHz. Assume a GOS of 2% for an Erlang Bsystem is specified and the offered traffic per user is 0.03 E, calculate:

P.T.O.

- i) No. of cells in the service area,
- ii) No. of channels per cell,
- iii) Traffic intensity of each channel,
- iv) Maximum Carried Traffic,
- v) Total No. of users that can be served for 2% GOS,
- vi) No. of mobiles per unique channel,
- vii) Maximum no. of users that can be served at one time by the system.

NOTE: Refer Annexure 'A'. [10]

b) Explain the following terms : [6]

- i) 1G Telephone Systems
- ii) 2G Phone Systems,
- iii) 2.5 G Systems,
- iv) 3G Systems,
- v) 4G Systems.

Q3) a) Explain the use of two wave Model to explain Mobile Radio Path Loss and Antenna Height Effects? Show that the power received is given by **[8]**

$$P_r = [h_1 h_2/d]^2,$$

where h_1 and h_2 are the heights of the transmitting antenna and mobile antenna respectively and ' d ' is the distance between them.

b) A mobile is located 5 km away from a base station and uses vertical $\lambda/4$ monopole antenna with a gain of 2.55 dB to receive cellular radio signals. The E field at a distance of 1 km from the transmitter is measured to be 10^{-3} W V/m. The carrier frequency used is 900 MHz calculate the following: [8]

- i) Length and effective aperture of the receiving antenna,
- ii) Received power at the mobile unit using the two ray Ground Reflection Model, assuming that the height of the transmitting antenna is 50 m and receiving antenna is 1.5 m above the ground.

Q4) a) Explain what is meant by Diversity Reception? What are the different types? What are its advantages in Cellular communication. [6]

b) What is the need for equalization in a receiver and explain about the linear equalizer in detail. [4]

c) Explain the Trellis Coded Modulation concept and Turbo Codes along with its application. [6]

SECTION - II

- Q5)** a) State and explain the practical antenna design considerations issues. Write a note on Smart Antenna. [8]
- b) Explain how the effects of Signal Coverage and Interference can be tackled by : [8]
- i) Decreasing Power,
 - ii) Decreasing antenna Height,
 - iii) Beam Tilting,
 - iv) Proper Cell site location.
- Q6)** a) Explain the following GSM subsystem Entities : [10]
- i) Mobile Station showing the GSM Reference Model, Classification of MS based on power, Types of MS's and explain International Mobile Equipment Identity(IMEI), Temporary Mobile Subscriber Identity (TMSI), International Mobile Subscriber Identity (IMSI), SIM (Subscriber Identity Module).
 - ii) Base Station Subsystem.
 - iii) Operation & Maintenance Subsystem (OMSS)
- b) What are the limitations of GSM cell in terms of diameter and capacity for traditional GSM? How can the capacity be increased? [4]
- c) How is synchronization achieved in GSM? Who is responsible for Synchronization? Why is it very important? [4]
- Q7)** a) Diagram and explain the forward CDMA channel modulation process. What is the role of Walsh codes in it? [10]
- b) The IS-95 system uses a rate $\frac{1}{2}$ convolutional encoding in the forward channel and a rate $\frac{1}{3}$ convolutional coding in the reverse channel. What were the reasons for doing so? [6]
- Q8)** a) What are the coordinating measures that have to be taken by two cellular service providers operating in the same frequency band between two adjacent cities or areas to prevent interference between each other? What are the different methods used? [6]
- b) How does the near far effect influence CDMA systems? What are the countermeasures in CDMA systems? [6]
- c) What is the Capture Effect and how does it impact the performance of random access method? [4]

Number of Trunked Channels (C)

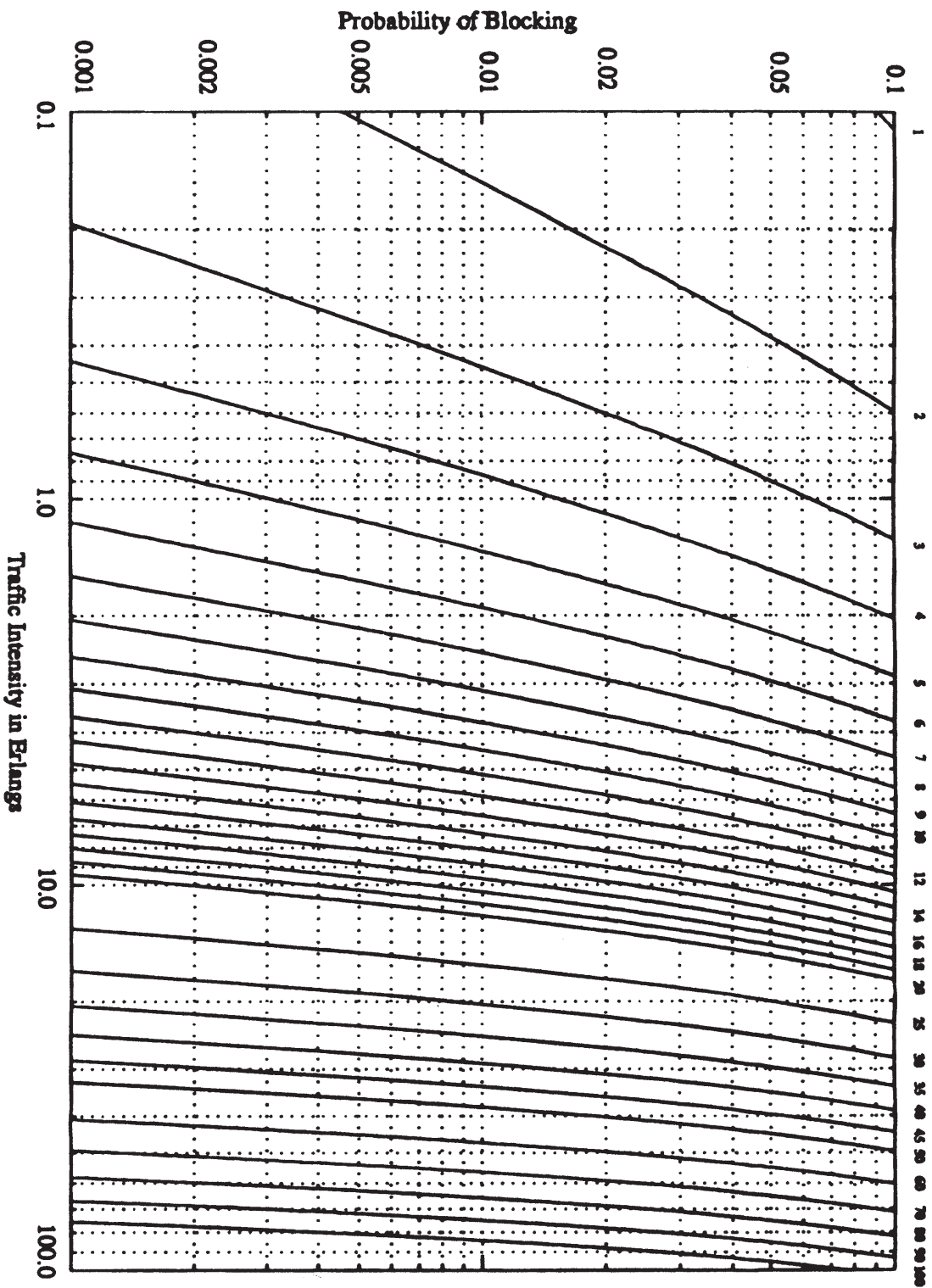


Figure 3.6 The Erlang B chart showing the probability of blocking as functions of the number of channels and traffic intensity in Erlangs.



P1309 **[4065] - 653**
M.E. (E & TC) (Signal Processing)
STATISTICAL SIGNAL PROCESSING
(504507) (2008 Course) (Sem. - II)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

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

SECTION - I

Q1) a) State whether the following statements are True or False. Justify your answer. (Solve any three) **[12]**

i) Spectral estimation techniques based on periodogram, give better resolution compared to these based on parametric models.

ii) The filter with below-given transfer function is stable.

$$H(z) = \frac{1 + r_x(k) = 2\delta(k) + \left(\frac{1}{3}\right)^{|k|}}{1 + 1.5z^{-1} - 0.81z^{-2} - 1.215z^{-3}}$$

iii) Pade' approximation technique promises to estimate at the most 'p + q + 1' values of the signal without error. [Here p and q represent denominator and numerator polynomial orders of the model, respectively]

iv) Mth order forward linear predictor and Mth order lattice have one coefficient common.

b) Find the power density spectrum for the following WSS random process

with a given autocorrelation sequence,

[6]

Q2) a) Compare the MYWE (Modified Yule - Walker) equations for an ARMA model of 'P' poles and 'q' Zeroes to the Pade' equations for the denominator polynomial coefficients $a_p(k)$, $0 \leq k \leq P$. [Point out similarities and differences] **[6]**

P.T.O.

- b) First five values in the autocorrelation sequence for the process $x(n)$ are

$$r_x = \left[3, \frac{9}{4}, \frac{9}{8}, \frac{9}{16}, \frac{9}{32} \right]^T$$

- i) Use MYWE method to find ARMA (1, 1) model for $x(n)$. [6]
 ii) Are the given values in the acr sequence consistent with the model that you found in part (i)? [4]

Q3) a) State and explain any two important properties of the reflection coefficient sequence that is generated by Levinson - Durbin recursion. [4]

- b) The reflection coefficients corresponding to a third order all - pole model are $\Gamma_1 = -0.8$, $\Gamma_2 = 0.389$, $\Gamma_3 = 0.4727$ and the modeling error is given by $\epsilon_3 = 0.23737$ [12]

- i) Find the filter coefficients, $q_3(k)$ for this model.
 ii) Find the autocorrelation coefficients $r_x(m)$, $0 \leq m \leq 3$.
 iii) Also find the modeling errors ϵ_0 , ϵ_1 and ϵ_2 .

Q4) a) An AR(2) process $s(n)$ is generated using the difference equation. [6]
 $s(n) = w(n) + 0.1 s(n-1) + 0.8 s(n-2)$. Where $w(n)$ is a white noise with unity variance. Find the auto correlation logs $r_s(m)$ for $m = 0, 1, 2$.

- b) Explain the method for the design of an FIR Least - squares Inverse filter. [10]

Hence find a system function $H(z)$ of FIR Least - squares Inverse filter of length four, for the system $G(z) = 1 - z^{-1}$

SECTION - II

Q5) a) Answer any three of the following: [12]

- i) What is the difference between Least Squares and Least Mean Square Techniques?
 ii) What are the limitations of FFT-based techniques of Power Spectrum estimation?
 iii) Consider a causal, first order AR process $s(n)$ described by a difference equation,
 $s(n) = as(n - 1) + w(n)$

Where $w(n)$ is a white noise with variance σ_w^2 . Draw the block diagram and find an autocorrelation function $r_{ss}(m)$.

- iv) Justify the statement, "Lattice filter coefficients of lower order model remain unchanged when filter order is increased."

- b) Explain the term 'Whitening filter'. The power spectrum of a WSS process $x(n)$ is [6]

$$P_x(e^{j\omega}) = \frac{13+12\cos\omega}{25-24\cos\omega}$$

Find the whitening filter $H(z)$ having input $x(n)$ that produces an unit variance white noise.

- Q6)** a) Compare Barlet and Welch techniques for power spectrum estimation on the basis of total number of computations. [6]
 b) What do you understand by the term 'modified periodogram'? How the resolution is affected by the window function? [4]
 c) Periodogram technique is to be used to resolve the two sinusoids (with $\omega_1 = 0.2$ and $\omega_2 = 0.25$), buried in unity variance white noise. What is the minimum length of data record required to resolve the two frequencies? [6]

- Q7)** a) If ϵ_{j+1} and ϵ_j represent modeling errors for $(j+1)$ and $(j)^{\text{th}}$ order respectively, in Levinson - Durbin recursion, and if Γ_j represent j^{th} reflection coefficient, [6]
 prove that

- b) $\Gamma_{j+1} = [1 + |\Gamma_j|^2]^{-1/2} \Gamma_j$
 Given the autocorrelation sequence, [6]
 $r_x(0) = 1, r_x(1) = 0.8, r_x(2) = 0.5, r_x(3) = 0.1$
 Find the reflection coefficients Γ_j , the model parameters $a_j(k)$ and the modeling errors ϵ_j for $j = 1, 2, 3$. [6]
 c) Draw lattice structure for the above model. [4]

- Q8)** a) Draw a block-diagram for general Wiener filtering theme. Hence derive the expressions for optimal weight vector and minimum mean square error. [6]
 b) What do you understand by the term 'innovations representation' of the process? How it is related to whitening filter? [6]
 c) Discuss Schur algorithm. [4]



P1311

[4065]-655

M.E. (E & T/C) (Signal Processing)
VLSI IN SIGNAL PROCESSING
(2008 Course) (504509) (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 diagram must be drawn wherever necessary.
- 4) Figures to the right indicate full marks.
- 5) Assume suitable data if necessary.

SECTION - I

- Q1)** a) For the DFG shown below find the Iteration bound using LPM algorithm. Explain LPM algorithm. **[10]**

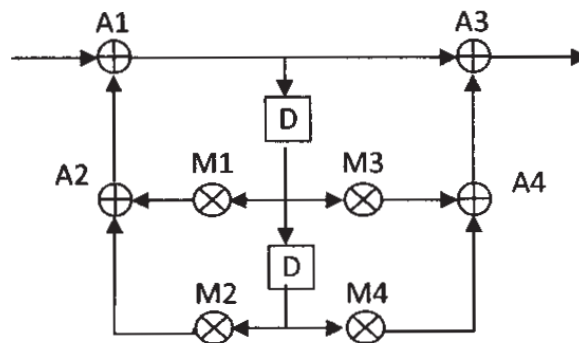


Fig. 1.(a)

- b) Draw Block Diagram, SFG, DFG and DG for the $y(n) = a.y(n-1) + b.x(n-1) + c.x(n)$. **[8]**
- Q2)** a) Explain the advantages of Pipelining and Parallel processing on account of Power consumption and Justify the same. **[8]**
- b) Calculate the power reduction of a computation if it is pipelined by 4 stages and processed using a block structure with block size 4, but is operated with the same sample rate as the original system. Assume that the original system was operated at a supply voltage of 5 V, and assume the threshold voltage V_t of the CMOS process to be 0.4 V. Calculate the power consumption of the parallel-pipelined system as compared with the original system. What is the operating supply voltage of the parallel-pipelined system? **[8]**

P.T.O.

Q3) a) What is retiming of DFG? Explain the application of retiming in DSP systems. Explain the properties of retiming. [8]

b) Perform the retiming for folding on the DFG shown in Fig.1 (a) so that sets shown in non-negative edge delays in the folded architecture. Assume the following folding sets for the iteration period $N = 4$

$$S_M = \{M_4, M_1, M_3, M_2\}$$

$$S_A = \{A_1, A_3, A_4, A_2\} \quad [8]$$

Q4) Write short notes on any two : [16]

a) Register minimization techniques.

b) Design B2 for FIR systolic arrays.

c) Systolic Design for Matrix multiplication.

SECTION - II

Q5) a) Describe a 4×4 bit Baugh-Wooley carry save multiplier also draw the DG for the same. [8]

b) With the help of neat diagrams explain architecture of any one FPGA. [8]

Q6) a) How minimum clock skew is achieved in FPGA devices? What are the challenges in Clock Distribution for SoC designs? Explain in brief. [8]

b) Explain how floating point arithmetic is implemented on FPGAs. [8]

Q7) a) Explain the VLSI Design flow for FPGAs. Compare FPGA and CPLD. [8]

b) Explain the applications of DCM available on FPGAs. How 4X clock can be achieved using DCM? [8]

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

a) Routing resources on FPGA.

b) VLSI Design tools.

c) Carry free radix-2 addition and substraction.

d) Scaled CMOS Technologies to meet DSP application demands.



P1314

[4065] - 662

M.E. (Electronics) (Digital System)

MICRO ELECTRONICS

(Sem. - I) (2008 Course) (504195)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) Answer any three questions from each section.
- 2) Assume suitable data, if necessary.

SECTION - I

- Q1)** a) Explain CMOS Inverter and its transfer characteristics. [7]
b) Design CMOS Logic gates for the function give
i) $f = \overline{A} + \overline{B} \cdot \overline{C}$
ii) $f = \overline{ABC + D}$
iii) $f = \overline{A} + (\overline{B} + \overline{C}) \overline{D}$ [9]
- Q2)** a) What are different causes of Power dissipation in CMOS, discuss in detail. [8]
b) What is Domino Logic? Explain operation of Domino Logic for AND gate. [8]
- Q3)** a) Write VHDL code for divide by 5 synchronous counter. [8]
b) What is transistor sizes? Derive the relationship between the widths of n & ipbanks of MOSFET. [8]
- Q4)** Write short notes on : [18]
a) Synthesizable VHDL constructs.
b) Ultra fast VLSI circuits and system.
c) Data types in VHDL.

SECTION - II

- Q5)** a) Explain the following attributes with suitable examples
EVENT, QUIET, LAST EVENT, DELAYED [10]
b) What are the type of TEST, Benches, Explain its application. [6]
- Q6)** a) Design a Moore synchronous machine to detect overlapped 1011
sequence. [8]
b) Compare Moore & Mealy Machine. [8]
- Q7)** a) What is transmission gate? How it works? Explain in detail application
of transmission gate. [8]
b) Explain MOS implementation of current sink and current source along
with their I-V characteristics. [8]
- Q8)** Write short notes on : [18]
a) Routing techniques.
b) Clock distribution.
c) Analogue VLSI.



Total No. of Questions : 8]

[Total No. of Pages : 2

P1315

[4065]-664

M.E. (Electronics) (Digital System)

SIGNAL PROCESSING ARCHITECTURES

(504196) (2008 Revised Course) (Sem. - I)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Explain overlap and add fast convolution algorithm. Explain how the aliasing in time domain is avoided by selecting proper number of DFT points? How DFT/FFT is used to implement fast convolution? [8]
- b) Can you eliminate aliasing in case of impulse invariant transformation. Why? Why BLT is the best transformation for mapping analog filter to a digital filter? [8]
- Q2)** a) How will you select a window for STFT analysis? How will you analyze a time varying signal using STFT? What are its limitations? Explain how wavelet transform eliminates the limitations of STFT? [9]
- b) Explain constant Q property of wavelet transform. Consider the 8 point sequence given by $f = (2, 5, 8, 9, 7, 4, -1, 1)$. Execute 2 level Haar decomposition and find 8 point output. [8]
- Q3)** a) Explain how pipelining improves the throughput of the system. What is the advantage of using parallel processing? Explain with the help of suitable example. [8]
- b) Explain the folding transformation. Consider one suitable example to explain how folding transformation will improve the throughput of the system. [8]

P.T.O.

- Q4)** a) Explain decimation in frequency FFT algorithm. Derive the required equations. What is in place computation? Why bit reversal is required. [9]
- b) Draw a schematic for a sampling rate converter by a factor of 5/3. Design a common filter for interpolator and a decimator. Draw the spectrum of the signal at the output of each block. [8]

SECTION - II

- Q5)** a) A signal with a sampling frequency of 3072 kHz is to be decimated by a factor of 64 to get a new sampling frequency of 48 kHz. Signal band of interest is 0 to 20 kHz. For a three stage design, find the specifications for first, second and the third stage filter. (Find pass band edge frequency, stop band edge frequency and cut off frequency for each stage filter). [9]
- b) What are QMFs? Explain multiresolution analysis using wave let filter. [8]
- Q6)** a) Explain Booth's algorithm for multiplication using a suitable example. [8]
- b) Draw a barrel shifter for 8 bit shift register. How multiplexers facilitate barrel shifting? [8]
- Q7)** a) Draw a super Harvard architecture for DSP. What is the use of a program cache? How a MAC instruction is executed efficiently using this architecture. [9]
- b) Explain the use of a modified bus structure in TMS 320 C 6 7 XX. What is a multiport memory? [8]
- Q8)** a) What is VLIW architecture? Explain special DSP instructions. What is the use of circular buffers? [8]
- b) Explain finite word length effects. What is the effect of coefficient quantization? Why cascade realization is preferred for filters. [8]



P1317

[4065]-668

**M.E. (Electronics) (Digital Systems)
MACHINE INTELLIGENCE
(2008 Course) (Elective - II) (504198)**

Time : 3 Hours]

[Max. Marks : 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)** a) What are different soft computing constituents? Describe different characteristics of soft computing. **[8]**
- b) Define support, core, normality, cross over point, fuzzy singleton, alpha cut, strong alpha cut, convexity of a fuzzy set with suitable examples. **[8]**
- Q2)** a) Explain membership function of two dimensions. What are advantages over one dimension membership functions. **[8]**
- b) Explain the extension principle for fuzzy set with suitable example? **[8]**
- Q3)** a) Draw and explain the block diagram of Tsukamoto fuzzy inference system. **[8]**
- b) Develop a reasonable membership function for the following fuzzy sets based on linguistic variable of temperature parameter. **[8]**
- i) Hot.
 - ii) Cold.
 - iii) Very hot.
 - iv) Very cold.
 - v) Not hot.
 - vi) Not cold.
 - vii) Very very hot.
 - viii) Very very cold.

P.T.O.

- Q4)** a) Suppose x, y and 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 represent the fuzzy relation of closeness between x and y and S represents a fuzzy relation of closeness of y and z . These fuzzy relation are given by fuzzy matrices such as,

$$R = \begin{bmatrix} 1 & 0.6 & 0.3 \\ 0.4 & 0.9 & 0.1 \\ 0.5 & 0.2 & 0.7 \end{bmatrix} \quad S = \begin{bmatrix} 1 & 0.1 & 0.5 \\ 0.7 & 0.9 & 0.2 \\ 0.1 & 0.8 & 0.8 \end{bmatrix}$$

Obtain the max-min composition and max product composition which represent the closeness between x to z . **[10]**

- b) What are different defuzzification schemes used for obtaining a crisp output? **[8]**

SECTION - II

- Q5)** a) What are differences in the manner of solving problems by human being and by machines? Illustrate with examples. **[8]**

- b) What is perceptron? Draw and explain how two layer perceptron can be used to solve 2 input XOR problem. **[8]**

- Q6)** a) Draw and explain McCulloch-Pitts, Perceptron and adline model of artificial neuron. List the main differences among these models. **[8]**

- b) Compare learning laws of Hebbian, Perceptron, delta, Widrow Hoff, Correlation, Competitive and outstar w.r.t. Weight adjustment, Initial value of weight and learning rate parameter and type of learning (Supervised/ Unsupervised). **[8]**

- Q7)** a) Describe in detail the back propagation learning algorithm for multilayer perceptron (MLP). What are different methods used for speeding up of MLP training. **[8]**

- b) Explain in detail the concept of data clustering algorithm. Discuss implementation details of K- means data clustering algorithm. **[8]**

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

- a) Neuro fuzzy control.
- b) Genetic Algorithm in Game playing.
- c) ANFSIS (Adaptive N/W based fuzzy Inference Systems).
- d) Hop field network.



Total No. of Questions : 8]

[Total No. of Pages : 2

P1319

[4065]-689

M.E. (E & TC) (Communication Networks)

WIRED AND WIRELESS NETWORKS

(2010 Course) (Sem. - II) (504607)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Explain the function of bridges and routers in networks and on which layers bridges and routers are used? [8]
b) Explain internetworking concept and architectural models in detail. [8]
- Q2)** a) Explain IPV4 addressing scheme. [8]
b) Explain NAT in detail. [8]
- Q3)** a) Explain ATM with the help of
i) ATM virtual circuits. [9]
ii) ATM reference model.
b) What is need for multiple protocols in communication? [8]
- Q4)** a) Explain different network topologies : [8]
i) Mesh.
ii) Star.
iii) Bus.
iv) Ring.
v) Tree.
vi) Hybrid.
b) Explain design issues for the protocol layers. [9]

P.T.O.

SECTION - II

- Q5)** Discuss the following :
- a) Internet Trends and Internet Applications. [8]
 - b) Network Programming. [8]
- Q6)** Explain the flow and error control mechanism.
- a) Stop and Wait ARQ. [6]
 - b) Go-Back-N ARQ. [5]
 - c) Selective Repeat ARQ. [5]
- Q7)**
- a) Explain VLAN in detail. [8]
 - b) What is VLSM (Variable Length Subnet Mask)? How does VLSM work? [9]
- Q8)**
- a) Describe need of sub netting in internet addressing. [8]
 - b) An address in block is given as 110.23, 120.14/20. Find the class of address, the number of addresses in block, the first address and the last address. [9]



P1320

[4065]-691

M.E. (E & TC) (Communication Network)

WIRELESS SYSTEM DESIGN

(2008 Course) (504609) (Sem. - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) What is reflection coefficient (Γ) of transmission line? Write expression in terms of load impedance and characteristic impedance. **[8]**
- b) Why RF system representation is done in terms of S parameters? Write definitions of S parameters with expressions. **[10]**
- Q2)** a) Explain following terms regarding RF amplifier. **[8]**
- i) Input and output reflection coefficients (VSWR).
 - ii) Noise Figure (dB).
 - iii) Gain flatness (dB).
 - iv) Bandwidth (Hz).
- b) How stability of RF amplifier is concern of load and source reflection coefficient? What do you mean by conditional and unconditional stability? **[8]**
- Q3)** a) With suitable block diagrams explain how stability of an active device can be achieved at input and output ports? **[8]**
- b) What is 'Unilateral Figure of Merit? Write its expression in terms of S parameters. **[8]**
- Q4)** a) Draw and describe YIG-Tuned oscillator. Also write its merits. **[8]**
- b) Draw and explain block diagram of basic oscillator model, write expression of closed-loop transfer function. Also explain concept of negative resistance. **[8]**

P.T.O.

SECTION - II

- Q5)** a) Draw and describe Voltage Controlled Oscillator. [8]
b) What do you mean by fundamental mode and overtone mode in Quartz Oscillator? Write expression for oscillating frequency in overtone mode. [8]
- Q6)** a) How multiplication of two signals is useful in a mixer? Write expression for the multiplication. [8]
b) What do you mean by source degeneration in a mixer? What are its types? [8]
- Q7)** a) Draw and explain double balanced mixer. [8]
b) Explain linearity and isolation characteristics of a mixer. [8]
- Q8)** Write short note on any three of the following : [18]
a) Link budget.
b) System degradation due to RF component.
c) Colpitts oscillator.
d) Square law MOSFET mixer.
e) Nonlinear systems as linear mixers.



P1321

[4065] - 698

M.E. (Production)

MATHEMATICS & STATISTICS

(2008 Course) (511101) (Sem. - I)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Define an analytic function of $W = f(z)$ at the point $z = z_0$ and show that the function defined by $W = |z|^2$, for any complex variable z is differentiable at the origin 0 but not analytic at that point. [5]
- b) Show that the Cauchy-Riemann equations namely $\frac{\partial u}{\partial x} = \frac{\partial v}{\partial y}$, $\frac{\partial u}{\partial y} = -\frac{\partial v}{\partial x}$ are the necessary conditions for a function $W = f(z) = u + iv$ to be analytic at $z = z_0$ and also state the sufficient conditions. [6]
- c) Find the Laurent's series expansion for $f(z) = \frac{1}{(z-1)(z-2)}$ in the region $0 < |z-1| < 1$. [6]
- Q2)** a) Find the bilinear transformation, which transforms $z = i, 0, -i$ onto $W = 1, i, -1$ and maps $\text{Re}(z) \geq 0$ on to $|W| \leq 1$. [6]
- b) Evaluate $\int_C (z - z^2) dz$, where C is the upper half of the circle $|z| \leq 1$.
What is the value of this integral if C is the Lower half of the above circle? [5]
- c) Using Cauchy's residue theorem evaluate $\int_0^{2\pi} \frac{\cos 3\theta}{5 - 4 \cos \theta} d\theta$. [5]

P.T.O.

Q3) a) Find the values of $u(x, t)$ satisfying the parabolic equation $\frac{\partial u}{\partial t} = 4 \frac{\partial^2 u}{\partial x^2}$ subject to the boundary conditions $u(0, t) = 0 = u(8, t)$ and $u(x, 0) = 4x - \frac{x^2}{2}$ at the points $x = i, i = 0, 1, 2, \dots, 8$ and $t = \frac{1}{8}j, j = 0, 1, 2, 3, 4, 5$. [9]

b) Evaluate the pivotal values of the equation $\frac{\partial^2 u}{\partial t^2} = 16 \frac{\partial^2 u}{\partial x^2}$ taking $\delta x = 1$ upto $t = 1.25$. The boundary conditions are $u(0, t) = u(5, t) = 0$ and $u(x, 0) = x^2(5 - x)$. [8]

Q4) a) Using residue theorem for an improper integral, show that $\int_0^{\infty} \frac{dx}{1+x^2} = \frac{\pi}{2\sqrt{2}}$. [8]

b) Solve the Poisson's equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 8x^2y^2$ for the square mesh of the sides $-2 \leq x \leq 2, -2 \leq y \leq 2$ with $u(x, y) = 0$ on the boundary taking $h = 1$. [8]

Q5) a) Find the curves on which the functional $\int_0^1 \left[\left(\frac{dy}{dx} \right)^2 + 12xy \right] dx$ with $y(0) = 0$ and $y(1) = 1$ can be extremised. [8]

b) Show that the functional

$\int_0^{\pi/2} \left[2xy + \left(\frac{dx}{dt} \right)^2 + \left(\frac{dy}{dt} \right)^2 \right] dt$ such that $x(0) = 0, x(\pi/2) = -1, y(0) = 0, y(\pi/2) = 1$ is stationary for $x = \sin t, y = \cos t$. [8]

SECTION - II

Q6) a) For the Bessel's function $J_n(x)$ prove the recurrence formulas that

i) $\frac{d}{dx} [x^{-n} J_n(x)] = x^{-n} J_{n-1}(x)$

ii) $J_n(x) = \frac{1}{2} [J_{n-1}(x) - J_{n+1}(x)]$ [6]

- b) For Legendre's function $P_n(x)$, prove that
- $(n + 1)P_n(x) = (2n + 1)x P_n(x) - nP_{n-1}(x)$
 - $nP_n(x) = xP_n'(x) - P_{n-1}'(x)$ [6]
- c) Express $J_5(x)$ in terms of $J_1(x)$ and $J_0(x)$. [4]

Q7) a) Assume inter-arrival time X service time Y are exponentially distributed with mean 3 and 2 min. respectively. Simulate the model for 10 minutes by using the following random variable.

RN for X :	0.82	0.23	0.37	0.75	0.15	0.27	
RN for Y :	0.66	0.31	0.48	0.92	0.38	0.72	[8]

- b) In a shooting competition, the probability of a man hitting a target is $2/5$. If he fires 5 times what is the probability of hitting the target.
- At least twice.
 - At most twice. [4]
- c) The mean and variance of the Binomial distribution are 6 and 2 respectively. Find $P(x > 1)$ and $P(x = 2)$. [4]

Q8) a) Samples of 40 are taken from a lot, which is on the average 20% defective.

- What is the probability that a sample of forty will contain exactly 11 defective?
- What is the probability that it will contain 11 or more defective? (Use normal distribution). [6]

b) Fit the Binomial distribution to the set of following observations

$x :$	0	2	3	4	5	
$f :$	27	6	3	0	0	[5]

c) Fit the Poisson distribution to the following data and test the goodness of fit. [6]

$x :$	0	1	2	3	4
$f :$	112	73	30	4	1

Q9) a) Based on 15 subgroups each of size 200 taken at intervals of 45 minutes from a manufacturing process the average defective was found to be 0.068. Construct p -chart and np -chart. [6]

b) From the data given below about the treatment of 250 patients suffering from a disease, State whether the new treatment is superior to the conventional treatment.

	Favourable	Not Favourable	
New :	140	30	
Conventional :	60	20	[6]

- c) A random sample of 200 screw is drawn from a population which represents a size of screws. If a sample is distributed normally with mean 3.15 cm and standard deviation 0.025 cm, find the expected number of screws whose size falls between 3.12 cm and 3.2 cm. It is given that $Z_1 = -1.2$, $A_1 = 0.3849$ and $Z_2 = 2.0$, $A_2 = 0.4772$. [5]

Q10) a) Test whether the following Markov chain (transition matrix) is ergodic

or regular $\begin{bmatrix} \frac{1}{4} & \frac{1}{4} & \frac{1}{2} \\ \frac{1}{4} & \frac{3}{4} & 0 \\ \frac{1}{2} & 0 & \frac{1}{2} \end{bmatrix}$ construct the state diagram also. [7]

b) Find the steady state probabilities and mean recurrence time for the

following Markov chain $\begin{bmatrix} 0.5 & 0.3 & 0.2 \\ 0.2 & 0.4 & 0.4 \\ 0.1 & 0.5 & 0.4 \end{bmatrix}$. [9]



P1323

[4065]-706

M.E. (Production)

SHEET METAL PROCESSING

(2008 Course) (Elective - II) (511105 (b))

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Solve any three questions from each section.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Figures to the right indicate full marks.*
- 4) *Draw neat sketches wherever required.*

SECTION - I

- Q1)** a) Explain different attributes of material behaviour affecting sheet metal product. **[8]**
b) Explain different defects appearing in sheet metal product. **[8]**
- Q2)** a) Explain slip line fields for all possible friction coefficient applicable to compression with width/height = 2:1 **[6]**
b) Describe various steps taken from the product design stage to the finished product while manufacturing in a small quantity, a small can to carry oil using Aluminium sheet. **[10]**
- Q3)** a) Explain with suitable example a process analysis for deep drawing of axisymmetric parts. **[8]**
b) Explain requirements of Press tools used in sheet metal operation. **[8]**
- Q4)** Write short notes on any three : **[18]**
a) Methods for testing of sheet metal product.
b) Steps followed in deep drawing of sheet.
c) Rate sensitivity and its effect on sheet metal product.
d) Forming limit diagram.

SECTION - II

- Q5)** a) Explain with suitable example a part formed three high roll forming. [8]
b) Explain different steps to be followed in a sheet metal joining process. [8]
- Q6)** a) Make brief classification of presses. Explain the method of selection of press for a corrugated sheet. [8]
b) Explain different devices used for handling of pressed out parts. [8]
- Q7)** a) Explain with suitable example how modelling is done of a sheet metal component. [8]
b) Explain with suitable example a scope of CAD/CAM in sheet metal forming. [8]
- Q8)** Write short notes on any three : [18]
a) Warm forming.
b) Strain distribution of a drawn component.
c) Safety devices and their selection at press shop.
d) Automation in part handling in sheet metal.



P1324

[4065]-707

M.E. (Production) (Manufacturing and Automation)

TOOL AND DIE DESIGN

(2008 Course) (Elective - II) (511105 (c))

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) A simple cutting tool has 0° rake angle and 3° clearance angle. The maximum length of the flank wear allowed before regrinding is 1mm. Assuming the volume rate of wear of the tool to be constant, what will be the percentage increase in the tool life if the clearance angle is increased to 7° ? [8]
- b) Calculate the side rake and back rake angles when the inclination angle is $5^\circ 29'$, orthogonal rake is $-6^\circ 38'$ and side cutting edge angle is 15° . [8]
- Q2)** a) Determine the clamping force and screw tightening moment for a workpiece in which a hole is to be drilled. In drilling the cutting moment is 40 kN-mm. The workpiece is located on the V-block with angle of V 90° . The coefficient of friction between the work and clamp is 0.20. Assume factor of safety 2, permissible tensile stress for screw material 150 MPa, thread angle 3° and angle of friction 6° . [8]
- b) Explain with suitable example the application of equalizing clamp. [8]

P.T.O.

Q3) Design a progressive die for the component shown in Fig. 1. Assume shear strength of material 230 MPa and sheet size 2500 × 1250 mm. [18]

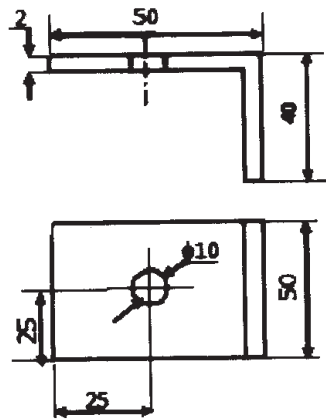


Fig. 1

- Q4)** a) List various tool angles and discuss their significance. [8]
 b) Explain with any suitable example the concept of modular fixturing system. [8]

SECTION - II

Q5) Design the forging process and dies for the component shown in Fig.2. [16]

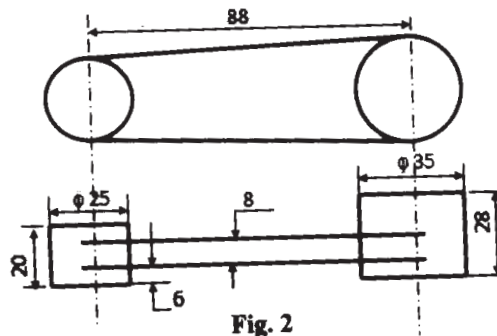


Fig. 2

Q6) a) For injection molding of a certain component maximum clamping force requirement is 180 kN/piece. Quantity to be produced is 30 lakh. Capacities of various injection molding machines along with machine hour rate is as given below :

Capacity of machine in terms of clamping force (kN)	500	1000	2250	3000	4500	6000
Machine hour rate (Rs)	15	17.7	23.5	28.5	37	45

Determine the number of impressions for minimum cost if cycle time is 30 seconds and cost of producing one impression is 2300 Rs. [8]

b) Following data applies to the component shown in Fig.3.

Material : LDPE;

Shrinkage: 0.96;

Poisson ratio: 3.33;

Modulus of elasticity (for mold material): 2.1×10^5 MPa;

Injection pressure: 80 MPa;

Outer diameter of cavity plate : 150 mm.

Determine the mold opening force.

[8]

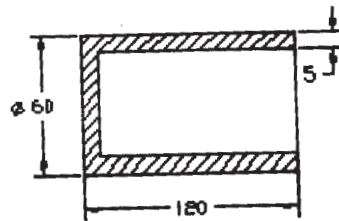


Fig. 3

Q7) a) Explain with neat sketch the die venting and water cooling in the die casting. [8]

b) What are the different classifications of dies in die casting? [8]

Q8) Write short notes on : [18]

a) Computer aided forging die design.

b) Design of gating system for injection mold.

c) Ejection system for die casting.



P1325

[4065] - 711
M.E. (Production)
(Manufacturing and Automation)
INDUSTRIAL AUTOMATION
(2008 Course) (511110) (Sem. - II)

*Time : 3 Hours]**[Max. Marks : 100**Instructions to the candidates:*

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

SECTION - I

Q1) a) A proposal has been submitted to replace the group of assembly workers, each working individually, with the assembly line. The following table gives the individual work elements.

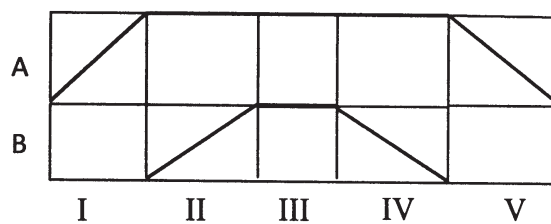
Element	1	2	3	4	5	6	7	8
Element time (min)	1.0	0.5	0.8	0.3	1.2	0.2	0.5	1.5
Immediate predecessors	---	---	1,2	2	3	3,4	4	5,6,7

The demand rate for this job is 1600 units per week with 40 hrs. per week. The current number of operators required to meet this demand is eight using individual manual workers.

- i) Use largest candidate rule to assign the work elements to station and calculate balance delay. **[8]**
 - ii) The initial cost to install the assembly line is Rs. 1000000. If the hourly rate for workers is Rs. 250, will the assembly line be justified using 3 year service life? Assume 50 weeks per year and rate of return 10%. **[4]**
- b) Explain the lower bound approach for analysis of assembly lines. **[4]**

P.T.O.

- Q2) a)** A hydraulic system having cycle time of 15 seconds requires 350 l/min at 20 bar pressure for first 8 seconds and 40 l/min at 320 bar pressure for remaining time. Draw the hydraulic circuits and calculate the efficiency of each circuit when using :
- Single fixed displacement pump with intensifier. [5]
 - Single fixed displacement pump with accumulator. [5]
- b)** Explain with neat sketch the hydraulic servo system for position control. [6]
- Q3) a)** Explain the use of turbulence amplifier for logic circuit. [6]
- b)** Draw the suitable pneumatic circuit using cascade system to actuate cylinder A and cylinder B as per following position step diagram. [10]



- Q4) Write short notes on :** [18]
- Variable displacement pump control for constant flow.
 - Transfer line monitoring system.
 - Time delay valve.

SECTION - II

- Q5) a)** Construct the ladder logic diagram to perform following tasks : [8]
- To allow fluid to flow into tank till it is filled completely.
 - To allow the fluid to flow out of tank after the delay of 120 seconds.
 - To stop the out flow after 90 seconds.
- b)** Write a program for 8085A μ p to find smallest element in a block of 8-bit unsigned binary data, whose number is stored in the memory location A001H, and the data are stored in a memory location beginning from A002H. Store the smallest number in a memory location FF00H. [8]
- Q6) a)** A feeder selector device at one of the stations of an automatic assembly machine has a feed rate of 25 parts/min and provides a throughput of one part in four. The ideal cycle time of the assembly machine is 10 sec. The feeder stops for 20 parts in feed track and will start while 10 parts in feed track. Determine how long will it take for the feeder to turn on once it is turned off and how long it will take to turn off once it is turned on? [6]

- b) In a automated material handling system AGVs are used for material handling. A number of deliveries and empty returns are indicated in a from-to chart in Table 1. The corresponding distances are indicated in Table 2. The speed of an AGV is 100 ft/min. Considering a traffic factor of 0.9, determine : [10]
- i) The total transport work.
 - ii) Average total time per delivery, the handling system efficiency, and the resulting average number of deliveries per hour.
 - iii) Number of vehicles needed to satisfy the indicated deliveries per hour.

Table 1 : From-To chart showing number of moves per hour between different stations

From	To			
	1	2	3	4
1	0	7D	5D	3D
2	4E	0	0	3D
3	5E	0	0	0
4	6E	0	0	0

(Deliveries indicated by 'D' and Empty moves indicated by 'E')

Table 2 : From-To chart showing distances between different stations

From	To			
	1	2	3	4
1	0	150	100	130
2	150	0	NA	80
3	100	NA	0	NA
4	130	NA	NA	0

(NA : not applicable)

- Q7)** a) The linear joint of the industrial robot is actuated by the piston mechanism. The length of the joint when fully retracted is 600 mm, and when fully extended is 975 mm. If the robot controller has 8 bit storage capacity, determine the control resolution of this robot. [6]
- b) Explain important functions of a work cell controller in an industrial robot. [10]

Q8) Write short notes on :

[18]

- a) Job orienting devices.
- b) Applications of redundant robot manipulators.
- c) Piezoresistive pressure sensor.



P1330

[4065] - 720

M.E. (Production) (CAD / CAM)

COMPUTER AIDED DESIGN

(2008 Course) (511201) (Sem. - I)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) Attempt any Three from each section.
- 2) Figures to the right indicate full marks.
- 3) Draw neat self-explanatory sketches wherever required.
- 4) Use of pocket calculators is allowed.
- 5) Assume suitable data, if necessary.

SECTION - I

- Q1)** a) Describe briefly the various data exchange systems currently in use. [8]
b) Discuss the stages in the product life cycle and the importance of each stage. Differentiate between Reverse Engineering and Forward Engineering. [8]
- Q2)** a) Find the transformed co-ordinates when a square (1, 1), (1, 2), (2, 2) and (1, 2) is rotated by 65° anticlockwise about a line passing through one of its vertex (1, 1) and another arbitrary point (3, 4). [8]
b) What is rendering? What are the different stages of rendering an image? [8]
- Q3)** a) Compare the splines for the same control points created by B-spline and Bezier spline techniques with suitable examples. [8]
b) "B-spline can be treated as segmented series of Bezier curve". Justify this statement. [8]
- Q4)** a) Four position vectors $P_1[0, 0]$, $P_2[1, 1]$, $P_3[2, -1]$ and $P_4[3, 0]$ are given with tangent vectors $P'_1[1, 1]$ and $P'_2[1, 1]$. Determine the piecewise cubic spline curve through them. [8]
b) Write the mathematical representation, application and limitations of the following surfaces :
i) Spherical surface. ii) Composite surface. [8]

P.T.O.

- Q5)** Write short notes on : **[18]**
- a) Translational and Rotational Mapping.
 - b) Parametric Programming.
 - c) NURBS.

SECTION - II

- Q6)** a) Explain the detailed syntax (with modifiers) and uses of the “measure” command. **[8]**
b) What is z-buffer algorithm for B-REP and CSG models? **[8]**
- Q7)** a) What are the different techniques used to decide assembling sequence to generate assemblies. **[8]**
b) What is conventional animation and what are the different steps used in conventional animation in creating an animated film? **[8]**
- Q8)** a) Describe the generation process of sphere using cylinder as a primitive and torus using other natural quadrics. **[8]**
b) Explain the basic fundamentals of solid modelling representation any CAD software. **[8]**
- Q9)** a) Why Euler’s formula is used in solid modelling? Verify it for a tetrahedron and a cube. Draw an arbitrary solid object and ascertain its validity using Euler’s generalized rule. **[8]**
b) Explain the procedure of mass property calculations in CAD software. **[8]**
- Q10)** Write short notes on : **[18]**
- a) Feature Based Segmentation.
 - b) Parametric Programming.
 - c) Virtual Realism.



P1332**[4065]-722**

M.E. (Production) (CAD/CAM)
OPTIMIZATION TECHNIQUES
(2008 Course) (511203) (Sem. - I)

*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) Figures on left indicates marks.

SECTION - I

- Q1)** a) Discuss Saddle point. State different conditions. [8]
 b) Find the dimensions of the cylindrical tin (with top and bottom) made up of sheet metal, to maximize its volume such that the total surface area is equal to $A_0 = 2\pi$. [10]
- Q2)** a) Discuss Newton's Method with example for single variable optimization. [8]
 b) Minimize : $f(X) = 0.65 - \left(\frac{0.75}{1+X^2} \right) - 0.65X \left(\tan^{-1} \left(\frac{1}{x} \right) \right)$ in the interval $[0, 3]$ by Fibonacci method using $n = 6$. [8]
- Q3)** a) Explain use of Secant Method with an example. [8]
 b) Discuss use of pattern search method for multi-variable optimization. [8]
- Q4)** a) Discuss use of Hessian Border Matrix in optimization. [8]
 b) Find minimum of $f = x(x - 1.5)$ in the interval $(0.0, 1.00)$ to within 10% of exact value by Exhaustive search. [8]

SECTION - II

- Q5)** a) Explain use of rope-drum-buffer. How does it minimize inventory? [6]
 b) Given the function : [10]
 $f(X_1, X_2) = X_1^3 + X_2^3 + X_1^2 + X_2^2 + 6$
 Find the minimum value of the function by "Steepest Descent Method".
 (do **THREE** iterations only).

P.T.O.

- Q6)** a) Discuss Genetic Operators in view of Genetic Algorithm. [8]
b) Explain Simulated Annealing. Is it possible to get the Global optimum by SA? [8]

- Q7)** a) State the steps involve in “Theory of Constraints”. How TOC is implemented? [8]
b) “An hour saved on the bottleneck is mirage”. Discuss. [8]

- Q8)** a) Explain the use of Artificial Neural Networks in optimization. [8]
b) Use exterior penalty method, to solve : [10]

$$\text{Minimize } f(x_1, x_2) = \frac{1}{3} (x_1 + 1)^3 + x_2$$

$$\text{Subject to } g_1(x_1, x_2) = 1 - x_1 \leq 0$$

$$g_2(x_1, x_2) = -x_2 \leq 0.$$



P1335

[4065]-727

M.E. (Production) (CAD/CAM)

MECHATRONICS

(2010 Course) (Elective - II) (511205)

Time : 3 Hours]

[Max. Marks : 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) Followings are the excerpts from the specifications of a laser displacement sensor.

- Measurement range: $\pm 10\text{mm}$
- Measurement point: 40mm
- Resolution: $3\mu\text{m}$
- Linearity: 1% Full Scale
- Response time: 0.15ms
- Linear output: $4 - 20\text{mA}$

Answer the following questions : **[8]**

- i) Explain the meaning of each term.
- ii) Suppose, the distance between the sensor and the object is 35mm . Then what would be output in mA?
- iii) What is the error due to nonlinearity under the above condition?
- iv) Find out the sensitivity of the sensor in mA/mm.

b) Draw and explain the functional block diagram of a typical sensor and actuator systems? **[8]**

Q2) a) Explain the following modes of control with neat diagrams: **[10]**

- i) Proportional control.
- ii) PID control.

P.T.O.

b) Write the simplest Boolean equation for the Karnaugh map below : [6]

	CD	$C\bar{D}$	$\bar{C}D$	$\bar{C}\bar{D}$
AB	1	0	0	1
$A\bar{B}$	0	0	0	0
$\bar{A}B$	0	0	0	0
$\bar{A}\bar{B}$	0	1	1	0

Q3) Discuss the working of following with neat diagrams : [16]

- Fibre-Optic temperature sensor.
- Ultrasonic flow meters.
- Piezoelectric sensors.

Q4) Write a short note on the following : [18]

- Multiplexers.
- Analog to Digital converters.
- Instrumentation amplifier.

SECTION - II

Q5) a) Describe the physical organization of hardware in the PLC? [8]

b) “The choice of coordinate system and the position sensor used for the CNC machine tool is interconnected”. Justify this statement with an example? [8]

Q6) a) Design a conveyor control system that follows the design guidelines below : [10]

- The conveyor has an optical sensor S1 that detects boxes entering a workcell.
- There is also an optical sensor S2 that detects boxes leaving the workcell.
- The boxes enter the workcell on a conveyor controlled by output C1.
- The boxes exit the workcell on a conveyor controlled by output C2.
- The controller must keep a running count of boxes using the entry and exit sensors.

- If there are more than five boxes in the workcell the entry conveyor will stop.
- If there are no boxes in the workcell the exit conveyor will be turned off.
- If the entry conveyor has been stopped for more than 30 seconds the count will be reset to zero, assuming that the boxes in the workcell were scrapped.

- b) Explain the following in brief : **[6]**
- i) Counters.
 - ii) Shift registers.

Q7) a) A digital to analog converter is to be selected for an application where the output will vary from - 5V to 10V DC, and we need to be able to specify the voltage to within 50mV. What resolution will be required? How many bits will this D/A converter need? What will the accuracy be? **[6]**

b) Distinguish between a microprocessor and a microcontroller? Explain with a neat line diagram the organization chart for a microcontroller system? **[10]**

Q8) Write a short note on the following : **[18]**

- a) Elements of data acquisition and control system.
- b) Micro-sensors.
- c) Application of Artificial Intelligence in Mechatronics.



P1336

[4065]-728

M.E. (Production) (CAD/CAM)

RAPID PROTOTYPING

(2008 Course) (511205) (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) *Figures to the right indicate full marks.*
- 4) *Neat diagrams must be drawn wherever necessary.*
- 5) *Use of non-programmable electronic pocket calculator and statistical tables is allowed.*
- 6) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Explain how Rapid Prototyping and Manufacturing (RP&M) can be used as a communication tool in the modern era. [8]
- b) What are the three phases of prototyping? Contrasting these with those of geometric modeling, what similarities can be drawn? [8]
- Q2)** a) Classify the RP systems and explain the Stereolithography Photopolymer Systems. [8]
- b) Describe the advantages of Rapid Prototyping in-terms of its beneficiaries to the product designer, tool designer, manufacturing engineer, marketers and consumers? [8]
- Q3)** a) Explain with suitable example the following properties of prototype: [8]
- i) Material.
 - ii) Dimensional accuracy.
 - iii) Surface finish.
 - iv) Machinability.
- b) Describe with a suitable example the concept of Meniscus Smoothing. [8]

- Q4)** Write short notes on (**any three**) : **[18]**
- a) Comparison of STL and SLC file formats.
 - b) Laser Sintering (LS) process.
 - c) Environmental resistance in RP.
 - d) Reverse engineering in RP.

SECTION - II

- Q5)** a) Explain with the help of block diagram the design concept of generation of models, form and fit checking, and functional testing in Rapid Prototyping (RP). **[8]**
- b) Explain with a suitable example how *Direct and Indirect Rapid Tooling* helps to enhance production. **[8]**
- Q6)** a) Explain briefly the curved line width function and state its application. **[8]**
- b) Write short note on *photomodulus model*? **[8]**
- Q7)** a) Explain with a flow chart the economic analysis in using the Rapid prototyping technology in the present context. **[8]**
- b) Describe with a neat sketch the 3D printing process. **[8]**
- Q8)** Write short notes on (**any three**): **[18]**
- a) Miniaturization using RP.
 - b) Application of RP in forensic science.
 - c) Dynamic testing of RP & M models.
 - d) Photoelastic Stress Analysis of RP &M models.



Total No. of Questions : 8]

[Total No. of Pages : 2

P1337

[4065]-731

**M.E. (Production) (CAD/CAM)
COMPUTER INTEGRATED MANUFACTURING
(2010 Course) (511208) (Sem. - II)**

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) How do you differentiate physical integration, application integration and business integration with respect to CIM? Give specific example of each? [8]
b) How can you apply the CIM in case of various types of manufacturing? [8]
- Q2)** a) Describe Hardware and Software used in CIM. [8]
b) What are the common guidelines for designing a product? Explain. [8]
- Q3)** a) Which are the various tasks that can be accomplished in database requirements of CIM? Explain. [8]
b) What are the functions of product data management (PDM)? [8]
- Q4)** a) What are the design and manufacturing attributes in part classification and coding systems? [9]
b) What do you understand by cellular manufacturing system? What do you understand by cell design? What are the criteria used for cell design? [9]

SECTION - II

- Q5)** a) Describe benefits of FMS over alternative approaches. [8]
b) What are the factors to be considered to optimize the overall efficiency and effectiveness of FMS? [8]

P.T.O.

- Q6)** a) Discuss the importance of palletizing. [8]
b) Briefly describe significant application areas of robots. [8]
- Q7)** a) Describe the components of small local area network (LAN). [8]
b) Which are the operations to be carried out using computers in manufacturing company? Draw the typical LAN and various equipments connected to LAN. [8]
- Q8)** a) Describe different modes of robot operation. [9]
b) What are the benefits of collaborative product development? [9]



P1338

[4065]-732

M.E. (Production) (CAD/CAM)
FINITE ELEMENT ANALYSIS
(2008 Course) (511209) (Sem. - II)

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) Neat diagrams must be drawn wherever necessary.
- 3) Use of electronic pocket calculator is allowed.
- 4) Assumptions made should be clearly stated and justified.

SECTION - I

- Q1)** a) What do you understand by the finite element model? Give an example of modeling a mechanical component. [8]
- b) Determine the nodal displacements at node 2, stresses in each material and support reactions in the bar shown in Fig.1. due to applied force $P = 400 \times 10^3$ N and temperature rise of 30°C , Given : $A_1 = 2400\text{mm}^2$, $A_2 = 1200\text{mm}^2$, $E_1 = 0.7 \times 10^5$ N/mm², $E_2 = 2 \times 10^5$ N/mm² and $\alpha_1 = 22 \times 10^{-6}/\text{C}^\circ$, $\alpha_2 = 12 \times 10^{-6}/\text{C}^\circ$, $E = 200 \times 10^5$ N/cm². [10]

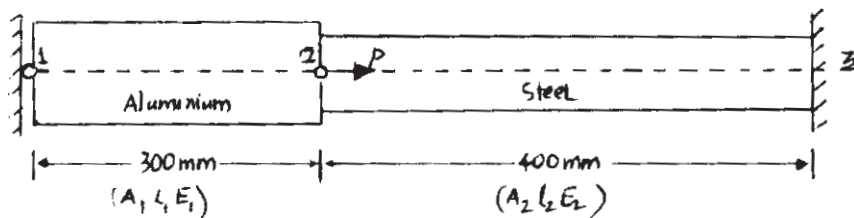


Fig.1

- Q2)** a) Discuss the generalized three dimensional stiffness matrix of a beam Element. [6]

- b) Analyze the beam shown in Fig.2 by finite element method and determine the end reactions. Also determine the deflections at mid spans given $E = 2 \times 10^5 \text{ N/mm}^2$ and $I = 5 \times 10^6 \text{ mm}^4$. [10]

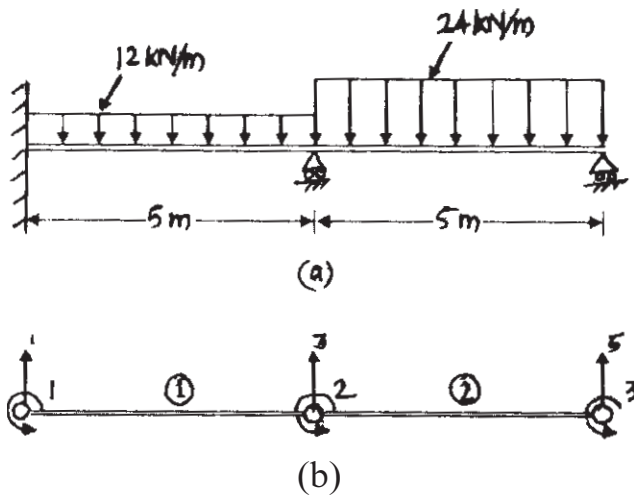


Fig.2.

- Q3) a) Explain the principle of Rayleigh-Ritz method. [6]
 b) Determine the extension of the bar shown in Fig.3 due to self weight and a concentrated load of 400N applied at its end. Given $b_1 = 150\text{mm}$, $b_2 = 75\text{mm}$, $t = 20\text{mm}$, $E = 2 \times 10^5 \text{ N/mm}^2$, $\rho = 0.8 \times 10^{-4} \text{ N}$. [10]

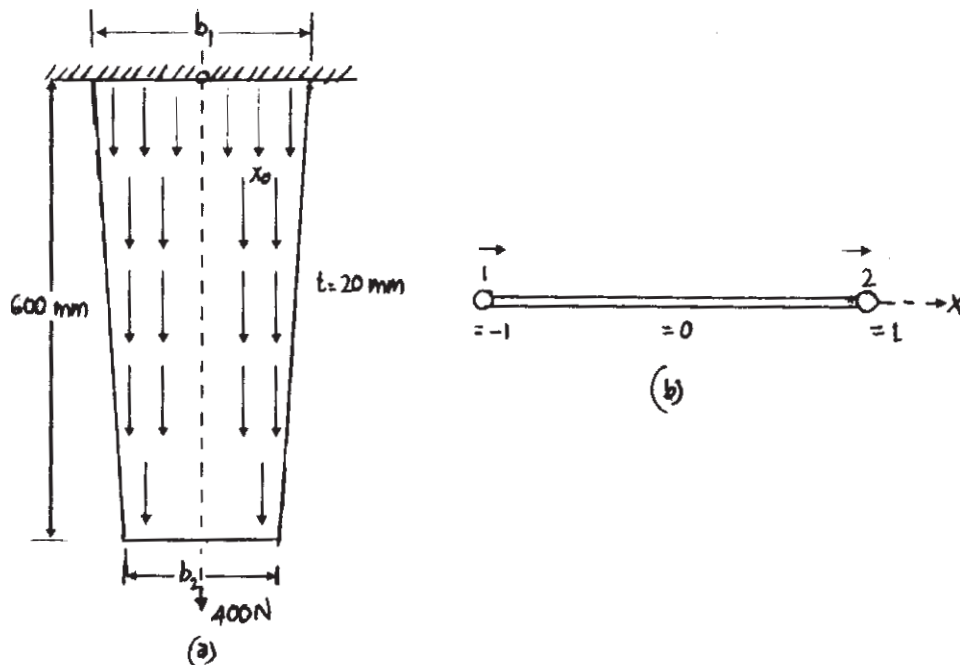


Fig. 3.

- Q4)** a) Derive Lagrange's quadratic interpolation function in Cartesian Co-ordinate system using the properties of shape function. [8]
- b) Write short notes on (any two) : [8]
- Shape function and interpolation function.
 - Connectivity conditions.
 - Sources of error.
 - P, h & p-h methods.

SECTION - II

- Q5)** a) Solve the differential equation by using any two methods. [12]

$$\frac{d^2u}{dx^2} + 9u + 6x = 0 \quad \text{B.C.s : } u(0) = 0 \quad u(1) = 0$$

- Exact solution.
 - Finite Difference Method.
 - Weighted residual method.
 - Sub-domain method.
 - Galerkin method.
- b) Derive stiffness equation for a spar element oriented arbitrarily in a 2-dimensional plane. [6]

- Q6)** a) Define : Plane Truss, Orientation of Transformation matrix, pin joint, Roller support. [6]

- b) Analyze the plane truss completely. $E = 400 \text{ GPa}$, $A = 20 \text{ cm}^2$ Refer Fig.4. [10]

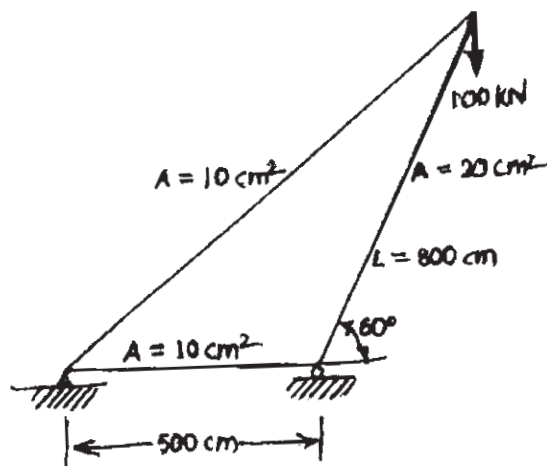


Fig.4

- Q7)** a) State Hamilton's principle and derive an expression for equilibrium. [6]
 b) Fig.5. shows an indeterminate pin connected plane stress with cross sectional area of diagonal members equal to 2000mm^2 and all other members with cross sectional area of 1000mm^2 . If Young's modulus $E = 200\text{kN/mm}^2$. [10]
- Assemble global stiffness matrix.
 - Determine load vector if temperature of member 1-3 increases by 25°C . Given $\alpha = 12 \times 10^{-6}/^\circ\text{C}$.
 - Determine load vector if member 1-3 is longer by 0.2mm .
 - Introduce Boundary Conditions.

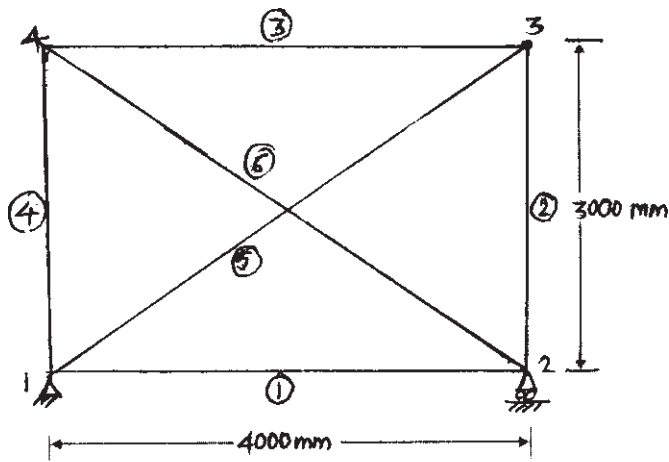


Fig.5

- Q8)** Write short notes on (any two) : [16]
- Automatic mesh generation.
 - Solving a design problem using a FEA Package.
 - Differentiate between Isoparametric and nonlinear element.
 - Differentiate between the terms 'lumped loads' and consistent loads.



P1339**[4065] - 733**

M.E. (Production) (CAD/CAM)
ADVANCED MATHEMATICS
(2010 Course) (511210) (Sem. - II)

*Time : 3 Hours]**[Max. Marks : 100**Instructions to the candidates:*

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

SECTION - I

Q1) a) Reduce the quadratic form $2x_1x_2 + 2x_1x_3 - 2x_2x_3$ to the canonical form by an orthogonal reduction and discuss its nature. Also find the modal matrix. [8]

b) If $A = \begin{bmatrix} 0 & 1+2i \\ -1+2i & 0 \end{bmatrix}$ show that $(I - A)(I + A)^{-1}$ is a unitary matrix. [8]

Q2) a) Find the curve on which the functional $\int_0^1 [(y')^2 + 12xy] dx$, with $y(0) = 0$ and $y(1) = 1$ can be extremised. [8]

b) Solve the boundary value problem $y'' + y + x = 0$ ($0 \leq x \leq 1$), $y(0) = y(1) = 0$ by Galerkin's method. Compare your solution with the exact solution. [8]

Q3) a) Find the fourier transform of e^{-x^2} . [8]

b) Solve by the method of Laplace transform the equation $y''' + 2y'' - y' - 2y = 0$ with $y(0) = y'(0) = 0$ and $y'(0) = 6$. [8]

P.T.O.

Q4) a) Solve the integral equation : [6]

$$\int_0^{\infty} f(x) \cos \lambda x dx = e^{-\lambda}$$

b) Show that the transformations [6]

$$y_1 = x_1 - x_2 + x_3$$

$$y_2 = 3x_1 - x_2 + 2x_3$$

$$y_3 = 2x_1 - 2x_2 + 3x_3.$$

is regular, write down the inverse transformation.

c) Two masses M_1 and M_2 are connected by an inextensible string which passes over a fixed pulley. Using Lagrange's equations show that the acceleration of either mass is numerically $= (m_1 - m_2)g/(m_1 + m_2)$. [6]

SECTION - II

Q5) a) A tightly stretched Flexible string has its ends fixed at $x = 0$ and $x = l$. At time $t = 0$, the string is given a shape defined by $f(x) = \mu x(l - x)$, where μ is a constant and then released, find the displacement of any point x of the string at any time $t > 0$. [9]

b) The ends A and B of a rod 20 cm long have the temperature at 30°C and 80°C until steady state prevails. The temperature of the ends are changed to 40°C and 60°C respectively. Find the temperature distribution in the rod at time ' t '. [9]

Q6) a) Describe in brief types of simulation approaches. [8]

b) Discuss the state variable model and its advantage's over differential equation model. [8]

Q7) a) A random variable X has a uniform distribution over $(-3, 3)$, Find ' k '

$$\text{for which } p(x > k) = \frac{1}{3}$$

Also evaluate $p(x < 2)$ and $p[|x - 2| < 2]$ [8]

b) The height of six randomly chosen sailors are (in inch): 63, 65, 68, 69, 71, 72,. Those of 10 randomly. Chosen soldier's are 61, 62, 65, 66, 69, 69, 70, 71, 72, 73. Discuss the light that these data throwon the suggestion that sailor's are on the average toller than soldier's. [8]

Q8) a) For a chi-square distribution with n.d.f establish the following recurrence relation between the moments. [9]

$$\mu_{r+1} = 2r (\mu_r + n\mu_{r-1}), r \geq 1. \text{ Hence Find } \beta_1 \text{ \& } \beta_2.$$

b) Solve $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ for, [9]

$0 < x < \pi, 0 < y < \pi$, given that

$$u(0, y) = u(\pi, y) = u(x, \pi) = 0, u(x, 0) = \sin^2 x.$$



P1344

[4065] - 742

M.E. (Computer) (Common to Network Engineering)**APPLIED ALGORITHMS****(510101) (2008 Course) (Sem. - I)***Time : 3 Hours]**[Max. Marks :100**Instructions to the candidates:*

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

SECTION - I

- Q1)** a) Prove the following by Mathematical induction
- i) $C(n, 0) + C(n, 1) + C(n, 2) + \dots + C(n, n) = 2^n$.
 - ii) $C(n, 0) - C(n, 1) + \dots + (-1)^i C(n, i) + \dots + (-1)^n C(n, n) = 0$. [8]
- b) For events A and B
- i) Show that $P(A \cup B) = P(A) + P(B) - P(A \cap B)$.
 - ii) State and prove a generalization of formula in part (i) to n sets A_1, \dots, A_n .
 - iii) What is the significance of the above formula in the algorithmic design and analysis? [8]
- Q2)** a) What is worst case, average case and best case time complexity of an algorithm? Write a the Binary search and Linear search algorithm and Analyze the same to find out its worst case, average case and best case complexity. [10]
- b) Solve the following recurrence relations : [6]
- i) $t(n) = 3t(n - 1) + n, n \geq 1$, Initial condition $t(0) = 1$.
 - ii) $t(n) = 4t(n - 1) + 5, n \geq 1$, Initial condition $t(0) = 2$.
- Q3)** a) What is worst case, average case and best case time complexity of an algorithm? Write a the Quick sort and Merge sort algorithm and Analyze the same to find out its worst case, average case and best case complexity. [8]

- b) Some friends of your work on wireless networks, and they are currently studying the properties of network of n mobile devices. As the devices move around, they define a graph of any point in time as follows : there is node representing each of the ‘ n ’ devices, and there is an edge between device i and j if the physical locations of i and j are no more than 500 meters apart.

They had like it to be the case that the network of devices is connected at all times and so they have constrained the motion of devices to satisfy the property : at all times, each device i is within 500 meters of at least $n/2$ of the other devices (assume n is an even number).

In other word the property is “Let G be a graph on n nodes, where n is an even number. If every node of G has degree at least $n/2$, then G is connected”.

- i) Does this property by itself guarantee that the network will remain connected?
- ii) Decide whether you think claim is true or false?
- iii) Give a proof of either claim or its negation. [8]

Q4) a) Determine the running time of quicksort for

- i) Sorted input.
- ii) Random input.

When pivot element is chosen as

- i) The first element.
- ii) A random element. [8]

- b) Assume you have functions f and g such that $f(n)$ is $O(g(n))$. For each of the following statement, decide whether you think it is true or false.

And give a proof or counter example.

- i) $\log_2 f(n)$ is $O(\log_2 g(n))$.
- ii) $2^{f(n)}$ is $O(2^{g(n)})$
- iii) $f(n)^2$ is $O(g(n)^2)$. [10]

SECTION - II

Q5) a) Find the optimal tour for the instance of travelling salesman problem given below in the matrix (8 * 8) by your own way.

And then generate the tour by 2-approximation algorithm.

Compare tour generated by your way and 2-approximation algorithm.

0	19	14	16	17	13	18	20
19	0	17	12	11	19	15	15
14	17	0	18	16	12	16	16
16	12	18	0	10	20	11	20
17	11	16	10	0	16	10	14
13	19	12	20	16	0	18	15
18	15	16	11	10	18	0	17
20	15	16	20	14	15	17	0

[10]

b) What is an NP-hard and approximation algorithm? What is the relation between these two? Give suitable example. [6]

Q6) a) i) What is the essential difference between Dynamic programming and Recursion?

ii) Design an Dynamic programming algorithm for n matrices A_1, A_2, \dots, A_n of dimensions $P_1 * P_2, P_2 * P_3, \dots, P_n * P_{n+1}$, respectively, our goal is to compute the matrix product $A_1 A_2 \dots A_n$ in an order such that it would take the minimum number of computations to derive the product. [10]

b) Consider 0/1 knapsack problem $N = 3, w = (4, 6, 8), p = (10, 12, 15)$ using dynamic programming devise the recurrence relations for the problem and solve the same. Determine the optimal profit for the knapsack of capacity 10. [8]

Q7) a) Write the CRCW and EREW Algorithms for parallel computers. [10]

b) Let there be n numbers (where $n = 2^l$) and there sum needs to be found out using multiple processor. Design the algorithm using parallel computation. [6]

Q8) a) Write a short note on “Prefix Computation”. [6]

b) What are the advantages of Greedy algorithmic strategy? Analyze an single source shortest path algorithm with time and space complexity using greedy approach. [10]



P1345

[4065]-744

**M.E. (Computer Engg. and Computer Network)
PRINCIPLES AND PRACTICES FOR IT MANAGEMENT
(2008 Course) (510103) (Sem. - I)**

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Figures to the right indicate full marks.*
- 4) *Your answers will be valued as a whole.*
- 5) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Explain the Significance of SRS and main points must be there in your SRS? [6]
b) What is meant by research and explain main methods to carry out research with examples? [6]
c) What is project charter? Explain it's significance and main elements. [6]
- Q2)** a) Explain different type of project constraints. Explain how to manage these different constraints with the help of example. [8]
b) Write note on Corporate Social Responsibility. [8]
- Q3)** a) Explain different project quality standards. [4]
b) Explain the Management of Long term projects? [4]
c) What are some pitfalls a project manager should be aware of when assigning tasks to the project team members? [4]
d) What is the budget at completion? [4]
- Q4)** a) What is most expensive part of IT budgets? [4]
b) What should project managers do when they are about to run over budget? [4]
c) What is the Budget at Completion? [4]
d) Explain various team building methodologies. [4]

P.T.O.

Q5) Write short notes on following : **[16]**

- a) IPR.
- b) Ethical Conduct and ethical Judgments.
- c) Use of IT in Healthcare.
- d) Use of IT in Finance.

SECTION - II

Q6) a) Create a WBS & PND for following project. You are IT project Manager of Network upgrade project. The network will consist of 187 workstations, 5 servers, & 17 network printers. The network will be segmented through switches. The 187 workstations and printers will be on one segment and the servers on the other. The 4 servers on the network will be replaced with 4 new Windows 2003 Servers; 3 servers will be domain controllers and the rest will be mail servers.

In addition to the creation of the network infrastructure, each workstation will be replaced with a new PC. Each PC will be configured identically with Windows XP and will use DHCP to receive its IP address. **[10]**

b) Explain CRF as a MIS. **[8]**

Q7) a) Explain in detail CMMI. **[6]**

b) Explain Energy Management and energy audit? **[6]**

c) Explain concept of knowledge management. **[4]**

Q8) a) Explain the purpose and principles of management. **[4]**

b) Explain what is meaning of business policies? Also explain tools and techniques of strategic management. **[8]**

c) Explain what is DSS (Decision Support System). **[4]**

Q9) a) Explain the concept of CRM in detail. **[6]**

b) What is meaning of Technology Management with example. **[6]**

c) Explain what is Risk Management. **[4]**

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

a) Technical Reviews.

b) Software Licensing.

c) TQM.

d) Ethical Hacking.



P1349

[4065]-749

**M.E. (Computer Engineering)
INFORMATION AND NETWORK SECURITY
(2008 Course) (Elective - II) (510105 (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) Explain secure electronic records and secure digital signatures with respect to cyber laws. **[6]**
- b) What is security policy? Explain steps necessary for developing security policy. **[8]**
- c) Explain, what is unconditionally secure encryption scheme and computationally secure encryption scheme? **[4]**
- Q2)** a) Compare “Denial of service” and “distributed denial of service” with suitable examples. **[8]**
- b) What are the principles of public key cryptography? Explain RSA public key encryption algorithm. **[8]**
- Q3)** a) Explain certificate revocation in X-509 Authentication service. **[8]**
- b) What is the difference between a one-way hash function and a message authentication code? **[8]**
- Q4)** Write Short Notes on (Any three) : **[16]**
- a) Privacy regulations.
 - b) Data security architecture.
 - c) Routing algorithm vulnerabilities.
 - d) ICMP redirect hazard.

P.T.O.

SECTION - II

- Q5)** a) Explain, what is Session Key Management with suitable example. [7]
b) What is secure RTP? Explain with suitable example. [7]
c) What is a dual signature and what is its purpose? [4]
- Q6)** a) Explain the attacks that can be made on packet-filtering routers and discuss the appropriate counter measures. [8]
b) Explain different techniques used by firewalls to control access and enforce a security policy. [8]
- Q7)** a) Explain Diffie-Hellman Key exchange with example. [8]
b) Compare wireless security and wired data security, explain any one method/procedure for wireless security. [8]
- Q8)** Write short notes on (Any three) : [16]
a) Trap door function.
b) Algorithms for discrete logarithms.
c) Shared secret data authentication.
d) DNS certificates.



Total No. of Questions : 8]

[Total No. of Pages : 2

P1350

[4065]-753

**M.E. (Computer Engineering)
DISTRIBUTED SYSTEMS
(2008 Course) (510108) (Sem. - II)**

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) In a large network connected to multiple resources, when a resource fails, discuss how the failure can be identified and tolerated. [6]
- b) A service is implemented by several servers. Explain why resources might be transferred between them. Would it be satisfactory for clients to multicast all requests to the group of servers as a way of achieving transparency for clients? [6]
- c) Enlist and explain different challenges faced while constructing distributed systems. [6]
- Q2)** a) What factors affect the responsiveness of an application that accesses shared data managed by a server? Describe remedies that are available and discuss their usefulness. [8]
- b) Discuss how Denial of service attack takes place in a distributed network system using different real-time networking scenarios. [8]
- Q3)** a) Discuss in detail, the different events to be handled when a remote object reference interface is not available during execution or compilation time. List out the events generated. [8]
- b) How would you incorporate persistent asynchronous communication into a model of communication based on RMI to remote objects? [8]
- Q4)** a) Explain why “synchronization delay” happens and give your suggestions to avoid it. How does this delay reduce the throughput of the system?[8]

P.T.O.

- b) Show that byzantine agreement can be reached for three generals, with one of them faulty, if the generals digitally sign their messages. [8]

SECTION - II

- Q5)** a) Which features of the AFS design make it more scalable than NFS? What are the limits on its scalability, assuming that servers can be added as required? Which recent developments offer greater scalability? [7]
- b) List out issues and difficulties related to design and implementation of middleware for peer-to-peer system? Suggest solutions to overcome such issues. [7]
- c) Using a virtual file system concept, discuss how UNIX handles remote files on local machine. [4]
- Q6)** a) What is thrashing? Why is thrashing an important issue in DSM systems and what methods are available for dealing with it? [8]
- b) What advantage can a DSM implementation obtain from knowing the association between data items and synchronization objects? What is the disadvantage of making the association explicit? [8]
- Q7)** a) If Diffie-Hellman scheme could be used for key authentication instead of RC4 stream cipher algorithm for IEEE 802.11 (Wi Fi) group communication, provide your analysis and possible suggestions as how security can be improved? [8]
- b) Describe some of the ways in which conventional email is vulnerable to eavesdropping, masquerading, tampering, replay, denial of service. Suggest methods by which email could be protected against each of these forms of attack. [8]
- Q8)** a) To what extent do web services satisfy the requirements for supporting the grid? Outline how the OGSi services add the functionality that web services do not provide. [8]
- b) Define a dynamic business portal and give a detailed description that includes its need for security, handling remote objects and storage features. Explain using a specific example. [8]



P1351

[4065]-754

M.E. (Computer Engineering/Computer Networks)

HIGH PERFORMANCE DATABASE SYSTEMS

(510309) (2008 Course) (Sem. - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Solve any Three Questions from each section.*
- 2) *Answers to each section should be written on different answer sheets.*
- 3) *Assume suitable data, if necessary.*
- 4) *Draw neat diagram wherever required.*

SECTION - I

- Q1)** a) Explain the different techniques used for tuning the database. [6]
b) List atleast four features of TPC benchmark that makes them realistic and dependable measures. [6]
c) Why TPC-D benchmark was replaced by TPC-H and TPC-R benchmark. [4]
- Q2)** a) Discuss cost-based & heuristic optimization. [6]
b) Discuss the role of low level primitive operations in case of query optimization. [6]
c) Explain the steps involved in query processing. List different measures of query cost. [4]
- Q3)** a) Explain what is meant by location, fragmentation and replication transparency and indicate how these are achieved in a distributed database. [6]
b) Why is a hash structure not the base choice for a search key on which a range queries are likely. [6]
c) Explain log-based recovery. [4]

- Q4)** a) List the issues to be considered while building data warehouse and difficulties while implementing data warehouse. [6]
- b) Is classification a kind of data mining. If yes, justify it and give an example. If no, write its utility and purpose. [6]
- c) Explain with suitable example star and snowflake schema. [6]

SECTION - II

- Q5)** a) Data warehouse is a subject-oriented, integrated, non-volatile, time-variant collection of data to support management decision making process. Comments. [5]
- b) What are the differences between transactional databases and data warehouse. [5]
- c) Briefly explain about the applications of Data warehousing. [6]

- Q6)** a) Given the following transactional data: [8]

Sr. No.	Transaction Id (TID)	List of item - IDs
1	T 10	P1,P2,P5
2	T 20	P2, P4
3	T 30	P2,P3
4	T 40	P1,P2,P4
5	T 50	P1,P3
6	T 60	P2,P3
7	T 70	P1,P3
8	T 80	P1,P2,P3,P5
9	T 90	P1,P2,P3

Find candidate and frequent item sets using APRIORI algorithm where minimum support count is 2.

- b) List the different ways to represent knowledge extracted during data mining. Explain any two in detail. [8]

- Q7)** a) Describe advantages of XML over HTML. What are well formed XML documents. For education scenario/domain define your own tags and thus define XML DTD for the same. [6]
- b) Explain the merits and demerits of main memory databases. [6]
- c) Explain Semantic databases in short. [4]

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

- a) Multimedia databases.
- b) SQL Extension.
- c) Granularity of locking.
- d) LDAP.



P1355

[4065]-769

**M.E. (Computer) (Computer Networks)
WIRELESS TECHNOLOGY
(2008 Course) (510305 (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) What is a Channel Capacity? Discuss the Shannon's contribution towards it. Suppose that the spectrum of a channel is between 3 MHz and 4 MHz and $SNR_{dB} = 24$ dB, then calculate Channel Capacity.
- b) What is multipath propagation and what are its effects? List the factors that influence small scale fading.

[16]

- Q2)** a) Explain how tunneling works for mobile IP using various methods. Discuss the advantages and disadvantages of these methods.
- b) What are the main benefits of spread spectrum system? How can spreading be achieved? How can DSSS systems benefits from multi-path propagation?

[16]

- Q3)** a) Explain the different techniques of improving coverage and capacity in cellular system.
- b) State the relationship between the transmitted power P_t and the received power P_r in free space.
- i) What is the received power (in dB m) in the free space of signal whose transmit power is 2 W and carrier frequency is 2.4 GHz if the receiver is at a distance of 1.6 km from the transmitter? Assume that the transmitter and receiver antenna gain are 1.6.
 - ii) What is the path loss in dB.

[16]

P.T.O.

- Q4)** Write short note on any THREE of the following : **[18]**
- a) Factors determining antenna Gain.
 - b) GSM Architecture.
 - c) Bluetooth state transition diagram.
 - d) Advantages and Disadvantages of I-TCP.

SECTION - II

- Q5)** a) Suppose the transmission in IEEE 802.11 networks is using DCF, some of the conditions in networks are
- If the medium has been idle for longer than the DIFS.
 - If the medium is busy,
 - Error recovery is the responsibility of the station sending a frame,
 - High priority frames to be transmitted.
- Discuss the rules applied for these conditions.
- b) Explain power management in IEEE 802.11 infrastructure network and Bluetooth Network.

[16]

- Q6)** a) What are the different tasks performed by access point when frame is transmitted from wireless medium to wired medium?
- b) What is the use of NAV? Explain significance of Duration field.

[16]

- Q7)** a) A bank wishes to offer to its customers the benefit of ‘mobile banking’ facility. The account holder is provided facilities to query his account details and perform related functions. Identify a suitable environment to support such a requirement of the bank. Clearly identify the underlying protocols, suitable infrastructure and the application support requirement.
- b) Why the MAC protocol of the wired network cannot be used for wireless? How does IEEE 802.11 solve these problems?

[16]

- Q8)** Write short note on any THREE of the following : **[18]**
- a) IEEE 802.11 Frame Control field.
 - b) WEP’s design flaws.
 - c) EAP Methods.
 - d) Wi-Fi Vs Wi-Max.



Total No. of Questions : 8]

[Total No. of Pages : 2

P1356

[4065]-771

**M.E. (Computer Networks)
OPERATING SYSTEM DESIGN
(2008 Course) (510308) (Sem. - II)**

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer any three questions from each section.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) What is the need of memory protection? Discuss the different mechanism for memory protection. **[8]**
b) What is file allocation? Discuss and compare contiguous file allocation and chained file allocation methods. **[8]**
- Q2)** a) Discuss the characteristics of real time operating system. Explain the different classes of algorithm for real time scheduling. **[8]**
b) Compare the Processes and Threads. Explain the different categories of thread implementation. **[8]**
- Q3)** a) What is Idempotency? Discuss the Idempotency and Handling of duplicate request messages. **[8]**
b) What is need of ordered message delivery in many to many communication? Explain the Absolute Ordering, Consistent ordering and Casual ordering. **[8]**
- Q4)** a) What is Monitor? Explain the structure of Monitor. Discuss the bounded buffer Producer/Consumer problem using Monitor. **[10]**
b) Discuss the problem of mutual exclusion in multiprocessor system? How it is resolved by using hardware approach. **[8]**

SECTION - II

- Q5)** a) Explain the deadlock avoidance method and concept of safe and unsafe state with example. Discuss the reasons for rarely use of Deadlock avoidance in actual practice. **[8]**

P.T.O.

- b) Explain the Centralized and Hierarchical approach for the deadlock detection using example. [8]
- Q6)** a) What is the need of file caching? Discuss the cache location and modification propagation terms used in caching. [8]
- b) What is multicopy update problem in file system? Discuss the approaches to handle this problem. [8]
- Q7)** a) Explain the Password based authentication and discuss the different mechanism used to provide good security in password based authentication. [8]
- b) Explain the Capabilities to implement Access Matrix. [8]
- Q8)** a) Explain the semaphore APIs in unix. Write the algorithm to implement reader writer problem using semaphore APIs of Unix. [8]
- b) Discuss the named and unnamed pipes. Write the pseudo code for Client-Server application to transfer the file using unnamed pipes. [10]



Total No. of Questions : 8]

[Total No. of Pages : 2

P1357

[4065] - 773

**M.E. (Computer) Computer Networking
ADVANCED SOFTWARE ENGINEERING
(2008 Course) (510310) (Sem. - II)**

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Why other systems within a system's environment can have unanticipated effects on the functioning of a system? [4]
- b) Explain the following terms [8]
- i) Centralized systems.
 - ii) Event driven system.
 - iii) System availability.
 - iv) System dependability.
- c) Suggest why it is important to make a distinction between developing the user requirements and developing system requirements in the requirements engineering process. [4]
- Q2)** a) Why an object-oriented approach to software development may not be suitable for real-time systems? [4]
- b) With suitable example, explain how you will do object identification in the object-oriented design process. [6]
- c) What is user interface prototyping? What are the different approaches that you can use for user interface prototyping. [6]

P.T.O.

- Q3)** a) Suggest appropriate reliability metrics, reasons for your choice of metric and appropriate values for it for the following system [8]
i) A word processor.
ii) A system to control braking in car.
iii) A system that monitors patients in a hospital's intensive care unit.
iv) An automated vending machine control system.
b) Why are patterns an effective form of design reuse? Explain. [6]
c) What is meant by glue code? [2]

- Q4)** a) Where you will use the algebraic techniques of formal specification? Why? [4]
b) Explain the layered model of an architecture using suitable example. [6]
c) What are the basic facilities that must be provided by an object request broker? [4]
d) Discuss whether it is ethical to instrument software to monitor its use without telling end users that their work is being monitored. [4]

SECTION - II

- Q5)** a) Draw the flow graph for searching a given record in a sorted file using binary search technique. Determine the cyclomatic complexity of your logic and find the set of basis paths for testing the same. [9]
b) State differences and similarities in verification and validation. [4]
c) What is baselines in reference of software configuration management? [3]

- Q6)** a) When would you recommend against the use of an agile method for developing a software system? [4]
b) What is throw-away prototyping? How it is different from incremental development approach? [6]
c) Explain the rapid application development environment. [6]

- Q7)** a) Explain the terms corrective maintenance and adaptive maintenance. Are corrective maintenance and debugging the same? Explain your answer. [8]
b) Explain in detail the constructive cost model (COCOMO). [8]

- Q8)** Write short notes on : [18]
a) The people capability Maturity Model.
b) Software Quality.
c) Risk Management.



P1360**[4065]-786****M.E. (Chemical Engg.)****INDUSTRIAL POLLUTION CONTROL
(2008 Course) (Elective - II) (509105 (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) A power plant burns 5 tonnes of coal per hour and discharges the combustion products through a stack that has an effective height of 80m. The coal has a Sulfur content of 4% and the wind velocity at the top of stack is 6m/s. The atmospheric conditions are moderately to slightly stable. Determine the maximum ground level concentration of SO₂ at a distance of 850m from the stack. Upto distance of 1 km from stack. A = 0.295, B = 0.119, P = 0.986 and beyond 1000 m A = 0.295, B = 0.0579, P = 1.09. Also determine the ground level concentration at a distance of 3 km downwind at the centreline of plume and at a crosswind distance of 0.4 km on either side of the centreline. **[12]**
- b) Explain the limitations of Gaussian plume model. **[6]**
- Q2)** a) Explain packed towers for the air pollution control. **[6]**
- b) Stack gas flows through an electrostatic precipitator at a rate of 12 m³/s. The plate area is 250 m², and the drift velocity for the system has been found to be $W = 2.8 \times 10^5$ dp. Draw a size-efficiency curve for particles ranging in size from 0.1 to 10μm. **[10]**
- Q3)** Explain the environmental pollution caused by a fertilizer industry and discuss the various methods and equipments which can be used for controlling the pollution. **[16]**

P.T.O.

Q4) A completely mixed activated sludge plant is to treat 10000 m³/day of industrial wastewater. The wastewater has a BOD of 1200 mg/L that must be reduced to 200 mg/L Prior to discharge to a Municipal sewer. Pilot plant analysis indicates that a mean cell residence time of 5 days maintaining MLSS concentration of 5000 mg/L produces the desired results. The value for Y is determined to be 0.7 kg/kg and the value of kd is found to be 0.03 d⁻¹.

Determine :

- a) Volume of the reactor. **[16]**
- b) The mass and volume of solids wasted each day .
- c) The sludge recycle ratio.

SECTION - II

Q5) a) Explain the method for designing a thickner. **[8]**
b) A municipal wastewater treatment plant processes an average flow of 5000 m³/day, with peak flows as high as 12500 m³/day. Design a primary clarifier to remove approximately 60 percent of the suspended solids at average flow. Overflow rate is 35 m³/m² day. Depth of tank can be taken as 3m. **[8]**

Q6) a) With neat sketch explain the relationship between cell growth and food utilization. **[6]**
b) A biotower composed of modular plastic medium is to be used as secondary treatment component in a municipal wastewater treatment plant. Flow from the primary clarifier is 20000 m³/day with a BOD of 150 mg/L. Pilot plant analysis has established a treatability constant of 0.055 min⁻¹ for the system at 20°C and the n factor can be taken as 0.50. Two towers are to be used, each with a square surface and separated by a common wall. The medium is to have a depth of 6.5 m, and the recirculation ratio is to be 2:1 during average flow periods. Determine the dimensions of the units required to produce an effluent with a soluble BOD of 10 mg/L. Minimum temperature is expected to be 25°C. **[12]**

Q7) a) Explain the sources and classification of solid waste. **[8]**
b) Write a note on waste management hierarchy. **[8]**

Q8) a) Explain gasification and Pyrolysis as a method of solid waste disposal. **[10]**
b) Write a short note on gases in landfills. **[6]**



P1361

[4065]-789

**M.E. (Chemical Engineering)
FLUIDIZATION ENGINEERING
(2008 Course) (509105 (d)) (Elective - II)**

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Define the fluidized state. [4]
b) Explain the hydrodynamics of fluidization system. [4]
c) Write down the different industrial applications of fluidization system. [8]
- Q2)** a) Write short note on Regimization of the fluidized state with diagrams. [10]
b) Mechanism of bubble formation. [8]
- Q3)** Write down the Davidson model for gas flow with all required equations for the model. [16]
- Q4)** a) A bed consists of uniform spherical particles of diameter 3 mm and density 4200 kg/m³. What will be the minimum fluidising velocity in a liquid of viscosity 3 mn s/m² and density 1100 kg/m³? [8]
b) Explain the effect of fluid velocity on pressure gradient and pressure drop. [8]

SECTION - II

- Q5)** Explain the following terms : [16]
a) Bed expansion in fluidization.
b) Non-uniform fluidization.

P.T.O.

- Q6)** Discuss the following in details : **[16]**
- a) Turbulent fluidization.
 - b) Semi-fluidized bed systems.
- Q7)** a) Explain the spouted bed with schematic diagram. **[8]**
- b) Discuss the three phase fluidization and inverse fluidization. **[8]**
- Q8)** Write short notes on : **[18]**
- a) Modeling by bed collapsing.
 - b) Slurry bubble columns.
 - c) Draft tube system.



Total No. of Questions : 8]

[Total No. of Pages : 2

P1362

[4065]-790

M.E. (Chemical)

PROCESS MODELING AND SIMULATION

(2008 Course) (509108) (Sem. - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Discuss the limitations of process simulation.
b) Explain usefulness of process simulation in detail. **[16]**
- Q2)** Develop the model equations of a double pipe heat exchanger wherein the resistance to heat transfer from a condensing fluid to inner fluid can be represented by convective heat transfer coefficients on both sides of the heat transfer wall. Assume that resistance to wall is negligible but the wall has finite heat capacity. **[18]**
- Q3)** Model a batch reverse osmosis plant unit. Assume the notations as per your choice. Write the assumptions. **[16]**
- Q4)** Develop a model for absorption column. It can be assumed that a linear equilibrium relation holds between liquid (x_m) and vapor (y_m) on each plate :
 $y_m = a_{xm} + b.$ **[16]**

SECTION - II

- Q5)** a) Give the classification of optimization problems.
b) Write the steps involved in formulation of optimization problems. **[18]**

P.T.O.

Q6) The concentration of NOX from the exhaust pipe of a vehicle during the change the engine speed is given below : **[16]**

Engine speed (X 1000 rpm)	NOX concentration (ppm)
0.05	50
0.2	47
1.6	30
1.8	32
2.0	34
2.5	39

Find an equation that best describes the NOX pollutant emission as a function of engine speed. Justify why you choose the particular form and number of terms you have. Numerically find the coefficients in your equation via regression analysis. Estimate NOX concentration if you were run the engine at 1000 rpm.

Q7) a) What are the different designs of experiment?
b) Discuss full factorial design method in detail. **[16]**

Q8) Write notes on : **[16]**
a) Application of optimization in separation techniques.
b) Evolutionary operation techniques.



[4065] - 800
P1366
M.E. (Chemical) (Environmental Engg.)
APPLIED STATISTICS FOR ENVIRONMENTAL ENGINEERS
(2008 Course) (509131) (Sem. - I)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) The following are measurements of the air velocity and evaporation coefficient of burning fuel droplets in an impulse engine.

Air Velocity (cm/s)	Evaporation Coefficient (mm ² / sec)
20	0.18
60	0.37
100	0.35
140	0.78
180	0.56
220	0.75
260	1.18
300	1.36
340	1.17
380	1.65

Fit a straight line to these data by method of least squares and use it to estimate the evaporation coefficient of a droplet when the air velocity is 190 cm/sec. **[6]**

- b) Show that : If a probability distribution has the mean μ and the standard deviation σ , the probability of getting a value deviates from μ by at least $K\sigma$ is at most $\frac{1}{K^2}$. [12]

Q2) a) In view of measures of dispersion explain

- i) Range.
- ii) Mean deviation.
- iii) Standard deviation. [8]

b) Explain how would you work out following statistical measures often used by researchers.

- i) Coefficient of variation.
- ii) Coefficient of r_{yx_2, x_1} .
- iii) Regression equation of X on Y. [8]

Q3) a) The mean weight loss of $n = 16$ grinding balls after a certain length of time in mill slurry is 3.42 grams with a standard deviation of 0.68 gram. Construct a 99% confidence interval for the true mean weight loss of such grinding balls under stated conditions. [6]

b) Explain merits and limitations of R type and Q type factor analyses related to maximum likelihood method of factor analysis in detail. [10]

Q4) Five hundred ball bearings have a mean weight of 5.02 oz and a standard deviation of 0.30 oz. Find the probability that a random sample of 100 ball bearings chosen from this group will have a combined weight

- a) Between 496 and 500 oz,
- b) Move then 510 oz.

For the sampling distribution of means, $\mu_x = \mu = 5.02$ oz. [16]

SECTION - II

Q5) a) Show that the moment generating function of a random variable x , which is chi square distributed with ν degrees of freedom, is $M(t) = (1 - 2t)^{-\nu/2}$. [10]

- b) The following data present the yield in quintals of common ten subdivisions of equal area of two agricultural plots.

Plot 1	6.2	5.7	6.5	6.0	6.3	5.8	5.7	6.0	6.0	5.8
Plot 2	5.6	5.9	5.6	5.7	5.8	5.7	6.0	5.5	5.7	5.5

Test whether two samples taken from two random populations have the same variance.

(5% point of F for $v_1 = 9$ and $v_2 = 9$ is 3.18). [8]

Q6) Distinguish between the following : [16]

- Statistic and parameter.
- Confidence level and significance level.
- Sampling of attributes and sampling of variables.
- Random sampling and non-random sampling.

Q7) An experiment was designed to study the performance of four different detergents. The following “Whiteness” readings were obtained with specially designed equipment for 12 loads of washing distributed over three different models of washing machines :

	Machine 1	Machine 2	Machine 3	Totals
Detergent A	45	43	51	139
Detergent B	47	46	52	145
Detergent C	48	50	55	153
Detergent D	42	37	49	128
Totals	182	176	207	565

Looking on the detergents as treatments and machines as blocks, obtain the appropriate analysis of variance table and test at the 0.01 level of significance whether there are differences in detergents or in the washing machines. [16]

Q8) a) The assignment cost of assigning any one operator to any one machine is given in the following table.

		Operator			
		I	II	III	IV
Machine	A	10	5	13	15
	B	3	9	18	3
	C	10	7	3	2
	D	5	11	9	7

Find the optimal assignment. [8]

b) Explain graphical sensitivity analysis in the light of Simplex method. [8]



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[4065]-802

M.E. (Chemical) (Environmental Engg.)

ENVIRONMENTAL CHEMISTRY

(2008 Course) (509133) (Sem. - I)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** Explain the importance of environmental chemistry and explain it with suitable example. **[16]**
- Q2)** Discuss the classification of surfactants and pesticides. Explain the pollution due to soap and surfactants. **[18]**
- Q3)** What are the ways of shifting chemical equilibria? Discuss in detail. **[16]**
- Q4)** Write short notes on : **[16]**
- a) Soil chemistry.
 - b) Chemistry of water.

SECTION - II

- Q5)** Draw a neat sketch and explain the construction, principle and working of : **[16]**
- a) Gas chromatograph.
 - b) HPLC.
- Q6)** Define following terms and explain how to determine the same from wastewater. **[18]**
- a) BOD.
 - b) COD
 - c) TOC.
 - d) TDS.

P.T.O.

Q7) Explain the principle and working of: **[16]**
a) Neuron activation analysis.
b) Ion exchange chromatography.

Q8) Write short notes on : **[16]**
a) Green House Effect.
b) Polarography.



P1372

[4065]-811

**M.E. (Chemical) (Environmental Engg.)
WASTE WATER TREATMENT AND DESIGN
(2008 Course) (509138) (Sem. - II)**

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Question one & five are compulsory.*
- 2) *Attempt any two from the remaining questions.*

SECTION - I

- Q1)** a) What is hydraulic detention time for a flow in a Reactor? Why this differs in the real reactor? [6]
- b) How mean residence time is obtained from the response curve of the tracer analysis of a reactor. [6]
- c) What is dispersion number? How tracer analysis is used for the calculation of this number? [6]
- Q2)** a) How water is polluted? How the order of treatment for the purification of wastewater is used? Explain the physical and chemical characteristics of the wastewater constituents. How these characteristics are determined? [8]
- b) What are COD and BOD of a wastewater sample? For BOD test which chemical reactions are considered? [8]
- Q3)** a) Which are the dissolved gases generally found in the wastewater? Explain how the quantity of each gas is determined under given conditions of temperature and pressure. [8]
- b) Why rapid mixing is required in wastewater treatment? How required mixing pattern is maintained for the various types of mixers used in the treatment of wastewater. [8]
- Q4)** Write short notes on the following : [16]
- a) E and F curve.
 - b) Power number.
 - c) Flow pattern and dispersion factor.
 - d) Settling velocity.

P.T.O.

SECTION - II

- Q5)** a) Explain types of reactors and their use in wastewater treatment. [6]
b) Explain why a series of reactors are required for achieving the proper type of flow? [6]
c) Explain Peclet number and its use for deciding number of reactors to be used in series for the wastewater treatment. [6]
- Q6)** a) Why bioreactor differs from conventional chemical reactor? How suspended and attached growth processes are carried out? [8]
b) Explain why SRT is an important design parameter of Bioreactor. [8]
- Q7)** a) Why adsorption is effective on a carbon? Give sequence of adsorption mass transfer and explain controlling step in the process. [8]
b) Explain the development of Mass transfer Zone in the adsorption column. [8]
- Q8)** Write short notes on the following : [16]
a) Adsorption isotherms.
b) Membrane Filtration in wastewater treatment.
c) Flocculation.
d) Levels of wastewater treatment.



P1373 [4065] - 813

M.E. (Chemical) (Environmental Engg.)

INDUSTRIAL WASTE TREATMENT

(509140) (2008 Course) (Sem. - II)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

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

b) Write the classification of wastewater.

c) Discuss the concept of Reuse, Reduce and Recycle.

[18]

Q2) Explain the treatment techniques for the removal of oil & Grease from industrial wastewater with neat flow diagram. [16]

Q3) What are clean up and cleaner technologies? Explain with proper examples.[16]

Q4) Write short notes on: [16]

a) Trickling Filters.

b) Advanced Wastewater Treatment.

SECTION - II

Q5) Draw a flowsheet for the treatment of paper Industry Wastewater and explain it in detail. [18]

P.T.O

Q6) Explain the sources, characteristics and treatment of sugar industry waste. Draw necessary flow diagram. **[16]**

Q7) Define BOD. Explain the procedure to determine BOD. What are the limitations of BOD Test. **[16]**

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

- a) Flow chart for sludge treatment & disposal.
- b) Oxidation Pond.



Total No. of Questions : 8]

[Total No. of Pages : 2

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[4065]-815

M.E. (Chemical) (Environmental Engineering)

WATER QUALITY MODELING

(2008 Course) (509141(b)) (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) *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) Define the following terms : **[18]**

- a) Carbonaceous deoxygenation rate coefficient (k_d).
- b) Reaeration rate coefficient (k_2).
- c) Settling rate (k_s).
- d) Sediment oxygen demand (k_o).
- e) Pollution loads.
- f) Point and nonpoint sources.

Q2) Develop one dimensional dynamic reservoir model with suitable assumptions. **[16]**

Q3) a) What are the biological and ecological considerations practised in water quality modeling. **[8]**

b) Explain sensitivity testing in detail. **[8]**

Q4) Write note on : **[16]**

- a) Steady state prediction models.
- b) Dynamic loading.
- c) Water quality management models.
- d) Eutrophication models.

P.T.O.

SECTION - II

- Q5)** Tiny droplets of benzene are slowly leaking from an on-ground storage tank. Tensiometers show readings of – 88cm and – 126cm of water at depths of 30cm and 100cm respectively, below the ground. The vertical unsaturated hydraulic conductivity K_{22} is 5.4m/day. The porosities are $\eta = 0.55$, $\eta_d = 0.38$ and $\eta_a = 0.17$. The other pertinent information are $f_{cp} = 0.1$, $K_{sc} = 104.7$ L/day, $m_d = 1.19 \times 10^3$ kg/m³, $E_{22} = 0.0012$ m²/day. The half life of benzene is 10 days and its solubility in water is 0.07 part per 100 parts by weight. The vapour pressure of benzene is 1.0mm Hg. Calculate the benzene concentration 10m below the surface. **[18]**
- Q6)** a) Considering only mass balances, formulate a model for River Water Quality Model (RWQM). **[10]**
b) State the objectives of RWQM. **[6]**
- Q7)** A river sample is put in a settling column. At two points in time, samples are taken at the sampling port, producing following results : at 0 day $m_s = 20$ mg/L; at 2 days, $m_s = 15$ mg/L. Determine the settling coefficient K_s . **[16]**
- Q8)** a) A sodium chloride tracer resulting in a concentration of 500mg/L in the discharged effluent of a sewage treatment plant is used to determine the dispersion coefficient, E_{xx} . The concentration of sodium chloride in the background stream is 50mg/L. If the plant flow is 200m³/day and that of the stream is 2456m³/day. What is the resulting concentration in the mixed stream. **[8]**
b) Explain model calibration and verification in detail with suitable example. **[8]**



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[4065] - 819

M.E. (Petroleum Engineering)

NUMERICAL METHODS AND SIMULATION IN
PETROLEUM ENGINEERING

(New) (2008 Course) (512101) (Sem. - I)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) *Answer two questions from each section.*
- 2) *Answers to the two sections must be written in separate answer books.*
- 3) *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) For the following system of equations, find x, y, z using SOR, Gauss and Gauss Jordan method. $w = 1.1$.

$$2x + y + z = 6$$

$$2x + 3y + z = 13$$

$$x - y + 3z = 21$$

[25]

Q2) a) Solve the following system of equations by Newton Raphson method

$$x^3y + \sin(x^2y) = 54$$

$$\cos(x^2y) + xy = \cos y$$

b) Find the roots of the equation by Graeffe method :

$$x^3 + 4x^2 + 6x - 2 = 0.$$

[25]

Q3) Solve $y' = y + \cos(x) + 4, y(1) = 5$, using Heun, RK-4 and Adam Bashforth predictor corrector method. [25]

SECTION - II

- Q4)** Given a 1 D reservoir. Find the pressures in the interior of the reservoir, if the pressures are at 70 psi for one well and 4000 psi at the other well, both at each boundary. Length of the reservoir are 400 ft. Assume $\Delta x = 100$ ft. $P_i = 5000$ psi. Solve by explicit, crank-nicolson and implicit method. Only set up the matrix. **[25]**
- Q5)** Find the finite difference approximations for the following : **[25]**
- a) First derivative backward of order Δx squared.
 - b) Second derivative forward of order Δx squared.
 - c) Second derivative central of order Δx squared.
- Q6)** Derive the IMPES method. **[25]**



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[4065] - 832

M.E. (Petroleum)

ADVANCED NATURAL GAS ENGINEERING AND TECHNOLOGY

(512110) (2008 Course) (Sem. - II)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) Answers to the two sections must be written in separate answer books.*
- 2) Answer 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, S and explain how these properties are obtained by some suitable correlation.

OR

Following surface conditions are given:

- a) API gravity of condensate = 50
- b) GOR in the first separator = 11,500 scf/stb
- c) Pressure in the first separator = 500 psi
- d) Temperature in the first separator = 90 deg F
- e) Specific gravity of gas in the first separator = 0.73

Calculate the wellstream specific gravity, and critical properties of gas

[25]

Q2) Derive the pipe line flow equation hence derive an equation for series pipelines.

OR

The following data are provided for air-water flow. Estimate the slip and no-slip mixture properties. Estimate the gravitational and frictional pressure gradients using both slip and no-slip properties

P.T.O.

- a) $Q_1 = 0.15 \text{ ft}^3/\text{sec}$
- b) $Q_g = 0.22 \text{ ft}^3/\text{sec}$
- c) $\rho_1 = 62.4 \text{ lbs}/\text{ft}^3$
- d) $\rho_g = 1.5 \text{ lbs}/\text{ft}^3$
- e) $\mu_1 = 1.2 \text{ cp}$
- f) $\mu_g = 0.015 \text{ cp}$
- g) $D = 5 \text{ inches}$
- h) $H_1 = 0.45$
- i) $\theta = 90 \text{ degrees}$
- j) $\text{Roughness} = 0.00006 \text{ ft}$ [25]

Q3) Explain the parts of a centrifugal and reciprocating compressor.

OR

Natural gas with the following properties and conditions is to be compressed by a centrifugal compressor.

- a) $\gamma_g = 0.60$
- b) $P_s = 256 \text{ psia}$
- c) $P_d = 665 \text{ psia}$
- d) $k = 1.2$
- e) $t_s = 99 \text{ deg F}$

If the desired flow rate is 35 MMSCFD, what horsepower is required to compress the gas assuming 70% adiabatic efficiency and 95% mechanical efficiency?

[25]

SECTION - II

Q4) Derive and explain the p/z graph.

OR

For water drive reservoirs with water production at the wells, derive the following equation. [25]

Q5) Draw and explain process flow sheet for H_2S removal. [25]

Q6) Explain isochronal well testing.

OR

Following data were provided for a multi-rate isochronal test. Generate inflow performance relationship using the analytical $m(p)$ method and the empirical $m(p)$ method.

a) $P_r = 352$ psia

b) $M(p) = m(p_r) 9.9714 \times 10^6$ psia²/cp

Time (hours)	Qg (MMSCF/D)	Pwf (psia)	M(pwf)
0.5	0.983	344.7	9.6386×10^6
0.5	2.631	329.5	9.0027×10^6
0.5	3.654	318.7	8.5674×10^6
0.5	4.782	305.5	8.0534×10^6
1	0.977	342.4	9.5406×10^6
1	2.588	322.9	8.7351×10^6
1	3.565	309.5	8.2071×10^6
1	4.625	293.6	7.6136×10^6
2	0.97	339.5	9.4179×10^6
2	2.533	315.4	8.4371×10^6
2	3.453	298.6	7.7922×10^6
2	4.438	279.6	7.0990×10^6
3	0.965	337.6	9.3381×10^6
3	2.5	310.5	8.2458×10^6
3	3.39	291.9	7.5435×10^6
3	4.318	270.5	6.7797×10^6

[25]



Total No. of Questions : 6]

[Total No. of Pages : 1

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[4065]-833

**M.E. (Petroleum Engineering)
ARTIFICIAL LIFT TECHNIQUES
(2008 Course) (512111 (a)) (Elective - III)**

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Answer two questions from each section.*
- 2) Answers to the two sections must be written in separate answer books.*
- 3) Figures to the right indicate full marks.*
- 4) Neat diagrams should be drawn wherever necessary.*
- 5) Use of a non-programmable calculator is allowed.*
- 6) Assume suitable data if necessary and clearly state it.*

SECTION - I

- Q1)** Explain coiled tubing workover operations. **[25]**
- Q2)** Draw the IPR, Outflow Performance and Tubing in-take Curves and explain in detail. **[25]**
- Q3)** Explain in detail the design of intermittent Gas Lift. **[25]**

SECTION - II

- Q4)** Explain in detail the parts and functions of SRP. **[25]**
- Q5)** Explain acidising. **[25]**
- Q6)** Explain Nodal analysis. **[25]**

XXXX

P1381

[4065]-842

**M.E. (Information Technology)
ADVANCED OPERATING SYSTEMS
(2008 Course) (514403) (Sem. - I)**

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 a distributed system? Explain in detail the major issues in designing a distributed operating system. [10]
b) Describe four distributed computing system models with the help of neat diagrams. [8]
- Q2)** 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) What is a stub? How are stubs generated? Explain how the use of stubs helps in making an RPC mechanism transparent. [8]
- Q3)** a) Explain the desirable features of a good message passing system. [8]
b) Describe the three types of communication protocols used in RPCs. [8]
- Q4)** a) Explain the Bully and Ring election algorithms. Discuss the time complexity for both algorithms. [8]
b) Describe the implementation of logical clocks using : [8]
i) Counters.
ii) Physical clocks.

SECTION - II

- Q5)** 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) What are the main causes of thrashing in a DSM system? What are the commonly used methods to solve the thrashing problem in a DSM system? [8]

P.T.O.

- Q6)** a) Discuss the desirable features of a good distributed file system. [8]
b) Explain the different issues involved in designing a load balancing algorithm. [8]
- Q7)** a) Explain any two address space transfer mechanisms which are suitable for a process migration facility with high performance and high reliability goals. [8]
b) Explain in brief the design goals of Amoeba. [8]
- Q8)** Write short notes (any three) : [18]
a) Lamport's algorithm.
b) Group communication in Chorus.
c) Gifford Quorum based protocol.
d) Thread synchronization in Mach.



P1384

[4065] - 851

M.E. (CSE) (IT)

MANAGEMENT TRENDS IN INFORMATION TECHNOLOGY

(2008 Course) (Sem. - II) (514427)

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 on 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) Consider a home security system which detects both human and non-human (smoke, fire etc.) intrusion. When an intrusion is detected signals or alarms should reach the owner of the house, fire brigade personnel and the nearest police station. Create a feasibility plan, a milestone list and a contingency plan for the project. **[8]**
- b) In detail explain ERP as a MIS. **[8]**
- Q2)** a) For the system described in Q1) a) generate a project network diagram with different dependency types between tasks, calculate the project slack & show the technique to adjust the project schedule. **[8]**
- b) Write a note on energy audit/energy management. **[8]**
- Q3)** a) Create and explain a Decision Support System (DSS) for a Supply Chain Management (SCM) system. **[8]**
- b) Elaborate on conflict management beginning with definition of conflict, reasons, indicators, constructive/destructive conflict and techniques for avoiding/resolving conflicts. **[8]**
- Q4)** Write short notes on: **[18]**
- a) Intellectual Property Rights (IPR).
 - b) Corporate Social Responsibility (CSR).
 - c) Applications of IT in Quality Control.

P.T.O.

SECTION - II

- Q5)** a) Consider the upgradation of the infrastructure for conduction of an on-line examination. The upgradation is in terms of increasing the no.of users of the system, increasing the geographical limit of the system and the data (examinee's details & result) which was available previously on a CD to now being directly uploaded/downloaded to & from the site itself. Design a project change request form to accomodate the above changes. Prepare a change impact statement in response to the project change request form. [8]
- b) Explain the various stages of formal group development. Also explain various criteria for informal group formation. [8]
- Q6)** a) Explain the need for WBS (work breakdown structures). You are the project manager for a project which will develop an in-house software used to monitor computer parts inventory of the different methods available to create a WBS, Justify your choice and create the WBS for the above said project. [8]
- b) Consider the hospitality industry. What are the expectations and perceptions of good service in this industry which is heavily dependent on database (s) and is transaction intensive. Explain. [8]
- Q7)** a) "Project managers have a clear vision of what the deliverables of a system will be, & what it takes to create those deliverables". Justify this statement with project estimates, budget issues and expenses. [8]
- b) Write a note on ethical conducts & ethical judgements. [8]
- Q8)** Write short notes on: [18]
- a) Datawarehousing as an effective MIS.
 - b) Cyber laws and IT acts.
 - c) Project Quality Standards.



Total No. of Questions : 10]

[Total No. of Pages : 2

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[4065]-852

M.E. (IT)

INTERNET AND WEB TECHNOLOGIES

(2008 Course) (514411 (a)) (Elective - III) (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 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 LDAP Directory Architecture. [8]
b) How Common Gateway Interface works? [8]
- Q2)** a) What is SNMP protocol used for? [8]
b) Identify the business applications which are ideal Web Technology implementations. [8]
- Q3)** a) Illustrate Kerberos System Functioning. [8]
b) Illustrate PHP. [8]
- Q4)** a) Explain architecture of Search Engine. [8]
b) Explain function of Proxy Servers. [8]
- Q5)** Answer any three short notes (with illustration) : [18]
a) Java beans.
b) SOAP.
c) AJAX.
d) WEB 2.0.

SECTION - II

- Q6)** a) What are the advantages and disadvantages of N-Tier Web System. [8]
b) Draw and explain the Functional Diagram of Telnet system. [8]

P.T.O.

- Q7)** a) What are different skills set available to develop the Web Systems. [8]
b) Illustrate use of Java Mail. [8]
- Q8)** a) Explain Servlet life Cycle. [8]
b) Compare Applets with Servlets. [8]
- Q9)** a) Illustrate use of xml in DBMS. [8]
b) Explain any three Java Patterns. [8]
- Q10)** Short notes (any three) : [18]
a) COM vs CORBA.
b) Internationalization vs Localization.
c) JSR.
d) ASP vs Active X technology.



Total No. of Questions : 10]

[Total No. of Pages : 2

P1386

[4065]-854

M.E. (Information Technology)
MOBILE COMPUTING AND 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) *Answer 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.*

SECTION - I

- Q1)** a) Draw and explain basic PCS architecture. [8]
b) What are the various roles of HLR and VLR in roaming management? [8]
- Q2)** a) Discuss the spread spectrum techniques. [8]
b) What are various strengths of SMS? Explain all of them? Also state what are the applications areas where these strengths can be used? [8]
- Q3)** a) How localization of a subscriber is carried out in GSM? What is 'handover' in mobile system? How it is effected in GSM? [8]
b) Describe 3G networks, how is a 3G network different from 2G CDMA network? [8]
- Q4)** a) Show master slave architecture in a piconet of blue tooth devices. What are the states in which a blue tooth device can be found? [8]
b) What is MMS? How is it different from Short Message Service and Extended Message Service? Explain the MMS architecture with diagram. [8]
- Q5)** Write a short note on : [18]
a) Java Card.
b) EDGE.
c) VLR Database Overflow.
d) Cell Splitting.

P.T.O.

SECTION - II

- Q6)** a) Describe the three handoff detection strategies. What are the advantages and disadvantages of the three handoff detection strategies? Which strategy is better in terms of load balancing? [10]
b) Explain the concept of Wireless Markup Language and its features. [8]
- Q7)** a) What is Direct Sequence Spread Spectrum Technology? Explain how it works in the CDMA technology? [8]
b) What is Wi-Max? How it is different than Wi-Fi? [8]
- Q8)** a) Why are so many different identifiers/address (MSISDN, TMSI, IMSI) needed in GSM? Give reasons and distinguish between user related and system related identifiers. [8]
b) Explain relation between GPRS/EDGE/3G-GSM/3G-CDMA and WAP. [8]
- Q9)** a) Explain framework for m-commerce and levels of framework. [8]
b) Write a short note on - Limitations of Mobile Devices. [8]
- Q10)** a) List advantages and disadvantages of m-commerce. [8]
b) What are the emerging issues in mobile commerce? Describe a metaphor that represents m-commerce activity. [8]



Total No. of Questions : 8]

[Total No. of Pages : 2

P1387

[4065] - 858

M.E. (IT)

HIGH PERFORMANCE COMPUTER NETWORKS

(Elective - IV) (2008 Course) (514439(c))

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

Q1) Design a High Performance Computer Network for the Multinational Organization for the scenario given below : **[16]**

Number of Machines : 1000

Number of Companies branches : 20

Number of machines per branch : 50

Number of servers : 5

Connect all the machines in the branches from different states to Server Farm.

Internet connectivity will be given to all the machines along with the VPN facility.

Suggest internet lease line capacity for each branch.

Justify your design with proper specifications.

Q2) a) Describe standards of gigabit Ethernet with relevant application.

b) Explain Architecture of Broad Band Networks.

[16]

Q3) a) Explain techniques of Frame Relay Congestion control.

b) Compare X.25, Frame Relay and ATM.

[16]

P.T.O.

- Q4)** Solve any three : **[18]**
- a) IP over ATM.
 - b) SRP Protocol and Authentication.
 - c) Queuing System.
 - d) QoS in HPCN.

SECTION - II

- Q5)** a) Explain DMT with neat block diagram.
b) Compare DSL, ADSL, HDSL, SDSL, VDSL. **[16]**

- Q6)** a) Explain SAN Architecture.
b) Explain SONET with layered Architecture. **[16]**

- Q7)** a) Explain Wi-Fi and Wi-Max in detail with practical example.
b) Explain 3G technologies along with their applications. **[16]**

- Q8)** Solve any three : **[18]**
- a) UMTS.
 - b) DWDM.
 - c) GSM Architecture.
 - d) Fiber Channel protocol Architecture.



Total No. of Questions : 8]

[Total No. of Pages : 2

P1388

[4065] - 859

M.E. (IT)

SERVICE ORIENTED ARCHITECTURE

(2008 Course) (Elective - IV) (514429(D))

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer any three questions from each section.*
- 2) *Question no. 1 is compulsory.*
- 3) *Assume suitable data.*

SECTION - I

- Q1)** a) Consider a Airline ticket reservation and model it with SOA Architecture. [14]
b) Identify the business applications which are ideal for SOA type implementations. [4]
- Q2)** a) What are merits and Demerits using SOA implementations in Business? [8]
b) What are SOA Delivery methods. [8]
- Q3)** a) Illustrate run time business qualities in SOA. [8]
b) Give the examples of technical and business constraints while designing SOA. [8]
- Q4)** a) Illustrate the SOA development life cycle. [8]
b) Illustrate SOA Governance. [8]

SECTION - II

- Q5)** a) Consider online news paper system and model it with SOA architecture. [14]
b) Identify and justify 4 web portals application based on interdisciplinary businesses. [4]

P.T.O.

- Q6)* a) How the security is managed in SOA? [8]
b) What are the different standards for SOA? [8]
- Q7)* a) What are the software tools used for End to End SOA solution for a business? [8]
b) State the Enterprise solution assets. [8]
- Q8)* a) How the change in a service is addressed? [8]
b) Illustrate Quality of Service Compliance in SOA. [8]



P1391

[4065]-884

**M.E. (Instrumentation & Control)
(Process Instru. & Biomedical Instru.)**

**COMMUNICATION PROTOCOLS FOR INSTRUMENTATION
(2008 Course) (5061103) (Sem. - I)**

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** With neat diagrams wherever necessary, explain how Fieldbus implements the following functions and at which levels. **[18]**
- a) Cyclic Data exchange.
 - b) Asynchronous traffic.
 - c) Messaging system.
- Q2)** Explain the following Industry Protocols : **[16]**
- a) ControlNet.
 - b) Data Highway plus.
- Q3)**
- a) The manufacturing/process industry can be viewed as a combination of several networks. How are the networks classified? **[2]**
 - b) Discuss the characteristics of the lower two networks. **[2]**
 - c) Suggest any three protocols/methods used at different levels in the industry. **[12]**
- Q4)** Write short notes on : **[16]**
- a) RS 232C
 - b) WPAN

P.T.O.

SECTION - II

- Q5)** 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.
- Q6)** How is the Commissioning done of Fieldbus devices? Explain the following test procedures done during commissioning : **[16]**
- a) Segment testing.
 - b) Field Device testing.
 - c) Operational testing.
- Q7)** a) With neat diagrams explain the installation of Profibus DP and PA nodes. **[8]**
- b) Explain the Token passing Bus arbitration method. **[8]**
- Q8)** Write short notes : **[18]**
- a) Z-wave
 - b) Grounding schemes for IC 61158-2 segment.
 - c) Variants of Profibus.



P1394**[4065]-891****M.E. (Instrumentation) (Biomedical & Process Instru.)****CONTROL SYSTEM DESIGN****(2008 Course) (5061108) (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 books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *All questions carry equal marks.*
- 6) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*

SECTION - I**Q1)** The open-loop transfer function of unity feedback control system is given :

$$G(s)H(s) = \frac{2000K}{s(s+20)}$$

It is desired that $e_{ss} = 1\%$ for unit ramp input and the phase margin $> 45^\circ$. Determine the parameters of the phase lead network to be used for this purpose. Draw the Bode plot for compensated system. **[25]**

Q2) Obtain approximate PI and PID controllers for the following FOPDT system:

$$G(s) = \frac{0.66e^{-2.6s}}{6.7s+1}$$

using the direct synthesis approach and given the reference trajectory

$$Q(s) = \frac{e^{-2.6s}}{5s+1} \quad \mathbf{[25]}$$

Q3) Consider the system described by $\dot{X} = Ax + Bu$

where $A = \begin{bmatrix} 0 & 1 \\ 0 & -2 \end{bmatrix}, B = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$

P.T.O.

The performance index J is given by

$$J = \int_0^{\infty} (x'Qx + u'Ru)dt$$

where $Q = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}, R = [1]$

Assume that the following control u is used.

$$u = -Kx$$

Determine the optimal feedback gain matrix K . [25]

SECTION - II

Q4) a) Consider the system

$$x(k+1) = Gx(k) + Hu(k)$$

where $G = \begin{bmatrix} 0 & 1 \\ -0.16 & -1 \end{bmatrix}, H = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$

Determine a suitable state feedback gain matrix K using Ackermann's formula such that the system will have the closed loop poles at

$$Z = 0.5 + j0.5, Z = 0.5 - j0.5. \quad [16]$$

b) Show that if the desired eigenvalues are all zeros then any initial state $x(0)$ can be brought to the origin in at most n sampling periods and the response is deadbit, provided the control signal $u(k)$ is unbounded. [9]

Q5) A unity feedback system having transfer function

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

with ZOH. Design a digital lead compensator in the w plane such that the phase margin is 50° , the gain margin is at least 10dB and K_v is 2 sec^{-1} . Assume sampling period of $T = 0.2$ [25]

Q6) a) Write a short Note on Model Predictive control. [8]

b) Write a short Note on H-infinity design techniques. [9]

c) With an example explain concepts of robust control. [8]



P1395

[4065]-894

M.E. (Instrumentation and Control)
MODERN CONTROL THEORY
(2008 Course) (5061111 - (a)) (Elective - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Answer any two questions from each section.
- 2) Figures to the right indicate full marks.
- 3) Assume suitable data if necessary.

SECTION - I

Q1) Attempt following :

- a) Find the transfer function for the following system. [10]

$$\dot{x} = \begin{bmatrix} -2 & 3 \\ -1 & -1 \end{bmatrix} x + \begin{bmatrix} 4 & 0 \\ -5 & 6 \end{bmatrix} u$$

$$y = [7 \quad 8]x$$

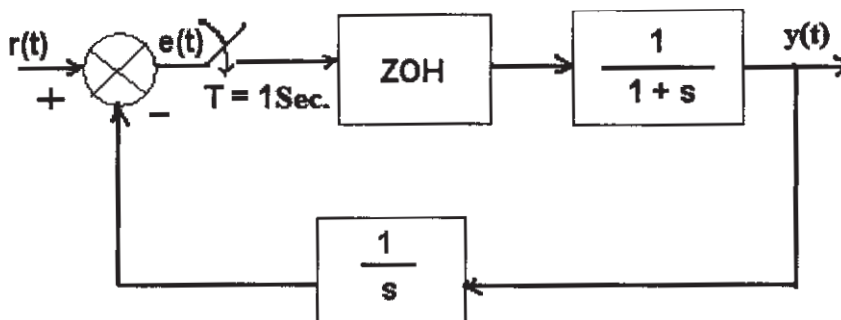
- b) Test controllability and observability of a given system. [15]

$$\dot{x}(t) = \begin{bmatrix} 2 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 3 & 1 \end{bmatrix} x(t) + \begin{bmatrix} 0 & 1 \\ 1 & 0 \\ 0 & 1 \end{bmatrix} u(t)$$

$$y(t) = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \end{bmatrix} x(t)$$

Q2) Attempt following :

- a) For the sampled data system shown in figure below, find the output $y(k)$ for $r(t)$ is unit step. [10]



P.T.O.

- b) Consider the digital controller defined by [15]

$$D(z) = \frac{U(z)}{E(z)} = \frac{4(z-1)(z^2 + 1.2z + 1)}{(z+0.1)(z^2 - 0.3z + 0.8)}$$

Realize this digital controller in the cascade scheme and in parallel scheme.

Q3) Attempt following :

- a) Obtain the discrete time state and output equations and the pulse transfer function ($T = 1$ sec.) of the following continuous time system. [10]

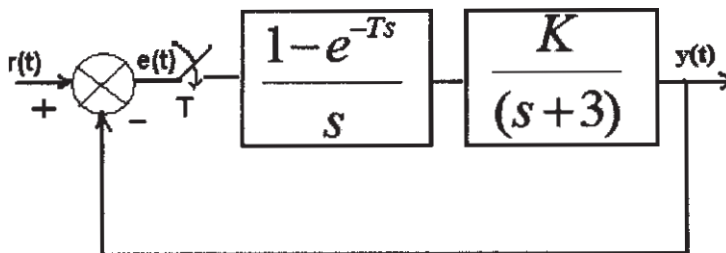
$$G(s) = \frac{1}{s(s+2)}$$

- b) Compare stability properties of the system shown with [15]

i) $T = 0.5$.

ii) $T = 1$.

Assume $K > 0$.



SECTION - II

Q4) Attempt following :

- a) For a nominal plant model consider all closed loop poles to lie to the left of -0.5 in the complex plane also controller include integral action. [15]

$$G_0(s) = \frac{(s-4)}{(s-1)(s+4)}$$

Find a particular controller satisfying these conditions and Parameterize all controllers satisfying this condition. [10]

- b) Solve the following differential equation.

$$y(k+2) + 3y(k+1) + 2y(k) = 0$$

$$y(-1) = -\frac{1}{2}, y(-2) = \frac{3}{4}.$$

Q5) For a given transfer function matrix.

$$G(s) = \begin{bmatrix} \frac{4}{s^2 + 3s + 2} & \frac{-0.5}{s + 1} \\ \frac{1}{s + 2} & \frac{2}{s^2 + 3s + 2} \end{bmatrix}$$

- a) Find polynomial matrix $P(s)$. **[10]**
b) Find Smith McMillan form $M(s)$ of $G(s)$. Also find zeros and poles of $G(s)$. **[15]**

Q6) Attempt following :

- a) By using the Nyquist criterion, determine whether the closed loop system having the following open loop transfer function is stable or not. If not, how many closed loop poles lie in the right half s-plane. **[15]**

$$G(s)H(s) = \frac{1 + 4s}{s^2(1 + s)(1 + 2s)}$$

- b) Write short notes on : **[10]**
i) Sampling theorem.
ii) Pulse transfer function.



Total No. of Questions : 8]

[Total No. of Pages : 2

P1396

[4065]-897

M.E. (Instrumentation and Control) (Process Instru. Biomedical Instru.)

ADVANCE PROCESS INSTRUMENTATION

(2008 Course) (Elective - II) (5061111)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answers to the two sections should be written in separate answer books.*
- 2) *Solve any three questions from each section.*
- 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 is the need of mathematical modeling? Explain various steps involved in it? [8]
- b) Derive in detail the mathematical model of two interacting tanks. Comment on selection of control scheme for the same. [8]
- Q2)** a) Discuss Cascade Control design criteria in detail. Also give the process example wherein cascade control is appropriate. [8]
- b) Explain both the methods of identifying mathematical model of a system using PRC. Also discuss on Calculations for finding first and Second time constants using PRC method. [8]
- Q3)** a) What is interaction? Elaborate its important effects on multivariable system behavior. [9]
- b) Explain how RGA method is useful in understanding and minimizing interaction in multivariable control along with important properties of RGA. [9]
- Q4)** a) In feed forward-feedback control strategy which controller needs to be tuned first? What would be the effect of reverting the order of tuning? Explain with stating clear assumptions. [8]
- b) Describe how additions of feed-forward control to original feedback only system affects the resonant frequency and the amplitude ratio at resonant frequency. [8]

P.T.O.

SECTION - II

- Q5)** a) Explain how a documented management system can help to reduce process variation. Give reasons why the system and SPC techniques should be introduced together for maximum beneficial effect. [9]
- b) What is the role of Teamwork in process improvement? How can the simple techniques of problem identification and solving help teams to improve processes? [9]
- Q6)** a) What is Predictive control? What are various single loop predictive control methods? [8]
- b) Discuss in detail the guidelines for algorithm selection guidelines for predictive control methods. [8]
- Q7)** Explain DMC technique with feedback and without feedback? Elaborate the difference between them. [16]
- Q8)** a) Discuss Applications of Neural Network in Modeling and Estimation in details. [10]
- b) A mercury-in-glass thermometer acts as a first order system with an input of temperature and an output of the mercury position against a scale. The thermomemter is initially at 0°C and is then suddenly placed in water at 100°C. After 80s the thermometer reads 98°C determine; [6]
- i) The time constant.
- ii) The delay time.
- iii) The rise time.



P1398

[4065]-908

M.E. (Polymer Engg.)

POLYMER PROCESSING AND TESTING

(509117) (2008 Course) (Sem. I)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Attempt Q.No.1 from Section I and Q.No.6 from Section II. Attempt any other two questions from Section I and any other two questions from Section II.*
- 2) *Figures to the right indicate full marks.*
- 3) *Assume suitable data, if required.*
- 4) *Answers to the two sections must be written in separate answer books.*
- 5) *Use of pocket calculator is allowed.*

SECTION - I

- Q1)** Attempt any four : **[20]**
- a) Explain in short the test method for determination of density by density gradient method.
 - b) Explain in short pretest conditioning of test samples with reference to testing of plastics.
 - c) Write in short about Cup flow test used for thermoset materials.
 - d) Explain in short acetone immersion test developed for rigid PVC pipes.
 - e) Draw a neat sketch of test arrangement for measurement of melt flow rate using capillary rheometer attached to screw extruder. Explain usefulness of such testing.
- Q2)**
- a) Discuss test methods for cellular as well as non-cellular plastics to determine dielectric constant and dissipation factor. **[8]**
 - b) Explain the terms compression set and tension set with respect to testing of rubbers. **[7]**
- Q3)**
- a) Define and explain the terms volume resistance and surface resistance with reference to measurement of insulation resistance. **[8]**
 - b) Discuss application and at least one test method of tensile impact test. **[7]**

P.T.O.

- Q4)** a) Explain the limitations of existing major accelerated weathering tests. [7]
 b) Discuss the test methods for testing of tear resistance of coated fabrics. [8]
- Q5)** a) Explain laser shearography technique as non-destructive test method. Explain applications. [7]
 d) Discuss pulse echo and through-transmission mode ultrasonic testing techniques. [8]

SECTION - II

- Q6)** Attempt any four : [20]
- a) Explain in short why shot weight consistency is more affected in screw position based switchover technique than pressure based switchover technique. When non-return valve in front of injection moulding screw has leakage due to wear.
- b) Write down formulae for calculation of cooling time of injection moulded part for - plate like part of thickness 'h'.
- c) In a roll fed continuous thermoforming, plastic sheet moves at a speed of 5 meters/min and is heated by two temperature heating elements. Calculate power required to heat the sheet from 36°C to 140°C.
- Sheet width = 500 mm
 Thickness = 500 microns
 Plastic density = 900 kg/m³
 Heating area of heating elements = 0.009m²
 Emmissivity of heat = 0.9
 Net enthalpy for given temperature difference = 60 kJ/kg.
- d) Explain the need of devolatization zone in extrusion and draw representative pressure profile for a single screw with devolatization zone.
- e) Explain the effect of use of plug on article wall thickness in case of thermoforming.
- Q7)** a) With a neat sketch, explain how biaxially oriented sheet is made by using tentering conveyor and oven. [7]
 b) Explain the significance of Deborah number with respect to Sharkskin effect observed in extrusion. [8]

- Q8)** a) Explain why large size containers made up of ultra high molecular weight HDPE are usually made on accumulator type extrusion blow moulding machines having grooved barrel systems. [8]
- b) Explain the difference between convergent and divergent die and mandrel systems used in extrusion blow moulding. Give criteria of choice of die and mandrel system based on the container geometry, shape and size.[7]
- Q9)** a) Draw a neat sketch of any one type of co-extrusion die and explain functioning of the die. [8]
- b) Write in short about materials, process and application of reaction injection moulding. [7]
- Q10)** a) Explain basic principles of melting model proposed by Tadmore for single screw extrusion. Explain the significance of temperature of the melt film. [8]
- b) Explain any one type of sizing system used in pipe extrusion. [7]



P1401

[4065]-915

M.E. (Polymer Engineering)

POLYMER PHYSICS AND CHARACTERIZATION

(2008 Course) (509122) (Sem. - II)

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) *Answer to the two sections should be written in separate books.*
- 3) *Figures to the right indicate full marks.*

SECTION - I

- Q1)** a) Discuss HPLC as separation technique in polymers. [9]
b) Write a note on contact angle measurement. [8]
- Q2)** a) Discuss thermal analysis of polymers by DTA. [9]
b) Explain elemental analysis of polymers in detail. [8]
- Q3)** a) Discuss pyrolysis technique and its uses. [8]
b) Write a note on thermodynamics of polymer solutions and melt. [8]
- Q4)** a) Explain solubility parameter. [8]
b) Write a note on relationship between viscoelastic properties and viscometric functions. [8]

SECTION - II

- Q5)** a) Write a note C-13 NMR spectroscopy. [9]
b) Write a note on molecular configurations in polymer solutions. [8]
- Q6)** a) Explain GPC to determine MWD in polymers. [9]
b) Discuss role of FTIR in polymer analysis. [8]
- Q7)** a) Write a note on use of DSC to determine kinetics of crystallization. [8]
b) Discuss solubility parameter. [8]
- Q8)** a) Discuss X-ray studies of polymers. [8]
b) Write a note on shear flow and shear-less flow in polymers. [8]



P1403

[4065] - 917

M.E. (Polymer Engg.)

PROCESSING AND MECHANICS OF COMPOSITES

(509124) (2008 Course) (Sem. - II)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) *Q.No. 1 from Section I and Q.No. 6 from Section II are compulsory. Answer any other two questions from Section I and any other two from Section II.*
- 2) *Figures to the right indicate full marks.*
- 3) *Answer to the two sections must be written in separate answer books.*
- 4) *Use of scientific calculator, log-log paper is allowed.*
- 5) *Assume suitable design data, if required.*

SECTION - I**Q1)** Attempt Any four

- a) Fibers in a composite lamina are arranged in a hexagonal array with each side of hexagon equal. Determine the maximum fiber volume fraction that can be packed in this arrangement. [5]
- b) A lamina has ply orientation of 30° . If strains in global direction are

$$\epsilon_x = 0.001$$

$$\epsilon_y = 0.0015$$

$$\epsilon_{xy} = 0.00008$$
 Calculate the strains in local co-ordinate system. [5]
- c) Give merits and demerits of pultrusion process. [5]
- d) Give schematic process diagram of sheet - moulding compound (SMC) and explain various forms of fibers that can be used in the process. [5]
- e) Write in short about prepregs and usefulness of it in composite manufacturing processes. [5]

Q2) a) Explain shear coupling ratio's for an orthotropic lamina and express them as a function of reduced transformed compliance terms. [5]

P.T.O

b) Failure strengths of an orthotropic lamina are given below.

	Direction 1	Direction 2	1-2 plane
Tensile	1300 MPa	30 MPa	-
Compressive	280 MPa	140 MPa	-
Shear	-	-	60 MPa

Consider fibers at $\theta = 30^\circ$ IP - loading applied is $\sigma_x = 5$ MPa $\sigma_y = 10$ MPa and $\tau_{xy} = -5$ MPa, check failure by Tsai - Wn tensor theory and Tsai - Hill theory.

Given: Engineering properties of lamina

$$E_1 = 35 \text{ GPa} \quad E_2 = 7 \text{ GPa}$$

$$G_{12} = 3 \text{ GPa} \quad \nu_{12} = 0.3$$

[10]

Q3) a) Kevlar / epoxy lamina has following engineering constants.

$$E_1 = 75 \text{ GPa} \quad E_2 = 6 \text{ GPa} \quad G_{12} = 2 \text{ GPa} \quad \nu_{12} = 0.34$$

Calculate reduced stiffness matrix, reduced transformed stiffness matrix for $\theta = 45^\circ$. Also calculate strains if $\sigma_x = \sigma_y = \tau_{xy} = 5$ MPa [5]

b) Write in short about Woven Fabrics and non - crimp fabrics. [5]

c) Prove the rule of mixture for modulus in case of uni-directional composite.

$$E_c = E_f V_f + E_m V_m$$

c Composite

m matrix

f = fibers

V = Volume fractions

E = modulus

[5]

Q4) a) Data related to boron - epoxy lamina is observed as:

$$E_1 = 81.7 \text{ GPa}$$

$$E_2 = 9.1 \text{ GPa}$$

$$\nu_{12} = 1.97$$

$$\nu_{21} = 0.22$$

Comment whether data satisfies constraints on elastic constants for an orthotropic material. [3]

- b) Write about invariants of an orthotropic lamina. [7]
 c) Discuss the effect of mismatch of poisson's ratio and explain why this leads to 0° splitting in case of cross ply laminate having fibers at 0° and 90° . [5]

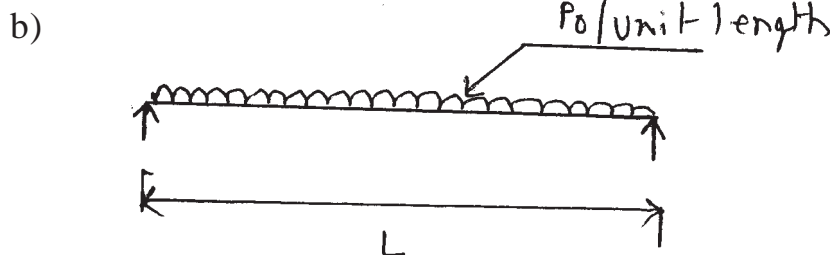
- Q5) a) Explain maximum strain theory and its limitations. [7]
 b) Write compliance matrices for monoclinic, tri-clinic, transversely isotropic and specially orthotropic materials. [8]

SECTION - II

Q6) Attempt any four : [20]

- a) For a symmetric angle ply laminate
 $[\pm 45]_s$, E_x = laminate modulus in x direction = 25 GPa.
 ν_{xy} = Effective laminate poisson's ratio in xy plane = 0.68.
 Find shear modulus of the laminate.
- b) Identify the type of laminate
 i) $[-1 | -2 | -2 | 2 | 2 | 1]$
 ii) $[-1 | -2 | -3 | 1 | 2 | 3]$
- c) Define unsymmetric or asymmetric or non symmetric laminates. Give force and moment relationship.
- d) Explain and discuss quasi-isotropic laminates.
- e) Explain and discuss balanced laminates.

Q7) a) Give governing vibration equations for laminated plates. [7]



Show that for a simply supported beam under uniform load, effective bending modulus of the beam is given by

Where W_c = Central deflection b = width h = depth. [8]

Q8) a) Find [A], [B] and [D] matrices for $[+30 / -30 / -30 / +30]$ as well as $[+30 / -30 / +30 / -30]$ laminate. Comment on the type of laminate.

Given:

$$[Q] = \begin{bmatrix} 140 & 3 & 0 \\ 3 & 10 & 0 \\ 0 & 0 & 5 \end{bmatrix} \quad [12]$$

- b) Give any one example of anti-symmetric angle ply laminate. [3]

Q9) a) For a symmetric laminate, show that effective flexural longitudinal modulus E_x^f is given by

$$E_x^f = \frac{12}{h^3 D_{11}^*}$$

Where D_{11}^* is element of bending compliance matrix. [7]

- b) Obtain an expression for bending stiffness of sandwich beam. [5]
c) What is a hybrid beam. [3]

Q10)a) An isotropic lamina with poisson's ratio 0.25 and made up of glass-polyester has reduced stiffness matrix as follows:

$$[Q]_{\text{glass - polyester}} = \begin{bmatrix} 106 & 26 & 0 \\ 26 & 106 & 0 \\ 0 & 0 & 40 \end{bmatrix} \text{ kN/mm}^2$$

Another isotropic lamina with poisson's ratio of 0.3 and made up of boron polyester has reduced stiffness matrix as follows

$$[Q]_{\text{boron - polyester}} = \begin{bmatrix} 300 & 90 & 0 \\ 90 & 300 & 0 \\ 0 & 0 & 105 \end{bmatrix} \text{ kN/mm}^2$$

If laminate is constructed with boron - polyester as outer layers and glass - polyester as central core, find variation of stress and strain through the laminate for $\sigma_{11} = 25 \text{ kN}$.

Assume thickness of each ply as 1 mm. [11]

- b) Give systematic classification of different types of laminate configurations in the form of chart clearly showing various subgroups. [4]



Total No. of Questions : 8]

[Total No. of Pages : 2

P1404

[4065]-918

**M.E. (Polymer Engineering)
SCIENCE AND ENGINEERING OF FIBERS
(2008 Course) (Elective - III) (509125 (a))**

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 books.*
- 3) *Figures to the right indicate full marks.*

SECTION - I

- Q1)** a) Differentiate the terms staple, yarn and filament with reference to their properties. [9]
b) Classify fibers. Write a note on advantages and disadvantages of the same. [8]
- Q2)** a) Explain the process of staple fiber production with various steps involved. [9]
b) Discuss the complete process of melt spinning. [8]
- Q3)** a) Explain how orientation affects the properties of the fiber. [8]
b) Write a note on heat setting. [8]
- Q4)** a) Discuss in detail the stages involved in production of synthetic fiber-PP. [8]
b) What is drawing? Explain. [8]

SECTION - II

- Q5)** a) Write a note on regenerated cellulose fibers. Explain its importance. [9]
b) Explain the polymerization method of PET. [8]
- Q6)** Write a note on :
a) Modified Synthetic Fibers. [9]
b) Carrier dyeing. [8]

P.T.O.

- Q7)** a) Explain production of nylon with various stages involved in it. [8]
b) Explain how do you get regenerated protein fibers. [8]

- Q8)** a) Discuss dying in detail. [8]
b) Explain what thermosol process is. [8]



P1405

[4065]-920

**M.E. (Polymer Engineering)
SPECIALTY POLYMER MATERIALS
(2008 Course) (Elective - III) (509125 (c))**

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 books.*
- 3) *Figures to the right indicate full marks.*

SECTION - I

- Q1)** a) What do you understand by thermotropic polymers? Give the structural requirements for a polymer to show thermotropic behavior. [9]
b) Write a note on polyheterocyclic conductive polymers. [8]
- Q2)** a) Discuss preparation and curing reactions of any one heat resistant polymer. [9]
b) Write a note on manufacture, casting and applications of polysulphones. [8]
- Q3)** a) Discuss role of biopolymers in medicine with reference to any one polymer. [8]
b) Write a note on hydrogels and its preparation and uses. [8]
- Q4)** a) Explain Flory-Huggins theory. Give its importance. [8]
b) Explain the concept of self reinforced composites. With suitable examples explain the important property contributions by such material. [8]

SECTION - II

- Q5)** a) Write a note synthesis of liquid crystalline polymers. Enlist the properties of LC polymers. [9]
b) Write a note on conjugated polymers and sensors. [8]
- Q6)** a) What are IPNS? Write a note on polyurethane membranes. [9]
b) Explain the concept of control release drug system with suitable example. [8]

P.T.O.

- Q7)** a) Enlist various commercial blends. Describe their striking properties and applications. [8]
b) What is reverse osmosis? Explain the concept and give its applications. [8]
- Q8)** a) Write a note on theory of conduction. Give the applications of polyacetylene. [8]
b) Write a note on materials for communication systems. [8]



Total No. of Questions : 8]

[Total No. of Pages : 2

P1406

[4065] - 922

**M.E. (Polymer Engineering)
ELASTOMER TECHNOLOGY**

(2008 Course) (Elective - IV) (509126)

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 books.*
- 3) *Figures to the right indicate full marks.*

SECTION - I

- Q1)** a) Differentiate between raw and vulcanized rubber based on physical factors. [9]
b) Write a note on mastication, its process, effect on properties and applications. [8]
- Q2)** a) Differentiate between activators and accelerators. Explain the specific role of each of them with reactions involved. [9]
b) Explain in detail injection molding of rubber. [8]
- Q3)** a) Write a note on manufacturing process for various types of rubber belts. [8]
b) Discuss testing of rubber in general. Enlist ASTM standard methods.[8]
- Q4)** a) Write a note on sulphur free vulcanization of rubber. [8]
b) What are thermoplastic elastomers? Write a note on properties and application of the same. [8]

P.T.O.

SECTION - II

- Q5)** a) Write a note on stress strain relationship for vulcanized rubber. Also write a short note on molecular requirements for a material to act as rubber. [9]
b) Elaborate on manufacturing of dipped goods from latex. [8]
- Q6)** a) Discuss tackifiers and extender oils and their function as processing aids in rubber. [9]
b) Explain with suitable examples how properties are influenced by compounding ingredients. [8]
- Q7)** a) Write a note on cable manufacture. [8]
b) Discuss rubber processing by calendaring. [8]
- Q8)** a) Write a note on kinetic and thermodynamic theory of rubber elasticity. [8]
b) Give the synthesis details of SBR, NBR, and BR. [8]



Total No. of Questions : 6]

[Total No. of Pages : 1

P1415 [4065] - 935
M.E. (Printing Engg. & Graphic Communication)
SUBSTRATES AND INKS
(Sem. - II) (508110) (2008 Course)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) What are the standard paper sizes in Metric & English Units and it's significance. [15]
b) What is Green Printing. [10]
- Q2)** Explain in details ASTM and TAPPI standards for boards. [25]
- Q3)** a) What are the drying Mechanisms used in printing. [15]
b) Explain different resins used for different substrates. [10]

SECTION - II

- Q4)** Explain different featured used in Security printing. [25]
- Q5)** Calculate working size of paper 16 pages of A4 size brochure trimmed with 4 colour printing on offset machine and estimation of cost for 1000 sets. [25]
- Q6)** What are the standards for substrate and inks used in printing industry. [25]



Total No. of Questions : 6]

[Total No. of Pages : 2

P1416

[4065]-936

M.E. (Printing & Graphic Communication)

MULTIMEDIA SYSTEMS & COMMUNICATION

(2008 Course) (Elective - III) (508111 (a))

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer any two questions from Section - I and any two questions from Section - II.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *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) 'Encapsulation, Inheritance and Polymorphism are main pillars of OOPS', Justify it with proper example. **[15]**
- b) Explain the following terms related to future television graphics:
- i) HDTV.
 - ii) Graphic Centralization.
- [10]**
- Q2)** a) Explain in brief JPEG and MPEG Standards for Multimedia Applications. **[15]**
- b) Explain in brief the following Image Editor features:
- i) Sharpening and Softening of Images.
 - ii) Contrast change and Brightening.
- [10]**
- Q3)** a) Explain in detail the emerging trends in multimedia systems. **[15]**
- b) Explain the following in brief: **[10]**
- i) SED Display.
 - ii) TFT-LCD Display.

P.T.O.

SECTION - II

- Q4)** a) What are different Animation Issues? Explain in brief how different Animation issues can be handled. **[15]**
- b) Justify the statement: ‘A stand-alone Internet radio devices emerged to Offer listeners a no-computer option for listening to audio streams’. **[10]**
- Q5)** a) What is ‘Web Search engine’? With the help of simple block schematic explain the working principle of ‘Web Search engine’. **[15]**
- b) Explain in detail the Social Criticism and Cultural Impact of the following:
- i) Online Chat.
 - ii) Online Shopping.
- [10]**
- Q6)** a) List various audio, video & animation authoring tools. Explain one tool in detail. **[15]**
- b) Explain in the following in brief: **[10]**
- i) Camera Raw.
 - ii) Metadata & Asset Management.



Total No. of Questions : 6]

[Total No. of Pages : 2

P1418

[4065] - 941

M.E. (Printing Engg & Graphic Communication)

ANALYSIS OF SPOT & PROCESS INKS

(2008 Course) (508112) (Elective - IV)

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) *Assume suitable data, wherever necessary.*
- 5) *Figures to the right indicate full marks.*

SECTION - I

- Q1)** a) Explain classification of spot & process inks. [15]
b) What is water base inks? [10]
- Q2)** a) Explain Pigment & Dyes base inks. [13]
b) Explain ink vehicles & their properties. [12]
- Q3)** a) What is thixotrophy of inks. [13]
b) Give composition of metallic inks used in Gravure Printing and method of making the ink. [12]

SECTION - II

- Q4)** a) Explain difference between inks used for flexography in publishing & packaging. [15]
b) What is the role of plastisizer and additives in off set inks? [10]

P.T.O.

Q5) Give in details Tests & Measurements for inks. **[25]**

Q6) a) Write notes on : **[15]**

- i) Ink Density.
- ii) Dot fidelity.
- iii) Print sharpness.

b) What is ink variation and deviation? **[10]**



P1419 **[4065] - 11**
M.E. (Civil) (Construction & Management)
ADVANCED CONSTRUCTION ENGINEERING
(2002 Course) (Elective - I) (501106 (c))

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 function and method with neat sketches the following activities involved in construction of R.C.C. diaphragm wall. **[18]**
- a) Bentonite Installation Plant.
 - b) Method of construction of Primary and Secondary panels of diaphragm wall.
 - c) Specifications and method of concreting, for concrete of M 200 in diaphragm wall.
- Q2)** a) Draw neat sketches and explain sequence of construction in “Natural draught cooling towers” **[8]**
b) Explain in detail measures adopted in ensuring “Full leak tightness” in nuclear containment structures. **[8]**
- Q3)** a) What are tools adopted in carrying out “Inspection of a bridge”. **[6]**
b) Prepare a “checklist” for inspection of a bridge and a detailed “Inspection Proforma” for any one of the item from the checklist. **[10]**
- Q4)** Write short notes on any three of the following: **[18]**
- a) Quality control methods used in Earth Dams.
 - b) Bridge Maintenance Policy.
 - c) Draw a Flow chart of activities in an R.M.C. plant.
 - d) Non destructive tests - to check integrity of the bridge.
 - e) Use of ‘Welded Reinforcement Grid’ (WRG) in earthquake resistant structures.

P.T.O

SECTION - II

- Q5)** a) What are measures you will adopt in ensuring full leak tightness in Nuclear containment structures? [8]
b) Prepare a 'Method Statement' giving sequence of construction adopted in "Natural Draught Cooling Towers". [8]
- Q6)** a) Explain in details what is "MCA in Nuclear Containment Structures". [8]
b) Explain in details use of slipforming and climbing shutters in construction of chimneys. [8]
- Q7)** a) Which are the different type of vibratory loads for which Machine foundations are designed. [8]
b) Explain different construction methods used to carry out river training works. [8]
- Q8)** Write short notes on any three of the following: [18]
a) List out and explain the function of each component of the Earth dam.
b) Tremie concreting in Diaphragm Walls.
c) Construction method adopted in single flue chimney.
d) River training works - purpose and explain methods adopted.
e) Explain type of cracks in concrete bridges observed which causes distress to the bridge.



P1420

[4065]-22

M.E. (Civil) (Hydraulic Engineering)

IRRIGATION AND DRAINAGE

(2002 Course) (501303)

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

SECTION - I

- Q1)** a) With the help of neat sketches, explain the various forms of soil moisture. Which forms of soil moisture are available for utilization by the plants? **[10]**
- b) Differentiate between the flow of water in saturated and unsaturated soils. **[6]**
- Q2)** a) Briefly explain the processes of evaporation, transpiration and evapotranspiration. **[6]**
- b) What are various methods of determination of consumptive use of water? Explain them briefly. **[6]**
- c) Using the data given below, determine after how many days you will supply water for irrigation for healthy growth of the plants : **[6]**
- i) Field capacity of soil = 29%
 - ii) Permanent wilting point = 11%
 - iii) Density of soil = 1320 kg/m³
 - iv) Effective depth of root zone = 750 mm
 - v) Percentage of readily available moisture = 75%
 - vi) Daily consumptive use by the plant = 12 mm.
- Q3)** a) What is meant by saline and alkaline soils? Briefly explain the precautions to be taken to prevent salinity of irrigated land and measures to be taken to reclaim such soils. **[10]**
- b) Write a note on soil erosion and soil conservation. **[6]**

P.T.O.

- Q4)** a) Explain the general concept of drip irrigation. [4]
b) What are the advantages and disadvantages of drip irrigation? [6]
c) Briefly describe the design procedure for drip irrigation. [6]
- Q5)** Write short notes on any FOUR of the following : [16]
a) Soil moisture tension.
b) Soil moisture stress.
c) Soil moisture determination.
d) Evaporimeter.
e) Methods of reducing evaporation for reservoirs.

SECTION - II

- Q6)** a) Draw a neat sketch in section of a permanent lift irrigation scheme & state the function of each component part of the scheme. [9]
b) Explain in detail sprinkler method of irrigation. What are the merits & demerits of sprinkler method? [8]
- Q7)** a) Explain the various design considerations for the preparation of a permanent lift irrigation scheme. [8]
b) How will you classify the sprinkler irrigation system? Also explain the design concept of sprinkler irrigation. [8]
- Q8)** a) Write short notes on : [8]
i) Command area development (CAD) in India.
ii) On farm structures.
b) Describe canal outlet by considering the following points. [8]
i) Meaning or definition of canal outlet.
ii) Requirement of a good outlet.
iii) Minimum Modular head.
iv) Efficiency of an outlet.
- Q9)** a) Explain clearly the following : [8]
i) Warabandi system of distribution of irrigation water.
ii) Rotational method of application of irrigation water.
b) What are the various canal outlets for flow regulation? Describe canal outlets in detail. [8]

- Q10)** a) Discuss the causes, preventive measures & remedies for water logging. **[6]**
- b) Discuss in brief the various lay outs of drainage system suitable for land drainage. **[6]**
- c) Determine the spacing of tile drains in an impermeable soil encountered at 5m below the ground level. Assume the depth of impervious strata from the centre of tile drain as 3m & the water table level should not be more than 0.5 m above this level. Assume coefficient of permeability = 1.2 cm/hr & velocity = 0.025 cm/hr. **[5]**

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Total No. of Questions : 6]

[Total No. of Pages : 2

P1421

[4065]-34

M.E. (Civil/Structures)

PLATES AND SHELLS

(Revised 2002 Course) (501506)

Time : 4 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer any two questions from each section.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagrams 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. State the various assumptions made in small deflection theory. [8]
- b) A square plate of length 500 mm and 10 mm thickness is simply supported on its four corners. It is subjected to uniformly distributed pure couple of 450 Nm on all the edges. Find the lateral displacement at the midpoints of the edges. Take $E=200$ GPa and $\nu = 0.3$. [17]
- Q2)** a) A window of a high rise building is subjected to uniform wind load intensity of P_0 . Approximating the window as a rectangular plate simply supported over its edges, derive the expression for the deflected surface using Navier's method. [15]
- b) Apply Ritz's method to obtain the expression for deflected shape of a simply supported isotropic plate subjected to uniform intensity of loading q . [10]
- Q3)** A circular clamped plate of radius 'a' is subjected to axisymmetric triangular loading of intensity zero at the center and q_0 at the edge. Develop from first principles, expression for maximum deflection. [25]

P.T.O.

SECTION - II

Q4) A thin conical shell tank carries water up to a height 'd' from the vertex. It is supported on a central column. Derive the expression for the membrane stresses N_{θ} and N_{φ} in the shell. Also find the locations of the maximum values of stress resultants, with their magnitude. Plot the variation of the internal forces along the meridian.

What difference will it make if the shell is supported at the top edge by a ring beam? [25]

Q5) a) Derive equilibrium equation and hence equation for deflection using general cylindrical shell theory (considering bending action) for axisymmetric loading. [20]

b) What are the limitations of the membrane theory in the analysis of shells? [5]

Q6) a) Explain in brief different theories of bending in cylindrical shells. [7]

b) Analyze a semicircular cylindrical shell of 3 m radius, simply supported over a span of 10 m. It is subjected to uniformly distributed load of intensity 4 kN/m² inclusive of the self weight. Calculate the maximum compressive stress at the crown in the mid span section. Use Lundgren's beam theory. [18]



P1422

[4065]-35

M.E. (Civil) (Structures)

**REINFORCED CONCRETE AND PRESTRESSED CONCRETE DESIGN
(2002 Course) (501502)**

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 suitable data, if necessary.*

SECTION - I

- Q1)** a) Design a slab using yield line theory for a hall of size 5m × 7m c/c simply supported at all sides. Use M20 & TMT steel take Live load = 5 kN/m² & floor finish load = 1.5 kN/m². Draw details of reinforcement in plan and sectional elevation. **[10]**
- b) Design a grid slab for a floor of a hall 13.5m × 9m c/c having square grid of 1.5m. Use M25 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 4m, thickness 250mm for the following Axial forces of 1800 kN and 250 kN due to dead & live load and due to seismic load respectively.
Bending moment of 300 kNm and 4000 kNm due to dead & live load and due to seismic load respectively.
Use M20 Fe500.
Draw details of reinforcement in cross section and sectional elevation. **[25]**
- Q3)** Design a Intze type ESR for 6 lakh liters with staging height 14m using M25, Fe500 Design must include Analysis and Design calculations of Top dome, top ring beam, cylindrical wall, Middle level ring beam, Conical & bottom dome of the tank. Draw details of reinforcement at salient points. **[25]**

P.T.O.

SECTION - II

- Q4)** a) Explain in detail with proper sketches, how change in structural configuration helps in reducing losses of prestress. **[10]**
- b) The cross section a composite beam of a T section having a pre-tensioned rib of 200mm wide and 500mm depth with M40 and cast in situ slab (flange) 1000mm wide and 100mm thick with M20. The rib is prestressed with 20 wires of 7mm dia. with ultimate tensile stress of 1500 N/mm². 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]**
- Q5)** Design intermediate post tensioned prestressed concrete Tee or 'T' section roof beam of theatre for flexure and shear for the following.
Clear span = 16m, width of support = 400mm, spacing of beams 3.2m c/c, RCC slab thickness 130mm, live load on slab 1.5 kN/m², water proofing load on slab = 1 kN/m², concrete grade M50 HT steel is Multi-strand cables with $f_y = 1900 \text{ N/mm}^2$, do not consider the composite action. Design must include detail load, bending moment calculation, Check fiber stresses in concrete and deflection, design of end block. Draw sketches showing cable profiles and end block reinforcement details. **[25]**
- Q6)** a) Explain in detail with proper sketches, process of prestressing of circular tanks. **[7]**
- b) Design post tensioned prestressed concrete slab for a floor of IT park for the following Isolated clear spans of $8 \times 8\text{m}$ width of supporting beam on all sides 300mm, live load on slab 4.5 kN/m², floor finish load on slab = 1.2 kN/m², concrete grade M50 HT steel is cables of cross sectional area 120mm² with $f_y = 1700 \text{ N/mm}^2$.
Design must include check fiber stresses in concrete and deflection design of end block. Draw sketches showing cable profile. **[18]**

* * *

P1424

[4065] - 38

M.E. (Civil) (Structures)

BRIDGE ENGINEERING

(2002 Course) (Elective - I) (501509 (a))

Time : 4 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) Answer any two questions from each Section.
- 2) Answers to two sections should be written in separate books.
- 3) Figures to the right indicate full marks.
- 4) Use of IRC codes, IS 1343, IS 456-2000 & non programmable calculator is allowed.
- 5) Neat diagrams must be drawn wherever necessary.
- 6) Assume any other data, if necessary.

SECTION - I

- Q1)** a) What are the factors affecting the span of bridge. [9]
b) Write detail note box girder bridge. [8]
c) Write short note on Forces on Abutments. [8]

- Q2)** a) Compare simply supported PSC girder with plate girder in following respect: [10]

- i) Launching.
- ii) Ease of construction.
- iii) Construction period.
- iv) Economy.

- b) Design the culvert with the data: [15]

- i) Clear span of the culvert = 5m
- ii) Clear carriage way width = 7.5m
- iii) Size of kerb = 200 mm × 600 mm
- iv) Average thickness of wearing coat 80mm
- v) Use material M20, Fe 500
- vi) Culvert is on the national highway.

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

- Q3)** a) A bridge is of 16m span has three longitudinal girders, clear waterway width is 7.5m, spacing of cross girders is 4mC/C, Calculate design bending moment on the bridge girder if the bridge is on national highway. [15]

P.T.O.

- b) Compare design moment calculation on bridge girder with cross girder to that of with diaphragms. [10]

SECTION - II

- Q4)** a) Describe different types of bridge foundations mentioning the situations for particular type are used stating merit and demerits of each type. [9]
b) List the different forces to be considered for design of bridge substructure design, explain importance of each. [8]
c) Draw detailed cross section of typical pneumatic caisson Name all components. [8]
- Q5)** a) List the major steps involved in pier cap design, also state the forces considered in design of the same. [10]
b) Check the stability of the abutment for the following: [15]
i) Top width of abutment = 1m
ii) Height of abutment = 5m.
iii) Front face of abutment is vertical
iv) And the back face is battered at 1:6
v) Material of abutment stone masonry.
vi) Unit Weight of soil = 18kN/m³
vii) Angle of repose = 30°
viii) Superstructure : A T beam - bridge with span 13m.
ix) Type of loading: IRC class A
- Q6)** a) Design a reinforced elastomeric bearing at a pinned end of a plate girder of a bridge with following data: [15]
i) Maximum vertical load = 1000 kN
ii) Dynamic vertical load = 80 kN
iii) Transverse lateral load = 25 kN
iv) Longitudinal load = 56 kN
v) Longitudinal total translation 10 mm
vi) Rotation at support 0.003°
vii) Shear modulus of elastomeric bearing = 12 N/mm²
viii) Allowable comp. stress for concrete = 8 N/mm²
ix) Allowable comp. stress for elastomer = 10 N/mm²
b) Describe different types of bearings used in bridges mentioning the situations for particular type are used stating merit and demerits of each type. [10]



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[4065] - 40

M.E. (Civil) (Structures)

NONLINEAR ANALYSIS OF STRUCTURE

(Elective - I) (2002 Course) (501509)

Time : 4 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) *Answer any two questions from each Section.*
- 2) *Figures to the right indicate full marks.*
- 3) *Assume suitable data, if required.*
- 4) *Use of non programmable calculator is permitted.*
- 5) *Use of stability coefficient table is permitted.*

SECTION - I

- Q1)** a) Explain with neat sketch stress - strain relation in elastic, rigid - plastic, elasto - plastic state. [7]
- b) Derive with usual notation the $m - \phi$ nonlinear equation for beam. [8]
- c) Explain with suitable example the type of nonlinearities in a structure. [10]
- Q2)** a) Using stress function approach and accounting for geometrical nonlinearity, write strain energies due to stretching and bending and kinetic energy of an orthotropic plate. [13]
- b) Find relation for $m - \phi$ by approximate solution method, for a beam supported at its two ends and loaded centrally with point load. [12]
- Q3)** a) Obtain collapse mechanism for a cantilever beam of length l loaded with point load at its ends. [12]
- b) Explain step - by step procedure for nonlinear analysis of structure and Newton - Raphson method for solution of equation. [13]

SECTION - II

- Q4)** a) Derive the nonlinear stiffness matrix with usual notations for plane frame member. [15]
- b) Develop the stiffness matrix in global $x - y$ co-ordinates for member AB of plane frame as shown in fig 4.a [10]

P.T.O.

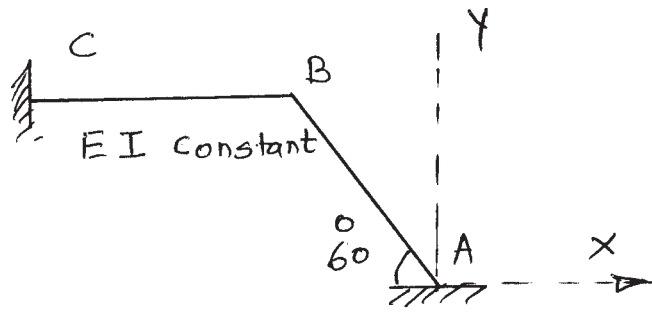


Fig 4.a

Q5) Develop stiffness matrix for non linear analysis of plane frame as shown in Fig 5.a. c/s. of member AB & BC = $1.5 \times 10^6 \text{m}$, $E = 200 \text{ GPa}$. [25]

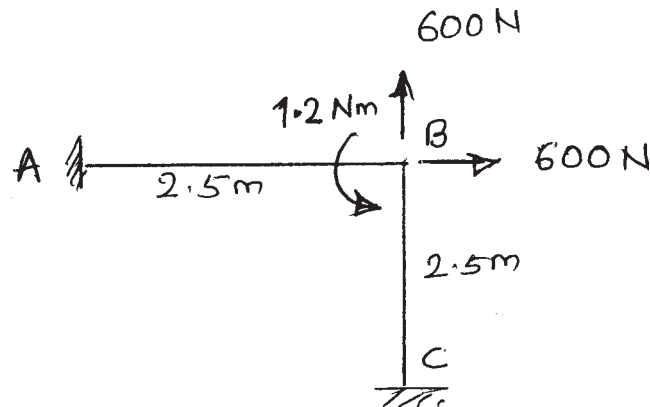


Fig 5.a

Q6) Analyse the prop cantilever as shown in fig 6. for elastoplastic range. Assume $E = 200 \text{ GPa}$, depth / width ratio of beam as 1. [25]

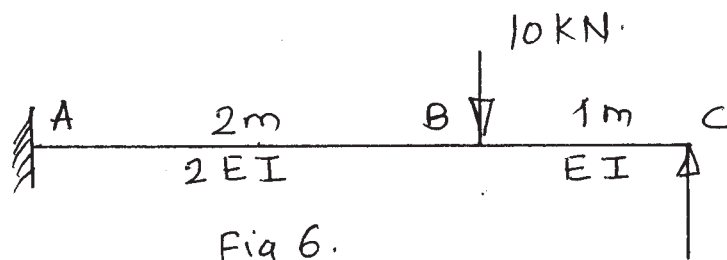


Fig 6.



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[4065] - 143

**M.E. (Electronics) (Digital Systems)
ADVANCED DIGITAL SYSTEM DESIGN
(2002 Course) (504306)**

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

Q1) Describe issues in design of data path and control unit of a processor. Design sequential circuit to compute the product of two binary numbers. Justify the design process of data path and control path can not be independent. **[16]**

Q2) a) Draw the detail CPU architecture of RISC. Compare it with CISC in detail. **[8]**

b) What do you mean by self starting and self correcting sequence generator? Design a self correcting sequence generator in which output Y is '1' if the input sequence of 11001 occurs at consecutive clock pulses, otherwise 'Y' = '0'. **[8]**

Q3) a) Draw the Built in Self Test (BIST) arrangement. Explain BIST for sequential circuit. Draw necessary block diagram. **[8]**

b) Draw the sequential circuit to compute the mean of K numbers. Draw the ASM chart and Data path circuit. **[8]**

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

- a) Signature analysis.
- b) Switch Bouncing.
- c) CAD Tools.
- d) Built in Logic Block observer (BILBO).

P.T.O.

SECTION - II

- Q5)** a) Find the Hazard free minimum cost of implementation of the function.
 $F(X_1, X_2, X_3, X_4) = \Sigma m(0, 4, 11, 13, 15) + D(2, 3, 5, 8)$. [8]
b) What is pipelined processor architecture? Discuss considerations in design of parallel processing hardware units. [8]
- Q6)** a) What will happen for a finite transmission line, if it is not terminated in Z_0 . [8]
b) Implement the Boolean function $F = X_1X_2 + X_1X_3$. [8]
i) Which type of Hazards exist in circuit.
ii) Derive the Hazard free circuit of above Boolean function.
- Q7)** a) What is system reliability and how it is measured? Explain how it is calculated for digital system with n components, each with different failure rate. [8]
b) What is the need of network design tool? Explain its structure. [8]
- Q8)** Write short notes (any three) : [18]
a) Boundary scan.
b) IEEE 486 Bus.
c) Static Hazards.
d) System integrity.



Total No. of Questions : 8]

[Total No. of Pages : 2

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[4065]-149

M.E. (Electronics) (Digital System)

MICRO ELECTRONICS

(2002 Course) (504301)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Draw and explain the block diagram of Moore Machine. [8]
b) Design a sequence detector to detect following sequence using J-K flip-flop 110. [8]
- Q2)** a) What are the limitation of silicon logic? List the features of material used to design ultra fast VLSI circuits. [8]
b) Explain MOS diode with it's important characteristics. [8]
- Q3)** a) Draw & explain operation of CMOS inverter with it's transfer characteristics. Compare the features of CMOS & BICMOS technology. [10]
b) What guidelines to be followed while designing a sub system? [6]
- Q4)** Write short notes on: [18]
a) Critical and non Critical Races.
b) N.well process.
c) Transmission Gate.

P.T.O.

SECTION - II

- Q5)** a) Design CMOS logic gates for following functions (any two): [10]
- i) $f = \overline{A} + \overline{B} \cdot \overline{C}$
 - ii) $f = \overline{A \cdot B \cdot C \cdot D}$
 - iii) $f = \overline{ABC + D}$
- b) Write VHDL code for 8:1 multiplexer using 4:1 multiplexer as a component. [6]
- Q6)** Write a short notes on: [18]
- a) Synthesizable VHDL constructs.
 - b) Process statements.
 - c) Scalar Data types.
- Q7)** a) What is Hazard? Explain with example all types of Hazards. [10]
- b) Explain P-well CMOS process in details. [6]
- Q8)** a) Explain operation of transmission gate & it's application. [10]
- b) Write VHDL code for 4bit shift register. [6]



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[4065] - 153

M.E. (Electronics) (Computer)

EMBEDDED SYSTEM AND SOFTWARE

(2002 Revised Course) (504402)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) *Answer any 3 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) *Assume suitable data if required.*
- 5) *Use of scientific calculator is allowed.*

SECTION - I

- Q1)** a) Define embedded system. Draw a schematic for a sample embedded system and explain it. [8]
b) What is a real - time operating system? Why RTOS is required for embedded system. [9]
- Q2)** a) Draw architectural diagram of any ARM processor and explain it. [8]
b) Draw and explain interrupt structure for ARM processor. Explain how interrupts are processed. [8]
- Q3)** a) Draw the block schematic for 8051 microcontroller. Explain the function of each block. [9]
b) Explain the port configuration of 8051. [8]
- Q4)** a) What is the difference between a microprocessor and a microcontroller. Define the architectural differences. [8]
b) Explain bit manipulating instructions of 8051. [8]

P.T.O.

SECTION - II

- Q5)** a) Explain i2C bus and draw a suitable diagram to explain it. [8]
b) Explain the timers and their use in case of 8051. [8]
- Q6)** a) Explain SPI and its applications. [9]
b) Draw the diagram of PIC microcontroller and explain it. [9]
- Q7)** a) Explain control signals used in Rs232. How the handshaking occurs?[8]
b) Explain different addressing modes of ARM controller. [8]
- Q8)** a) How will you enter a VHDL code? How will you run a program? [8]
b) How will you carry out the synthesis? [8]



Total No. of Questions : 10]

[Total No. of Pages : 2

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[4065] - 190
M.E. (Production)
HARD AND SOFT AUTOMATION
(2002 Revised 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) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 7) *Assume suitable data, if necessary.*
- 8) *Your answer will be valued as a whole.*

SECTION - I

- Q1)** a) Differentiate between mechanization and automation in brief. [8]
b) In a six station Geneva mechanism the driver rotates at 5 RPM [8]
Determine :
i) Cycle time of Indexing mechanism.
ii) Process time.
iii) Time spend by each cycle in indexing the table to the next working position.
- Q2)** a) Explain in brief “CORRELAP” used for location of machine in plant. [8]
b) Explain the basic terminology for analysis of transfer line with no internal storage. [8]
- Q3)** a) Explain in brief “Motor type Relay” and “Commanding drum system”. [8]
b) Explain 2D/3D method of inspection using LED or laser. [8]
- Q4)** a) What is “travel control system” used in automation. [8]
b) Explain different transducers used in Robotics. [8]

P.T.O.

- Q5)** Write short notes on any three : **[18]**
- a) Butter stock simulation.
 - b) Semi automatic versus automatic system.
 - c) Time control system.
 - d) CCD cameras.
 - e) CRAFT.

SECTION - II

- Q6)** a) Draw a Hierarchial Architecture for a cellular manufacturing system. Explain the essential characteristics of various items of a cellular manufacturing system. **[8]**
- b) Explain Generalized timed petrinets. **[8]**
- Q7)** a) What is meant by “Stochastic Processes”? Show how the basic discrete event system be modeled by “Markov Chain Analysis”. **[8]**
- b) With the neat sketches discuss different methods of obtaining low cost hard automation. **[8]**
- Q8)** a) Explain different factors affecting tool exchange rule. **[8]**
- b) Explain CTMS-continuous Markov chain model in brief. **[8]**
- Q9)** a) Using Routh Hurwitz Criterion decide the stability of the system having $F(s) = s^4 - 5s^2 + 4$ **[8]**
- b) Explain tribological considerations in designing handling equipments. **[8]**
- Q10)** Write short notes on any three : **[18]**
- a) Balancing of line.
 - b) Protective coating of equipments to eliminate erosive or corrosive.
 - c) LVDT.
 - d) Feedback control system.
 - e) FMM, FMC & FMS.



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[4065]-193

M.E. (Production)

ADVANCED MACHINE TOOL DESIGN

(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) Show that in 'twin gear block' or 'triple gear block' the difference between the consecutive numbering teeth should be greater than or equal to 4. [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) Starting from the first principle and using non-dimensional analysis derive an equation for cutting force while machining steel with HSS single point cutting tool. [8]
- b) How can you make a variator using internal cone and conical roller, a positive self locking unit? [8]
- Q3)** a) Show any typical method of preloading a lead screw and the major considerations thereof. [6]
- b) In a surface grinding machine it is necessary to design table guides having straight flat configuration so as to obtain hydrodynamic lubrication. If the viscosity of the film is 0.07 N-s/m^2 and minimum oil film thickness is

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15 micron, find the width of the guide. Table moves with a feed velocity of 0.4 mm/sec and the uplifting hydrodynamic force balances half of the vertical load acting on the table. Weight of the table and vertical component of cutting force together comes to be 25 kN and the specific pressure on guide on each side is 1.5 N/cm². Design a guide. [10]

- Q4)** a) In designing the bed of a machine tool, it is often found that the hollow rectangular cross-section is the most suitable one. Make a comprehensive evaluation of the various types of cross sections commonly used in machine tool on the basis of stress and deflection in both bending and torsion. [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) Analyze the load taken by the balls in a ball bearing used as a spindle support and show that due to contact deformation not more than 80% of the balls take the entire thrust. [8]
- 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. [8]
- Q7)** a) What is meant by regenerative chatter? Explain it with reference to any one type of machine tool. [8]
- 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) 'Stick-slip' error can be reduced by using hydraulic relieving of the table of a vertical boring machine. Prove that in such a case the oil film thickness is given $1.47 h_0$, where h_0 is the minimum oil film thickness, mainly due to surface asperities. [8]
- b) Draw a circuit diagram for hydrostatic power pack and flow line for a high speed spindle. Explain the function of important units of the system. Find out an expression for load that can be supported by it. [8]

- Q9)** a) Compare the following systems : **[8]**
- i) Stepper motor and DC servomotors.
 - ii) DNC and Stand-alone NC machine.
- b) What are the various types of transducers commonly used in a CNC machine? Explain the functioning of Linear Transducer and Angular 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.



Total No. of Questions : 8]

[Total No. of Pages : 2

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[4065] - 194

M.E. (Production)

CIM AND ADVANCED MANUFACTURING PROCESSES

(2002 Course)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) *Solve any three questions from each section.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Figures to the right indicate full marks.*
- 4) *Draw neat sketches wherever required.*

SECTION - I

- Q1)** a) What is a CAPP system? Explain Generative Process Planning Technique with suitable example by considering any engineering components [8]
b) Explain any two module related to manufacturing application for MRP-II? [8]
- Q2)** a) Explain necessary information required for preparation of data file for a component [8]
b) Describe with suitable example the implementation of CIM? [8]
- Q3)** a) Explain various functions of AGV?What are the equipments and accessories commonly used in AGV guidance and control? [8]
b) Explain computerized elements of a CIM system? [8]
- Q4)** Write short notes on any three. [18]
a) Online automatic part inspection.
b) Network topology in CIMS.
c) Combined CNC/DNC systems.
d) Opitz system for classification and codification of parts.

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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) With the help of neat sketch explain the principle of working of an iron beam machining system. How is the beam controlled? [8]
- Q6)** a) Explain different process parameters that affect on material removal rate in EDM process? [8]
b) Explain different factors affecting 'high speed machining'. [8]
- Q7)** a) Explain steriolithography process of rapid prototyping along with Advantages, limitation. [8]
b) Discuss the concept of lean manufacturing. [8]
- Q8)** Write short notes on any three: [18]
a) micromachining.
b) solid base curing Fused deposition method of Rapid prototyping.
c) Chemical milling process.
d) Agile manufacturing.



Total No. of Questions : 8]

[Total No. of Pages : 2

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[4065]-197

M.E. (Production)

Human Factors in Design and Manufacturing

(2002 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 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) Explain MRP1 in detail. **[16]**

Q2) Explain Analytical Hierarchy process with suitable illustration. **[16]**

Q3) Explain various stages of product life cycle in detail. **[16]**

Q4) Write short note on:

- a) Manpower planning. **[6]**
- b) Product data management. **[6]**
- c) Use of Diagraph. **[6]**

SECTION - II

Q5) Explain supply chain management of any automobile industry. **[16]**

P.T.O.

Q6) Explain following important aspects of Man - Machine system. **[16]**

- a) Design of displays.
- b) Design of controls.
- c) Working conditions.

Q7) Explain principles of Ergonomics. **[16]**

Q8) Write short note on:

- a) Lean manufacturing. **[6]**
- b) Impact of MRP in World Class. **[6]**
- c) Safety in manufacturing. **[6]**



Total No. of Questions : 8]

[Total No. of Pages : 2

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[4065] - 198

M.E. (Production)

PRECISION ENGINEERING

(Elective - II) (2002 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) *Neat diagrams must be drawn wherever necessary.*
- 5) *Use of non-programmable electronic pocket calculator and statistical tables is allowed.*
- 6) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Explain the degradation of workmanship principle. Describe the modern reference surfaces. [8]
b) Elaborate the significance of spindle rotation error for machine tools. [8]
- Q2)** a) Illustrate with a suitable example the purpose of using the interchangeability assembly concept in manufacturing. [8]
b) Explain with neat sketch, procedure of calculating the clearance in journal bearings. [8]
- Q3)** a) Detail the chief roles of the microscope in applied metrology. State the significance of interchange and displacement measurement. [8]
b) Describe with suitable sketches the influence of machining parameters on surface roughness. [8]
- Q4)** Write short notes on (any three): [18]
a) Significance of traceability.
b) Precision angle measurement.
c) Clamping and setting errors.
d) Role of amplification in measurement.

P.T.O.

SECTION - II

- Q5)** a) State the principles which govern the design of limit gauges giving examples of such gauges to check: [8]
- i) Length
 - ii) Diameter
 - iii) Depth
 - iv) Distance between an internal and an external face.
- b) State reasons why Coordinate Measuring Machines (CMM's) have not potentially shared by individual measuring instruments. [8]
- Q6)** a) Explain the general concept of accuracy of machine tool in the context of precision engineering. [8]
- b) Enumerate your thoughts on the merits and limitations of analog vs. digital measuring equipment. Give specific examples. [8]
- Q7)** a) Discuss the rational subgroup concept. What part does it play in control chart analysis? [8]
- b) Explain the need of microfinishing processes in the machining of metals. [8]
- Q8)** a) Explain with a suitable example the inaccuracies due to thermal effects in precision machining. [10]
- b) Write a short note on principle of constant location surfaces. [8]



Total No. of Questions : 8]

[Total No. of Pages : 3

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[4065] - 203

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 in the context of databases. **[16]**

- a) SQL aggregate functions (Hint AVG, COUNT..).
- b) Importance of data for today's businesses.
- c) Database transactions.
- d) Database storage (Hint Btree, hash..).

Q2) In context of databases give examples, explain concept. WRITE on ANY FOUR. **[16]**

- a) Parallel database queries.
- b) Primary keys.
- c) Classification in datmining.
- d) CREATE sql command.
- e) Database tuning.
- f) Table inheritance.

Q3) Explain ANY FOUR of the following concepts with examples. **[16]**

- a) Advanced search options in search engines like google.
- b) Distributed lock management.
- c) What do you understand by Shared Nothing architecture.
- d) Commit, rollback.
- e) Deadlocks detection.
- f) Intra query, inter query parallelism.

P.T.O.

- Q4)** Write short notes on any three : **[18]**
- a) TRANSACTION servers.
 - b) Client server systems.
 - c) Parallel versus distributed databases.
 - d) Fragmentation (horizontal, vertical).
 - e) Data mining applications.
 - f) RDBMS.

SECTION - II

- Q5)** Write short notes on any three : **[18]**
- a) Object oriented features useful for databases.
 - b) Any commercial database (Hint sqlserver, MS access..).
 - c) Database applications for INTERNET.
 - d) Database Administrator's role (Hint performance, tuning, security).
 - e) Application of databases for hospitals.
 - f) Application of internet databases for education field.
 - g) Application of databases for sports.
- Q6)** Give example and applications of following. Write on any four. **[16]**
- a) Relational tables, columns, keys.
 - b) Failure of database transactions.
 - c) SQL queries.
 - d) Information retrieval.
 - e) Goggle maps as a database/GIS application.
 - f) XML for databases.
- Q7)** Explain with examples the following. Write on any four. **[16]**
- a) Application of databases for savings account in typical banks.
 - b) Need for security in online shopping.
 - c) ER diagrams.
 - d) ATM banking as a database application.
 - e) HTML.
 - f) E COMMERCE.

Q8) With suitable examples, explain any four of the following :

[16]

- a) Application of databases for DVD rental libraries.
- b) Graphical or geographic data.
- c) Document databases (unstructured data).
- d) JDBC.
- e) Database indexes.
- f) SQL joins.



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[4065] - 207

M.E. (Computer)

GEOMETRIC AND SOLID MODELING

(Revised 2002 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) How do we do representation conversion? Explain with CSG to Boundary representation. [4]
b) With the help of an example show that ordinary Boolean intersection of two cubes may produce
i) Solid ii) Plane
iii) Pint iv) Line [8]
c) What spatial data structure for representation of solids? Explain flat and hierarchical spatial data structure. [6]
- Q2)** a) What are the different classes of manifolds? What is the relation between different shapes and manifolds? [8]
b) Explain the winged edge representation technique for representing the boundary of polyhedron. [8]
- Q3)** a) Explain the following with space decomposition. [12]
• Affine Cell decomposition.
• Simplicial decomposition.
• Triangulation.
• Stratifications.
b) What is range tree? What is its use in modeling? Explain in brief. [4]
- Q4)** Explain the following representation scheme. [16]
a) Pure primitive instancing. b) Constructive schemes.
c) Decomposition schemes. d) Hybrid schemes.

P.T.O

SECTION - II

- Q5)** What is sweeping technique for solid modeling? Explain the following with sweeping technique. **[16]**
- a) Translational.
 - b) Rotational.
 - c) General sweeping.
 - d) Generative modeling.
- Q6)** a) What property of raster displays makes the technique of the ray tracing possible? **[6]**
- b) What do we mean by parametric and implicit forms for different representation of conics? Give the parametric form and implicit form of the circle, ellipse, parabola and hyperbola. **[10]**
- Q7)** a) Compare and contrast between graph based model, Boolean model, boundary model and space partitioning model. **[8]**
- b) How do we intersect the two implicit surfaces numerically? Write the steps to do the intersection. **[8]**
- Q8)** a) A ray is represented by $r(t) = s + td$ where $s = 2i + j$ and $d = i + 2k$, find the coordinate on the ray that correspond to $t = 0, 1, 2.5$ and 3 respectively. **[8]**
- b) What is floating point arithmetic's? What is its significance for solid modeling? Explain the following errors with respect to floating point arithmetic. **[10]**
- i) conversion errors.
 - ii) round off errors.
 - iii) digit cancellation errors.



Total No. of Questions : 8]

[Total No. of Pages : 2

P1439

[4065]-209

M.E. (Computer)

NETWORK SECURITY

(2002 Course) (Elective - I)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer three questions from each section.*
- 2) *Answer 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) Explain in brief Cipher block modes of operation. [8]
b) List and briefly define types of cryptanalytic attacks based on what is known to the attacker. [8]
- Q2)** a) Consider an automated teller machine (ATM) in which users provide a personal identification number (PIN) and a card for account access. Give examples of confidentiality, integrity and availability requirements associated with the system and, in each case, indicate the degree of importance of the requirement. [10]
b) Use the properties of mod operator to prove the following: [6]
i) The remainder of any integer when divided by 10 is the rightmost digit.
ii) The remainder of any integer when divided by 100 is the integer made of the two rightmost digit.
- Q3)** a) Suppose that someone suggests the following way to confirm that two of you are both in possession of same secret key. You create a random bit string the length of the key, XOR it with the key, and send the result over the channel, your partner XORs the incoming block with the key and send it back. You check, and if what you receive is your original random string, you have verified that your partner has the same secret key, yet neither of you has ever transmitted the key. Is there any flaw in this scheme. Prove with example string and key. [8]

P.T.O.

- b) Distinguish between public and private keys in an arithmetic key cryptosystem. Compare and contrast the keys in symmetric key and asymmetric key cryptosystems. [8]

- Q4)** a) Distinguish between Feistel and Non-Feistel block cipher. [8]
b) Why do MD4, MD5 and SHA - 1 require padding of messages that are already a multiple of 512 bits? [10]

SECTION - II

- Q5)** a) What is biometric security? Which security mechanisms are followed in biometric security? Explain the fingerprinting in detail. [10]
b) Define security policy and explain its purpose with relation to IPSEC. [6]

- Q6)** a) Using the RSA scheme, let $p = 809$, $q = 751$ and $d = 23$ calculate the public key e . then. [10]
i) sign and verify a message with $M1 = 100$ call the signature $S1$.
ii) sign and verify a message with $M2 = 50$ call the signature $S2$.
iii) Show that if $M = M1 * M2 = 5000$, then $S = S1 * S2$.
b) Explain with the basic principle the SSL record protocol. [8]

- Q7)** a) List and briefly describe the principle physical characteristics used for biometric identification. In context with biometric user authentication, explain the terms, enrollment, verification and identification. [10]
b) Define a certificate authority and its relation to public key cryptography. [6]

- Q8)** a) Define Kerberos and name its servers, briefly explain the duties of each server. [6]
b) What are the types of analysis adopted by intrusion detection and protection systems (IDPS)? What are the types of IDPS? [10]



P1441

[4065] - 234

M.E. (Instrumentation, Process and Biomedical)

ADVANCED MATHEMATICS

(2002 Revised Course) (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 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) With usual notations, prove that (any two): [6]

i) $\mu^2 = 1 + \frac{\delta^2}{4}$

ii) $\Delta^3 y_2 = \nabla^3 y_5$

iii) $D = \frac{1}{h} \left[\Delta - \frac{\Delta^2}{2} + \frac{\Delta^3}{3} - \dots \right]$

b) In the table below, the values of y are consecutive terms of a series of which 23.6 is the 6th term. Find the first and tenth terms of the series:[10]

x:	3	4	5	6	7	8	9
y:	4.8	8.4	14.5	23.6	36.2	52.8	73.9

Q2) a) Fit a second degree parabola to the following data: [8]

x =	1.0	1.5	2.0	2.5	3.0	3.5	4.0
y =	1.1	1.3	1.6	2.0	2.7	3.4	4.1

b) Find a real root of $2x - \log_{10} x = 7$ correct to four decimal places using iteration method. [8]

P.T.O

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

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

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:

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

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

$$2x - 3y + 20z = 25$$

[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	2.1	2.8	4.1	4.9	6.2
$y:$	4.2	6.8	9.8	13.4	15.5	19.6

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

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

$x:$	45	50	55	60	65
$y:$	3.0	-	2.0	-	-2.4

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

SECTION - II

Q6) a) Show that $u = \frac{-2xyz}{(x^2 + y^2)^2}$, $v =$, $w = \frac{y}{x^2 + y^2}$ are the velocity

components of a possible fluid motion. Verify whether the motion is irrotational. [6]

- b) If ρ and \mathbf{v} are the density and velocity of moving fluid then derive the equation of continuity of fluid dynamics namely

Also show that the above equation of continuity can be rewritten as

[10]

Q7) a) If a fluid is at rest, $\frac{d\bar{q}}{dt} = \bar{0}$ show that $\nabla \cdot (p\bar{F}) = 0$ and hence $\bar{F} \cdot \text{curl} = 0$. [8]

- b) Apply Euler's dynamical equation of motion of a fluid to the case of liquid in motion where

$u = -wy, v = -wx, w = 0$, where w is constant, and integrate these equations taking the field as conservative and liquid as homogeneous. [8]

Q8) a) Given the PDF : $f(t) =$

for the random variable T , the time (in operating hours) to a failure of a compressor, what is its reliability for a 100-hour operating life? And what is the design life for a reliability of 0.95 to be desired? [6]

- b) Show that $R_1(t) = e^{-0.002t}$, $t \geq 0$ and

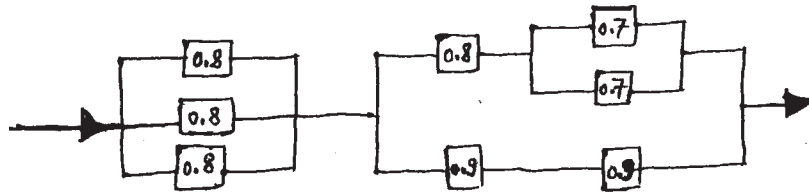
$$R_2(t) = \frac{1000-t}{1000}, 0 \leq t \leq 1000$$

have the same mean but their reliabilities are quite different for the same operating time. [6]

- c) An aircraft engine consists of three modules having constant failure rates of $\lambda_1 = 0.002$, $\lambda_2 = 0.015$, and $\lambda_3 = 0.0025$ failure per operating hour. Find the MTTF. [6]

Q9) a) The three parameter Weibull has $k = 4$, $t_0 = 100$ and $\theta = 780$. Compute its MTTF, median, standard deviation and reliability for a 500-hr mission. [8]

- b) Find the system reliability of the following series - parallel configurations. Component reliabilities are given. [8]



- Q10)a)** For a system with shape parameter 1.4 and a scale parameter 550 days determine the reliability for 100 days, if there are two redundant components. [6]
- b) The time to repair a failed widget has the following probability density function: [6]
 $h(t) = 0.08333t, 1 \leq t \leq 5$ hr.
 Find the probability of completing a repair in less than 3 hrs and the mean time to repair.
- c) Given two components, each having a constant failure rate of 0.10 failures per hour and a constant repair rate of 0.20 repair per hour, compute point and interval availability for a 10 hr. mission, and steady - state availability for both series and parallel configurations. [6]



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[4065] - 235

M.E. (Instrumentation) (Process and Biomedical)
CONTROL SYSTEM
(2002 Course) (506106)

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 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) Obtain State space and transfer function representation for the system shown in Fig. 1. **[18]**

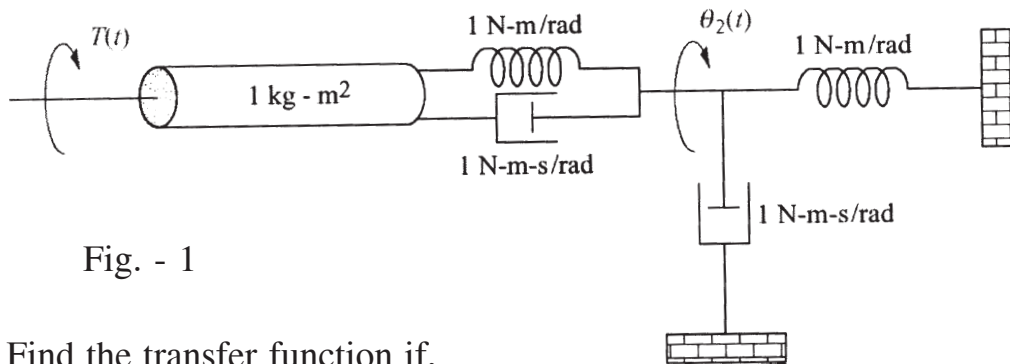


Fig. - 1

b) Find the transfer function if,

$$A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -6 & -11 & -6 \end{bmatrix}, B = \begin{bmatrix} 1 \\ 1 \\ 2 \end{bmatrix}, C = (1 \ 1 \ 1), D = 0 \quad [7]$$

Q2) a) Investigate the stability of the system shown in Fig. 2 for sampling period $T = 0.4$ second, $T = 3$ second, and without sample. Comment on effect of sampling period on stability. **[15]**

P.T.O.

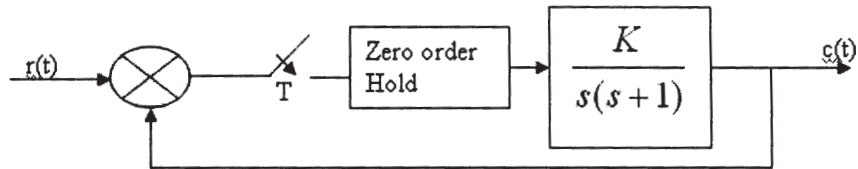


Fig. 2

b) Check the controllability and observability of the continuous system if

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -24 & -26 & -9 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u$$

$$y = 2x_1 + 7x_2 + x_3. \quad [10]$$

Q3) a) Obtain the solution $x(t)$ for the system [10]

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 1 \\ 2 \end{bmatrix} u$$

$$y = 8x_1 + 2x_2 \text{ with } \begin{bmatrix} x_1(0) \\ x_2(0) \end{bmatrix} = \begin{bmatrix} 1 \\ 0 \end{bmatrix} \& u = \text{unit step}$$

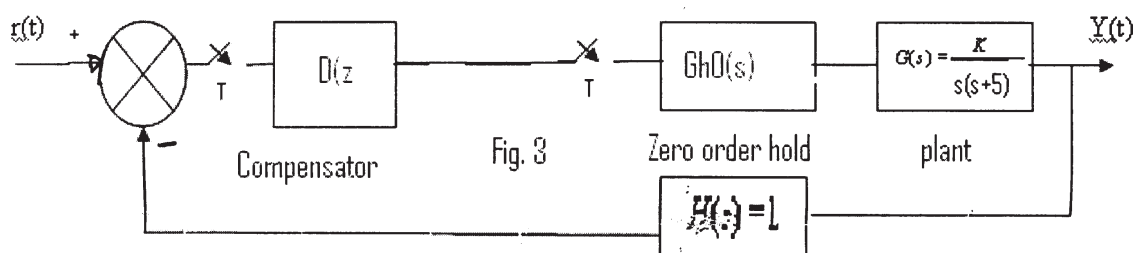
b) Write short note on : [15]

- i) Role of sampler and hold in digital control system.
- ii) Gilbert's method of Controllability.
- iii) Advantages and limitations of state space theory.

SECTION - II

Q4) Design a digital compensator for the system shown in fig. 3 to meet the following specifications. Assume $T = 1$ sec. [25]

- a) The velocity error constant should be equal or greater than 10.
- b) Phase Margin (Approx.) = 30 degrees.
- c) Bandwidth = 10 rad/sec.



Q5) a) Explain the steps involved in systems identification with help of flow chart and write short note on : **[15]**

- i) ARX model structure.
- ii) OE (output-error) model

b) Design a PI controller for the system. **[10]**

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

using the controller synthesis. Select suitable tuning parameter (filter) α .

Q6) a) Explain the concept of ringing. What are the different steps to design dead-beat controller? Design deadbeat controller for the system. Assume zero order hold and sampling period of $T = 1$ sec. **[15]**

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

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

- i) Direct synthesis method of controller design.
- ii) Advantages and disadvantages of digital control systems.



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[4065] - 240

M.E. (Instrumentation) (Process and 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)** Explain working principle of watch-dog timer. What are the ways to implement it in an 8051 - microcontroller based system. **[25]**
- Q2)** Device a scheme for measurement of temperature by using Microcontroller in frequency measurement mode. **[25]**
- Q3)** What are the constrains for driving an electro-magnetic relay in microcontroller based system? Support your answer with a scheme with the help of block diagram. **[25]**

SECTION - II

- Q4)** Explain 'Random Read' and 'Sequential read' cycle in 2-wire (IIC) based EEPROM with the help of timing diagram. **[25]**
- Q5)** Comment on advantages and limitations of RS232 and RS485 serial interface with a circuit schematic. What are the constrains on selection of speed of communication. **[25]**
- Q6)** Write short notes on : **[25]**
- a) Different techniques for key de-bouncing methods with circuit diagram and timing diagram.
 - b) Principle of working of Reset signal generation logic in 8051 microcontroller with the help of circuit diagram and timing diagram.



P1445

[4065] - 247

M.E. (Instru. & Control) (Process Instru.)

ADVANCED TECHNIQUES IN MODELING AND OPTIMIZATION

(2002 Course) (506110(b))

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Answer any 2 questions from each section.
- 2) Answers to the two sections should be written in separate books.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Figures to the right indicate full marks.
- 5) 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) Obtain the linearized model of the quadruple tank process shown in Fig. 1. Assume suitable parameters/terms if required. [25]

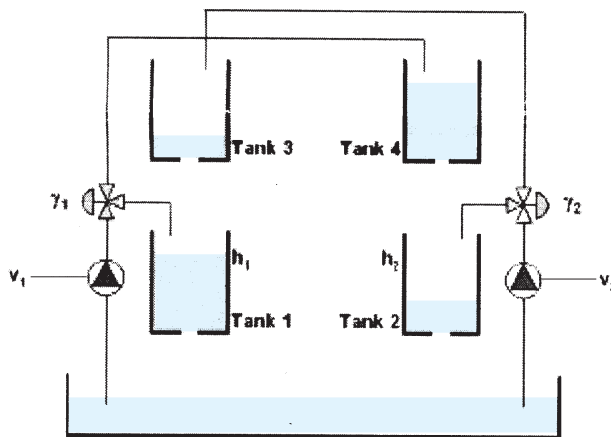
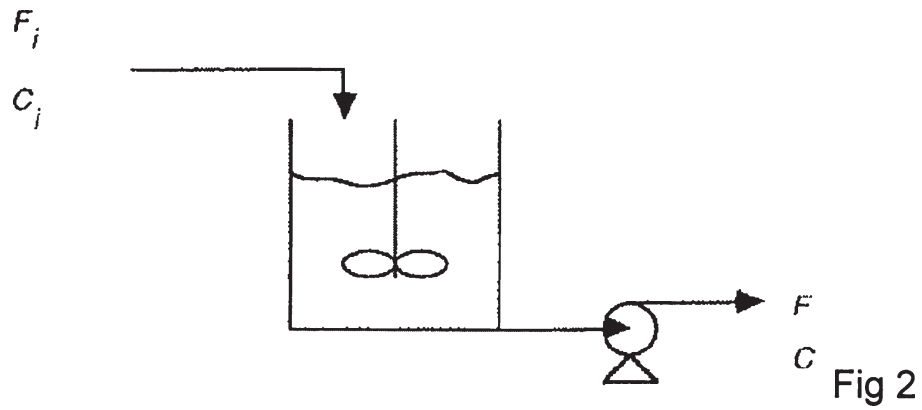


Fig.1

where
 A_i cross-section of Tank i ;
 a_i cross-section of the outlet hole;
 h_i water level.

Q2) Explain in detail the role of mathematical modeling in process industries. Obtain differential model of the CSTD system shown in Fig. 2. Also obtain the linearized state model. [25]

P.T.O.



Q3) Explain in details the steps used to solve a minimization problem (with reference to any suitable method of minimization) and [25]

Find the minimum value of

$$w = 3x_1 + 2x_2$$

Subject to the constraints

$$2x_1 + x_2 \geq 6$$

$$x_1 + x_2 \geq 4$$

where $x_1 \geq 0$ and $x_2 \geq 0$.

SECTION - II

Q4) How to carry-out the modeling of the CSTR as shown in Fig.3. What are different fundamental laws required to model. Explain the different steps/ procedure involved in the modeling. [25]

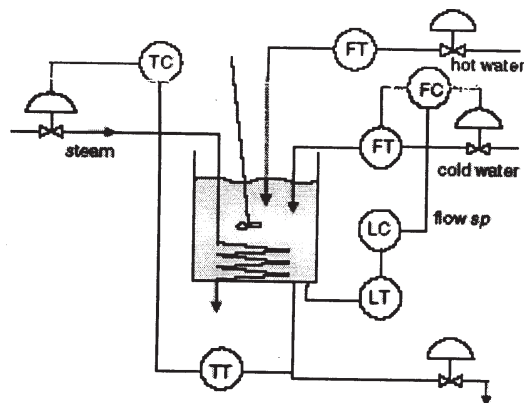


Fig. 3

Q5) A steel company has two mills. Mill 1 costs Rs. 70,000 per day to operate, and it can produce 400 tons of high-grade steel, 500 tons of medium-grade steel, and 450 tons of low-grade steel each day. Mill 2 costs Rs. 60,000 per day to operate, and it can produce 350 tons of high-grade steel, 600 tons of medium-grade steel, and 400 tons of low-grade steel each day. The company has orders totaling 100,000 tons of high-grade steel, 150,000 tons of medium-grade steel, and 124,500 tons of low-grade steel. How many days should the company run each mill to minimize its costs and still fill the orders. **[25]**

Q6) Write short note on : **[25]**

- a) Newton-Rapson method.
- b) Runga-Kutta method.
- c) Adom Bashforth method.



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[4065] - 264

M.E. CSE (Information Technology)

OPERATING SYSTEMS

(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 answer books.
- 4) Neat diagrams must be drawn wherever necessary.

SECTION - I

- Q1)** a) What is a distributed system? 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]
- Q2)** 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 absolute ordering and consistent ordering of messages. Give a mechanism to implement each one. [8]
- Q3)** a) Explain the Bully and Ring election algorithms. Discuss the time complexity for both algorithms. [8]
b) Describe the implementation of logical clocks using: [8]
i) Counters. ii) Physical clocks.
- Q4)** a) Discuss the desirable features of a good distributed file system. [8]
b) What are the differences between replication and caching? What are the advantages of replication of data in a distributed file system? [8]

P.T.O

SECTION - II

- Q5)** a) Explain any two address space transfer mechanisms which are suitable for a process migration facility with high performance and high reliability goals. [8]
b) Discuss the desirable features of a good process migration mechanism. [8]
- Q6)** 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) What are the main causes of thrashing in a DSM system? What are the commonly used methods to solve the thrashing problem in a DSM system? [8]
- Q7)** a) Explain how address translation takes place with the help of neat diagrams in [8]
i) Paging. ii) Segmentation.
b) Implement the Reader Writer problem using semaphores and discuss how the critical section requirements are fulfilled. [8]
- Q8)** Write short notes (Any Three): [18]
a) Mutual exclusion.
b) RPC.
c) Fault tolerance.
d) Gifford Quorum based protocol.



P1449

[4065] - 294

M.E. (Chemical)

ADVANCED PROCESS DYNAMICS & CONTROL

(109108) (2002 Course) (Sem. - II)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

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

SECTION - I

Q1) What is linearization? How it is done? Linearize the following models in time - domain around the steady state value and find transfer function model. **[16]**

- a) $q_0(t) = kh^{1/2}$
- b) $K(t) = K_0 \exp(-E/RT)$.

Q2) Explain empirical modeling approach of studying dynamic behaviour of processor. Explain the following methods of process identification. **[16]**

- a) Step-response method.
- b) Impulse - response method.

Q3) Explain the characteristics of non-linear systems. Explain the node, saddle, focus and center behavior of the non-linear system based on the eigen value analysis of state space model. **[16]**

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

- a) Time-delay systems.
- b) Open-loop unstable systems.
- c) Antireset wind-up systems.

P.T.O.

SECTION - II

Q5) A 2×2 MIMO process has steady-state gain matrix

$$\mathbf{K} = \begin{bmatrix} K_{11} & K_{12} \\ K_{21} & K_{22} \end{bmatrix}$$

Derive the expression for RGA of this system. State the properties of RGA and rules for determining the input-output pairing of variables. **[16]**

Q6) a) What are decouplers? Derive the transfer functions for decoupling element for a 2×2 system. **[8]**

b) For a 2×2 process modeled as

$$\bar{y}_1(s) = \frac{0.5 \exp(-1.5s)}{s+1} \bar{m}_1 + \frac{\exp(-0.5s)}{2s+1} \bar{m}_2.$$

$$\bar{y}_2(s) = \frac{2 \exp(-s)}{0.5s+1} \bar{m}_1 + \frac{1}{s+1} \bar{m}_2$$

Find the transfer function of decouplers for the control loops between $m_1 - y_1$ & $m_2 - y_2$. State whether the decouplers are physically realizable? **[8]**

Q7) a) Draw and explain block diagram of digital control system. **[8]**

b) What are hold elements? Explain ZOH & FOH type hold elements with relative advantages. **[8]**

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

- a) Limit cycle behavior.
- b) MPC.
- c) SPC.



P1450

[4065] - 295

M.E. (Chemical)

NOVEL SEPARATION TECHNIQUES

(2002 Course) (109104)

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) Neat diagrams must be drawn wherever necessary.*
- 3) Figures to the right indicate full marks.*
- 4) Assume suitable data, if necessary.*

SECTION - I

- Q1)** Describe the following transport models for R.O. membrane process -
- a) Nonporous membrane models.
 - b) Pore-based models.
 - c) Phenomenological models. **[18]**
- Q2)** Describe the construction of following membrane modules - **[16]**
- a) Spiral wound module.
 - b) Tubular module.
 - c) Hollow fibre module.
- Q3)** Explain the following pretreatment methods for R.O. Process - **[16]**
- a) Treatments for preventing chemical damage to the membrane.
 - b) Treatment to remove fouling of membranes.
- Q4)** Explain the following uF process configurations - **[16]**
- a) Batch concentration.
 - b) Feed & bleed type.
 - c) Diafiltration.

P.T.O.

SECTION - II

- Q5)** Explain the following MF processes in detail.
- a) Deadend MF.
 - b) Cross-flow MF. **[16]**
- Q6)** Explain the following modes of separation by pervaporation (PV) -
- a) Vacuum driven process.
 - b) Temperature - gradient driven process.
 - c) Carrier gas PV.
 - d) PV with fractional permeate condensation. **[16]**
- Q7)** Explain design considerations of ELM process with the help of following -
- a) Membrane formulation.
 - b) Emulsion preparation.
 - c) Demulsification. **[16]**
- Q8)** Write short notes on the following :
- a) TSA for removal of pollutants.
 - b) Elution chromatography.
 - c) SCFE. **[18]**



Total No. of Questions : 8]

[Total No. of Pages : 2

P1451

[4065]-296

M.E. (Chemical)

CATALYSIS AND SURFACE PHENOMENON

(109109) (2002 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) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 6) *Assume suitable data, if necessary.*

SECTION - I

Q1) Give the classification of catalysis and discuss the preparation of Catalysis using laboratory techniques. **[16]**

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

Q3) Discuss the characterization of catalysis using.

- a) ESCA method. **[8]**
- b) ESR method. **[8]**

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

- a) Porosimetry.
- b) Analysis of transition model Catalysis.
- c) Natural Zeolites.

SECTION - II

Q5) Discuss the heat & mass transport in porous catalyst. **[16]**

P.T.O.

Q6) Define adsorption. What are the different types of adsorption? Discuss any 4 types. Draw the nature of plots & write all necessary Equations. **[16]**

Q7) Derive the equation for effectiveness factor & Thiele modulus in catalysis. **[16]**

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

- a) Kinetics of Catalyst deactivation.
- b) Catalyst regeneration.
- c) Fixed Bed & Fluidized bed Reactor.



P1453

[4065] - 562

M.E. (Mechanical) (Automotive Engineering)

COMPUTATIONAL FLUID DYNAMICS

(2008 Course) (Elective - IV) (502310A)

Time : 3 Hours]

[Max. Marks : 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) For a square ABCD of length L as the control volume in a flow domain

- a) Apply mass conservation. [6]
- b) Apply momentum equation in terms of momentum flux and shear stress. [12]

Q2) a) Discuss the various types of boundary conditions of one example of each. [6]

- b) For one dimensional transient conduction, formulate the finite difference equation in explicit form and Crank Nicholson form. [10]

Q3) Present the algorithm for Alternating Direction Implicit (ADI) scheme for solving two dimensional transient heat conduction equation. What is the main advantage of this scheme? [16]

Q4) Write short note on : [16]

- a) Navier stokes equations.
- b) Finite volume method.

P.T.O.

SECTION - II

- Q5)** Obtain the expression for continuity equation, momentum equation and energy equation for converging-diverging nozzle for one dimensional compressible flow. **[18]**
- Q6)** Describe the MacCormak's technique for evaluating the density at time step $(t + \Delta t)$. **[16]**
- Q7)** For supersonic flow over flat plate.
- a) Write the full governing equations. **[6]**
 - b) Present the algorithm for updating u , the x-component velocity. **[10]**
- Q8)** a) Explain the physical meaning of divergence of velocity. **[6]**
- b) Take a suitable 2D Cartesian grid, show how surface and volume integral can be approximated. **[10]**



P1454

[4065] - 565

M.E. (Electrical)

ADVANCED MATHEMATICAL TECHNIQUE FOR CONTROL SYSTEM

(503101) (2008 Course) (Sem. - I)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) Answer 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) 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 what do you understand by Euclidian space, space vector and vectors. [10]

b) Explain the concept of convex function. [6]

OR

Q2) a) Explain the method of Legrangian Multiplier. [8]

b) Write the concept of local and global extrema. [8]

Q3) Explain the method of obtaining extremum point of multivariable optimization with equality constraints. [16]

OR

Q4) Use analytical method to investigate for extremum points.

$$f(x) = x_1^3 + x_2^3 + x_3^3 + 2x_1^2 + 6x_2^2 + 9x_3^2 \quad [16]$$

Q5) a) Explain the step by step procedure of revised simplex method. [9]

b) Write the steepest descent method of optimization of a problem. [9]

OR

Q6) Consider the linear programming problem maximize $f = 50x_1 + 100x_2$ subject to [18]

$$2x_1 + x_2 \leq 1250, 2x_1 + 5x_2 \leq 1000,$$

$$2x_1 + 3x_2 \leq 900, x_2 \leq 150$$

$$\text{Where } x_1 \geq 0 \text{ \& } x_2 \geq 0.$$

P.T.O.

SECTION - II

Q7) Find the maximum of the function

$$f(x) = x/2 \text{ for } x \leq 2$$
$$= -x + 3 \text{ for } x > 2$$

by using the unrestricted search method. Initial guess point $x_1 = -1.0$ & $S = 0.4$
[18]

OR

Q8) Find the maxi. value of the function $f = x(1.5 - x)$ in the interval (0, 1) to within 10% of the exact value by exhaustive search method. [18]

Q9) Explain the method of conversion of non serial system to serial system problem. [16]

OR

Q10) Explain the computational procedure in dynamic programming. [16]

Q11) Minimize $f = -3x_1 - 4x_2$
Subject to $3x_1 - x_2 + x_3 = 10$
 $3x_1 + 11x_2 + 2x_4 = 64$
 $x_i \geq 0, i = 1 \text{ to } 4$ & x_i is integer. [16]

OR

Q12) Explain the basic concept of stochastic linear and nonlinear programming. [16]



P1456

[4065]-567

**M.E. (Electrical) (Control System)
NONLINEAR CONTROL SYSTEM
(Revised 2008 Course) (Sem. - I) (503103)**

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 from Section I. Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12 from Section II.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 6) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Classify the nonlinearities present in physical system. Elaborate different types of nonlinearities. **[9]**
- b) Give in detail different types of singular points with their significance for non autonomous system. **[8]**

OR

- Q2)** a) Discuss the phenomena exhibited due to presence of nonlinear elements in control system. **[9]**
- b) Write in detail different methods of analysis of nonlinear systems. **[8]**
- Q3)** a) Compare Delta and Isoclines phase plane trajectory method. **[8]**
- b) Using Isocline method draw phase plane trajectory of second order equation $2\ddot{x} + 2\dot{x} + x = 0$ taking starting point as $\dot{x}=1.5, x=0$. **[9]**

OR

- Q4)** a) Explain phase plane plot for Vender pol equation. **[8]**
- b) Explain Pell's method of phase plane trajectory. **[9]**

P.T.O.

- Q5)** a) Explain Popov Criterion for the absolute stability. [8]
 b) Compare describing function and phase plane method used for analysis of nonlinear control system. [8]

OR

- Q6)** a) Derive describing function for relay with dead zone. [8]
 b) Determine the frequency and amplitude of the limit cycle if it exist for unity feedback control system a saturating amplifier has a gain of ± 1 in linear zone and saturate at input level of ± 2 is connected in cascade with $G(s) = \frac{1}{s(s+2)}$ use describing function method. [8]

SECTION - II

- Q7)** a) Explain in detail stability of equilibrium point for autonomous system. [8]
 b) An autonomous system is given below.

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ 1 & -2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

Examine the stability using Liapunov theorem. [8]

OR

- Q8)** a) Explain positive/negative definiteness for quadratic form of scalar function. [8]
 b) Select

$$V = 2x_1^2 + 3x_2^2$$

$$V = x_1^4 + x_2^2$$

as Liapunov function and discuss stability for each case for the system given by $\dot{x}_1 = 2x_2$ $\dot{x}_2 = x_1 - x_2$. [8]

- Q9)** a) For autonomous system determine the equation $A^T P + PA = -Q$ as Liapunov equation where P is real symmetric matrix and Q is positive definite matrix. [8]
 b) Explain Krasovskii method for determination of Liapunov function. [8]

OR

- Q10)** Explain clearly step involved in input. Out linearization and input state linearization. [16]

$$\dot{x}_1 = x_2 + 2x_1^3 + 4$$

$$\dot{x}_2 = -4$$

- Q11) a)** Explain the terms **[9]**
- i) Reacting phase.
 - ii) Sliding phase.
 - iii) Chattering phase.

- b) Determine sliding dynamics along sliding set for the system. **[9]**

$$\dot{x}_1 = -x_1 - 2x_2 + \text{sign}(x_1 - x_2)$$

$$\dot{x}_2 = -x_1$$

OR

- Q12) a)** For the given system **[10]**

$$\dot{x}_1 = x_2$$

$$\dot{x}_2 = 2x_1 + 3x_3$$

$$\dot{x}_3 = -x_1 - 2x_2 - 3x_3 + 4$$

Design a stable sliding surface for it.

- b) Consider the Vender Pol's equation **[8]**

$$\dot{x}_1 = 3x_2$$

$$\dot{x}_2 = -2x_1 - (x_1^2 - 1)x_2 + 4$$

Calculate relative degree taking output y as

i) $y = x_1$

ii) $y = x_2$

P1457 [4065] - 570

M.E. (Electrical) (Control System)

ADVANCED TOPICS IN CONTROL SYSTEMS

(2008 Course) (Elective - II) (503105 (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 answer books.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Figures to the right indicate full marks.
- 5) Assume suitable data, if necessary.

SECTION - I

- Q1)** a) What is Neural Network? How the ANN is inspired from biological neuron? Give atleast four reasons to use neural networks. [10]
 b) With neat diagram, explain the deterministic model of artificial neuron. Also explain with mathematical formula and graphical representation, the activation functions. [15]
- Q2)** a) Draw Recurrent network and explain Supervised, unsupervised, Reinforced and Hebbian learning. [10]
 b) Sketch Multiple input neuron model and derive it's activation function. [10]
 c) Define and explain, Generalization of Neural Network. [5]
- Q3)** Explain clearly the following:
 a) Periodic output Feedback. [8]
 b) Fast Output Sampling Feedback, and [8]
 c) Multirate output control. [9]

SECTION - II

- Q4)** a) Draw the neat block diagram and explain the method of pole placement using Linear state variable Feedback. [10]
 b) A linear control system is represented in the state variable form: [15]

$$\dot{x}(t) = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -6 & 7 & 0 \end{bmatrix} x(t) + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u(t)$$

Design a linear state variable feedback to place the poles at desired locations $S = -3, -2 + j3$ and $-2 - j3$.

P.T.O.

- Q5)** a) Explain precisely the term 'Adaptive Controller'. Draw a block diagram of an adaptive system and explain the function of each block. [8]
- b) With the help of neat diagram, explain the various Adaptive Schemes. [8]
- c) What is Model Reference Adaptive Control? What are the different methods generally being used in connection with 'MRAC'? [9]
- Q6)** a) Explain clearly the concept of variable structure control. [8]
- b) Explain with suitable examples the terms, 'Sliding surface' and 'Dynamic Sliding Surface'. [9]
- c) Enumerate the uncertainties in system matrix and Input Matrix. [8]



P1458 [4065] - 571

M.E. (Electrical) (Control System)

COMPUTER AIDED CONTROL SYSTEM DESIGN

(Elective - II) (2008 Course) (503105)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Explain clearly the terms, 'Absolute stability' and 'Relative stability'. Discuss the measures of relative stability. [6]
- b) Derive the transfer function of the following compensating networks and draw the corresponding Bode diagrams. [10]
- i) phase - lag network.
 - ii) phase - lead network.

OR

- Q2)** a) Compare cascade compensation with feedback compensation. Under what conditions feedback compensation is preferred? [6]
- b) A unity feedback control system has [10]

$$G(S) = \frac{K}{s(s+1)(1+0.5s)}$$

Design a phase - lead compensator to meet the following design specifications:

$$\text{Phase margin } \phi_m \geq 45^\circ$$

$$\text{Velocity error constant } k_v \geq 10 \text{ Sec}^{-1}.$$

Draw the Bode diagrams for compensated and uncompensated system.

- Q3)** a) Explain the importance of computer as an aid in the analysis and design of control system. [6]
- b) Give algorithm and flow chart for obtaining frequency response by Bode plots from the given open - loop transfer function $G(S)H(S)$ using digital computer. Compare the computer method with classical approach for obtaining Bode plots. [12]

P.T.O.

OR

- Q4)** a) Give algorithm and flow chart of the computer method for obtaining the transient response of a second-order control system to a unit step input. [12]
b) Explain how to reshape this transient response plot to obtain the optimum parameters for desired performance. [6]

- Q5)** a) Define critical point and discuss the different critical points in phase - plane method. [6]
b) Explain with illustration the phase - plane technique for simulating non-linear control system with saturation as nonlinearity. Give the algorithm. How to obtain the time response from phase - plane trajectory? [10]

OR

- Q6)** a) Compare critically the 'phase-plane method' and 'Describing function method' for the design of nonlinear control system. [6]
b) Explain with algorithm the computer method for simulating the non-linear control system containing ON-OFF (Ideal Relay) non linearity using the describing function method. How to investigate the stability of nonlinear control system using the describing function method. [10]

SECTION - II

- Q7)** a) Outline the procedure of determining the controllability and observability of the control system using computer method. Give its algorithm or flow chart; [8]
b) A linear control system is represented by the following state space model:

$$y(t) = \begin{bmatrix} 1 & 0 & 0 \\ 1 & 1 & 1 \end{bmatrix} x(t)$$

Investigate the controllability and observability of the system. [10]

OR

- Q8)** a) Explain with an example the relation between controllability, observability and pole - zero cancellation. [6]
b) Outline the procedure for determining the stability of a control system represented in state space form using computer method. Give its algorithm. [6]

- c) Explain the computer method for obtaining the solution of state equation and output equation of a control system represented by:

$$\dot{x}(t) = A x(t) + B u(t)$$

$$y(t) = C x(t)$$

with usual notations.

[6]

- Q9)** a) Draw neat block diagram and explain the method of pole-placement using Linear state variable feedback. [6]

- b) Given a linear time - invariant control system in state space form:

$$\dot{x}(t) = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 5 & -1 & -3 \end{bmatrix} x(t) + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u(t)$$

Design the linear state variable feedback to place the poles at desired locations: $S = -2, -3$ and -4 . [10]

OR

- Q10)**a) Draw the block diagram showing the structure of a full order observer system and explain how the states are estimated using full order observer. [10]

- b) Explain briefly the procedure for design of reduced order observer. [6]

- Q11)**a) Explain step by step the design procedure of tunable PID controller using Ziegler - Nichol's method. Give its algorithm. [8]

- b) Consider a process control plant with plant transfer function:

$$G_p(s) = \frac{36}{s^3 + 11s^2 + 36s + 36}$$

Design a PID controller for this system using Ziegler - Nichol's method. [8]

OR

- Q12)**a) Draw a neat block diagram of basic digital control system and explain the function of each block. Discuss the effect of sampling on stability of the system. [10]

- b) Explain the following design specifications for digital control system. [6]

- i) Disturbance rejection.
- ii) Control effort constraints.
- iii) Transient and steady - state accuracy.



P1459 [4065] - 572

M.E. (Electrical) (Control System)
SCADA SYSTEM AND APPLICATIONS
(2008 Course) (503105) (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) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Explain with the help of block diagram SCADA system in detail. [15]
b) Explain the ladder diagram of PLC with a suitable example. [10]
- Q2)** a) Write a short note on: [15]
i) Intelligent Electronic devices.
ii) Remote Terminal unit.
iii) Master terminal unit.
iv) Communication Network.
b) With the help of block diagram explain Programmable Logic Controller (PLC). [10]
- Q3)** a) Explain in detail various SCADA protocols. [15]
b) Explain Monolithic SCADA system and distributed SCADA system. [10]

SECTION - II

- Q4)** a) Discuss various SCADA architectures. [15]
b) Explain the 7 layers of OSI model and their functions. [10]
- Q5)** a) Explain Wired and Fiber optic methods of communication. [15]
b) Write a short note on HMI interface. [10]
- Q6)** Explain application of SCADA system in Automatic Substation control in detail. [25]



P1460**[4065] - 573****M.E. (Electrical) (Control Systems)****MULTIVARIABLE AND OPTIMAL CONTROL SYSTEMS****(2008 Course) (Sem. - II) (503108)***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 answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Discuss the factors to be considered in the formulation of an optimal control problem using quadratic performance index. [6]
- b) State and explain the state regular problem and show that for an infinite-time state regulator problem, the performance index is : [5]

$$J = \frac{1}{2} \int_0^{\infty} [x^T(t) Qx(t) + u^T(t) Ru(t)] dt$$

with usual notations.

- c) Outline the procedure for obtaining the optimal control law for infinite time state regulator problem. [5]

OR

- Q2)** a) Explain Clearly the iterative method for the numerical solution of reduced order matrix Riccati Equation. [6]
- b) A linear time-invariant control system is represented by the state

$$\text{equation : } \dot{x}(t) = \begin{bmatrix} 0 & 2 \\ -2 & 0 \end{bmatrix} x(t) + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u(t)$$

Find the optimal control law $u^*(t)$ for the system which minimizes the quadratic performance index : [10]

$$J = \frac{1}{2} \int_0^{\infty} [x^T(t) Qx(t) + u^T(t) Ru(t)] dt$$

P.T.O.

Assume $R = 1$ and $Q = \begin{bmatrix} 2 & 0 \\ 0 & 2 \end{bmatrix}$

Also test whether the closed-loop control system with optimal control $u^*(t)$ is asymptotically stable.

Q3) a) Define Hamiltonian. Outline the procedure for obtaining optimal control using Hamiltonian method. [8]

b) Consider the linear time-invariant first order control system :

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

Using Hamiltonian method find the optimal control law $u^*(t)$ which minimizes the performance index :

$$J = \frac{1}{2}x^2(2) + \frac{1}{2}\int_0^2 u^2 dt$$

Given : $x(0) = 1$; $x(2) = -1$. [10]

OR

Q4) a) Discuss the relation between Dynamic Programming and Pontryagin's minimum Principle. [6]

b) State the pontryagin's minimum principle. Explain clearly the procedure for solving optimal control problem using pontryagin's minimum principle. [12]

Q5) a) Define and explain the singular control solution. [6]

b) Draw the block diagram showing the structure of feedback time-optimal (minimum time) control system and explain with an example the minimum time-optimal control problem. [10]

OR

Q6) a) Explain the Bang-bang control strategy and state its merits. [6]

b) Use the minimum principle to show that it is necessary to use a Bang-bang controller to drive the system :

$$\dot{x}(t) = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}x(t) + \begin{bmatrix} 1 \\ 0 \end{bmatrix}u(t)$$

from the initial state $x_1 = x_2 = 1$ to a zero final state (equilibrium state) $x_1 = x_2 = 0$ if the input variable is constrained. Find such a control if $-1 \leq u \leq 1$. [10]

SECTION - II

- Q7) a)** State the advantages and disadvantages of representing the multivariable control system into
- i) Differential operator form
 - ii) Transfer matrix form.
 - iii) State space form [6]

- b) A multivariable control system is represented in state space form :

$$\dot{x}(t) = \begin{bmatrix} 0 & 3 & 1 \\ 1 & 2 & 1 \\ 0 & 0 & 1 \end{bmatrix} x(t) + \begin{bmatrix} 0 & 0 \\ 1 & 1 \\ 1 & 2 \end{bmatrix} u(t)$$

$$y(t) = \begin{bmatrix} 1 & 2 & 0 \\ 0 & 0 & 1 \end{bmatrix} x(t) + \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} u(t)$$

obtain the transfer matrix form of the system. [10]

OR

- Q8) a)** Explain with block diagram the structure of a typical multivariable control system. Explain any one industrial multivariable control system. [6]

- b) The overall transfer matrix of a multivariable control system is given by,

$$\frac{Y(s)}{U(s)} = \begin{bmatrix} \frac{1}{s+2} & \frac{1}{s+3} \\ \frac{1}{s+1} & \frac{1}{s+2} \end{bmatrix}$$

Find :

- i) The state space representation of the system.
- ii) The characteristic polynomial of the system. [10]

- Q9) a)** Define and explain the concepts of controllability and observability of multivariable control system. [6]

- b) A multivariable control system is represented in state space form :

$$\dot{x}(t) = \begin{bmatrix} 2 & 1 & 0 \\ 0 & 2 & 1 \\ 0 & 0 & 1 \end{bmatrix} x(t) + \begin{bmatrix} 1 & 1 \\ 2 & 2 \\ 0 & 0 \end{bmatrix} u(t)$$

$$y(t) = \begin{bmatrix} 1 & 0 & 1 \\ 0 & 0 & 1 \end{bmatrix} x(t)$$

Investigate the controllability and observability of the system. [12]

OR

- Q10**a) Discuss in detail the pole placement using Linear State Variable Feedback (LSVF) in multivariable control system. Draw appropriate block diagram showing LSVF. [8]

- b) A linear time-invariant control system is represented in state space form:

$$\dot{x}(t) = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -8 & 10 & -1 \end{bmatrix} x(t) + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u(t)$$

Design the linear state variable feedback to place the poles at desired locations $s = -4$ and $(-3 \pm j2)$. [10]

- Q11**a) Explain the concept of stability of multivariable control system represented in state space form. [6]

- b) What is the necessity of an observer? Explain with appropriate block diagram the design procedure of full order observer. [10]

OR

- Q12**a) Explain Decoupling or Non-interactive control for multivariable control system design. [6]

- b) Discuss any one classical method which can be extended to analysis of multivariable control system. State its limitations. [6]

- c) Define and explain the concept of 'Reproducibility' of multivariable control system. [4]



P1463**[4065]-33****M.E. (Civil) Structures****ADVANCED STRUCTURAL MECHANICS****(2002 Course) (501503)***Time : 4 Hours]**[Max. Marks : 100**Instructions to the candidates:*

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

SECTION - I

- Q1)** a) What is Airy's stress function? Show that the Airy's stress function for 2D problem satisfies the bi-harmonic equation? [7]
- b) In a plane stress problem where the weight is the only body force, the Airy's stress function is given by $\Phi = 6x^5 + ax^4y + bx^2y^4 - 3y^3$. Calculate the constants 'a' and 'b'. [8]
- c) Obtain expressions showing compatibility of strains in Cartesian co-ordinates? [10]
- Q2)** a) Derive finite difference coefficient in Cartesian co-ordinates for the Bi-harmonic operator? [15]
- b) A two span continuous beam ABC has equal spans $AB = BC = L$. The beam supports a concentrated load 'W' N at mid span of each span. Find deflections under the loads using Finite Difference Method? [10]
- Q3)** a) Using polar co-ordinates, obtain the solution for stress distribution for radial and transverse stresses in a hollow cylinder subjected to uniform internal and external pressure. [10]
- b) A thick walled long cylinder with closed ends has internal and external radii 'a' and 'b' respectively. It is subjected to uniform internal and external pressure P_i and P_o respectively. Treating this as an axially symmetric plane strain problem, obtain expressions for radial and tangential stresses in the cylinder wall. [15]

P.T.O.

SECTION - II

- Q4)** a) Explain classification of beams on elastic foundation? What is Winkler's hypothesis? State the assumptions made there in? [10]
- b) Write brief note on "South well Plot"? Develop elastic stability matrix for beam-column element? [15]
- Q5)** A three span girder is simply supported at the ends. The height of the girder and panel width is 4m and 3m respectively. The girder is subjected to point load of 500 kN at the interior panel points. Construct the B.M. and S.F. diagrams for the girder? [25]
- Q6)** a) Explain the various method of combining various mechanisms for the plastic collapse of multi-bay, multistory rectangular portal frame. Illustrate by simple examples? [10]
- b) A simply supported beam of rectangular cross section and span 9m is subjected to two point loads of 150 kN each at 3m and 6m from left end. Design section with depth equal to twice the width with load factor 2 and yield stress of the material 260 N/mm². [15]



Total No. of Questions : 8]

[Total No. of Pages : 2

P1465

[4065] - 120

M.E. (E & TC) (Microwave)

STATISTICAL SIGNAL ANALYSIS & STOCHASTIC PROCESSES

(2002 Course) (504201)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

Q1) a) What is maximum likelihood estimator? Can you use it to estimate random parameters? Justify your answer. **[8]**

b) Given N independent observations; Z_i , $i = 1, 2, \dots, N$ of a Gaussian variable with mean m , obtain estimate of variance. Is this estimate unbiased. **[8]**

Q2) Explain the problem of hypothesis testing. Consider the hypothesis testing problem in which $P(Z/H1) = 1/\sqrt{2\pi} \exp(-z^2/2)$ and $P(Z/H0) = \frac{1}{2} \exp(-|z|)$. Set up LRT and determine decision regions. **[16]**

Q3) a) Derive suitable expressions for detection of known signal in white noise using matched filter. **[6]**

b) With the help of expressions, statistical parameters, sketches etc. compare among various (at least four) probability distribution models. Suggest suitable applications of each with reference to statistical signal processing. **[12]**

P.T.O.

- Q4)** a) Explain significance of complementary error function in digital communication. [6]
- b) Let x_1, x_2, \dots, x_n be random sample from the poisson distribution $p(X = x/\theta) = [\exp(-\theta) * \theta^x] / x!$ for $x = 0, 1, 2, \dots$. Let $\theta_0 > 0$ be a specific value of θ . Find generalised LRT for testing $H_0 : \theta = \theta_0$ against $H_1 : \theta \neq \theta_0$. [10]

SECTION - II

- Q5)** Consider ARMA process generated by the difference [16]
 $x(n) = 1.6x(n-1) - 0.63x(n-2) + w(n) + 0.9w(n-1)$
- a) Determine the system function of noise whitening filter and its poles and zeros.
- b) Determine the power density spectrum of $x(n)$.
- Q6)** With reference to radar signal detection and tracking problems, explain the usage of detection and maximum likelihood estimation theory. Discuss three different types of models for radar target. What are probability of false alarm (pf) and probability of detection (pd)? Calculate average peak signal to noise ratio if we require that $pf = 10^{-3}$ and $Pd = 0.8$. [16]
- Q7)** What do you understand by innovation representation of stationary random process? Discuss the term noise whitening filter to help of expressions of power spectral density of wide sense stationary process, filters system function, cepstral coefficients etc. Therefore define AR, MA, ARMA processes. What do Yule-Walker equations indicate? [16]
- Q8)** Write short notes on : [18]
- a) Levinson - Durbin Algorithm.
- b) Wiener filter.
- c) Spread spectrum communication in view of detection and estimation.



P1469

[4065] - 475

M.E. (Civil) (Environmental Engg.)

NUMERICAL METHODS & APPLIED STATISTICS

(501501) (2010 Course) (Sem. - I)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

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

SECTION - I

Q1) a) Find Inverse of Matrix $\begin{bmatrix} 1 & 1 & 1 \\ 4 & 3 & -1 \\ 3 & 5 & 3 \end{bmatrix}$ Using Gauss - Jordan Method, and

hence solve the system

$$x_1 + x_2 + x_3 = 4$$

$$4x_1 + 3x_2 - x_3 = 12$$

$$3x_1 + 5x_2 + 3x_3 = 15$$

[9]

b) Determine the roots of equation $x^2 + y^2 = 6$ & $x^2 - y^2 = 3$, using Newton - Raphson Method. [8]

c) Find Lagrange's polynomial to fit the data [8]

x_i	:	0	1	2	3
$e^{x_i} - 1 = f(x_i)$:	0	1.7183	6.3891	19.0851

Q2) a) Using Simplex Method, Maximize [15]

$$Z = 5x_1 + 4x_2,$$

$$\text{Subject to } 4x_1 + 5x_2 \leq 10$$

$$3x_1 + 2x_2 \leq 9$$

$$8x_1 + 3x_2 \leq 12$$

$$x_1, x_2 \geq 0$$

P.T.O.

- b) The manager of an oil refinery must decide on the optimal mix of two possible blending process of which inputs and outputs per production run are as follows [10]

Process (Units)	Input (Units)		Output (Units)	
	A	B	X	Y
I	5	3	5	8
II	4	5	4	4

The maximum amounts available for crudes A & B are 200 units & 150 units respectively. Market requirement shows that atleast 100 units of gasoline X and 80 units of gasoline Y must be produced. The profit|production run for process I and process II are Rs. 300/- & Rs. 400/- respectively. Formulate LPP and solve by Graphical Method.

- Q3) a)** For the following distribution. Find first four moments about mean, coefficient of skewness and Kurtosis. [10]

x	:	2	2.5	3	3.5	4	4.5	5
f	:	5	38	65	92	70	40	10

- b) State and prove theorem of Compound Probability. [8]
 c) A toy is rejected if the design is faulty or not. The probability that design is faulty is 0.1 and toy is rejected if the design is faulty is 0.95 and otherwise is 0.45. If a toy is rejected, what is the probability that it is due to faulty design. σ [7]

SECTION - II

- Q4) a)** Find density function of sum of two independent random variables. [8]
 b) Show that for a binomial distribution variance is less than mean. [8]
 c) The life component of a normally distributed machine with mean value 250 hrs and a variance of σ^2 hours. Find maximum value of σ , so that probability of the components to have life between 200 and 300 hrs is 0.7. [9]

- Q5) a)** Explain procedure for testing of hypothesis. [15]
 b) Write short notes on the following [10]
 i) Point Estimates and interval Estimates.
 ii) Degrees of freedom.

Q6) a) Compute coefficient of correlation for the following distribution [8]

x	:	5	9	15	19	24	28	32
y	:	7	9	14	21	23	29	30
f	:	6	9	13	20	16	11	7

b) Obtain regression lines for the following: [8]

x	:	2	3	5	7	9	10	12	15
y	:	2	5	8	10	12	14	15	16

c) Estimate trend value using a four yearly moving average. [9]

Year	Value
1994	- 12
1995	- 25
1996	- 39
1997	- 54
1998	- 70
1999	- 87
2000	- 105
2001	- 100
2002	- 82
2003	- 65
2004	- 49
2005	- 34
2006	- 20
2007	- 07



P1470

[4065]-476

M.E. (Civil) (Environmental Engineering)

AIR POLLUTION AND CONTROL

(2010 Course) (501502) (Sem. I)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) State the definition of air pollution as given by Indian standards. Give the classification of air pollutants and hence differentiate between primary and secondary air pollutants. **[2 + 3 + 4 = 9]**
- b) The concentration of carbon monoxide (CO) in ambient air is 0.6% by volume at 25°C and atmospheric pressure of 760 mm of Hg. Determine the CO concentration in $\mu\text{g}/\text{m}^3$. **[9]**
- Q2)** a) What is temperature lapse rate? State the different types of lapse rate and explain how the temperature lapse rate are used to determine atmospheric stability. **[1 + 2 + 6 = 9]**
- b) Explain the Maximum Mixing Depth (MMD). Describe how the MMD is determined under different atmospheric conditions. **[7]**
- Q3)** a) State and explain the behaviour of plumes emitted from a elevated source like stack. **[12]**
- b) Explain the mechanism of Ozone depletion and the consequences due to Ozone depletion. **[4]**

- Q4)** a) Explain the Gaussian plume model for estimating concentration of air pollutants on down wind direction. [8]
- b) What is plume rise? Give the equations used for calculation of plume rise. [2 + 6 = 8]

SECTION - II

- Q5)** a) Explain the principles and mechanisms used for designing the equipments for collection and removal of particulate matter from flue gas. [10]
- b) Write short note on (any two) : [8]
- i) Gravitational settling chamber.
 - ii) Bag house filter
 - iii) Electrostatic precipitator.
 - iv) Cyclone separator.
- Q6)** a) Explain the principles and mechanisms used for removal of gaseous pollutants from flue gas. Also give suitable examples in each case. [12]
- b) Draw a neat sketch of venturi scrubber and explain its working. Under which circumstances the venturi scrubber will be most effective control equipment. [2 + 2 + 2 = 6]
- Q7)** a) What is automobile pollution? Explain the working of catalytic converter. [4 + 4 = 8]
- b) What are different methods and the strategies required for control of air pollution. [8]
- Q8)** a) State and explain the provisions made under Air Pollution (Prevention & Control) Act. [6]
- b) Give the ambient air quality standards. [4]
- c) Describe the effect of wind profile on dispersion of air pollutants. [6]



Total No. of Questions : 8]

[Total No. of Pages : 2

P1477

[4065] - 625

M.E. (E & T/C) (VLSI & Embedded Systems)

ANALOG AND DIGITAL CMOS IC DESIGN

(2008 Course) (504181) (Sem. - I)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) What is body effect in case of MOSFET? What is latch-up problem in CMOS? How to overcome it? [4]
b) What is MOS model? What are its objectives? How it is used by designers? [4]
c) Where and How MOSFET is used as diode/Active Resistor? [8]
- Q2)** a) Use self-biased high-swing cascode current sink configuration to design a current sink of 250 μ A and a V_{MIN} of 0.5V. Assume suitable data. [8]
b) Explain in detail the concept of BGR with its necessity. [8]
- Q3)** a) Current mirrors are based on which principle? Explain in short non-ideal effects of current mirrors. What is the use of current mirrors? [8]
b) Explain various architectures of High gain amplifier. [8]
- Q4)** Write short notes on any three : [18]
a) Active Load Inverter & its parameters.
b) Techniques used in Micro power opamp.
c) Current Amplifiers.
d) Buffered Op Amps using MOSFETs.

P.T.O.

SECTION - II

- Q5)** a) In CMOS technology why do we design the size of pMOS to be higher than the nMOS? Why PMOS and NMOS are sized equally in a transmission gate? [4]
- b) Why is NAND gate preferred over NOR gate for implementing a design using CMOS logic? Design NAND gate using pass transistor logic and transmission gate. [4]
- c) Consider a complex CMOS logic gate that implements the function
$$F = (A.B + C.D.E)'$$
 [8]
- i) Design the circuit.
- ii) An inverter with $\beta_n = \beta_p$ is used as a sizing reference. Find the device sizes in the gate if we chose to equalize the nMOS and pMOS resistances.
- Q6)** a) What is metastability? How long does it stay in this state? What are the cases in which metastability occurs? How do designer tolerate metastability? [8]
- b) Compare Domino and NORA high performance CMOS logic circuits. Explain NORA CMOS logic in detail. [8]
- Q7)** Design FSM controller for a coin - operated vending machine. Machine dispenses candy under the following conditions: [16]
- The machine accepts 1 rupee and 2 rupee coins. Only one coin at particular instant.
 - It takes 3 rupees for a piece of candy to be released from the machine.
 - If 4 rupees are deposited, the machine will not return the change, but it will credit the buyer with 1 rupee and wait for the buyer to make a second purchase.
- Draw the minimized state diagram. Write VHDL code and test bench for the same.
- Q8)** Write short notes on any three : [18]
- a) Significance and Types of Hazards.
 - b) Technology Scaling: Types and effects.
 - c) CMOS Parasitic.
 - d) Power dissipations and PDP in CMOS logic.



Total No. of Questions : 8]

[Total No. of Pages : 2

P1479

[4065]-690

M.E. (E & TC) (Communication Networks)

NETWORK TRAFFIC ANALYSIS AND QOS

(2010 Course) (504608) (Sem. - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) What is congestion? Explain How congestion can be controlled? [8]
b) Compare leaky bucket & token bucket in detail. [8]
- Q2)** a) What is QOS? Explain different types of QOS models. [8]
b) Explain in detail how traffic management implemented in LAN. [8]
- Q3)** a) Explain statistical analysis in detail. [8]
b) Explain traffic shaping in detail with neat diagram. [8]
- Q4)** Write short notes (any two): [18]
a) QOS in MANET.
b) RSVP.
c) Advantages of QOS.

SECTION - II

- Q5)** a) Define integrated service. Explain it in detail in context of QOS. [8]
b) Explain with neat diagram QOS architecture. [8]

P.T.O.

Q6) Explain following terms in detail. **[16]**

- a) Delay.
- b) Jitter.
- c) Availability.
- d) Bandwidth.

Q7) Explain in detail following:

- a) Bandwidth allocation in traffic control. **[8]**
- b) Multiprotocol labeling switching. **[8]**

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

- a) Traffic management in High speed network.
- b) Types of measurement tools.
- c) Adaptive communication protocol.



Total No. of Questions : 8]

[Total No. of Pages : 4

P1480

[4065]-699

M.E. (Production)

CAD/CAM/CIM

(2008 Course) (511102) (Sem. - I)

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 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) Solve any two of the following :

- a) The vertices of a triangle are situated at points (15, 30), (25, 35) and (5, 45). Find the co-ordinates of the vertices if the triangle is first rotated 10° counter clockwise direction about the origin and then scaled twice its size. **[10]**
- b) What do you mean by reflection transformation? Explain types of reflection transformation. **[10]**
- c) Explain the concept of solid modelling and surface modelling. State the differences between them with atleast two suitable applications of each. **[10]**

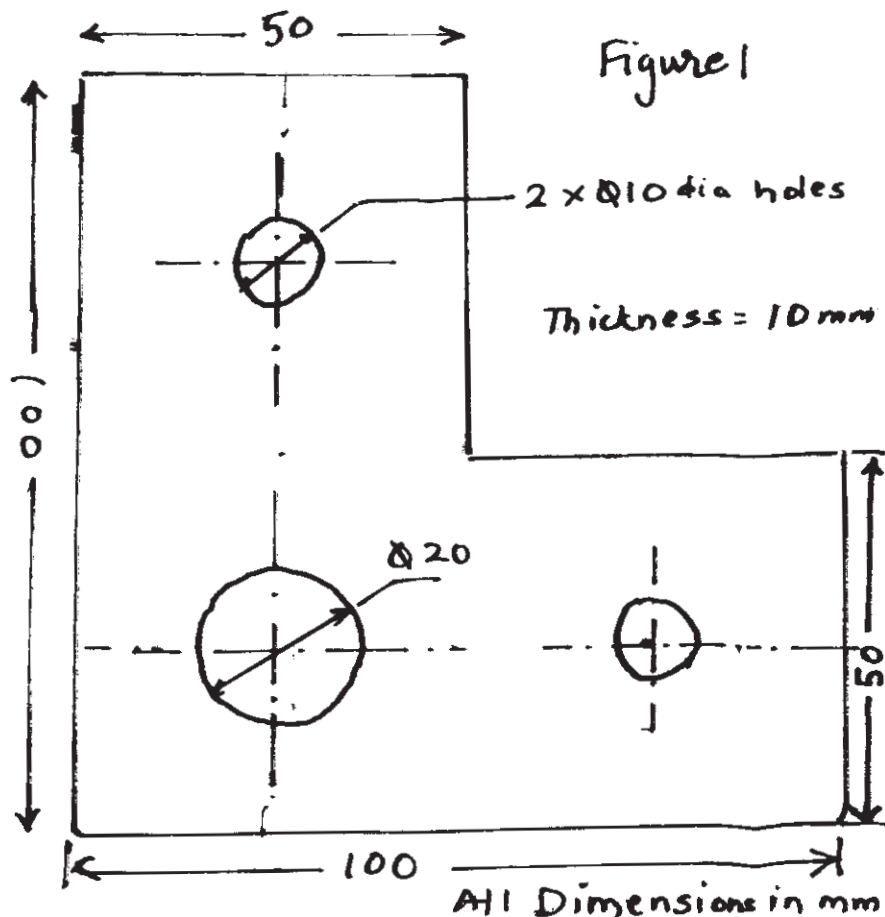
Q2) Solve any two of the following :

- a) A cubic Bezier curve which is defined by the control points as (30, 30), (50, 80), (100, 100) and (150, 30). Find the equation of the curve and its mid point. **[10]**
- b) What are the shading methods generally used in CAD? Explain the corresponding shading principle of a polygon. **[10]**
- c) Explain the need of a post processor as used in computer assisted part programming systems such as APT. Describe the functions of post processor. **[10]**

P.T.O.

Q3) Solve any two of the following :

- a) Why recirculating ball screws are used in CNC machine tools? Compare recirculating ball screws with conventional acme screws. [10]
- b) Explain with relation to 3D modelling : [10]
 - i) Extrude.
 - ii) Revolve.
 - iii) Rotate.
- c) The component to be machined is as shown in Figure.1. Write a program using canned cycles to drill the holes as shown in the figure. [10]

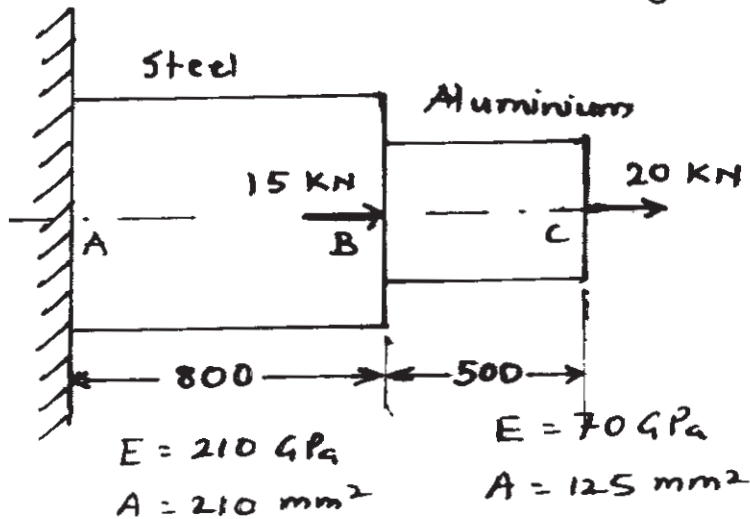


Q4) Solve any two of the following :

- a) What are the various types of analyses that are possible using FEA? Explain with suitable examples. [10]

- b) Consider the two stepped bar as shown in Figure.2. It is made up of steel and aluminium. It is fixed at one end (A) and subjected to two forces at point (B) and (C) as shown. If temperature of assembly is increased by 60°C , calculate deflection at each node, stresses in each section of bar and support reaction at point A. [10]

Figure 2



Dimensions in mm

- c) What are the steps to be carried out for solving a physical problem with the help of FEM software? [10]

SECTION - II

Q5) Solve any two of following :

- Briefly describe and differentiate two basic approaches for computer Aided Process Planning (CAPP). [10]
- Describe with proper sketch, computer Aided Material Requirement Planning System for any manufacturing unit. [10]
- Explain with appropriate examples any two types of optical sensing techniques used for inspection work. [10]

Q6) Solve any two of the following :

- State and describe any five process control strategies used in a modern manufacturing unit. [10]
- Write note on Opitz and MICLASS part classification and coding system in Group Technology. [10]

- c) What is the importance of Database System for machinability? Explain the information flow in machinability database system. [10]

Q7) Solve any two of the following :

- a) Explain with proper diagram, three phases in shop floor control system and their inter-relationship. [10]
- b) What is FMC and FMS? Discuss the different control subsystems of FMS. [10]
- c) What is Cellular Manufacturing System (CMS)? What are its limitations? What is virtual cell system? [10]

Q8) Solve any two of the following :

- a) Explain any four techniques of computer aided quality control. [10]
- b) Apply Rank Order Clustering (ROC) technique to arrange the parts and machines into groups from the following part-machine incidence matrix. [10]

		Jobs					
		J ₁	J ₂	J ₃	J ₄	J ₅	J ₆
Machines	M ₁	1			1	1	
	M ₂		1				
	M ₃			1		1	
	M ₄	1		1			
	M ₅		1		1		1

- c) In what situation is the installation of FMS justified? What are the issues to be considered while planning for installation of FMS? [10]



Total No. of Questions : 8]

[Total No. of Pages : 4

P1481

[4065] - 779

M.E. (Chemical)

APPLIED STATISTICS FOR CHEMICAL ENGINEERS

(2008 Course) (Sem. - I) (509101)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) *Answer any three questions from Section - I and 3 questions from Section - II.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *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 following table gives the length of life of 400 articles.

<u>Length of Life</u> (in hours)	<u>No.of articles</u>
1000-1199	12
1200-1399	30
1400-1599	65
1600-1799	78
1800-1999	90
2000-2199	55
2200-2399	36
2400-2599	25
2600-2799	9

Calculate:-

- a) Average, median and modal life. [6]
- b) M.D., S.D, COV, [6]
- c) Quartiles & QD [6]

P.T.O.

- Q2) a)** Calculate Karl Pearson's coefficient of skewness for the following distribution [8]

<u>Class - interval</u>	<u>Frequency</u>
70-80	12
80-90	18
90-100	35
100-110	42
110-120	50
120-130	45
130-140	30
140-150	8

- b) Calculate the first four moments $\mu_1, \mu_2, \mu_3, \mu_4$ about the mean for the following data. [8]

<u>Marks</u>	<u>No. of students</u>
0-10	5
10-20	12
20-30	18
30-40	40
40-50	15
50-60	7
60-70	3

Calculate the values of coefficients $\beta_1, \beta_2, \sqrt{\beta_2}$. Hence state whether the distribution is normal or leptokurtic or platykurtic.

- Q3) a)** Calculate Karl Pearson coefficient of correlation for the following data: [8]

<u>Roll No.</u>	<u>Marks in Maths(X)</u>	<u>Marks in Physics(Y)</u>
1	48	45
2	35	20
3	17	40
4	23	25
5	47	45

Comment on the nature of correlation between the values of X & Y.

- b) For the following X - Y data obtain the regression equation of [8]

i) X on Y, and

ii) Y on X

X →	6	2	10	4	8
Y →	9	11	5	8	7

- Q4) a)** In a random sample of 1000 persons from town 'A', 400 are found to be consumers of wheat. In a sample of 800 from town 'B', 400 are found to be consumers of wheat. Do these data reveal a significant difference between town A & town B, so far as the proportion of wheat consumers is concerned.
(Take 1% LOS with $Z_{\alpha} = 2.58$) [6]
- b)** In a survey of buying habits, 400 women shoppers are chosen at random in super market 'A' located in certain city. Their average monthly food expenditure is Rs. 250 with a SD of Rs.40. For 400 women shoppers chosen at random in super market B in another section of city, the average monthly food expenditure is Rs. 220 with a SD of Rs. 55. Test at 1% LOS whether the average food expenditure of the two population of shoppers from which the sample were obtained are equal. [5]
(Take $Z_{\alpha} = 2.58$)
- c)** In a sample of 1000 the S.D. is 2.5 & in another sample of 800 the S.D. is 2.7. Assuming that the samples are independent discuss whether the two samples can have come from a population which have the same s.d.
(Take 5% LOS with $Z_{\alpha} = 1.96$) [5]

SECTION - II

- Q5) a)** A random sample of size 16 has 53 as mean. The sum of the deviations taken from mean is 135 with LOS of 1% can this sample be regarded as taken from the population having 56 as mean? Also obtain 95% & 99% confidence limits of the mean of the population. [6]
(Given . for $\nu = 15$, $t_{0.05} = 2.13$, $t_{0.01} = 2.95$)
- b)** Two types of drugs were used on 5 & 7 patients for reducing their weights. Drug 'A' was imported and drug 'B' was indigenous. The decrease in the weight after using the drugs for 6 months was as follows:[5]
Drug A: 10 12 13 11 14
Drug B: 8 9 12 14 15 10 9
Is there a significant difference in the efficacy of the two drugs? If not, which drug should you buy?
(For $\nu = 10$, $t_{0.05} = 2.223$)
- c)** The heights of 6 randomly chosen are 76, 70, 68, 69, 69, 68. Those of 6 randomly chosen sailors are 68, 64, 65, 69, 72, 64. Discuss the light that these data throw on the suggestions that soldiers are on the average taller than the sailors. [5]
(Use t - test with $\nu = 10$, $t_{0.05} = 2.23$)

- Q6) a)** Based on information on 1000 randomly selected fields about the tenancy status of the cultivation of these fields and use of fertilizers collected in an agro - economic survey, the following classification was noted. [8]

	Owned	Rented	Total
Using fertilizers	416	184	600
Not using fertilizers	64	336	400
Total	480	520	1000

Would you conclude that owner cultivators are more inclined towards the use of fertilizers, at 5% level? Use χ^2 test with $\nu = 1$, $\chi_{0.05}^2 = 3.84$

Theoretical frequencies

- b)** 200 digits are chosen at random from a set of tables. The frequencies of the digits are as follows: [8]

Digit	0	1	2	3	4	5	6	7	8	9
Frequency	18	19	23	21	16	25	22	20	21	15

Use χ^2 test to assess the correctness of the hypothesis that the digits were distributed in equal numbers in the tables from which they were chosen. Use χ^2 test with $\nu = 9$ $\chi_{0.05}^2 = 16.22$.

- Q7) a)** A tea company appoints four salesmen A, B, C and D and observes their sales in three seasons - summer, winter and monsoon. The figures (in lakhs) are given in the following table [6]

Seasons	Salesmen				Season's
	A	B	C	D	Total
Summer	36	36	21	35	128
Winter	28	29	31	32	120
Monsoon	26	28	29	29	112
Salesman's	90	93	91	96	360
Total					

- i) Do the salesmen significantly differ in performance?
 ii) Is there significant difference between the seasons?

Use F test with

$$\nu_1 = 3, \nu_2 = 6, F_{0.05} = 4.76$$

$$\nu_1 = 2, \nu_2 = 6, F_{0.05} = 5.14$$

- b)** Analyze the following results of a latin square experiment for significance between rows and columns at 1% LOS with $F_{0.01} = 27.91$. [10]

- Q8)** Write short notes on the following: [18]

- a) Simplex method optimisation.
 b) Transportation problem.
 c) RBD of experiments.



P1482

[4065]-820

M.E. (Petroleum Engineering)
PETROLEUM RESERVOIR MANAGEMENT
(2008 Course) (512102) (Sem. - I)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Answers to the two sections should be written in separate answer books.
- 2) Attempt any two questions each from section-I and from section-II.
- 3) Assume additional data if required.
- 4) Use of graph paper is allowed.

SECTION - I

- Q1)** a) Create an overall workflow for the development of a static reservoir model. What is object based modeling? How is it useful in the mapping of interwell region? [15]
- b) Figure 1 shows a poroperm (K Vs Φ) cross plot for a carbonate reservoir ($N = 87$), all samples represent identical volumes. Treating them as the sample space, calculate the probabilities of each outcome of the following from figure along with appropriate explanation. [10]

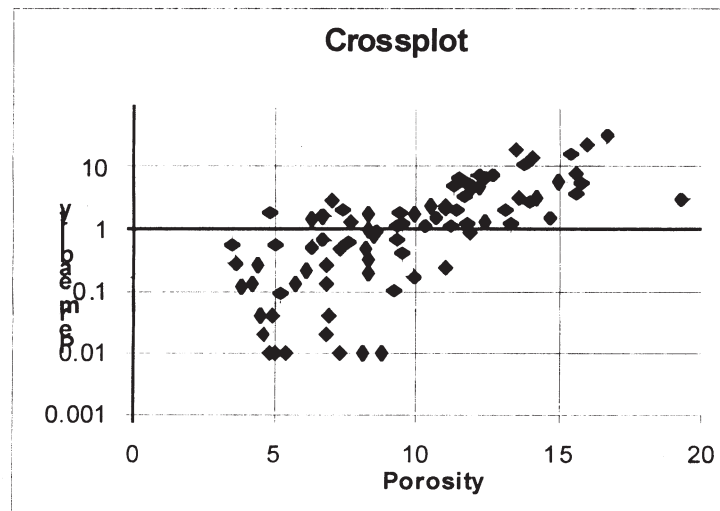


Figure 1 for Q.1.b.

(Assume net pay criterion of $K \geq 1$ and that a porosity cutoff is 10%)

- i) Probability of $K > 0.1$.
- ii) Probability of $\Phi > 10\%$.
- iii) Probability of $(K > 0.1) \cap (\Phi > 10\%)$.
- iv) Probability of $(K > 0.1 / \Phi < 10\%)$.
- v) Probability of $(0.1 < K < 1) \cap (5 < \Phi < 10)$.

P.T.O.

OR

- Q2)** a) How is reservoir heterogeneity interpreted on different scales? Discuss with neat sketches. [15]
b) Name and describe the rock properties and reservoir characteristics that would be necessary to estimate original hydrocarbons in place. Define the 'recovery factor' of oil and gas. [10]
- Q3)** a) The table given below shows porosity values as per increasing depth in a vertical well. [15]

Sr.No	Depth, m	Porosity, ϕ , (%)
1	1256	12.3
2	1257	13.2
3	1258	11.3
4	1259	8.2
5	1260	9.8
6	1261	9.5
7	1262	6.2

Generate semi-variogram for porosity as a function of lag distance. Interpret the graph using behavior of different parameters like sill, range, nugget value etc.

- b) Explain Exponential Decline and Hyperbolic Decline models with suitable diagrams. [10]

OR

- Q4)** Answer any five of the following : [25]
- a) Five important components of a petroleum system.
 - b) Effective permeability and relative permeability.
 - c) Hydraulic units or Flow units.
 - d) Net thickness and gross thickness of a formation.
 - e) Static and dynamic properties.
 - f) Porosity permeability relationship.
 - g) Stochastic modeling.
 - h) Reservoir drive mechanism.
 - i) Up scaling of reservoir properties.

SECTION - II

- Q5)** a) What is a mature field? What are the field challenges for the reservoir management of these fields? [15]
b) Describe commonly used flood patterns with their characteristics. What are the factors that influence the injector/producer pattern? [10]

OR

- Q6)** a) Explain the role of reservoir simulation in designing a water flood project, name at least five parameters related to water flooding that can be optimized by reservoir simulation. Why is a history match of primary production performance necessary in the study? [15]
b) Write a detailed note on History Matching. [10]
- Q7)** a) Describe the factors to be considered in the selection process of potentially applicable enhanced oil recovery process for a given field. What are preferred oil viscosity ranges and depth limitations for applying different EOR methods? [15]
b) Write a detailed note on Role of Horizontal wells in increasing reservoir recovery. [10]

OR

- Q8)** a) A detailed account of production history along with cost incurred during the project span is given in the following table. Oil price is assumed to be \$ 75/bbl throughout the tenure of the project. All values for costs are in million dollars, and oil production in millions of barrels annually. Using given data, prepare a detailed spreadsheet showing gross revenue, royalty, net revenue, yearly total expenditure and net profit per year. Royalty is 10% per year on annual production, which has to be paid with the beginning of commercial production. Income tax is 30% of net profit. [20]

Table : Economic evaluation data for the project

Year	Oil production MM bbl/Y	Capital cost (\$ MM)	Operation cost (\$ MM)	Production cost (\$ MM)
1	0	15.125	-----	-----
2	0	60.750	-----	-----
3	5.6	120.50	4.345	12.225
4	11.2	3.975	10.900	22.260
5	5.6	-----	19.500	12.982
6	2.1	-----	12.500	5.200
7	1.05	-----	11.500	2.765
8	1.2	-----	12.500	2.450
9	2.7	-----	9.500	5.910
10	1.9	-----	9.500	4.505
11	0.9	-----	9.500	2.500
12	0.6	-----	9.500	1.750
13	0.2	12.300	8.250	0.590

- b) What is a Petroleum Fiscal System? [5]

☒☒☒☒

Total No. of Questions : 6]

[Total No. of Pages : 2

P1484

[4065]-831

M.E. (Petroleum Engineering)

**ENVIRONMENTAL MANAGEMENT TECHNOLOGY &
SAFETY MEASURES**

(2008 Course) (512109) (Sem. - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answers to the two sections should be written in separate answer books.*
- 2) *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) Discuss the protocol for ‘field investigation’ of a contaminated site, assuming the contamination is due to spilling of petroleum products. Support your discussion by considering the following points: **[25]**

- a) Levels of protection.
- b) Work zone controls.
- c) Knowledge of safety procedures.

Q2) a) In the up-stream petroleum industry, there are two major operations, drilling and production. They have an impact on the environment. Give an overview of environmental impact of various processes, with respect to varieties of wastes generated. **[10]**

- b) Write a detailed note on “Climate Change and the role of petroleum industry”. **[15]**

Q3) Answer the following: **[25]**

- a) Draw a figure to show stratification of the atmosphere based on temperature/density relationship. Show major regions of the atmosphere on your diagram.
- b) Soil contamination due to petroleum products in an urban environment.
- c) The Air Quality Index [AQI] was introduced for general public to understand the outdoor air quality. Show the relationship between AQI and Health Effects.
- d) Safety in H₂S environment.

P.T.O.

SECTION - II

- Q4)** a) Write notes on the following: **[15]**
- i) Petroleum site assessment for environment impact.
 - ii) Disaster management in offshore installation.
- b) In the field of Environmental Biotechnology Phytoremediation is used to remove contaminants and metals from the soil and water, to render them harmless. Describe in brief following processes: **[10]**
- | | |
|----------------------|---------------------|
| Phytoextraction, | Phytodegradation, |
| Phytovolatilization, | Phytostabilization. |
- Q5)** Describe various types of audits involved in environment management of oil industry. How do they incorporate legal, ethical, social, and political issues? **[25]**
- Q6)** What are the causes of major marine oil spills? How do they affect marine environment? Explain in details short term and long term remedial measures taken to clean-up coast lines and restore environmental balance. **[25]**



Total No. of Questions : 8]

[Total No. of Pages : 2

P1486

[4065]-892

M.E. (Instrumentation & Control)
(Process Instru. and Biomedical Instru.)
ADVANCED SIGNAL PROCESSING
(Sem. - II) (2008 Course) (5061109)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

Q1) Why Time Frequency (TF) analysis is needed? What is the time-frequency distribution? Compare between Short Time Fourier Transform and Wigner distribution as a tool of Time frequency analysis? State disadvantages of STFT? **[16]**

Q2) What is the concept of multirate signal processing? Explain efficient structures for decimation and interpolation? Enlist efficient multirate filtering applications and explain at least two of them. **[16]**

Q3) What is mean by WSS process? Explain different models of stochastic process. **[16]**

Q4) a) Explain AR model of stochastic process in detail. **[8]**
b) What is Homomorphic signal processing? Explain any one application of Homomorphic deconvolution. **[10]**

SECTION - II

Q5) Define the term Power Spectrum and Periodogram. What are the different power Spectrum estimation methods? Explain any one parametric methods of power spectrum estimation. **[16]**

P.T.O.

Q6) Explain the principal of adaptive filtering. Explain RMS algorithm for adaptive filtering. Explain any one application from Noise and Echo cancellation. [16]

Q7) What is Multiresolution Analysis (MRA)? Define Wavelet Transform. Explain Continuous Wavelet Transform (CWT) and Discrete Wavelet Transform (DWT)? Explain Signal Analysis and Synthesis using wavelet transform? [18]

Q8) a) What is orthogonal transform? Explain Sine and Cosine transforms. [8]
b) Write a short note on international standards for speech, Image and Video Compression? [8]



P1487

[4065] - 906

M.E. (Polymer Engineering)

MATHEMATICAL AND STATISTICAL METHODS

(Sem. - I) (2008 Course) (509115)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

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

SECTION - I

Q1) a) Solve the following system of equations, using Gauss - Jordan Method:

$$2x_1 + x_2 + 3x_3 = 1$$

$$4x_1 - 3x_2 + 5x_3 = -7$$

$$-3x_1 + 2x_2 + 4x_3 = -3$$

[8]

b) Determine the LU decomposition of the matrix:

[8]

$$\begin{bmatrix} 2 & -6 & 10 \\ 1 & 5 & 1 \\ -1 & 15 & -5 \end{bmatrix}$$

Q2) a) Use Householder's method to reduce the following matrix to tridiagonal form:[8]

$$\begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 5 \\ 3 & 5 & 8 \end{bmatrix}$$

b) Find the largest eigen value and corresponding eigen vector for the matrix[8]

$$A = \begin{bmatrix} 4 & 1 & -1 \\ 2 & 3 & -1 \\ -2 & 1 & 5 \end{bmatrix}$$

Starting with the vector $\begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$

P.T.O.

Q3) a) Using Cholesky method, find the inverse of the matrix. [8]

$$\begin{bmatrix} 1 & -1 & 2 \\ -1 & 4 & 6 \\ 2 & 6 & 29 \end{bmatrix}$$

b) if $A = \begin{bmatrix} 1 & 0 & -1 \\ 1 & 2 & 1 \\ 2 & 2 & 3 \end{bmatrix}$ find A^{100} . [8]

Q4) a) Use Newton - Raphson method to solve the equations. [8]

$$x^2 - y^2 = 4$$

$$\text{and } x^2 + y^2 = 16$$

Take initial approximation as

$$x_0 = y_0 = 2\sqrt{2} = 2.828$$

Perform three iterations.

b) Solve the difference equation:

$$12f(k+2) - 7f(k+1) + f(k) = 0, k \geq 0$$

$$\text{Given that } f(0) = 0, f(1) = 3$$

[8]

Q5) a) Find Z - transform of the following (Any two): [10]

$$\frac{2^k}{k}$$

i) $f(k) = \quad, k \geq 1$

ii) $f(k) = e^{-ak} \sin bk, k \geq 0$

iii) $f(k) = k5^k, k \geq 0$

b) Find inverse Z - transform of the following (any two): [8]

i) $Z^{-1} \left(\frac{Z}{(z-1)(z-2)} \right)$ if $|z| \geq 2$.

ii) $Z^{-1} \left(\frac{Z(z+1)}{z^2 - 2z + 1} \right), |z| > 1$.

iii) $Z^{-1} \left(\frac{Z^3}{(z-1)(z-\frac{1}{2})^2} \right), |z| > 1$.

SECTION - II

Q6) a) Solve the system of equations by Runge-Kutta Fourth order method [8]

$$\begin{bmatrix} y_1' \\ y_2' \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -5 & -2 \end{bmatrix} \begin{bmatrix} y_1 \\ y_2 \end{bmatrix}$$

With initial conditions $y_1(0) = 2, y_2(0) = -4$, taking stepsize $h = 1.5$

b) Solve $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$, subject to the conditions: [8]

i) $u = 0$ at $x = 0$ and $x = 1$ for $t > 0$

$$\text{ii) } \left. \begin{array}{l} u = 2x, 0 \leq x \leq \frac{1}{2} \\ = 2(1-x), \frac{1}{2} \leq x \leq 1 \end{array} \right\} \text{at } t = 0.$$

Using Explicit Finite Difference Method. Calculate $u(x, t)$ upto $t = 0.02$, taking $\Delta x = 0.1, \Delta t = 0.01$

Q7) a) Using Adam Bashforth method, determine $y(0.8)$, given that $\frac{dy}{dx} = 1 + y^2$,

$$y(0) = 0, y(0.2) = 0.2027, \frac{dy}{dx}$$

$$y(0.4) = 0.4228, y(0.6) = 0.6841$$

$$h = 0.2 \quad [8]$$

b) Use Modified Euler's Method to solve $\frac{dy}{dx} = x - y^2, y(0) = 1$ to

Calculate $y(0.4)$, taking $h = 0.2$ [8]

Q8) a) Find the equation of the curve for which the functional

$$\int_0^{\pi/2} (y'^2 - y^2 + 2xy) dy, \text{ With } y(0) = 0 \text{ and } y\left(\frac{\pi}{2}\right) = 0, \text{ is to be extremized.}$$

[8]

b) Solve the boundary value problem:

$y'' + (1 + x^2)y + 1 = 0, y(-1) = y(1) = 0$, by taking the approximate solution as $y(x) = c_1(1 - x^2) + c_2 x^2(1 - x^2)$, using Rayleigh - Ritz Method. [8]

Q9) a) The life time of electric bulbs for a random sample of 10, from a large consignment gave the following data: [8]

Item:	1	2	3	4	5	6	7	8	9	10
Life in 1000' hours	4.2	4.6	3.9	4.1	5.2	3.8	3.9	4.3	4.4	5.6

(Given $t_{0.05; 9} = 2.262$)

Can we accept the hypothesis that the average life time of bulbs is 4,000 hours?

b) The following table gives the number of good and bad parts produced by each of three shifts in a factory. [8]

Shift	Good	Bad	Total
Day	900	130	1,030
Evening	700	170	870
Night	400	200	600
Total	<u>2000</u>	<u>500</u>	<u>2,500</u>

Is there any association between the shift and the quality of parts produced?

(Given $X^2_{0.05; 2} = 5.991$).

Q10)a) A dealer in electronic goods claims that only 2% of the items, supplied by him are defective. A random sample of 500 items contained 25 defectives. Test the claim of the dealer $|z| = 1.96$ at 5% level of significance. [8]

b) The following table gives the number of refrigerators sold by 4 machines, in the months of May, June, July. [10]

Month	Salesmen			
	A	B	C	D
May	50	40	48	39
June	46	48	50	45
July	39	44	40	39

- i) Is there a significant difference in the sales made by the four salesmen?
- ii) Is there a significant difference in the sales made during different months?

(Given: Table value of F at $df(2, 6) = 4.76$, at 5% level.



Total No. of Questions : 8]

[Total No. of Pages : 2

P1488

[4065]-934

M.E. (Printing & Graphic Communication)

WEB HANDLING ON PRESS

(2008 Course) (508109) (Sem. - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Solve any three questions from each section.*
- 2) *Solve Section - I and Section - II in separate answer books.*
- 3) *Figures on the right indicate full marks.*

SECTION - I

- Q1)** a) Explain purpose, working and functions of Stroboscope. [8]
b) Explain various Splicing mechanisms for web presses. [8]
- Q2)** a) What is Preconditioning of web? Explain working and purpose of corona treatment. [10]
b) Explain flame treatment and antistatic eliminators. [6]
- Q3)** a) Explain the zonal concept of web tension control. [8]
b) What are various web tensioning devices? Explain. [8]
- Q4)** Write short note on any three of the following: [18]
a) Web Viewing systems.
b) Treatment systems on web.
c) Factors influencing web tensions.
d) Web tension control.

SECTION - II

- Q5)** a) Explain lateral and circumferential register control by web movement and cylinder movement. [10]
b) Explain Register marks and its specification. [6]

P.T.O.

- Q6)** a) Explain web guiding systems and its correction mechanism. [8]
b) What is static and dynamic balancing of rollers? Explain. [8]
- Q7)** a) What is web transport roller? Explain lead-in-lead out rollers. [10]
b) Explain the terms : roller tolerances and wrap angles. [6]
- Q8)** Write short note on any three of the following: [18]
a) Automatic register control.
b) Imbalance of a roller.
c) Deflection of roller.
d) Compensator roller.



Total No. of Questions : 8]

[Total No. of Pages : 5

P1490

[4065] - 502

M.E. (Mechanical) (Heat Power)

ADVANCED HEAT TRANSFER

(2008 Course) (502108) (Sem. - 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) *Use of Data Tables and Charts is allowed.*
- 7) *Assume suitable data, if necessary.*

SECTION - I

Q1) Derive the general differential equation of heat conduction in spherical coordinate system and using its simplified form final expressions for heat flow rate and temperature distribution in hollow sphere. (Draw schematic of control volume) Solve the problem of steady state unidirectional heat flow through solid sphere with heat generation. Assume suitable boundary conditions and obtain expressions for T_{\max} . **[16]**

- Q2)** a) Under what conditions the lumped capacitance method may be used to predict the transient response of a solid to a change in its thermal environment? What is the physical interpretation of the *Biot number* and *Fourier number*? What requirement must be satisfied for use of a *one-term approximation* to determine the transient thermal response of a plane wall, a long cylinder. or a sphere experiencing one-dimensional conduction due to a change in surface conditions? At what stage of a transient process the requirement is not satisfied? **[8]**
- b) A new process for treatment of a special material is to be evaluated. The material a sphere of radius $r_0 = 5$ mm, is initially in equilibrium at 400°C in a furnace, It is suddenly removed from the furnace and subjected to a two-step cooling process. **[10]**

P.T.O.

Step 1 - Cooling in air at 20°C for a period of time t_a until the center temperature reaches a critical value, $T_a(0, t_a) = 335^\circ\text{C}$. For this situation, the convection heat transfer coefficient is $h_a = 10 \text{ W/m}^2 \cdot \text{K}$.

After the sphere has reached this critical temperature, the second step is initiated.

Step 2 - Cooling in a well-stirred water bath at 20°C, with a convection heat transfer coefficient of $h_w = 6000 \text{ W/m}^2 \cdot \text{K}$.

The thermophysical properties of the material are Density = 3000 kg/m³, Thermal conductivity = 20 W/m.K, Sp. Heat = 1000 J/kg.K, and Thermal Diffusivity $6.66 \times 10^{-6} \text{ m}^2/\text{s}$.

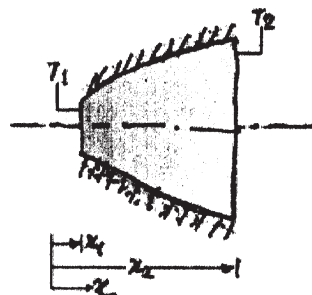
- i) Calculate the time t_a required for step 1 of the cooling process to be completed.
- ii) Calculate the time t_w required during step 2 of the process for the center of the sphere to cool from 335°C (the condition at the completion of step 1) to 50°C. For one-term approximation for given conditions constants are $C_1 = 1.376$, $\zeta_1 = 1.800 \text{ rad}$, State assumptions you made.

- Q3)** a) What are the velocity, thermal, and concentration boundary layers? Under what conditions do they develop? [8]
- b) In a particular application involving air flow over a heated surface, the boundary layer temperature distribution may be approximated as [8]

$$\frac{T - T_s}{T_\infty - T_s} = 1 - \exp\left[-\text{Pr} \frac{u_\infty y}{\nu}\right]$$

Where y is the distance normal to the surface and the prandtl number (0.71 for air). If $T_\infty = 400 \text{ K}$, $T_s = 300 \text{ K}$ and $u_\infty/\nu = 5000 \text{ m}^{-1}$. What is the surface heat flux?

- Q4)** a) The diagram shows a conical section 'fabricated from pure aluminum. It is of circular cross section having diameter $D = a x^{1/2}$, where $a = 0.5 \text{ m}^{1/2}$. The small end is located at $x_1 = 25 \text{ mm}$ and the large end at $x_2 = 125 \text{ mm}$, The end temperatures are $T_1 = 600 \text{ K}$ and $T_2 = 400 \text{ K}$, while the lateral surface is well insulated. ($K_{\text{Al}} = 236 \text{ W/m.K}$) [6]



- b) Annular aluminum ($K = 200 \text{ W/m K}$) fins of rectangular profile are attached to a circular tube having an outside diameter of 50 mm and an outer surface temperature of 200°C . The fins are 2 mm thick and radial length of 15 mm. The system is in ambient air at a temperature of 30°C and the surface convection coefficient is $50 \text{ W/m}^2\text{K}$. [10]
- What are the fin efficiency and effectiveness?
 - If there are 100 such fins per meter of tube length. what is the rate of heat transfer per unit length of tube? Draw schematic diagram.

SECTION - II

- Q5) a)** CPU of a computer has the dimensions of $10\text{cm} \times 50\text{cm} \times 40\text{cm}$ height. Its surface temperature is 39°C . It is kept in still air at 15°C . Neglecting heat transfer from its bottom, find the rate of heat transfer from the CPU. Properties of air at mean film temperature are density = 1.1614 kg/m^3 , $C_p = 1.007\text{kJ/kg K}$, $\nu = 15.89 \times 10^{-6}\text{m}^2/\text{s}$, average of the lengths of the two sides of the rectangle. [10]

Use the following correlations :

For vertical surface - $Nu = 0.59 Ra^{1/4}$ for Ra from 10^4 to 10^9

$Nu = 0.10 Ra^{1/3}$ for Ra from 10^9 to 10^{13}

For horizontal surface - $Nu = 0.54 Ra^{1/4}$ for Ra from 10^5 to 2×10^7

$Nu = 0.14 Ra^{1/3}$ for Ra from 2×10^7 to 2×10^{10} .

- b) Prove that $L/D = 2.86$ is the relation to decide whether tubes are to be kept horizontal or vertical in a condenser. L is the length and D the diameter of the tubes to be used in condenser. [8]

- Q6) a)** In a boiler, heat is radiated from the burning fuel (A_1) to the side walls (A_3) and the boiler tubes (A_2) at the top. Assume black body behavior and side walls perfectly insulated. Derive the equation for temperature of the side walls T_3 as a function of temperatures for the fuel bed T_1 and boiler tubes T_2 with corresponding areas A_1 and A_2 . Also, calculate the net radiative heat transfer rate to the boiler tubes, if $A_1 = A_2 = 0.25\text{m}^2$. Given $F_{12} = F_{23} = F_{13} = 0.5$, $T_1 = 1700^\circ\text{C}$ and $T_2 = 300^\circ\text{C}$. [8]

- b) State Wien's law and derive its expression starting from Planks law using standard notations. [8]

Q7) a) With the help of curve, discuss pool boiling phenomenon. [8]

b) A condenser consists of 169 tubes arranged in square array. Water flows through the tubes at 65°C while steam condenses on the outer surface of the tubes at 75°C. Length of each tube is 2m and diameter is 30mm. Find the rate of condensation of steam, if the tubes are kept horizontal. Properties of water at 70°C are : [8]

Density = 977.8kg/m³, $\mu = 415 \times 10^{-6}$ kg/ms, $C_p = 4.187$ kJ/kg K, $k = 0.668$ W/m K, latent heat of steam = 2300 kJ/kg.

Q8) a) Explain : [8]

- i) Reynolds analogy.
- ii) Chilton-Colbourn analogy.

b) Write short notes on : [8]

- i) Electronic cooling.
- ii) Ablative cooling.



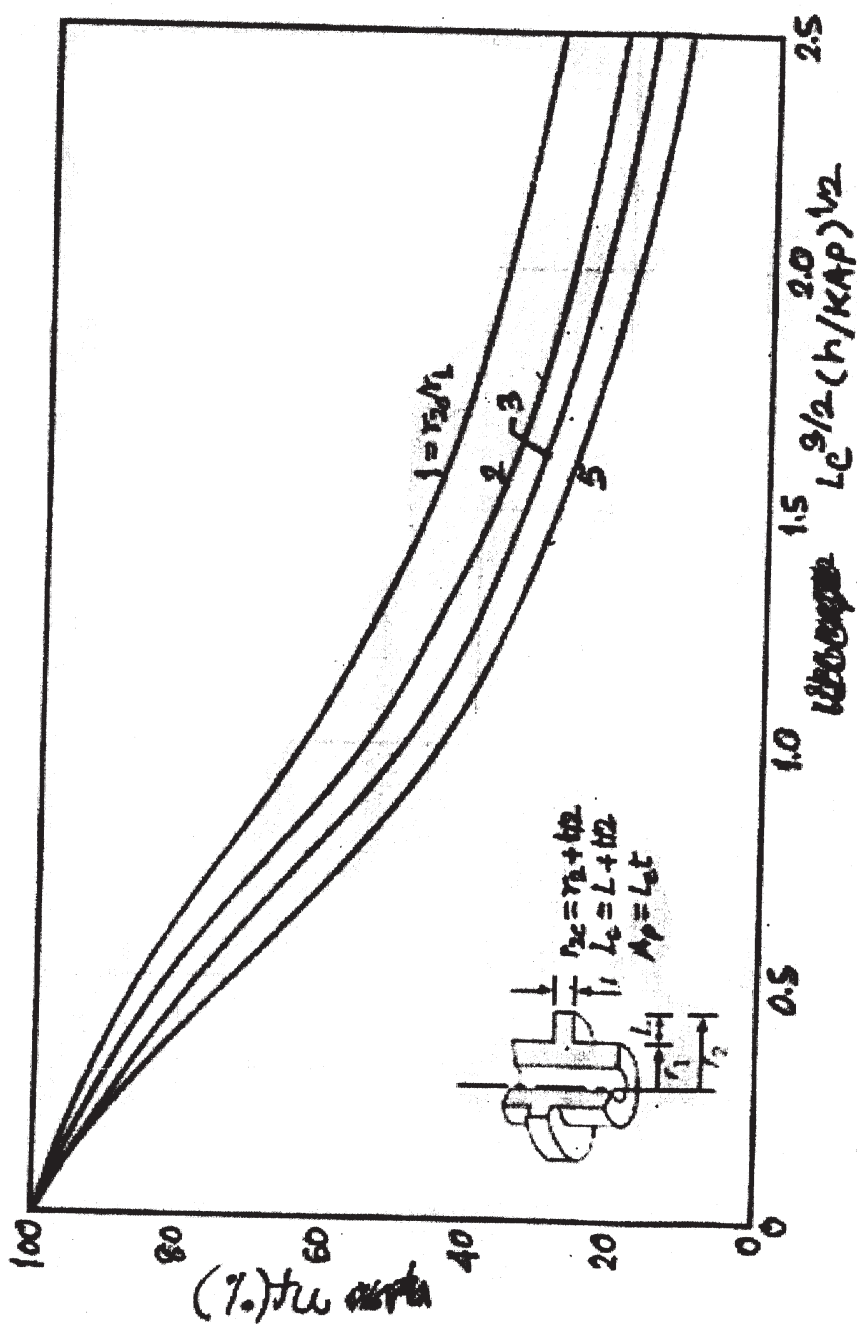


Fig. Efficiency of annular fins of rectangular profile For Q.4(b)



P1491

[4065]-743

**M.E. (Computer Engg.) (Computer Networks)
EMERGING TRENDS IN COMPUTER ARCHITECTURE
(2008 Course) (510102) (Sem. - I)**

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Explain the cluster architecture used in the IBM SP system. **[8]**
b) What is a Massively Parallel Processor (MPP) system? Discuss the characteristics of such a system and issues associated with it's design. **[8]**
- Q2)** a) State and explain in brief various design issues to be considered in the design of a cluster computer. Also discuss the idealized cluster architecture. **[8]**
b) Explain the schemes used for routing packets in a switched network. Also explain in brief the various data routing functions. **[8]**
- Q3)** a) Discuss the following mechanisms for fast locking. **[8]**
i) Ticket algorithm.
ii) Array-link based algorithm.
b) Discuss various factors that affect the performance of a communication subsystem. **[8]**
- Q4)** Write short notes on : **[18]**
a) EPIC architecture.
b) Fibre channels.
c) IBM Power IV.

P.T.O.

SECTION - II

- Q5)** a) Explain the term “Direct Access File System” (DAFS). Also compare it with NFS. **[8]**
- b) What is a “Network Attached Storage” (NAS)? Discuss the performance bottlenecks in NAS servers. **[8]**
- Q6)** a) What is WSRF? Also explain the WSRF specifications to be used in management of WS-resource. **[8]**
- b) Discuss the topology and architecture of Sneha-Samuham model for grid computing. **[8]**
- Q7)** a) Explain various paradigms for writing parallel algorithms. **[8]**
- b) Discuss various communication modes used in message-passing systems. **[8]**
- Q8)** Write short notes on : **[18]**
- a) Architecture of OSGA-DAI for grid database services.
- b) Storage area network.
- c) Support for data parallelism in high-performance Fortran (HPF).



Total No. of Questions : 8]

[Total No. of Pages : 3

P1493

[4065] - 47

M.E. (Mechanical Engg. Heat Power)

ADVANCED FLUID MECHANICS

(2002 Course) (502106)

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) *Use of logarithmic tables, slide rule and electronic pocket calculator is allowed.*
- 4) *Assume suitable data, if required.*

SECTION - I

Q1) Consider fully developed flow between two parallel plates, separated by a distance $2h$.

- a) Simplify the Navier-Stokes equations for this case. [3]
- b) Present the boundary conditions. [3]
- c) Solve for the velocity profile. [7]
- d) Determine the average velocity in terms of the maximum velocity. [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 equation for compressible flows. [7]

c) What is the behaviour of T , T_0 , p , p_0 and M across a shock. [5]

P.T.O.

Q4) a) What are the first order Forward and Backward difference expressions for $\frac{\partial u}{\partial x}$? [2]

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 :

$$u = x^2 - y^2,$$

$$v = -2xy$$

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 (two-dimensional) body is placed in a uniform flow of velocity U . On the wake side, the velocity profile is measured (at an x -location) as $u = f(y)$. A body is in open space. The point where the wake velocity is measured is sufficiently far from the body, so that the pressure recovery can be assumed.
- Draw a control volume to indicate the flow of mass and momentum. **[3]**
 - Perform mass balance across the control volume. **[5]**
 - Perform momentum balance and thus determine the Drag force. **[8]**



P1495

[4065] - 512

M.E. (Mechanical - Design Engineering)

ADVANCED STRESS ANALYSIS

(2008 Course) (Sem. - I) (502202)

Time : 3 Hours]

[Max. Marks :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) Derive the compatibility equation in cartesian co-ordinate system. [8]
 b) Investigate what problem of plane stress is represented by the function.

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

where, h is half depth of the beam, and F as the concentrated load. [8]

- Q2) a) A thin walled box section of dimensions '2a × a × t' is to be compared with a solid section of diameter 'a' find the thickness 't' so that the two sections have
- i) the same maximum stress for the sametorque.
 - ii) the same stiffness. [10]

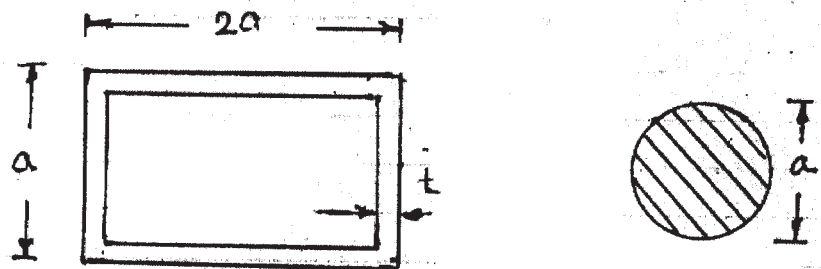


Fig. 1 Q. 2(a)

- b) Compare Kelvin's fluid - flow analogy with Prandtl's membrane analogy. [6]

P.T.O.

Q3) State the assumptions made in solutions of problems in contact stresses. Derive from fundamentals the expression for the contact stresses between two rollers (with parallel axis) under compressive load. How this relation is used to find contact stresses between two spur gears. [16]

Q4) Explain with suitable examples the types of stresses induced in the rotating disc. Find the stresses in the rotating disc with varying thickness. [16]

Q5) Write short notes on any THREE. [18]

- a) Rayleigh Ritz method.
- b) Torsion of thin walled tubes.
- c) Airy stress function and its significance in stress analysis.
- d) Castigliano's theorem.

SECTION - II

Q6) a) A fringe order of 2.5 was observed at a point in a stressed plane stress model with light having a wavelength of 589 nm. Assuming that stress optic coefficient 'C' remains constant, what fringe order would be observed at the point considered when light with wavelength of 548 nm is used? Derive the formula used. [10]

b) Explain in details desirable properties of strain gauge material. [6]

Q7) Derive an expression and locate shear centre for the cross section shown in fig. 2 [16]

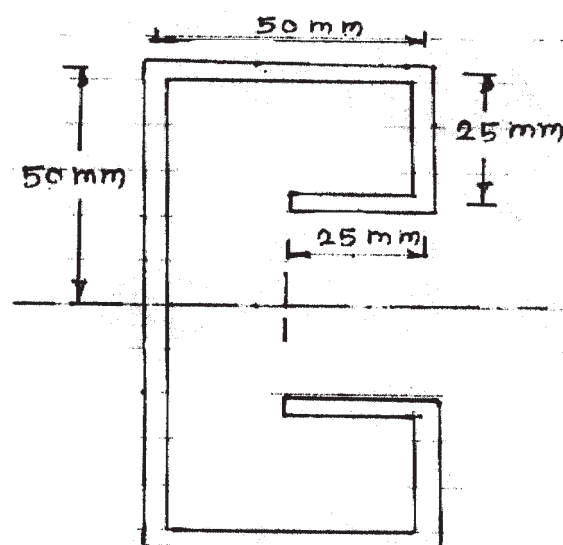


Fig. 2 Q.No.7

Q8) a) Determine the shape factor for I section shown in fig. 3 [8]

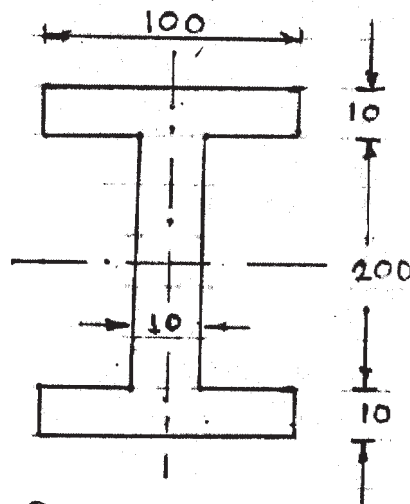


Fig 3 Q.No. 8

b) Explain the fracture mechanics approach for estimation of residual life of component. What is critical stress intensity factor? How it is useful in design of cracked components? [8]

Q9) Derive the governing equations for evaluation of stresses and deflections in circular plate with edges clamped and subjected to central concentrated force 'P'. State any assumptions that you make and explain limitations if any. [16]

Q10) Write short note on any 'THREE'. [18]

- Modes of fractures.
- Dimensional analysis.
- Strain gauge rosette.
- Spring back effect in plastic bending.



P1501**[4065]-446**

**M.E. (Civil - Hydraulic Engineering)
OPEN CHANNEL HYDRAULICS
(2008 Course) (501308) (Sem. - II)**

*Time : 3 Hours]**[Max. Marks : 100**Instructions to the candidates:*

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

SECTION - I

Q1) a) For a circular conduct of flowing partially full, show that the condition

$$\frac{Q^2}{gD^5} = \frac{\theta - \sin \theta \cos \theta}{64 \sin \theta} \text{ is satisfied when the depth is critical.} \quad [8]$$

- b) A rectangular channel is 4m wide and carries a discharge of 20m³/s at a depth of 2m. At a certain section, it is proposed to build a hump. Calculate the water surface elevations at upstream of the hump and over the hump if the hump height is
- i) 0.33m and
 - ii) 0.20m.
- Assume no loss of energy at the hump. [10]

Q2) a) Describe hydraulic jump on a sloping floor with respect, to length and energy loss. [8]

- b) A sluice gate in a 3m wide rectangular horizontal channel releases a discharge of 18.m³/s. The gate opening is 0.67m and the coefficient of contraction can be assumed to be 0.6. Examine the type of hydraulic jump formed when the tail water is 4m. [8]

Q3) a) Sketch the gradually varied flow on the upstream and downstream of a sluice gate introduced in a [6]

- i) Steep slope.
- ii) Mild slope and
- iii) Horizontal bed channel.

P.T.O.

- b) A very wide rectangular channel conveys a discharge of $3.25\text{m}^3/\text{s}/\text{m}$ width at a depth of 2.5m . The bed slope is 1 in 5000. Due to weir placed across the channel, the water level is raised by 1.5m just on the upstream of it. Find at what distance upstream of the weir the depth of water will be 3m . Take $C = 52$. Classify the type of surface profile. Use step method and take two trials. [10]

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

- a) Channel transition with a hump.
- b) Velocity distribution in open channel flow.
- c) Finite difference method for gradually varied flow computations.
- d) Specific energy diagram and specific force diagram.
- e) Classification of flow profiles.

SECTION - II

Q5) a) Derive the basic differential equation of spatially varied flow with decreasing discharge. [8]

- b) Obtain an expression to determine the critical depth and its location for a lateral spillway channel of rectangular section. Use chezy formula taking C as a constant. [8]

Q6) a) Obtain the equation of motion in case of stratified flow. [8]

- b) Explain exchange co-efficients in detail. [8]

Q7) a) What is flood routing? What are uses of flood routing? Differentiate between channel routing and reservoir routing. [9]

- b) Explain in detail the 'Method of Characteristics' solution of St. Venant equation. [8]

Q8) a) A 3m wide rectangular channel has a flow with a velocity of 2.5 m/s , and the depth of flow of 1.2m . The rate of inflow at the upstream end is suddenly increased to such an extent that the depth is doubled in magnitude. Estimate the absolute velocity of the resulting surge and the new discharge. [8]

- b) Write short notes on any three of the following : [9]

- i) Dam break problem.
- ii) Group velocity.
- iii) Standing and progressive waves.
- iv) Profile computations in spatially varied flow.
- v) Muskingum method.



P1502**[4065]-840****M.E. (Computer) (Information Technology)****APPLIED ALGORITHMS****(2008 Course) (514421) (Sem. - I)***Time : 3 Hours]**[Max. Marks : 100**Instructions to the candidates:*

- 1) Answer **THREE** questions from each section.
- 2) Answers to the **TWO** sections should be written in **SEPARATE** answer books.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

SECTION - I

Q1) a) Prove that for every natural number n , $2^0 + 2^1 + \dots + 2^n = 2^{n+1} - 1$ using mathematical induction. **[6]**

b) Prove by contraposition “If a product of two positive integers is greater than 100, then at least one of the number is greater than 10”. **[6]**

c) Comment on the following equalities : **[4]**

i) $5n^2 - 6n = \Theta(n^2)$

ii) $n! = O(n^n)$

iii) $33n^3 + 4n^2 = \Omega(n^2)$

iv) $33n^3 + 4n^2 = \Omega(n^3)$

Q2) a) Solve the following recurrence :

$$T(n) = 7 \dots\dots\dots \text{for } n = 0$$

$$0 \dots\dots\dots \text{for } n = 1$$

$$4T(n-2) + 3T(n-1) \dots \text{otherwise} \quad \text{[6]}$$

b) Consider the following while loop structure :

```

i = 1;
while (i <= m)
{
P(i);
i=i+1;
}

```

Give the analysis of the above loop structure, assuming :

'*t*' to be the time taken by P(*i*) and

'*c*' to be the upper bound on time required.

[6]

c) Analyze the following algorithm:

```
int b_search(int x)
{
    i=1;
    j=n;
    while (i<j)
    {
        //assumption is 'x' doesn't exist in array
        mid=(i+j)%2;
        {
            case x < T[mid] : j=mid-1;
            case x == T[mid] : i=mid; j=mid;
            case x > T[mid] : i=mid+1;
        }
        return(i)
    }
}
```

[6]

Q3) a) Consider the following algorithm used to maintain the max heap property:

MAX-HEAPIFY(A, i)

```
{
/* A is an array of inputs, i is index to A. When it is called,
MAX_HEAPIFY assumes that the binary trees rooted at Left(i) and
Right(i) are max-heaps, but A[i] might be smaller than children, thus
violates the rule of max_heap. The algorithm allows the value at A[i] to
"float down" so as to maintain heap property.*/
```

```
l = LEFT(i)
```

```
r = RIGHT(i)
```

```
if (l <= heapsize[A] and A[l] > A[i]) then
```

```
    largest = l
```

```
else
```

```
    largest = i
```

```
if (r <= heapsize[A] and A[r] > A[largest])
```

```
    then
```

```
        largest = r
```

```
If (largest ≠ i) then
```

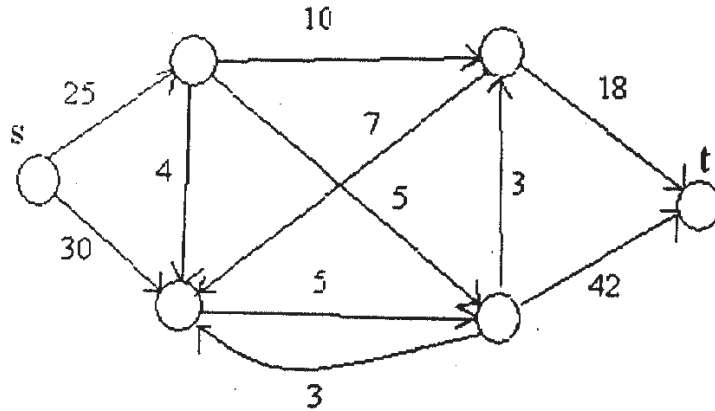
```
    exchange(A[i], A[largest])
```

```
MAX-HEAPIFY(A, largest)
```

```
}
```

With the help of recurrence relation, determine the running time of this algorithm. [8]

- b) Determine max flow between S and t using Ford-Fulkerson method. Show the stepwise results. [8]



- Q4) a) Assume that A is an array of n integers. Write an algorithm to produce a random permutation of this array by assigning random priority to array elements. Prove that this algorithm produces uniform random permutation of the input assuming that all priorities are distinct. [8]
- b) Write short note on : Minimum Spanning trees. [8]

SECTION - II

- Q5) a) Given two line segments P_0P_1 and P_0P_2 , how do you determine whether is the line segment P_0P_1 is clockwise from the line segment P_0P_2 , with respect to common endpoint P_0 ? What is the time complexity to determine the same? Justify your answer. [6]
- b) Define convex hull of set of points. Enlist few applications of convex hulls. [4]
- c) What is Voronoi diagram? Give any suitable example of your choice for Voronoi diagram and briefly explain the same. [6]
- d) State True or False : [2]
- i) Graham's scan algorithm is used for solving convex hull problem.
 - ii) Divide and Conquer strategy can be used for solving convex hull problem.

- Q6)** a) Solve the following Linear Programming Problem using SIMPLEX method. [10]

$$\text{Maximize } Z = 2x + 4y + 3z$$

Subject to :

$$3x + 4y + 2z \leq 60$$

$$2x + y + 2z \leq 40$$

$$x + 3y + 2z \leq 80$$

$$x, y, z \geq 0$$

- b) The vertex cover problem is to find the vertex cover of minimum size in a given undirected graph, where in vertex-cover of an undirected graph $G(V,E)$ is a subset $V' \subseteq V$ such that if $(u,v) \in E$, then $u \in V'$ or $v \in V'$ (or both), in the minimum weight vertex cover problem, we are given an undirected graph. $G(V,E)$ in which each vertex $v \in V$ has an associated positive weight $w(v)$. For any vertex cover $V' \subseteq V$, we define the weight of cover $w(V') = \sum_{v \in V'} w(v)$. The goal is to find the vertex cover of minimum weight.

Write the linear programming model for above problem. (Solving the linear programming problem is not expected). [6]

- Q7)** a) Give an approximation algorithm that determines whether or not a given graph has an Euler Path. [8]

- b) Define the following terms : [8]

- i) Absolute approximation of algorithm.
- ii) ϵ (epsilon) approximation of algorithm.
- iii) Polynomial time approximation of algorithm
- iv) Approximation ratio.

- Q8)** a) Compare CRCW and EREW algorithm techniques. [8]

- b) What is the basic problem in CRCW PRAM, when more than one processor tries to write in the same cell? How it can be overcome? [4]

- c) When do claim that a parallel algorithm is work optimal? Briefly explain. [4]



P1505**[4065]-168**

M.E. (Electrical) (Control System)
NON LINEAR CONTROL SYSTEMS
(2002 Course) (503102)

*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) Discuss the characteristics of nonlinear system. **[8]**
- i) Frequency-Amplitude dependence.
 - ii) Jump resonance.
 - iii) Limit cycle.
 - iv) Soft and Hard Excitation.
- b) Explain the following terms : **[8]**
- i) Phase Plane.
 - ii) Phase Plane trajectory.
 - iii) Isocline.
 - iv) Phase Portrait.
- c) Explain different singular points for autonomous system. **[9]**
- Q2)** a) A unity feed back control system consists of nonlinear element cascaded with $G(s) = \frac{1}{s(s+2)}$ where the nonlinear function is defined by relay whose output equal to ± 1 . For unit step input using isocline method, construct the phase plane trajectory. Also comment on stability. **[15]**
- b) Using Delta method draw phase plane trajectory of Second Order equation $\ddot{x} + 2\dot{x} + x = 0$, take starting point as $\dot{x} = 1.5$ & $x = 0$. **[10]**

P.T.O.

- Q3)** a) Derive the describing function and determine frequency and amplitude of the limit cycle if exist for unity feedback control system an ideal relay with output equal to ± 2 is cascaded with the forward path transfer

$$\text{function } G(s) = \frac{1}{s(s+1)} \quad [15]$$

- b) Derive the describing function for saturation. [10]

SECTION - II

- Q4)** a) Derive describing function for relay with dead zone. [9]

- b) Explain [16]

- i) Circle criterion.
ii) Popov method.

- Q5)** a) Check the definiteness of scalar function in quadratic form. [8]

$$V(x) = x_1^2 - 2x_1x_2 + 4x_2^2 + 3x_1x_3 + 5x_3^2 + x_2x_3$$

- b) Explain positive definiteness positive semidefiniteness, negative definiteness, negative semidefiniteness. [8]

- c) The system is given below

$$\dot{x}_1 = 2x_2$$

$$\dot{x}_2 = -2x_1 - 3x_2$$

- Select i) $V = x_1^2 + x_2^2$ ii) $V = 2x_1^2 + x_2^4$ as Liapunov function and determine stability for each case. [9]

- Q6)** a) Explain delta method for constructing phase plane trajectory for a given system. [8]

- b) What is an adaptive system? Explain design of nonlinear adaptive system. [8]

- c) For linear time-invariant system $\dot{x} = Ax$, derive expression $A^T P + P A = -Q$ where P & Q are Square Symmetric positive definite matrices. [9]



P1507

[4065]-219

M.E. (Petroleum)

ARTIFICIAL LIFT AND STIMULATION TECHNIQUES

(2002 Course)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Question numbers one and six are compulsory. Out of the remaining solve 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, and electronic pocket calculator is allowed.*
- 6) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Assume suitable data, draw the schematic graph and explain the method to determine the point of gas injection, in continuous gas lift. **[10]**
- b) Construct typical graphs in following cases. **[8]**
- i) IPR below bubble point and above bubble point, depletion drive.
 - ii) IPR before and after improvement of formation damage.
 - iii) GOR, PI and pressure trends against time for depletion drive indicate all the relevant features on it.
- Q2)** a) Categorize the suitable parameters to select ESP, Gas lift-Continuous and Intermittent, PCP, Hydraulic-Jet, Reciprocating as per their applications in following areas in a tabular form. Applications in handling of viscous fluid, paraffin, solids handling capability. Offshore, deviated hole, GOR, PI, BHP - High/Low. High and low volume lift capability-Poor/fair/good/excellent/not applicable. **[12]**
- b) It was desired to produce 730 bbls of oil per day from a well using gas lift. The optimum GLR at the operating point is 3076 SCF/STB. The formation oil has a gravity of 39° API and a GLR of 350 SCF/STB. Calculate the required gas injection rate. **[4]**

P.T.O.

Q3) Draw and explain subsurface layout of ESP components and their assembly. Also calculate TDH and total HP, if pump with 0.38 HP/stage is available and each stage can provide a head of 35 feet.

Given Data :

It is desired to produce oil of Sp. Gravity 0.96 (No gas) at the rate of 1400 bbls/day from 5650 ft deep well. The static liquid level = 2300 ft. Casing = 5½ inch O.D. Tubing = 2⅜ inch O.D. T = 154°F. During the test on this water well it was seen that, it is producing 800 bbls/day with liquid level at 3000 ft in the csg., which then stabilized to above 2300 ft. Use 100 ft safety in setting pump. Tubing friction is given as 30.5 ft/1000 ft. At the surface there is 2300 ft of 2.0 inch flow line with an increase in elevation = 39 ft., with friction = 30.5 ft/1000 ft. [16]

Q4) a) Draw dynagraph curves and indicate various operational problems of SRP system on it. Also explain and derive the equation to calculate ideal counterbalance effect in surface set up of SRP. [12]

b) Draw the neat schematic sketch of subsurface pumping cycle of SRP. Indicate various components of it. [4]

Q5) Write the various workover problems for oil and gas wells and discuss the solution for them in brief, to solve these problems. [16]

SECTION - II

Q6) a) Explain skin factor and its relevance for a damaged and improved well. [6]
b) Draw the schematic sketch and explain Gas ‘Cusping’ and water ‘coning’ phenomena. What are the reasons of it? How to stop it? Explain. [12]

Q7) a) Use the equation of state and derive the formula of gas formation volume factor. Also estimate the value of gas formation volume factor for 0.818 gravity dry gas in a reservoir with temperature 220°F and reservoir pressure of 2200 psig. Assume gas compressibility factor, Z = 0.855. [6]

b) Draw the schematic sketch and explain in brief various types of flow regimes during flow through vertical production tubing. [6]

c) Explain liquid loading of gas wells. [4]

Q8) Explain the following PVT parameters : [16]

a) Oil formation volume factor.

b) Gas compressibility factor.

c) Oil viscosity.

d) Bubble point pressure.

- Q9)** a) Draw the neat schematic sketch of a typical sub-surface completion of a producing wellbore. Indicate production casing, two tubing's, packers, use of screen and gravels to control sand production. Show three productive formations in it. **[10]**
- b) Write and explain chemical reactions one each for matrix acidization of Carbonate and Sandstone mineral in brief. Also explain the meaning of dissolving power of acid. **[6]**
- Q10)** a) When to go for Artificial lift technology? Why? Explain. **[4]**
- b) Discuss the hydraulic fracturing process using a typical surface read-out graph. Also explain selection criteria for fracturing fluid. **[12]**



Total No. of Questions : 8]

[Total No. of Pages : 2

P1509

[4065] - 238

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

TRANSDUCER DESIGN

(2002 Course) (506102)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

Q1) The Torque sensor is to be selected for measuring torque of a car axels. Suggest transducer to measure torque in motion of the vehicle. The test set up is available to measure the torque & also to keep car in motion. Selection of torque sensor alongwith signal conditioning & display system with recording facility be described. **[16]**

Max. torque expected is 1000 N.m. with fluctuations of order of 200 Hz.

Q2) Design liquid level sensor to measure liquid level in a petrol tank on the pump station. Describe type of sensor, its specifications, signal conditioning system & continuous level monitoring system to keep record. **[16]**

Q3) A flow measuring system employing ultran sonic technique is to installed on a 1mtr. dia pipeline carrying water from reservoir of a dam to filtration tank of pune municipality. Discuss the scheme, with recording and monitoring system. **[18]**

Q4) Design a force transducer, employing contelever mechanism, to measure a load of a chemical liquid holding tank. Total load expected is 1 ton. The fluctuations are expected during filling and emptying of the tank. The load variations are for tank capacity of 5% to 100%. Describe a design of force transducer, along with. **[16]**

P.T.O.

SECTION - II

Q5) A mini lathe used in watchmaker's workshop has a linear displacement of 50mm. The resolution demanded is 0.01mm and accuracy desired in 0.1%. LVDT is suggested for measurement of displacement. Discuss LVDT specification signal conditioner circuit & display mechanism to help monitor the displacement. **[16]**

Q6) a) A Hall effect device is to be used to control magnetic flux monitoring system. Discuss the sensor its operation & instrument system with digital display. The flux measurement is to be done in an environment where temperature variation is from 0° to 60°C. discuss temperature monitoring device as well. **[10]**

b) A piezoelectric accelerometer of 1g capacity is suggested to monitor vibrations to the building of Hydro power house. Suggest complete scheme with specifications of accelerameter & its related display & recording instrumentation maximum resolution desired is 0.1% with accuracy better than 0.15%. **[8]**

Q7) Design temperature instrumentation for a steel melting plant. Discuss a sensor to be employed to monitor temperature from 50°C to 1800°C. Discuss circuit & its display record instrumentation. **[16]**

Q8) A pressure monitoring system is to be installed in a process plant. The pressures upto 200 Bar. Discuss suitable transducer & control system for this range of pressure monitoring. **[16]**



Total No. of Questions : 8]

[Total No. of Pages : 2

P1510

[4065] - 268

M.E. (CSE) (Information Technology)

NET CENTRIC COMPUTING

(2002 Revised Course) (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.*
- 5) Use of non-programmable calculator is allowed.*

SECTION - I

- Q1)** a) How selective repeat protocol is different from go back in protocol?
Which protocol is best and why? [8]
- b) Why TCP/IP model is chosen for Internet over SPX/IPX model? [8]
- Q2)** a) Which parameters are used to distinguish networks from each other?
Give the classification of PAN, LAN, MAN, WAN and Internet using
above parameters. [8]
- b) Which parameters are used to calculate the performance of computer
networks? How network performance is calculated? [8]
- Q3)** a) What are the different types of faults occurs over computer networks?
How are they detected? Are there any mechanisms available to prevent
them to occur? [8]
- b) How a network installed using routers transfer the information over
the network installed using the bridges? [8]
- Q4)** Write short notes on (Any three) : [18]
- a) Repeater.
 - b) Gateways.
 - c) NETBIOS.
 - d) Multipoint Line Layout Heuristics.

P.T.O.

SECTION - II

- Q5)** a) A client sends a 128-byte request to a server located 100 km away over a 1-gigabit optical fiber. Determine the efficiency of the optical line if client uses remote procedure call. [8]
- b) How a DWDM mechanism provides more number of channels over the same transmission window? [8]
- Q6)** a) Explain any two switching techniques used in optical domain. [8]
- b) What security mechanisms are available to prevent attacks on on-line commercial applications? [8]
- Q7)** a) List and explain any two protocols for the transport of voice over IP networks. [8]
- b) What is RAID? How good it is for the backup management? [8]
- Q8)** Write short notes on (any three) : [18]
- a) Lossy Compression.
 - b) ESAU-Williams Algorithm.
 - c) NAS.
 - d) Kerberos.



Total No. of Questions : 6]

[Total No. of Pages : 2

P1512

[4065] - 466

M.E. (Civil - Structures)

MANAGEMENT IN STRUCTURAL ENGINEERING

(2008 Course) (501410)(Sem.- II)

Time : 4 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) *Answer any two questions from each section.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicates full marks.*
- 5) *Use of electronic pocket calculator is allowed.*

SECTION - I

- Q1)** a) Explain briefly the role of resource Management in planning and controlling productivity. [8]
b) What are the time reduction techniques. Explain any one of them. [8]
c) Why the classification of construction material is done? What are the factors affecting it? And classify the construction material [9]
- Q2)** a) Explain the meaning of 'Durability of Concrete' what is its importance in concrete construction. [8]
b) What is sampling in relation with quality control? What are the various sampling techniques? [8]
c) Explain in details different methods of corrosion control. [9]
- Q3)** a) Explain schmidt's rebound hamner Test. [8]
b) Write a short note on
i) limitation on investigators.
ii) factors affecting health of structures. [8]
c) Explain the relationship between client Architect, consulting Engineers and contractors. [9]

P.T.O.

SECTION - II

- Q4)** a) What is the difference between repair, restoration, retrofitting and strengthening. [8]
b) Define adhesives. Name different adhesives used in concrete work? which is most suitable adhesive in construction work? Why? [8]
c) Discuss the factor affecting choice of repair methods. [4]
d) Why vinyl resins are widely used as protective coatings and patch work maker. [5]
- Q5)** a) Explain the structural aspects for formwork in building. [8]
b) Explain how to reduce cost of form work. [5]
c) Explain material handling and stacking. [4]
d) Write short note on. [8]
i) Safety precautions working at height.
ii) Formwork for bridge construction.
- Q6)** a) Write terms and conditions that should be fulfilled in demolition contracts. [8]
b) Write a short note on recycling of demolished material. [8]
c) Explain in details planning and executing of demolition. [9]



Total No. of Questions : 8]

[Total No. of Pages : 2

P1513 [4065] - 486

M.E. (Civil) (Environmental Engg.)

SOLID WASTE AND HAZARDOUS WASTE MANAGEMENT

(Sem. - II) (2010 Course) (501510)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

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

SECTION - I

Q1) What are the Problems and issues of solid waste and hazardous waste management. Discuss the environmental Impacts of mismanagement of solid and Hazardous wastes. **[16]**

Q2) Define Risk. What is the goal of risk assessment. Discuss the concept of zero-risk hazardous waste management. **[16]**

Q3) a) A Municipal Sewage Treatment plant produces a sludge containing toxic metals at a concentration in excess of TCLP limits. After dilution with stormwater runoff the concentration is less than TCLP limits. Discuss whether the sludge is hazardous waste. **[6]**

b) For a multispeciality hospital, located in rural areas, how will you manage the solid waste generated from this hospital including Biomedical waste. **[10]**

Q4) a) Discuss the manifest system for the disposal of hazardous wastes. **[9]**

b) Discuss the general considerations for the waste storage at a source of solid waste. **[9]**

P.T.O.

SECTION - II

- Q5)** a) Discuss the energy recovery from solid waste. [6]
b) Define sanitary landfills. Discuss the following with respect to sanitary landfilling. [10]
i) Site selection criteria.
ii) Methods of landfilling.
- Q6)** a) Discuss the elements of a Leachate control system. [8]
b) Explain with neat sketch a hazardous waste landfill with a double linear and drain system. [8]
- Q7)** Explain the Principle, construction and working of the following with neat diagrams.
a) Waste Heat Boilers. [5]
b) Pyrolysis. [6]
c) Incineration. [5]
- Q8)** Write short notes on: [3 × 6 = 18]
a) Economic analysis of solid waste management.
b) Transfer stations.
c) Management of Nuclear waste.



P1514**[4065] - 504****M.E. (Mech.) - Heat Power****ADVANCED FLUID MECHANICS****(502110) (2008 Course) (Sem. - II)***Time : 3 Hours]**[Max. Marks :100**Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *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 a stream function exists for the velocity field of :- $u = a(x^2 - y^2)$,
 $v = -2axy$, $w = 0$ find it, plot it and interpret it. **[8]**
- b) Consider steady, incompressible, laminar flow of a Newtonian fluid in the narrow gap between two infinite parallel plates (Fig. 1). The top plate is moving at velocity v & the bottom plate is stationary. The distance between these two plates is h , and gravity acts in the negative z direction (into the page in the Fig. 1). There is no applied pressure other than hydrostatic pressure due to gravity. This flow is called couette flow. Calculate the velocity and pressure fields and estimate the shear force per unit area acting on the bottom plate. **[8]**
- Q2)** a) SAE 30W oil at 20°C flows through the 90 mm diameter pipe in Fig. 2 at an average velocity of 4.3 m/s **[10]**
- i) Verify that the flow is laminar
 - ii) Determine the volume flow rate in m^3/h .
 - iii) Calculate the expected reading h of the mercury manometer in mm.
- b) List the assumptions made in deriving the equation of motion for a laminar boundary layer over a flat plate. **[6]**

P.T.O.

- Q3) a)** A steel sphere of 4mm diameter falls in glycerine at a terminal velocity of 0.04 m/s. Assuming stokes law is applicable, determine:
- Dynamic viscosity of glycerine.
 - Drag force, and
 - Drag co-efficient for the sphere.
- Take specific weight of steel and glycerine as 75 kN/m^3 and 12.5 kN/m^3 respectively. [8]
- b)** State and explain Prandtl mixing length hypothesis. [8]
- Q4) a)** Derive the governing equation for conservation of mass in integral form. [8]
- b)** What is 'Substantial derivative'? Is it different than derivative using differential calculus? Justify your answer. [6]
- c)** What is mean by average drag co-efficient C_D ? How does it differ from the local drag co-efficient C_{D^*} ? [4]

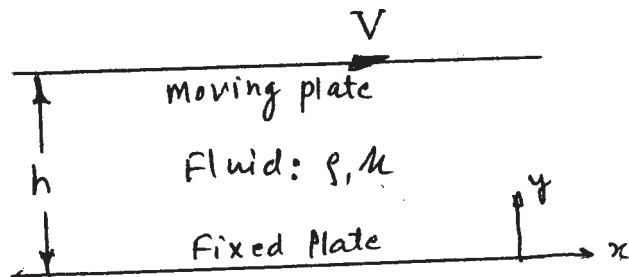


Fig 1.

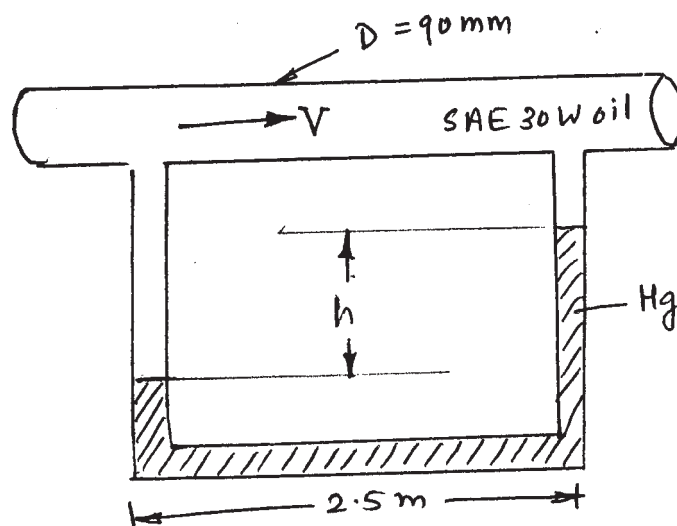


Fig 2

SECTION - II

- Q5)** a) Derive an expression for Prandtl's universal velocity distribution for turbulent flow in pipe. Why this velocity distribution is called universal? Also explain the terms shear velocity and velocity defect in detail. [10]
b) A rough pipe is of diameter 80 mm. The velocity at a point 30 mm from wall is 30% more than the velocity at a point 10 mm from pipe wall. Determine the average height of the roughness. [8]
- Q6)** a) Explain the concept of hydrodynamic stability in fluid flow. When is flow called stable, unstable and naturally stable? Which are the two ways of creating energy disturbance in transition flow, to analyse its stability? [8]
b) Explain k-epsilon model in turbulent flow. [8]
- Q7)** a) Air at 20°C and 1 atm issues at 0.001 kg/s from a 4 mm diameter orifice into still air. At a section in the jet 1 m down stream of the orifice, estimate
i) the maximum velocity.
ii) the jet width or diameter.
iii) the ratio of $\frac{\rho_{jet}}{\rho_{air}}$.
Take $\rho_{air} = 1.213 \text{ kg/m}^3$, $\mu_{air} = \text{Dynamic viscosity at } 20^\circ\text{C \& 1 Atm} = 1.8 \times 10^{-5} \text{ N-s}$. [10]
b) Write in brief the concept of oblique - shock. [6]
- Q8)** a) A normal shock occurs in the divergent section of a convergent - divergent nozzle. The upstream Mach Number is 1.8, Pressure is 0.5 bar, and the area ratio of the divergent section is 3. Calculate the Mach Number, static and stagnation pressure at the exit of the nozzle assuming isentropic flow after the shock. [10]
b) What do you mean by 'Chocking in nozzles'. [6]



APPENDICES

- A.1 One-dimensional normal shock relations for a perfect gas, $K = 1.4$
- A.2 One-dimensional isentropic flow parameters for perfect gas, $K = 1.4$
- A.3 Fanno flow parameters for perfect gas, $K = 1.4$
- A.4 Rayleigh flow parameters for perfect gas, $K = 1.4$
- A.5 Properties of standard atmosphere
- A.6 Class projects

Table A-1

One-dimensional normal shock relations for a perfect gas, $K = 1.4$

M_1	M_2	$\frac{P_2}{P_1}$	$\frac{T_2}{T_1}$	$\frac{(\rho_2)_s}{(\rho_1)_s}$	M_{x2}	M_{y2}	$\frac{P_{y2}}{P_{x2}}$	$\frac{T_{y2}}{T_{x2}}$	$\frac{(\rho_{y2})_s}{(\rho_{x2})_s}$
1.00	1.000	1.000	1.000	1.000	1.80	0.617	3.613	1.532	0.813
1.02	0.980	1.047	1.013	1.000	1.82	0.612	3.698	1.547	0.804
1.04	0.962	1.095	1.026	1.000	1.84	0.608	3.783	1.562	0.795
1.06	0.944	1.144	1.039	1.000	1.86	0.604	3.869	1.577	0.786
1.08	0.928	1.194	1.052	0.999	1.88	0.600	3.957	1.592	0.777
1.10	0.912	1.245	1.065	0.999	1.90	0.596	4.045	1.608	0.767
1.12	0.896	1.297	1.078	0.998	1.92	0.592	4.134	1.624	0.758
1.14	0.882	1.350	1.090	0.997	1.94	0.588	4.224	1.639	0.749
1.16	0.868	1.403	1.103	0.996	1.96	0.584	4.315	1.655	0.740
1.18	0.855	1.458	1.115	0.995	1.98	0.581	4.407	1.671	0.730
1.20	0.842	1.513	1.128	0.993	2.00	0.577	4.500	1.688	0.721
1.22	0.830	1.570	1.140	0.991	2.02	0.574	4.594	1.704	0.711
1.24	0.818	1.627	1.153	0.988	2.04	0.571	4.689	1.720	0.702

Table A-1 Cont'd

One-dimensional normal shock relations for a perfect gas, $K = 1.4$

M_2	M_1	$\frac{P_1}{P_2}$	$\frac{T_1}{T_2}$	$\frac{(\rho_1)_s}{(\rho_2)_s}$	M_{x1}	M_{y1}	$\frac{P_{x1}}{P_{y1}}$	$\frac{T_{x1}}{T_{y1}}$	$\frac{(\rho_{x1})_s}{(\rho_{y1})_s}$
1.26	0.807	1.686	1.166	0.986	2.06	0.567	4.784	1.737	0.693
1.28	0.796	1.745	1.178	0.983	2.08	0.564	4.881	1.754	0.683
1.30	0.786	1.805	1.191	0.979	2.10	0.561	4.978	1.770	0.674
1.32	0.776	1.866	1.204	0.976	2.12	0.558	5.077	1.787	0.665
1.34	0.766	1.928	1.216	0.972	2.14	0.555	5.176	1.803	0.656
1.36	0.757	1.991	1.229	0.968	2.16	0.552	5.277	1.822	0.646
1.38	0.748	2.055	1.242	0.963	2.18	0.550	5.378	1.839	0.637
1.40	0.740	2.120	1.255	0.958	2.20	0.547	5.480	1.857	0.628
1.42	0.731	2.186	1.268	0.953	2.22	0.544	5.583	1.875	0.619
1.44	0.723	2.253	1.281	0.948	2.24	0.542	5.687	1.892	0.610
1.46	0.716	2.320	1.294	0.942	2.26	0.539	5.792	1.910	0.601
1.48	0.708	2.389	1.307	0.936	2.28	0.537	5.898	1.929	0.592
1.50	0.701	2.458	1.320	0.930	2.30	0.534	6.005	1.947	0.583
1.52	0.694	2.529	1.334	0.923	2.32	0.532	6.111	1.965	0.575
1.54	0.687	2.600	1.347	0.917	2.34	0.530	6.222	1.984	0.566
1.56	0.681	2.673	1.361	0.910	2.36	0.527	6.331	2.002	0.557
1.58	0.675	2.758	1.374	0.903	2.38	0.525	6.442	2.021	0.549
1.60	0.668	2.830	1.388	0.895	2.40	0.523	6.555	2.040	0.540
1.62	0.663	2.895	1.402	0.888	2.42	0.521	6.666	2.060	0.532
1.64	0.657	2.971	1.416	0.880	2.44	0.519	6.779	2.079	0.525
1.66	0.651	3.048	1.430	0.872	2.46	0.517	6.894	2.098	0.518
1.68	0.645	3.126	1.444	0.864	2.48	0.515	7.009	2.118	0.510
1.70	0.641	3.205	1.458	0.856	2.50	0.513	7.125	2.138	0.503
1.72	0.635	3.285	1.473	0.847	2.52	0.511	7.242	2.157	0.495
1.74	0.631	3.366	1.487	0.839	2.54	0.509	7.360	2.177	0.488
1.76	0.626	3.447	1.502	0.830	2.56	0.507	7.479	2.198	0.481
1.78	0.621	3.530	1.517	0.821	2.58	0.506	7.599	2.218	0.474
1.80	0.614	3.613	1.532	0.813	2.60	0.504	7.720	2.238	0.468
1.82	0.608	3.698	1.547	0.804	2.62	0.502	7.842	2.258	0.462
1.84	0.603	3.783	1.562	0.795	2.64	0.500	7.965	2.278	0.456
1.86	0.598	3.869	1.577	0.786	2.66	0.498	8.089	2.298	0.450
1.88	0.593	3.957	1.592	0.777	2.68	0.496	8.214	2.318	0.444
1.90	0.588	4.045	1.608	0.767	2.70	0.494	8.340	2.338	0.438
1.92	0.583	4.134	1.624	0.758	2.72	0.492	8.466	2.358	0.432
1.94	0.578	4.224	1.639	0.749	2.74	0.490	8.593	2.378	0.426
1.96	0.573	4.315	1.655	0.740	2.76	0.488	8.720	2.398	0.420
1.98	0.568	4.407	1.671	0.730	2.78	0.486	8.848	2.418	0.414
2.00	0.563	4.500	1.688	0.721	2.80	0.484	8.977	2.438	0.408

Table A-2

One-dimensional isentropic flow parameters for perfect gas, $K = 1.4$

M	$\frac{A}{A^*}$	$\frac{P}{P^*}$	$\frac{\rho}{\rho^*}$	$\frac{T}{T^*}$	$M \left(\frac{A}{A^*}\right)^2 \left(\frac{\rho}{\rho^*}\right)$	$M \left(\frac{A}{A^*}\right)^2 \left(\frac{T}{T^*}\right)$	$\frac{P}{P_0}$	$\frac{\rho}{\rho_0}$	$\frac{T}{T_0}$	$\frac{A}{A^*} \left(\frac{A^*}{A}\right)^2 \left(\frac{\rho}{\rho^*}\right)$	$\frac{A}{A^*} \left(\frac{A^*}{A}\right)^2 \left(\frac{T}{T^*}\right)$
0.00	1.000	1.000	1.000	1.000	0.718	1.03	0.669	0.750	0.891	0.701	0.701
0.01	57.87	0.9999	0.9999	0.9999	57.87	1.04	0.656	0.740	0.886	0.681	0.681
0.02	28.94	0.9997	0.9999	0.9999	28.93	1.02	0.643	0.729	0.881	0.663	0.663
0.04	14.48	0.9991	0.9999	0.9996	14.46	1.02	0.630	0.719	0.876	0.645	0.645
0.06	9.67	0.997	0.998	0.999	9.64	1.02	0.617	0.708	0.871	0.628	0.628
0.08	7.36	0.996	0.997	0.999	7.33	1.01	0.604	0.698	0.865	0.612	0.612
0.10	5.82	0.993	0.995	0.998	5.78	1.01	0.591	0.687	0.860	0.596	0.596
0.12	4.86	0.990	0.993	0.997	4.83	1.02	0.578	0.676	0.855	0.582	0.582
0.14	4.18	0.986	0.990	0.996	4.13	0.94	0.566	0.666	0.850	0.568	0.568
0.16	3.67	0.982	0.987	0.993	3.61	1.00	0.553	0.655	0.844	0.554	0.554
0.18	3.28	0.978	0.984	0.994	3.20	0.98	0.541	0.645	0.839	0.541	0.541
0.20	2.96	0.973	0.980	0.992	2.88	1.00	0.528	0.632	0.833	0.528	0.528
0.22	2.71	0.967	0.976	0.990	2.62	1.02	0.515	0.623	0.828	0.516	0.516
0.24	2.50	0.961	0.972	0.988	2.40	1.04	0.504	0.613	0.822	0.503	0.503
0.26	2.32	0.954	0.967	0.987	2.21	1.06	0.492	0.602	0.817	0.493	0.493
0.28	2.17	0.947	0.962	0.985	2.05	1.08	0.480	0.592	0.810	0.483	0.483
0.30	2.04	0.939	0.956	0.982	1.91	1.10	0.468	0.582	0.805	0.472	0.472
0.32	1.92	0.932	0.951	0.980	1.79	1.12	0.457	0.571	0.799	0.462	0.462
0.34	1.82	0.923	0.944	0.977	1.68	1.14	0.445	0.561	0.794	0.452	0.452
0.36	1.74	0.914	0.938	0.975	1.59	1.16	0.434	0.551	0.788	0.443	0.443
0.38	1.66	0.905	0.931	0.972	1.50	1.18	0.423	0.541	0.782	0.434	0.434
0.40	1.59	0.896	0.924	0.969	1.42	1.20	0.412	0.531	0.776	0.425	0.425
0.42	1.53	0.886	0.917	0.966	1.35	1.22	0.404	0.521	0.771	0.416	0.416
0.44	1.47	0.876	0.909	0.963	1.29	1.24	0.391	0.512	0.765	0.408	0.408
0.46	1.42	0.865	0.902	0.959	1.23	1.26	0.381	0.502	0.759	0.400	0.400
0.48	1.38	0.854	0.893	0.956	1.18	1.28	0.371	0.492	0.753	0.392	0.392
0.50	1.34	0.843	0.885	0.952	1.13	1.30	0.361	0.483	0.747	0.385	0.385
0.52	1.30	0.832	0.877	0.949	1.08	1.32	0.351	0.474	0.742	0.378	0.378
0.54	1.27	0.820	0.868	0.945	1.04	1.34	0.342	0.464	0.736	0.370	0.370
0.56	1.24	0.808	0.859	0.941	1.00	1.36	0.332	0.455	0.730	0.364	0.364
0.58	1.21	0.796	0.850	0.937	0.966	1.38	0.322	0.446	0.724	0.357	0.357
0.60	1.19	0.784	0.840	0.933	0.932	1.40	0.314	0.437	0.718	0.350	0.350
0.62	1.17	0.772	0.831	0.929	0.899	1.42	0.305	0.429	0.713	0.344	0.344
0.64	1.16	0.759	0.821	0.924	0.869	1.44	0.297	0.420	0.707	0.338	0.338
0.66	1.13	0.747	0.812	0.920	0.841	1.46	0.289	0.412	0.701	0.332	0.332
0.68	1.12	0.734	0.802	0.915	0.814	1.48	0.280	0.403	0.695	0.326	0.326
0.70	1.09	0.721	0.792	0.911	0.789	1.50	0.272	0.395	0.690	0.320	0.320
0.72	1.08	0.708	0.781	0.906	0.765	1.52	0.265	0.387	0.684	0.315	0.315
0.74	1.07	0.695	0.771	0.901	0.742	1.54	0.257	0.379	0.678	0.309	0.309
0.76	1.06	0.682	0.761	0.896	0.721	1.56	0.250	0.371	0.672	0.304	0.304

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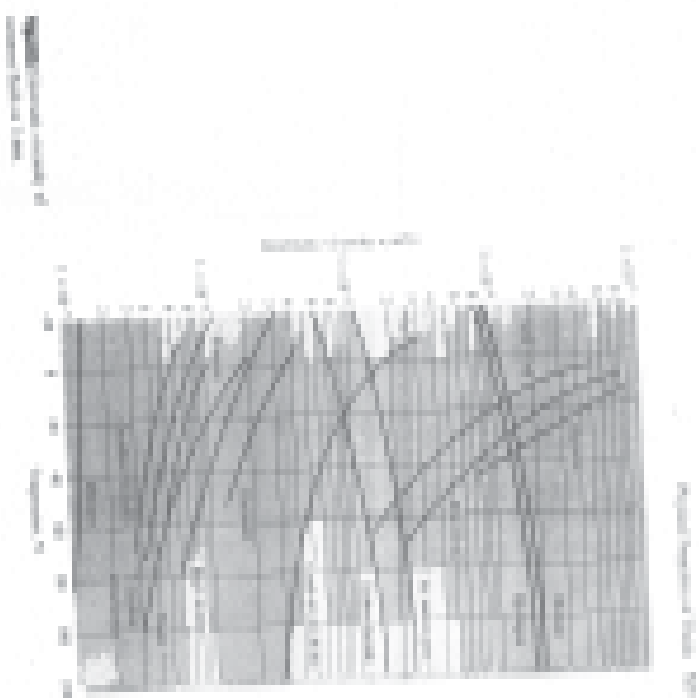
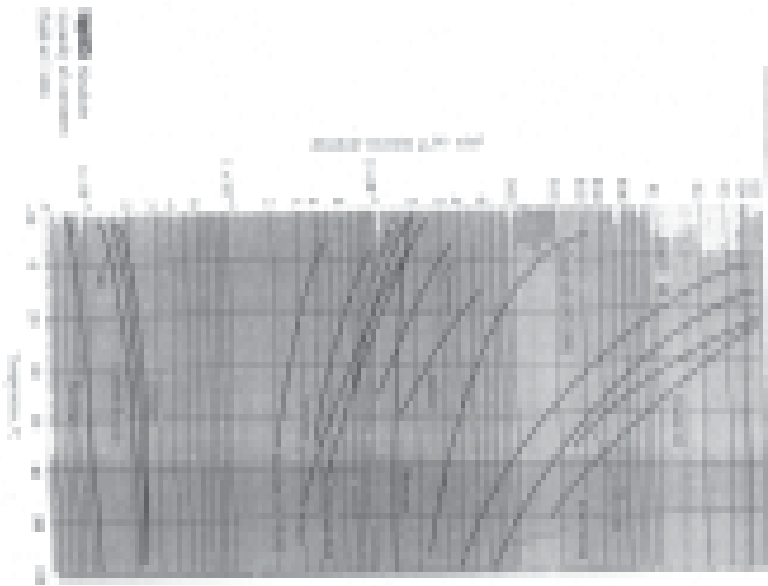
Table A-2 Contd.

One-dimensional isentropic flow parameters for perfect gas, $K = 1.4$

M	$\frac{A}{A^*}$	$\frac{P}{P^*}$	$\frac{\rho}{\rho^*}$	$\frac{T}{T^*}$	$M \left(\frac{A}{A^*}\right)^2 \left(\frac{\rho}{\rho^*}\right)$	$M \left(\frac{A}{A^*}\right)^2 \left(\frac{T}{T^*}\right)$	$\frac{P}{P_0}$	$\frac{\rho}{\rho_0}$	$\frac{T}{T_0}$	$\frac{A}{A^*} \left(\frac{A^*}{A}\right)^2 \left(\frac{\rho}{\rho^*}\right)$	$\frac{A}{A^*} \left(\frac{A^*}{A}\right)^2 \left(\frac{T}{T^*}\right)$
1.58	1.23	0.242	0.363	0.667	0.299	2.30	0.080	0.165	0.486	0.175	0.175
1.60	1.25	0.237	0.356	0.661	0.294	2.32	0.078	0.161	0.482	0.173	0.173
1.62	1.27	0.228	0.348	0.656	0.289	2.34	0.075	0.157	0.477	0.171	0.171
1.64	1.28	0.222	0.341	0.650	0.285	2.36	0.073	0.154	0.473	0.169	0.169
1.66	1.30	0.215	0.334	0.645	0.280	2.38	0.071	0.150	0.469	0.166	0.166
1.68	1.32	0.209	0.327	0.639	0.275	2.40	0.068	0.147	0.465	0.164	0.164
1.70	1.34	0.203	0.320	0.634	0.271	2.42	0.066	0.144	0.461	0.162	0.162
1.72	1.36	0.197	0.313	0.628	0.267	2.44	0.064	0.141	0.456	0.160	0.160
1.74	1.38	0.191	0.306	0.623	0.262	2.46	0.062	0.138	0.452	0.158	0.158
1.76	1.40	0.185	0.300	0.617	0.258	2.48	0.060	0.135	0.448	0.156	0.156
1.78	1.42	0.179	0.293	0.612	0.254	2.50	0.059	0.132	0.444	0.154	0.154
1.80	1.44	0.174	0.287	0.607	0.250	2.52	0.057	0.129	0.441	0.152	0.152
1.82	1.46	0.169	0.281	0.602	0.247	2.54	0.055	0.126	0.437	0.151	0.151
1.84	1.48	0.164	0.275	0.596	0.243	2.56	0.053	0.123	0.433	0.149	0.149
1.86	1.51	0.159	0.269	0.591	0.239	2.58	0.052	0.121	0.429	0.147	0.147
1.88	1.53	0.154	0.263	0.586	0.236	2.60	0.050	0.118	0.425	0.145	0.145
1.90	1.56	0.149	0.257	0.581	0.232	2.62	0.049	0.115	0.421	0.143	0.143
1.92	1.58	0.145	0.251	0.576	0.229	2.64	0.047	0.113	0.418	0.142	0.142
1.94	1.61	0.140	0.246	0.571	0.225	2.66	0.046	0.110	0.414	0.140	0.140
1.96	1.63	0.136	0.240	0.566	0.222	2.68	0.044	0.108	0.410	0.138	0.138
1.98	1.66	0.132	0.235	0.561	0.219	2.70	0.043	0.106	0.407	0.137	0.137
2.00	1.69	0.128	0.230	0.556	0.216	2.72	0.042	0.103	0.403	0.135	0.135
2.02	1.72	0.124	0.225	0.551	0.213	2.74	0.040	0.101	0.400	0.134	0.134
2.04	1.75	0.120	0.220	0.546	0.210	2.76	0.039	0.099	0.396	0.132	0.132
2.06	1.78	0.116	0.215	0.541	0.207	2.78	0.038	0.097	0.393	0.130	0.130
2.08	1.81	0.113	0.210	0.536	0.204	2.80	0.037	0.095	0.389	0.129	0.129
2.10	1.84	0.109	0.206	0.531	0.201	2.82	0.036	0.093	0.386	0.128	0.128
2.12	1.87	0.106	0.201	0.526	0.198	2.84	0.035	0.091	0.383	0.126	0.126
2.14	1.90	0.103	0.197	0.522	0.195	2.86	0.034	0.089	0.379	0.125	0.125
2.16	1.94	0.100	0.192	0.517	0.193	2.88	0.033	0.087	0.376	0.123	0.123
2.18	1.97	0.097	0.188	0.513	0.190	2.90	0.032	0.085	0.373	0.122	0.122
2.20	2.01	0.094	0.184	0.508	0.188	2.92	0.031	0.083	0.370	0.120	0.120
2.22	2.04	0.091	0.180	0.504	0.185	2.94	0.030	0.081	0.366	0.119	0.119
2.24	2.08	0.088	0.176	0.499	0.183	2.96	0.029	0.080	0.363	0.118	0.118
2.26	2.12	0.085	0.172	0.495	0.180	2.98	0.028	0.078	0.360	0.117	0.117
2.28	2.15	0.082	0.168	0.490	0.178	3.00	0.027	0.076	0.357	0.115	0.115

Contd.

Appendix Physical Properties of Fluids



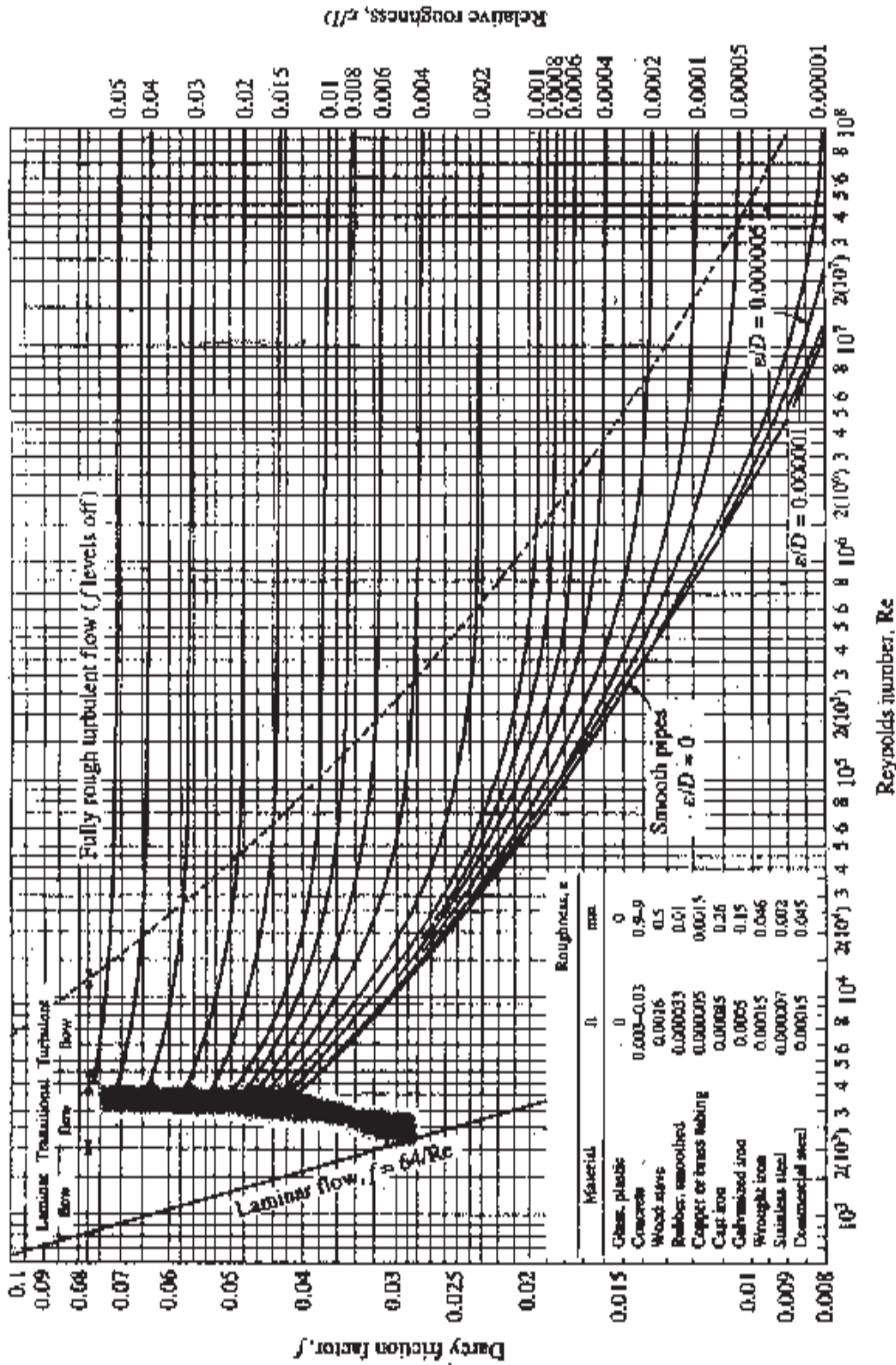


FIGURE A-12

The Moody chart for the friction factor for fully developed flow in circular pipes for use in the head loss relation $h_L = f \frac{L}{D} \frac{V^2}{2g}$. Friction factors in the turbulent flow are evaluated from the Colebrook equation $\frac{1}{\sqrt{f}} = -2 \log_{10} \left(\frac{\epsilon/D}{3.7} + \frac{2.51}{Re \sqrt{f}} \right)$.

Total No. of Questions : 6]

[Total No. of Pages : 2

P1518

[4065] - 584

M.E. (Electrical) (Power Systems)

POWER SYSTEM MODELLING

(2008 Course) (503203) (Sem. - I)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Answer any 2 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) If necessary, assume suitable data and state clearly the same.*
- 5) Use of pocket electronic calculator is allowed.*

SECTION - I

- Q1)** a) Develop a mathematical model for a loss-less, long transmission line. Making suitable assumptions, obtain therefrom, nominal- π model of the line. [12]
- b) Derive a mathematical model of a hydraulic turbine. State any assumptions made. [13]
- Q2)** a) State and explain the function of a phase-shifting transformer and then develop a mathematical model for the phase-shifting transformer. [12]
- b) What is a static var compensator? Why it is used in power system? Develop a mathematical model for a single phase, Thyristor Controlled Reactor (TCR). Draw the circuit model of a TCR and its steady state voltage current characteristic. [13]
- Q3)** a) State and explain the requirements of excitation systems for the synchronous generators. [12]
- b) State the types of excitation systems employed for the alternators with a neat block schematic diagram or a circuit diagram, explain the functioning of excitation system. [13]

P.T.O.

SECTION - II

Q4) a) Discuss the need for modelling of power system and its components. [12]

b) Develop the d-axis and q-axis equivalent circuits for a salient-pole synchronous machine. [13]

Q5) a) Determine the per unit values of L_d , L_q , L_{afd} and L_{fd} based on the rating of the machine given the following data : 500 MVA, 13.2kV, 0.9 p.F.lag, 50Hz, 3-phase Y connected, 2 pole alternator.

$$L_{aa} = (3.15 + 0.05 \cos 2\theta) \text{ mH};$$

$$L_{ab} = -\{1.52 + 0.05 \cos (2\theta + \frac{\pi}{3})\} \text{ mH};$$

$$L_{afd} = 40 \cos \theta \text{ mH};$$

$$L_{ffd} = 515 \text{ mH};$$

$$R_a = 3.82 \text{ m}\Omega; \text{ and } R_{fd} = 70 \text{ m}\Omega. \quad [15]$$

b) Write down the expressions for the flux linkage along the d-and q-axes of a salient pole machine and then develop an expression for the electromagnetic torque developed in the machine. [10]

Q6) Write short notes on any three of the following :

a) Model for a 3-phase tap-changing transformer. [8]

b) Per unit system and its advantages. [9]

c) Load modelling; and [8]

d) Park's transformation. [8]



P1520**[4065]-607****M.E. (E & TC) (Microwave)****RF WAVE AND MICROWAVE CIRCUIT DESIGN****(2008 Course) (504223) (Sem. - I)***Time : 3 Hours]**[Max. Marks : 100**Instructions to the candidates:*

- 1) *Solve any two questions from each section.*
- 2) *Figures to the right indicates full marks.*
- 3) *Assume suitable data, whenever necessary.*

SECTION - I

- Q1)** a) Explain third order intercept point IP_3 . For Cascade non linear stage show that **[15]**

$$y_2(t) = \alpha_1 \beta_1 A (\cos \omega_1 t + \cos \omega_2 t) + \left(\frac{3\alpha_3 \beta_1}{4} + \frac{3\alpha_1^3 \beta_3}{4} + \frac{3\alpha_1 \alpha_2 \beta_2}{2} \right) A^3 [\cos(2\omega_1 - \omega_2)t + \cos(2\omega_2 - \omega_1)t] + \dots$$

- b) Explain in detail PIN diode. **[10]**

- Q2)** a) Explain the concept Inter Symbol Interference. How ISI affects the wireless communication? Derive expression for roll off factor. **[12]**

- b) Which kind of definition is used for SFDR? Why is the definition reasonable? Calculate the SDFR for a receiver with $NF = 6$ dB. $IIP = -10$ dBm, $\Delta f = 200$ kHz and $SNR_{min} = 10$ dB. **[13]**

- Q3)** a) A MESFET operates at 5.7 GHz has the S parameters as : $S_{11} = 0.5 \angle -60^\circ$, $S_{12} = 0.02 \angle 0^\circ$, $S_{21} = 6.5 \angle 115^\circ$ and $S_{22} = 0.6 \angle -35^\circ$. Determine :

- i) If the circuit is unconditionally stable. Draw stability circles.
- ii) Find the maximum power gain under optimal choice of the reflection coefficients, assuming unilateral design ($S_{12} = 0$). **[13]**

- b) Design N-type three phase surface channel CCD. **[12]**

SECTION - II

- Q4)** a) Write steps to design high power amplifier. [5]
b) A MESFET operated at 7 GHz under appropriate bias conditions has the following S parameters : $S_{11} = 0.6 \angle -45^\circ$, $S_{12} = 0.2 \angle 0^\circ$, $S_{21} = 6.5 \angle 115^\circ$ and $S_{22} = 0.6 \angle -35^\circ$, Design an amplifier that stays within 85% OF $G_{TU \max}$ and insure that VSWR out = 1. [20]
- Q5)** a) Design a BJT Colpitts oscillator for 300 MHz. The parameters are $V_{ce} = 3\text{v}$, $I_c = 3 \text{ mA}$ at room temperature. $C_{bc} = 0.1\text{pF}$, $R_{be} = 2 \text{ K}\Omega$, $R_{ce} = 10\text{K}\Omega$, $C_{be} = 100\text{pF}$. If the inductance should not exceed $L_3 = L = 50 \text{ nH}$, find the value of capacitances in the feedback loop. [13]
b) What are the general design goals for oscillator? An oscillator is used to feed mixer. Consequencely, how much output power/voltage swing should an oscillator provide. [12]
- Q6)** a) Discuss design concept of broadband amplifier designs. [8]
b) Explain HPA and Multistage amplifier. [7]
c) Find the stability regions of a transistor whose S parameters are as : $S_{11} = 0.7 \angle 70^\circ$, $S_{12} = 0.2 \angle -10^\circ$, $S_{21} = 5.5 \angle 85^\circ$ and $S_{22} = 0.7 \angle -45^\circ$. Draw stability circles. [10]



P1522**[4065]-682****M.E. (E & TC) (Communication Networks)****MODELLING AND SIMULATION OF COMMUNICATION NETWORKS****(2008 Course) (504602) (Sem. - I)***Time : 3 Hours]**[Max. Marks : 100**Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagrams 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 types of simulation and compare them. [6]
 b) Discuss the advantages and disadvantages of simulation in communication systems. [6]
 c) What are the different techniques for mapping a problem into a simulation model? [6]
- Q2)** a) Comment on the correlated and uncorrelated Gaussian random number generation. [10]
 b) Highlight the various techniques of mapping uniform random variables to an arbitrary pdf. [6]
- Q3)** a) Discuss the components of a PN sequence generator. [6]
 b) Explain any one technique in typical simulation post processor with respect any PSK system. [10]
- Q4)** a) What are the steps involved in Monte Carlo simulation? [6]
 b) Packets arrive for transmission at random instants of time. The time between the successive arrivals vary from 1 msec to 5 msecs. The following tables give the inter-arrival time of 100 packets and their transmission times.

Inter-arrival time (msecs)	1	2	3	4	5
Frequency	35	25	20	12	8

Transmission time (msecs)	1	1.5	2	2.5	3
Frequency	20	35	25	15	5

P.T.O.

Simulate 10 packets by using the random numbers given below and evaluate the performance measures of the system.

Random numbers for arrival : 28, 57, 60, 17, 64, 20, 27, 58, 61, 30.

Random numbers for transmission times : 19, 7, 90, 2, 57, 28, 29, 83, 58, 41. [10]

Q5) Write short notes any two : [16]

- a) Performance estimation of a wireless system.
- b) Generation of uniformly distributed random numbers.
- c) Desirable features while selecting simulation software.

SECTION - II

Q6) a) Discuss all the parameters in simulation of non-linearities. [8]
b) Explain the semi-analytic simulation with an example. [10]

Q7) a) Discuss the two state memoryless markov modelling for discrete channels and prepare the transition matrix. [8]
b) A binary communication channel has three states. [8]
State 0 : running; State 1 : under service; State 3 : idle.
The transmission matrix for a time slot is

$$\begin{vmatrix} 0.9 & 0.05 & 0.05 \\ 0.05 & 0.85 & 0.10 \\ 0.10 & 0.07 & 0.83 \end{vmatrix}$$

Find the steady state probabilities for the three states.

Q8) a) Model a single server time continuous markov memoryless system with arrival rate 'x' per min and servicing rate 'y' per min. Draw the state transition diagram and evaluate the performance measures. [8]

b) A packet buffer and single communication channel can hold atmost 5 packets. The arrival rate of packets is 20/msec. The communication channel can serve 40 packets/msec. Calculate the system blocking probability. Also evaluate the performance measures. [8]

Q9) a) Explain the importance of tapped delay line model. [8]

b) Highlight the important parameters in simulating different communication models. [8]

Q10) Write a note on any two : [16]

- a) Pdf estimators.
- b) Discrete memoryless channel models.
- c) Modeling and simulation time varying systems.



P1525**[4065]-781****M.E. (Chemical)****ADVANCED SEPARATION PROCESSES****(2008 Course) (509103) (Sem. - I)***Time : 3 Hours]**[Max. Marks : 100**Instructions to the candidates:*

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

SECTION - I

- Q1)** a) Explain the principle of cross flow filtration and state its advantages. [6]
 b) What processes of surface based solid-liquid separation involving second liquid? [8]
 c) What is meant by separation factor? [4]

- Q2)** a) Give the classification of Adsorptive Bubble Separation Methods. [8]
 b) Explain column operations including Foam Drainage and Overflow, Foam Coalescence and Foam Breaking. [8]

- Q3)** a) What are the basic adsorption cycles? [8]
 b) Explain the process design considerations for adsorption : compound size beds, compound type beds. [8]

- Q4)** a) The individual mass transfer resistances residing in the fluid and within the solid during adsorption of water vapor from air by silica gel, using a fixed bed adsorber, were measured for low moisture content. It was found that

$$k_y a_p = 31.6G'^{0.55} \text{ kg H}_2\text{O/m}^3 \cdot \text{s} \cdot \Delta Y$$

$$k_s a_p = 0.965 \text{ kg H}_2\text{O/m}^3 \cdot \text{s} \cdot \Delta X$$

where G' is the mass velocity of the gas in $\text{kg/m}^2 \cdot \text{s}$. The silica-gel bed had an apparent bed density 671.2 kg/m^3 and an average particle size of 1.727 mm diameter and the external surface of the particles was $2.167 \text{ m}^2/\text{kg}$. Estimate the height of the adsorber for drying air at 26.7°C ,

P.T.O.

standard atmospheric pressure, from an initial humidity of 0.005 to a final humidity of 0.0001 kg H₂O/dry air. The entering gel is dry. A gel rate of 0.68 kg/m².s and an air rate of 1.36 kg/m².s is used. Equilibrium relation $Y = 0.0185X$. [12]

- b) Briefly describe Freudulich Adsorption Isotherm. [4]

SECTION - II

- Q5)** a) What is reverse osmosis? Explain the process and derive an equation for flux. [9]
b) What is interaction of diffusing components with membrane material and how does it affect flux in pervaporation? [9]
- Q6)** a) What are the different types of membranes? Discuss about porous and glassy types. What is glass transition temperature? [8]
b) Explain Ion Exchange Chromatography. [8]
- Q7)** a) Discuss the kinetics of crystallization. [8]
b) What are the various effects in crystallization? [8]
- Q8)** a) What are the various models used for explaining membrane fouling? [10]
b) What is concentration polarization and its effects? Derive relevant equations. [6]



P1528

[4065]-438

M.E. (Civil) (Hydraulic Engg.)

WATER RESOURCES PLANNING & MANAGEMENT

(2008 Course) (Sem. - I) (501302)

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

SECTION - I

- Q1)** a) Describe the water resources planning, its objectives and various parameters involved in it. [9]
- b) Enumerate the drawbacks in the planning of project & state ways how they can be overcome? [9]
- Q2)** a) What are the various methods of economic evaluation of water resources projects? Explain the benefit cost ratio criteria in detail. [8]
- b) Explain the use of multi objective analysis in planning the models for water resources projects. [8]
- Q3)** a) State the purpose of collecting different types of data for planning water resources. Discuss their types. [8]
- b) Write short notes on : [8]
- i) Water users cooperative societies.
 - ii) Various aspects of water resources planning.
- Q4)** a) Two reservoirs A & B are planned to be constructed at the cost of Rs. 30 million & 60 million respectively. Annual maintenance & operation costs of these projects are respectively Rs. 6 lakh & 15 lakh. The annual benefits from the projects are 4.5 million & 9.6 million respectively. Which of the two projects is more economical if the rate of interest is 10% & the useful life of the project A is 45 years & that of project B is 75 years? [8]

P.T.O.

- b) Write short notes on : [8]
i) Irrigation management policy.
ii) Physical features of India-influencing water resources utilisation.

SECTION - II

- Q5)** a) Explain the need for integrated water resources management. [9]
b) Describe the role of different bodies in water resources planning. [9]
- Q6)** a) Discuss the challenges in integrated water resources management. [8]
b) What are the state water disputes? Explain them by giving examples. [8]
- Q7)** a) For project design to be feasible, what are the various steps to be taken for most of the water resources projects? [8]
b) Write short notes on : [8]
i) Global water partnership.
ii) ICOLD.
- Q8)** a) Prepare the feasibility study report including investigations into resources, site conditions, legal issues & all other factors bearing upon the design of engineering works. [12]
b) Write short note on : ICID. [4]



Total No. of Questions : 8]

[Total No. of Pages : 2

P1531

[4065]-55

**M.E. (Mechanical) (Heat Power Engineering.)
ADVANCED REFRIGERATION AND CRYOGENICS
(2002 Course) (502109) (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 answer books.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Figures to the right indicate full marks.*
- 5) Assume suitable data, if necessary and mention it clearly.*
- 6) Use of logarithmic tables, slide rule, mollier charts, non programmable electronic pocket calculator is allowed.*

SECTION - I

- Q1)** a) Explain the effect of condensing temperature, suction temperature, suction superheat, and liquid subcooling on system refrigeration capacity and COP. **[8]**
- b) What are the various freezing methods for food preservation? Explain the different freezers used in practice. **[8]**
- Q2)** a) With neat schematic explain the cascade refrigeration system. Draw the cycle on TS and PH chart. **[8]**
- b) What are the various types of condensers used in refrigeration plants? Explain the selection criteria for condensers. **[8]**
- Q3)** Explain the following refrigeration methods listing advantages, disadvantages and applications. **[16]**
- a) Steam jet refrigeration.
 - b) Thermoelectric refrigeration.
- Q4)** Explain the selection criterion for the followings refrigeration system components with its applications. **[18]**
- a) Screw compressor.
 - b) Rotary compressors.
 - c) Thermostatic expansion valve.

P.T.O.

SECTION - II

- Q5)** Explain the followings : **[16]**
- a) Cryogenic insulations.
 - b) Simon helium liquefier.
 - c) Practical vapour absorption system.
 - d) Claude system.
- Q6)**
- a) Explain Linde Hampson liquefaction system with neat sketch. **[8]**
 - b) Compare vapour absorption system with vapour compression system. **[6]**
 - c) Write an expression for maximum COP of vapour compression system. **[2]**
- Q7)**
- a) With neat schematic explain how the liquid-oxygen is produced. **[8]**
 - b) Explain : compressors and expanders for liquefaction system. **[8]**
- Q8)** Write short notes on (any three) : **[18]**
- a) Double effect vapour absorption system.
 - b) Liquid desiccant absorption system.
 - c) Compressor capacity control.
 - d) Materials for cryogenic applications.



P1533

[4065]-72

M.E. (Mechanical) (Design Engineering)
COMPUTER AIDED DESIGN
(2002 Course) (Elective - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

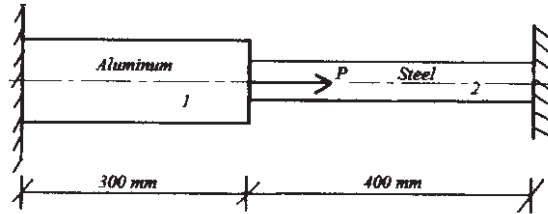
SECTION - I

- Q1)** a) A triangle PQR with vertices P (2, 4), Q (4, 6) and R (2, 6) is to be reflected about the line $2y = x + 2$. Determine : **[10]**
- i) The concatenated transformation matrix; and
 - ii) The coordinates of the vertices for a reflected triangle.
- b) Discuss the requirement of product data exchange between dissimilar CAD/CAM systems. **[6]**
- Q2)** a) A rectangle ABCD is represented by the vertices A(20, 20), B(106.6, 70), C(81.6, 113.3) and D(-5, 63.3). The rectangle is rotated by 30° clockwise about the vertex A. Determine the concatenated transformation matrix and new position of vertices. **[8]**
- b) What do you understand by parametric representation of curve? Discuss the advantages of parametric representation. **[8]**
- Q3)** a) Explain the following terms related to Networking: Network Server, Transmission media, Modem, Get way. **[4]**
- b) What are the different pitfalls in the simulation? How they can be avoided? **[6]**
- c) Show that the composition of two rotation is additive by concatenating the matrix representations for $R(\theta_1)$ and $R(\theta_2)$ to obtain : **[6]**
- $$R(\theta_1) \cdot R(\theta_2) = R(\theta_1 + \theta_2)$$

P.T.O.

Q4) a) Consider the bar as shown in the figure. An axial load of $P = 200 \text{ kN}$ is applied as shown. Determine : [10]

- i) The nodal displacement.
- ii) The stresses in each element.
- iii) The Reaction Forces.



$$A1 = 2400 \text{ mm}^2 \quad A2 = 600 \text{ mm}^2$$

$$E1 = 70 \times 10^9 \text{ N/m}^2 \quad E2 = 200 \times 10^9 \text{ N/m}^2$$

b) Explain how symmetry is used in FEA with applications. [6]

Q5) Short Notes on any three : [18]

- a) Engineering Animation.
- b) Data exchange translators.
- c) Software development and documentation.
- d) Curve Manipulation.
- e) Simulation languages.

SECTION - II

Q6) a) Explain following data exchange formats. [8]

- i) Shape based format.
- ii) Product data based formats.

b) Discuss the Problem Modeling and Boundary Conditions for the following cases: [8]

- i) A seating chair when a person is seating on it.
- ii) A pressure vessel just kept freely on the ground and subjected to internal pressure.
- iii) A simply supported beam.

Q7) a) Explain Bezier surface, its properties and parametric representation. [4]

b) Drive a concatenated transformation matrix for reflection about arbitrary point. [6]

c) Compare CORE and GKS graphics standards. State the various graphics standards available. [6]

- Q8)** a) Explain the important CAD modeling techniques. What is Hybrid approach? [8]
- b) Derive transformation matrix for Isometric Projection and perspective projection. [8]
- Q9)** a) Describe the method of data communication in serial and parallel modes. [6]
- b) State the properties of the global stiffness matrix. [6]
- c) Explain Discrete and Continuous system simulation by taking example of each. [6]



P1537

[4065]-227

M.E. (Petroleum)

WELL CONTROL

(2002 Course) (Elective - I)

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) Define and explain in brief : **[12]**
- i) Wall building property of mud.
 - ii) Mud loss.
 - iii) Mud viscosity.
 - iv) Specific gravity.
- b) While pulling out driller forgot to fill the hole and 33 stands of drill pipes were pulled out dry. Use following data and calculate reduction in bottom hole pressure. **[6]**
- Well depth = 9588 ft. (TVD), Casing shoe depth = 5600 ft. (TVD)
Mud weight = 12.5 ppg., Open hole capacity = 0.1486 bbl/ft.
Casing capacity = 0.1711 bbl/ft., Drill pipe metal displacement = 0.0076 bbl/ft.,
Length of one stand = 91 ft.
- Q2)** a) Explain, NPSH of a pump. **[4]**
- b) Draw the neat schematic sketch of a Christmas tree. **[4]**
- c) A well is being drilled with 13 ppg mud. How much barite is required to increase the mud density to 15 ppg? **[4]**
- Hole volume = 789 bbl. Surface volume = 333 bbl
Barite density is 35.4 ppg.

P.T.O.

- d) Determine the height in feet of the influx using following data : [4]
Pit gain = 39 bbl.
Hole size = 8.5 in
Drill collar OD = 6.5 in
Drill collar length = 750 ft.
Drill pipe OD = 5.0 in

- Q3) a) Draw neat schematic sketch of a well head equipment and show its components. [8]
b) What is a surface choke? Write the functions and objectives of its use and explain, how it helps to mount back pressure in the line and on the reservoir formation. [8]

- Q4) Write short notes on : [16]
a) Drilling difficulties.
b) Mud pressure losses.
c) Blow out.
d) Functions of drilling fluids.

SECTION - II

- Q5) Following data is available : [18]
A kick was observed after closing the surface BOP. Fill out a kill sheet. Prepare step down plan on graph paper for drillers method.
Data : Original mud weight = 9.7 ppg,
Measured depth = 9,800 ft.,
Kill rate pressure @ 50 SPM = 900 psi
Kill rate pressure @ 30 SPM = 740 psi
Drill string-drill pipe 5.0 in.-19.5 lb/ft. capacity is 0.01779 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 = 366 ft.
Annulus – Hole size = 12¼ 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. X 12 in. triplex @ 95% eff.) = 0.136 bbl/stk.
Leak of test with 9.8 ppg mud = 1130 psi
Casing setting depth = 4580 ft.
Shut in drill pipe pressure = 590 psi, Shut in casing pressure = 590 psi, Pit volume gain = 49 bbl, True vertical depth = 9388 ft.

Calculate :

- a) Initial circulating pressure.
 - b) Kill mud weight.
 - c) Final circulating pressure.
 - d) Surface to bit, and bit to surface strokes.
- Q6)** a) 700 ft. of 13 3/8" surface casing is to be set in 16" hole. The slurry yield is 1.18 cubic ft/sack & 83% excess is needed. The cement slurry weight is 14.8 ppg & requires 5.2 gal/sack of water. Cement is circulated to the surface. Capacity of the annulus to be cemented is 0.4231 cubic ft/ft. Capacity 13 3/8" Casing is 0.1495 bbl/ft. Calculate **[6]**
- i) No. of sacks.
 - ii) Volume of water in bbl.
 - iii) Displacement volume.
- b) Write a note on : **[10]**
- i) Well control during completion.
 - ii) Types of Drilling fluids.
- Q7)** a) Compare between following methods of well control. **[10]**
- i) Drillers method.
 - ii) Volumetric method.
- b) What is the basis to know the type of influx? Explain in brief. **[6]**
- Q8)** a) Draw and explain with neat schematic sketch a BOP accumulator and hydropneumatic well control system. **[8]**
- b) Draw various types of blowout preventors stacks and their along with their features. **[8]**



P1542

[4065]-498

**M.E. (Mechanical) (Heat Power)
INTERNAL COMBUSTION ENGINES
(2008 Course) (Elective - II) (502105 - A)**

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Suggest the suitable material with justification for the components of an I.C. Engine. **[8]**
- i) Cylinder block.
 - ii) Crankcase.
 - iii) Gudgeon pin.
 - iv) Gaskets.
- b) Write short note on material selection procedure for the components of an I.C. Engine. **[8]**
- Q2)** a) A 4 stroke spark ignition engine gave the following results during a test.
- | | |
|----------------------------------|--------------------------|
| Number of cylinders | 6 |
| Bore of cylinders | 90 mm |
| Stroke | 80 mm |
| Speed | 5000 rev/min |
| Fuel consumption rate | 0.3 cm ³ /min |
| Fuel density | 750 kg/m ³ |
| Calorific value | 44 MJ/kg |
| Net brake load | 180 N |
| Torque arm | 0.5 m |
| Net indicated area | 720 mm ² |
| Base length of indicator diagram | 60 mm |
| Pressure scale | 40 kPa/mm |

P.T.O.

Calculate the following :

- i) The Brake Power.
- ii) The Mean effective Pressure.
- iii) The Indicated Power.
- iv) The Mechanical Efficiency.
- v) The Brake Thermal efficiency.

[10]

- b) Explain why Two-stroke cycle spark-ignition engines have significantly lower bmep and higher bsfc than four-stroke cycle SI engines. [6]

Q3) a) Define Indicated Mean Effective Pressure and Brake Mean Effective Pressure. [6]

- b) The BMEP for a 4 cylinder, 4 stroke spark ignition engine is 8.4 bar. The total capacity is 1.3 litres. The engine is run at 4200 rev/min. Calculate the Brake Power. There are 10 kW of mechanical losses in the engine. Calculate the Indicated Mean effective Pressure. The Volumetric Efficiency is 85% and the Brake Thermal Efficiency of the engine is 28%. The air drawn in to the engine is at 5°C and at 1.01 bar. The fuel has a calorific value of 43.5 MJ/kg. Calculate the air/fuel ratio. [10]

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

- a) Indicator diagrams.
- b) Principles of Combustion chamber designing.
- c) Detonation in SI engine.
- d) Supercharged and Turbocharged engine performance.

SECTION - II

Q5) a) Explain the importance of simulation techniques for engine tuning. [8]

- b) Dry exhaust gas from a CI engine had the following composition by volume: CO₂ = 8%, CO = 1%, O₂ = 7%, N₂ = 84%. The fuel has 84% carbon, 14% Hydrogen and 2% oxygen content. Determine the Air to Fuel ratio for the fuel and mass of carbon per kg of dry flue gas. [8]

Q6) a) Discuss the construction of a MPFI system with a neat sketch and explain its working. [8]

- b) Discuss the emission control methods for conventional diesel engines. [8]

- Q7)** a) Discuss the recent trends in IC engines with examples. [8]
b) Explain the phenomenon of crankcase blowby. [4]
c) What are the health effects of air pollution from IC engines? [4]
- Q8)** Write short notes on : [18]
a) Electronic diesel control.
b) Catalytic Converter.
c) Euro Emission Norms.
d) Exhaust gas recirculation.
e) Squish and Tumble in IC engines.



P1546

[4065]-517

M.E. (Mechanical) (Design Engineering)
MATERIAL HANDLING EQUIPMENT DESIGN
(2008 Course) (Elective - II) (502205)

Time : 3 Hours]

[Max. Marks : 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) Discuss the importance of material handling in general by giving suitable industrial & domestic examples. **[8]**
b) Discuss objectives of material handling. **[8]**
- Q2)** a) Explain any four principles of material handling with suitable examples. **[8]**
b) Explain how designing of plant layout takes into consideration the relation with entities other than material flow. **[8]**
- Q3)** a) Explain the concept of unit load in detail. What are the various means of handling the unit load? **[8]**
b) Explain in detail how to choose a right equipment for material handling using material handling equation. **[8]**
- Q4)** a) What are the various factors affecting the selection & choice of material handling equipments. **[8]**
b) Explain in detail selection of suitable types of systems for various applications in material handling. **[8]**
- Q5)** a) List the Hoisting drives & discuss any two of them in detail. **[10]**
b) Explain various parameters considered in design of E.O.T. cranes. **[8]**

P.T.O.

SECTION - II

- Q6)** a) List various types of grab buckets. Explain one of them in detail. [8]
b) Discuss different steel wire ropes. [8]
- Q7)** Write short notes on following. Draw sketches wherever necessary (Any three) : [18]
a) Storage in bins & hoppers.
b) Various hopper shapes & hopper gates.
c) Gravity flow of solids through slides & chutes.
d) Bulk material handling.
- Q8)** a) Explain in detail various objectives of storage systems in material handling also explain various types of storage systems. [8]
b) Explain different types of conveyers & give their merits & demerits.[8]
- Q9)** a) Discuss the factors considered while planning a new storage system.[8]
b) Discuss the layout factors in designing a new warehouse. [8]
- Q10)** a) Discuss the factors considered in a warehouse automation. [8]
b) Explain various points considered while evaluating an existing warehouse system. [8]



P1547

[4065]-519

M.E. (Mechanical) (Design Engineering)

ROBOTICS

(2008 Course) (Elective - II) (502205)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer any three questions from each section.*
- 2) *Answers to the questions should be written in separate books.*
- 3) *Neat diagram must be drawn whenever necessary.*
- 4) *Use of non programmable calculator is allowed.*
- 5) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Discuss in detail the basic components of industrial robot. [8]
b) Explain issues to be considered during selection of industrial robot. [8]
- Q2)** a) Discuss forward and inverse kinematics scheme for three degree of freedom robot arm. [8]
b) Explain D-H representation applied to the robot manipulator. [8]
- Q3)** a) Find the resultant rotation matrix for Euler's angle representation in following sequence. [10]
i) Rotation by an angle Φ about OW axis.
ii) Rotation by an angle θ about OV axis.
iii) Rotation by an angle ψ about OU axis. Find the desired position and orientation of Cartesian coordinate RPY robot hand is given next. Find the necessary roll, pitch and yaw angles and displacements.

$$\begin{bmatrix} 0.5 & -0.6 & 0.7 & 3.3 \\ 0.5 & 0.7 & 0.4 & 0.5 \\ -0.7 & 0.2 & 0.6 & 11.0 \\ 0.0 & 0.0 & 0.0 & 1.0 \end{bmatrix}$$

- b) Explain briefly the use of Lagrangian formulation in manipulator dynamics. [6]

P.T.O.

- Q4)** a) Discuss Algebraic and Geometric analytical approach to the solution of a planar three-link manipulator. [8]
- b) A robot has the link parameters as shown in table. Determine the origin of the gripper with respect to base frame indicating all the intermediate steps. [8]

i	α_{i-1}	a_{i-1}	d_i	θ
1	0°	0	0	45°
2	90°	4	0	0°
3	0°	9	0	0°

TABLE 1. Q4 (b).

- Q5)** Write short notes on :
- a) Difference between forward and inverse manipulator kinematics. [6]
- b) Remote Centre Compliance. [6]
- c) Jointed Arm Robot Configuration. [6]

SECTION - II

- Q6)** a) Use of homogeneous transformations matrix in robot kinematics. [6]
- b) Derive an mathematical equations that describe the kinematic relation of the moving links of the robot arm with respect to base coordinate system. [10]
- Q7)** a) Compare Joint space and Cartesian space schemes used for robot trajectory planning. [8]
- b) Describe briefly the general considerations that are used for robot path description and generation. [8]
- Q8)** a) A two degree of freedom planar robot is to follow a straight line between the start (5, 10) and end (8, 14) points of the motion segment. Find the joint variables for the robot if the path is divided into 6 segments. Each link is 10 inches long. [8]
- b) Explain briefly solid state and proximity switches used in robots. [8]
- Q9)** a) Discuss briefly different techniques used for image data analysis. [6]
- b) A weldment is to be made on the component as shown in figure 1. The weld trajectory is a continuous path arc welding along the paths. X2-X3

with straight line, X3-X4 with circular interpolation. X4-X5 with straight line, X5-X6 with circular interpolation. The weld torch begins its moments from home position X1 and departs to location X7. Write a VAL program for suitable arc welding. [10]

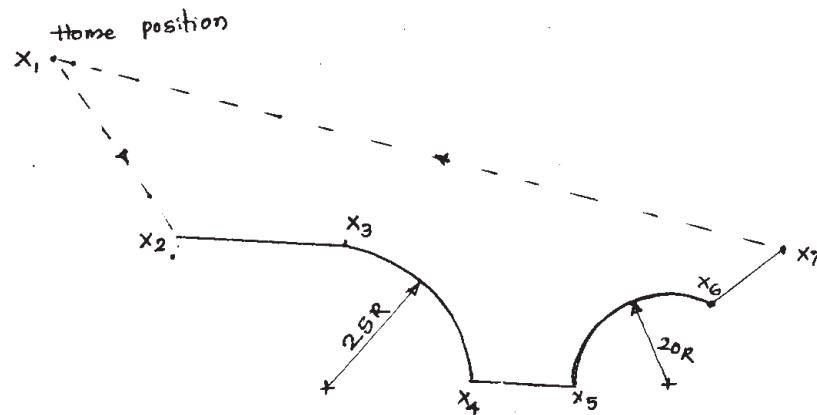


Figure1, Q9 (b)

Q10) Write short notes on :

- a) VAL robot programming. [6]
- b) Robotic vision system with neat block diagram. [6]
- c) Exoskeleton and Telicheries robots. [6]



P1556

[4065]-553

**M.E. (Mechanical) (Automotive Engineering)
TRIBOLOGY AND PREVENTIVE MAINTENANCE
(2008 Course) (Elective - II) (502303 (a))**

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *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 tribological systems and their characteristic feature. [8]
b) What are the general tribological considerations in design of gears. [8]
- Q2)** a) Explain relative importance of wear. What do you mean by surface fatigue wear? [8]
b) What are the causes of friction? Explain adhesion theory. [8]
- Q3)** Analyse the pressure distribution of an infinitely long journal bearing starting from two dimensional Reynold's equation and subsequently determine the total load rating. [16]
- Q4)** Write short note on the following (Any three) : [18]
a) Tribological aspects of engine components.
b) Engine friction and losses.
c) Mechanism of wear.
d) Lubricant monitoring.

SECTION - II

- Q5)** a) Indicates the factors which govern the selection of a lubricant for automotive application. [8]
b) What are the standard test methods for automotive lubricants? Explain any one in detail. [8]
- Q6)** a) Explain the working of air and gas lubricated bearing with the help of neat diagram. [8]
b) Explain the phenomenon of Elastohydrodynamic lubrication. [8]
- Q7)** a) What is the scope of preventive maintenance in an automotive industry? [8]
b) What is real time condition monitoring? Explain real time analyser. [8]
- Q8)** Write short note on the following (Any three) : [18]
a) Mechanism of rolling and sliding of pneumatic tyres.
b) Ferrography.
c) Maintenance of cooling system.
d) Maintenance of drive line system.



P1557

[4065]-555

M.E. (Mechanical) (Automotive Engineering)

AUTOMOBILE AIR CONDITIONING

(2008 Course) (Elective - II) (502303 (C))

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Q.1 and Q.5 are compulsory.*
- 2) *Answer any two questions from Q.2 to Q.4 and two questions from Q.6 to Q.8.*
- 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 the air conditioning system used for passenger car with schematic layout of its components arrangement. [6]
- b) What is the difference between humidity ratio and relative humidity? [6]
- c) A psychrometer reads 38°C DBT and 24°C WBT. Calculate relative humidity, specific humidity and enthalpy of atmospheric air for barometric pressure of 100 kPa. [6]
- Q2)** a) Discuss the suitability of R134a in automobile air conditioner. [8]
- b) What are the various types of condensers? What criteria are used in the selection of condenser? [8]
- Q3)** a) Explain the important design consideration in designing a system for automobile air conditioner. [8]
- b) Explain the various types of compressors used in automobile air conditioners. [8]
- Q4)** a) A minibus of 15 passenger carrying capacity has the data related to air conditioning system as follows. [12]
- Inside conditions: 24°C, 50% RH
Outside conditions: 38°C, 60% RH
Solar load = 7500 W

P.T.O.

Sensible and latent heat gain from passengers = 110W & 130W respectively.

Sensible load from other sources = 2500 W

Assume 100% fresh air is used. The bypass factor of cooling coil is 0.2. Determine ADP, Cooling coil capacity, Supply air conditions, and quantity of dehumidified air.

- b) Explain the term- Thermodynamic wet bulb temperature. [4]

SECTION - II

Q5) List the heat gain elements for compartment of extra-large buses like Volvo. With appropriate assumptions, do the cooling load calculation for such bus with passenger capacity of 45. [16]

Q6) a) Explain the equal friction method of duct design. What are its advantages and disadvantages over velocity method? [8]

b) A rectangular duct section 500 mm × 350 mm size carries 1.25 m³/s of air having density of 1.15 kg/m³. Determine equivalent diameter of circular duct if (i) the quantity of air carries in both the cases are same. (ii) the velocity of air in both the cases are same. If $f = 0.001$ for the sheet metal, find pressure loss per 100m length of duct. [8]

Q7) a) What are the various types of air filters? Explain the HEPA filter with neat sketch. [8]

b) What is effective temperature? Explain the significance in the design of the air conditioning system. [8]

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

- a) Sound control in AC system.
- b) Fan performance curves.
- c) Comfort chart.
- d) Air washer.

PSYCHROMETRIC CHART

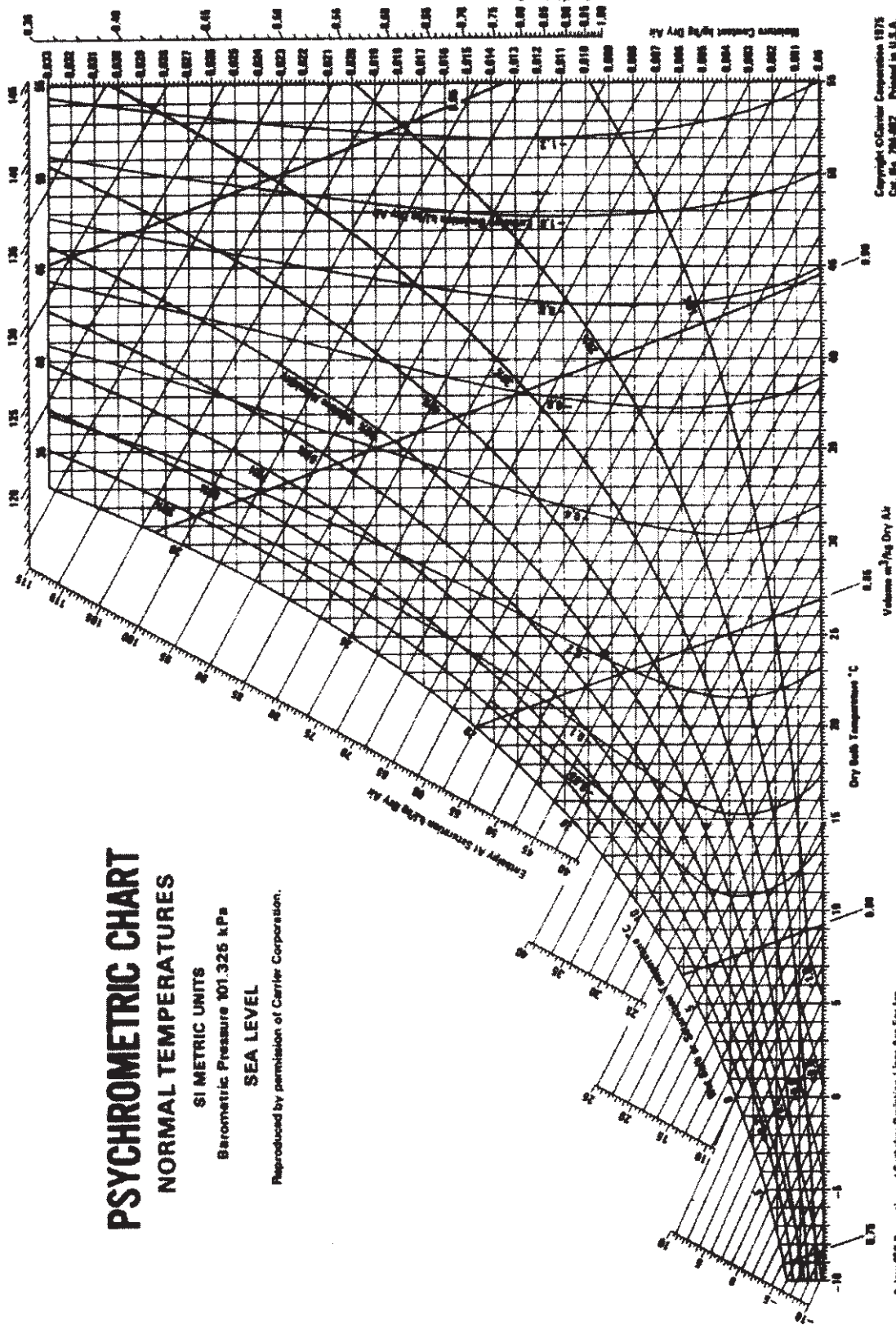
NORMAL TEMPERATURES

SI METRIC UNITS

Barometric Pressure 101.325 kPa

SEA LEVEL

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Cat. No. 794-002 Printed in U.S.A.

Volume m³/kg Dry Air

Dry Bulb Temperature °C

0.80

Select °C Properties and Enthalpy Division Lines Are For Ice



P1560

[4065] - 577

M.E. (Electrical) (Control Systems)
STOCHASTICS DYNAMICAL SYSTEMS
(2008 Course) (Elective - III) (503111 (b))

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) How a stochastic process is characterized? In this context, explain the terms; [10]
- i) Variance Matrix.
 - ii) Covariance Matrix, and
 - iii) White noise process.
- b) Outline the procedure to find the response of a linear Continuous - time stochastic system:
- $$\dot{x}(t) = A(t)x(t) + B(t)W(t)$$
- to a zero - mean white noise as input. Where $x(t)$ is a $n \times 1$ state vector; $A(t)$ is a $n \times n$ characteristic matrix; $B(t)$ is $n \times p$ control distribution matrix; and $w(t)$ is $p \times 1$ mean white noise (Vector stochastic process). [15]
- Q2)** a) How the stochastic Transitional Probability matrix for a system is developed? [8]
- b) Explain clearly the geometrical structures of linear estimation in stochastic system. [9]
- c) With reference to stochastic processes, explain the following: [8]
- i) Hilbert space,
 - ii) Spaces of square and integral variables.
- Q3)** a) Explain in detail the orthogonal increments process with suitable example. [10]
- b) State the general properties of orthogonal increments process. [5]
- c) With reference to stochastic system, explain briefly the following: [10]
- i) Brownian motion and white noise.
 - ii) Wiener integrals.

P.T.O.

SECTION - II

- Q4)** a) State and explain the continuous - time Kalman Filter algorithm. [10]
b) Find the time - invariant Optimal filter (kalman Filter) for the stochastic system:

$$\dot{x}(t) = x(t) + w(t)$$

$$y(t) = x(t) + v(t)$$

$$Q = 4 \quad ; \quad R = \quad ; \quad = \text{constant.}$$

Where $w(t)$ is state excitation noise and $v(t)$ is observation noise. Both $w(t)$ and $v(t)$ are zero - mean white noise processes with intensities Q and R respectively. Show that the answer is independent of [15]

- Q5)** a) With reference to stochastic dynamical control system, explain the following: [10]

- i) Non-linear filtering.
- ii) Distributed parameter systems.

- b) Outline the procedure to find the response of a linear discrete - time stochastic system: [15]

$$x(k+1) = F(k)x(k) + G(k)w(k)$$

to a zero - mean white noise as input. Where $x(k)$ is $n \times 1$ state vector; $F(k)$ is $n \times n$ characteristic Matrix; $G(k)$ is $n \times p$ control distribution matrix and $\{w(k); k = -1, 0, 1, 2, \dots\}$ is $p \times 1$ discrete zero - mean white noise vector (stochastic process).

- Q6)** a) State and explain the stochastic optimal linear regulator problem. [8]
b) State the separation principle and explain how it can be applied for the combined design of Optimal estimation and Controller in stochastic control system. Draw neatly the block diagram. [9]
c) Discuss the merits and demerits of Dynamic Programming in Linear stochastic Control problem solution. [8]



P1563

[4065]-631

M.E. (E & TC) (VLSI & Embedded System)

RECONFIGURABLE COMPUTING

(2008 Course) (504185 (a)) (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 answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) What are the key differences between reconfigurable machine and conventional processors, explain them. **[8]**
- b) Compare RISC-styled processor, VLIW, processor, DSP processors and FPGA with respect to limited instruction and data bandwidth, abstraction overhead and data movement consume capacity and coarse-grained data path network. **[8]**
- Q2)** a) State and explain issues in reconfigurable network design. **[8]**
- b) Give Rent's rule based hierarchical model for interconnect. **[8]**
- Q3)** a) What is need of instruction compression? Give different techniques and explain the one suitable for RD. **[8]**
- b) Explain relationship among peak computational density, Instruction density, Contexts, and data path width. **[8]**
- Q4)** a) How to compute area on chip per bit PE? Give the expression and explain. **[10]**
- b) State and explain characteristics of RD. **[8]**

SECTION - II

- Q5)** Draw the detail block diagram of TSFPGA. Explain each block in detail. Discuss merits and demerits. **[16]**
- Q6)** a) What are the limitations of conventional FPGA that are responsible for not to perform an application at its peak. **[8]**
b) Explain delta delay, intrinsic delay, interconnect delay pertaining to RD. **[8]**
- Q7)** a) Draw and explain the architecture of DPGA. **[8]**
b) What are research challenges in RC. **[8]**
- Q8)** Write short notes on any three : **[18]**
- a) Multicontext FPGA.
 - b) Instruction and interconnect growth.
 - c) RP space area model.
 - d) Granularity.



P1565**[4065] - 673****M.E. (Electronics) (Digital System)****IMAGE PROCESSING AND PATTERN RECOGNITION****(2008 Course) (504203) (Sem. - II)***Time : 3 Hours]**[Max. Marks :100**Instructions to the candidates:*

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

SECTION - I

- Q1)** a) Explain the functioning of Sobel edge operator and Prewitt edge operator. Can we find the direction of gradient? [8]
- b) For given set of pixels draw histogram and obtain the equalized histogram by applying histogram transformation. [8]

2	3	3	2
4	2	4	3
3	2	3	5
2	4	2	4

- Q2)** a) Explain what is gray level slicing and bit level slicing. [8]
- b) Explain Laplacian operator. What is its drawback? Explain Laplacian of Gaussian operator. [8]
- Q3)** a) Explain unsharp masking and high boost filtering. [8]
- b) Explain basics of spatial filtering using a filter mask convolution. [8]
- Q4)** Write short notes on: (Any Three) [18]
- a) Applications of pattern recognition.
 - b) FFT transform.
 - c) Line detection and template matching.
 - d) Gamma correction.
 - e) Logarithmic gray level scaling

P.T.O.

SECTION - II

- Q5)** a) Explain Binomial distribution and Poisson distribution. [10]
b) Calculate the conditional probability of rain given that high barometric pressure is high. Weather record shows that high barometric pressure (defined as being over 760 mm of mercury) occurred on 160 of 200 days in a data set, and it rained on 20 of the 160 days with high barometric pressure. [6]
- Q6)** a) What is decision boundary? Explain the steps in adaptive decision boundary algorithm. [8]
b) Explain in detail the leaving - one - out technique for estimation of error rates. [8]
- Q7)** a) Explain in detail the architecture of neural networks. Construct an ANN to produce logical OR operation. [8]
b) What is hierarchical clustering? Explain Agglomerative clustering algorithm. [8]
- Q8)** Write short notes on (ANY THREE) [18]
a) Back propagation algorithm.
b) Minimum risk estimators.
c) Baye's Theorem.
d) K-nearest neighbor techniques.
e) Support Vector Machine.



[4065] - 676
P1566
M.E. (Electronics) (Digital System)
EMBEDDED VIDEO PROCESSING
(504204(c)) (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 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) Explain the various formats used to represent digital video. Indicate advantages, drawbacks & applications of each format. [8]
 b) What are the features of transform coding? Write an expression of 2D - DCT & IDCT & explain every term used in the expression. [8]
- Q2)** a) Explain the different types of data structures which may be employed for entropy based coding of pixels in JPEG standard. [8]
 b) For broadcast TV with resolution 720×480 & frame rate of 30 fps, calculate computational complexity for motion estimation when the algorithm. [8]
 i) Full search &
 ii) Two dimensional logarithmic search is used.
 State the assumptions made & comment on result.
- Q3)** a) State the features of MPEG - 4 standard. With the help of neat block diagram explain the concept of audio - video objects & their spatio-temporal relationships to generate encoded bit streams. [10]
 b) A source has six symbols with probabilities as $a_1 = 0.1$, $a_2 = 0.4$, $a_3 = 0.06$, $a_4 = 0.1$, $a_5 = 0.04$ & $a_6 = 0.3$. Demonstrate step by step Huffman encoding algorithm to obtain variable length codes for each symbol. Also estimate the optimum length, actual length for the same & code efficiency. [8]
- Q4)** a) Explain the role of macroblock stuffing in MPEG - 1 encoder. [6]
 b) Explain hierarchical motion estimation limited to three levels. [6]
 c) State the features of video signal processors. [4]

P.T.O.

SECTION - II

- Q5)** a) Define Rate - distortion function with reference to video coding. Discuss the performance of motion compensation based & intra - frame coding based video coding techniques with suitable sketches. [10]
- b) Explain the term quantization. What are the different types of Quantizer?[8]
- Q6)** a) Discuss the need of pre - & post - processing & the techniques used for these processings. [8]
- b) Explain the QOS requirements for coded video. [8]
- Q7)** a) Draw a neat block diagram of H.261 encoder/decoder & explain function of each block. [8]
- b) What are the features of H.263? [4]
- c) What are the advantages of using B-frames for motion compensation?[4]
- Q8)** Write detailed notes on:- [16]
- a) Embedded & video processor.
 - b) Issues of video - codec interface.
 - c) Arithmetic coding.
 - d) DWT.



P1568
[4065] - 693
M.E. (E & T/C) (Communication Networks)
MOBILE COMPUTING
(504610 (b)) (2010 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 answer books.*
- 3) *Figures to the right indicate full marks.*

SECTION - I

- Q1)** a) Discuss various access methods in wireless communication along with their application areas. [8]
b) Explain GSM architecture along with details of its main entities. [8]
- Q2)** a) Discuss the authentication process in 802.11 frame work. [8]
b) Explain the authentication and related security issues used in GSM. [8]
- Q3)** a) Discuss in details about VOIP architecture. [8]
b) Explain GPRS transmission plane protocol architecture. [8]
- Q4)** Write a short note on: [18]
a) Bluetooth.
b) 4-G LTE network architecture.

SECTION - II

- Q5)** a) Explain 2-G mobile telephone technology. [8]
b) Explain various services, application and limitation of GPRS. [8]
- Q6)** a) Explain the fundamentals of wireless Markup language WML script applications. [8]
b) Explain three tier architecture of mobile computing. [8]
- Q7)** a) Discuss various security models used in mobile computing. [8]
b) What are the various issues to be considered in designing the WLAN environment. [8]
- Q8)** Write a short note on: [18]
a) 3-G telephone technology.
b) CDMA



P1574

[4065]-750

M.E. (Computer Engineering)

ADVANCED COMPILERS

(2008 Course) (Elective - II) (510105)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Solve any three questions from each section.*
- 2) *Answers to each section should be written on different answer sheets.*
- 3) *Assume suitable data, if necessary.*
- 4) *Draw neat diagram wherever required.*

SECTION - I

- Q1)** Explain following points with respect to design of compiler. **[16]**
- a) Grouping of phases
 - b) Number of passes required
 - c) Intermediate language
 - d) Tools needed
- Q2)** a) Given following regular expressions : **[8]**
P, pqq, p*q+
Draw transition diagrams, combined NFA, and convert it to DFA (state table). Recognize tokens from following input stream: ppqqppqp
Use LEX rules to resolve ambiguity.
- b) Explain: Register allocation techniques. **[8]**
- Q3)** a) Explain SSA form in detail. Support your answer with example. **[8]**
- b) Draw an example flow graph and explain following optimizations using it: **[8]**
- i) Copy propagation.
 - ii) Constant folding.
 - iii) Code Hoisting.
 - iv) Common sub-expression elimination.

- Q4)** Write short notes : **[18]**
- a) Code generation for pipelined machines.
 - b) YACC.
 - c) Unified algorithm for data flow analysis.

SECTION - II

- Q5)** a) Explain various ways of parallelism detection with respect to parallel compilers. **[8]**
- b) Explain: Auto scheduling compilers. **[8]**
- Q6)** a) Explain data partitioning and instruction scheduling associated with Distributed machine. **[8]**
- b) Assuming yourself as compiler designer, explain differences in symbol table for distributed compilation. **[8]**
- Q7)** a) Explain fundamental data flow properties and their use in optimization of compiler. **[8]**
- b) Explain how JIT compilers improve run time performance of programs. **[8]**
- Q8)** Write short notes : **[18]**
- a) Bi-directional data flow analysis.
 - b) GCC.
 - c) Interaction of various phases of compiler with symbol table.



P1575

[4065]-751

M.E. (Computer Engineering)

WEB SERVICES AND SOA

(2008 Course) (510105) (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) *Assume suitable data, if necessary.*

SECTION - I

Q1) Write in brief on following standards/protocols, explaining the protocol/std along with its need, give an example and state how to use the protocol/std. **[16]**

- a) UDDI.
- b) WS-Attachments.
- c) BPEL.
- d) CORBA.

Q2) a) Explain what you understand by REST. **[4]**

b) What do you understand by ESB. **[4]**

c) What do you understand by SOA governance. **[4]**

d) What do you understand by QoS. **[4]**

Q3) Draw neat diagrams and explain clearly the concept involved with help of the diagram drawn. **[16]**

- a) A typical multi-tier client server architecture.
- b) A service composition.
- c) Working of WEBSERVICES.
- d) WSDL document structure.

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

- a) Why web services, why SOA.
- b) SOA lifecycle : Planning, analysis, design, implementation, deployment.
- c) Service composition, federation, orchestration.
- d) The four Reliable messaging models : (Hint : atmostonce..)
- e) Java, J2EE.
- f) Characteristics of SOA: intrinsic reusability, intrinsic interoperability, vendor diversity, organizational agility.

P.T.O.

SECTION - II

- Q5)** Answer all questions below in context of AJAX. **[16]**
- a) How does AJAX help improve WebPages.
 - b) What is the role of HTML, CSS in context of AJAX.
 - c) What is the role of XML? JSON in context of AJAX.
 - d) What are the drawbacks of AJAX.
- Q6)** Imagine that you have to design a hypothetical website for a typical COLLEGE For this website discuss. **[16]**
- a) Who are the different actors/stakeholders/users who will use your website and how. What social networking features, can you think of adding to your site.
 - b) How can your website use AJAX? Explain with examples.
 - c) How can HTML, CSS, javascript, DOM be used for your website.
 - d) Can webservice be used for your site, how?
- Q7)** Discuss the need, concepts, application of following technologies. **[16]**
- a) HTTP, HTTPS.
 - b) RPC.
 - c) JAVA webservice.
 - d) RSS.
- Q8)** Write short notes on (any three) : **[18]**
- a) Service oriented architecture, business advantages and technical advantages.
 - b) Software components, middleware, interfaces.
 - c) Importance of security for Webservice/SOA based applications.
 - d) WIKIS.
 - e) XML, XML parsing, XML applications, XML use for webservices.
 - f) BLOGS, applications of BLOGS in education field.



Total No. of Questions : 8]

[Total No. of Pages : 2

P1576

[4065] - 756

M.E. (Computer)

SOFTWARE DESIGN AND ARCHITECTURE

(Elective - III) (2008 Course) (510111 (a))

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) *Answer 3 questions from Section I and 3 questions from Section II.*
- 2) *Question Nos. 4 and 8 are compulsory. Out of the remaining.*
- 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.*

SECTION - I

- Q1)** a) Draw and explain the model of the design process. [5]
b) What are the characteristics of an exceptional designer? [3]
c) What are the requirements for a good design? [4]
d) Discuss coupling and cohesion as design features. [4]
- Q2)** a) Explain the complete JSD design process. [8]
b) Explain the stepwise refinement process with example. What are the strengths and weaknesses of the stepwise strategy? [8]
- Q3)** a) Explain the steps of software architecture process. Elaborate on architectural requirements using example. [8]
b) Describe the concept of pattern. Explain the process model for designing with patterns. [8]
- Q4)** Write short notes on:
- a) Reliability. [3]
 - b) Characteristics of object oriented frameworks. [3]
 - c) Call and return architectural style. [3]
 - d) General categorization of formal techniques. [4]
 - e) Architectural mismatch. [5]

P.T.O.

SECTION - II

- Q5)** a) Explain with suitable example, the design tasks for module architecture view. [8]
b) For component and connector viewtype, explain the elements, relations and properties. [8]
- Q6)** a) Explain the rules of sound documentation. [8]
b) Describe the documentation for a view packet. [8]
- Q7)** a) Explain quantity archetype pattern. [8]
b) Give significance of literate modeling. Explain the UML artifacts with respect to comprehensibility. [8]
- Q8)** Answer the following:
- a) Differentiate between architecture and design. [2]
 - b) “Architecture serves as a means of education”. Justify. [2]
 - c) What are the decomposition dimensions of software product lines. [3]
 - d) What are the various approaches for assessing quality requirements?[4]
 - e) Write a note on model driven architecture. [5]
 - f) What are archetypes and business archetypes. [2]



Total No. of Questions : 8]

[Total No. of Pages : 2

P1577

[4065] - 759

M.E. (Computer)

ADVANCED INTERNET PROGRAMMING

(Elective - III) (2008 Course) (510111(d))

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 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) With respect to Remote Procedure Call state if the following is TRUE or FALSE. **[6]**

- i) RPC is only interaction based. It does not offer any flexibility in terms of hardware architecture.
- ii) RPC is a standard. It can be implemented in only one way.
- iii) Remote Procedure Call preserves business logic of the application.
- iv) RPC is server independent.
- v) RPC does not require TCP/IP.
- vi) Sun Micro System's Open Network Computing (ONC) is one of the implementations of RPC.

b) Explain the functions of RPC in terms of the following steps: **[12]**

- i) What does the client code do?
- ii) What does the server do after it receives the request?
- iii) What does the remote procedure do after it gets request from server?
- iv) After the remote procedure is complete what steps are taken to return the data to the client?

Q2) a) State the sequence of steps that are needed to go through to create a bean.

- b) What is meant by a manifest file?
- c) How is a ready bean packed in a jar file?
- d) Develop a suitable IDE for beans development? **[16]**

P.T.O.

- Q3)** a) State the purpose of DOM standard. What different types of documentation are covered by DOM?
b) With the help of an example show how DOM can present an XML document as a tree structure.
c) How do most browsers read and manipulate XML?
d) Write a short script to load a typical XML document into the DOM parser. [16]

Q4) Draw and explain the schematic diagrams showing the layout of the following: [16]

- a) Architecture of public access provider.
- b) Firewall screened internet connection.
- c) Processing payments using encrypted credit cards.

SECTION - II

Q5) Write suitable code skeletons to [16]
a) access LDAP server using JND from Java.
b) populate LDAP with suitable data.
Highlight important classes, interfaces, constructors, methods and packages.

Q6) a) What is the basic objective of the servlet API?
b) Show the life cycle of a servlet showing the servlet and servlet engine.
c) Write suitable code skeleton to demonstrate the use of a simple servlet which calculates the sum of two given numbers. [16]

Q7) a) With reference to the JMS API architecture, state the functions of the following:
i) JMS provider.
ii) JMS Client.
iii) Messages.
iv) Administered object.
v) Native Clients.
b) Draw a diagram showing the way the parts in (a) above interact in a JMS application. [16]

Q8) Write short notes on any TWO of the following: [18]
a) BEA Weblogic server.
b) JBOSS.
c) JNDI.



Total No. of Questions : 8]

[Total No. of Pages : 2

P1580

[4065] - 776

**M.E. (Computer) (Computer Networks)
INFRASTRUCTURE MANAGEMENT
(2008 Course) (510312) (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) Assume suitable data, if necessary.*

SECTION - I

Q1) State what is the goal of service strategy? What important processes are relevant to achieving its goal? What is the task achieved by : **[16]**

- a) IT financial Management.
- b) Service portfolio management.
- c) Demand management.
- d) Business relationship management.

Q2) Rapid growth of a software organization cannot be achieved without a set of properly defined processes for executing and controlling software projects. Besides various certifications, an organization needs a process for improving the processes. State and illustrate with suitable examples how you will execute a software process improvement (SPI) initiative to take an organization to highest level of maturity. You may choose any approach you may prefer. **[16]**

Q3) With reference to infrastructure, give example of a clear risk. State why risk management is essential in this case. When is risk management considered cost effective? How is risk identification carried out? What is risk prioritization? What are impact categories? What is risk management planning? Give examples of top 10 risks and their mitigation steps? **[18]**

P.T.O.

- Q4)** Write short notes on : **[16]**
- a) Effort estimation and scheduling.
 - b) Process capability baseline.
 - c) Requirements change management.

SECTION - II

- Q5)** What do you mean by a service desk? What is its justification and role? What is its organization structure and objective? Give example of local and virtual service desks? What is the significance of staff of service desk? What are its metrics? **[16]**

- Q6)** a) What is meant by a private cloud and a public cloud?
b) Either deny or justify the following statement with suitable reasons :
“There is no underlying new technology in cloud. It is just repackaging a commercial solution”. **[16]**

- Q7)** State what is meant by service design? What important processes are relevant to achieving its goal? What is the task achieved by : **[18]**
- a) Service catalogue management.
 - b) Availability management.
 - c) IT service continuity management.

- Q8)** a) What are the mostly used network services? What are the various policies To choose from for serving your network?
b) How will you ensure reasonable amount of data integrity in your organization?
c) What are the common attack deterrents? **[16]**



P1581

[4065] - 793

M.E. (Chemical)

CATALYSIS AND SURFACE PHENOMENON

(Elective - III) (509111) (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) As an industrial application discuss the following reactions incorporating reactions and surface mechanisms on catalysts.

- a) Fischer - Tropsch synthesis. **[10]**
- b) Ammonia synthesis. **[6]**

Q2) What information is needed for preparation of heterogeneous catalyst. Discuss in detail methods of preparation and formation of supported oxide and metal catalyst of general type. **[16]**

- Q3)**
- a) With neat sketch of the apparatus explain the volumetric method of determination of surface area of catalyst. **[9]**
 - b) What happens when a gas molecule collides on a surface of catalyst. **[7]**

- Q4)**
- a) Explain different types of hysteresis loops. **[10]**
 - b) Explain the effect of mass transfer on catalyst selectivity. **[8]**

SECTION - II

- Q5)**
- a) Describe the following methods of catalyst characterisation. State the principles involved. **[15]**
 - i) XRD.
 - ii) NMR
 - iii) XPS.
 - b) Define turnover frequency. **[3]**

P.T.O.

- Q6)** a) Describe the working of monolithic catalyst in automobile exhaust application. [8]
b) Explain the influence of a precursor state on the kinetics of desorption. [8]
- Q7)** a) Discuss the process of oxygen generation by photo induced oxidation of water. [8]
b) Derive an equation for estimating the rate of desorption. [8]
- Q8)** a) Derive an expression for purely surface reaction kinetics for rate of reaction when surface reaction controls. Consider the reaction
 $A + B \rightleftharpoons C + D$ [10]
b) Explain the operational consequences of poisoning. [6]



Total No. of Questions : 8]

[Total No. of Pages : 2

P1582

[4065]-827

M.E. (Petroleum)

WELL DESIGN AND ENGINEERING

(2008 Course) (Elective - II) (512105(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 Mollier charts, non-programmable electronic pocket calculator is allowed.*
- 6) *Assume suitable data, if necessary.*

SECTION - I

Q1) Following data is available, prepare Geo Technical order for a vertical oil well using Longitude : $10^{\circ} 21' 38''$, Latitude : $99^{\circ} 08' 40''$.

Well depth 4300M, Age is Eocene up to 2500M.

Further 1000M Paleocene, rest is upper cretaceous lithology is clay stone, shale, clay stone, limestone, Basalt (Depth same as age) Casing policy 20" - 500M 13 3/8" - 2100M, 95/8" - 2950M and rest is 7" casing. Pay zone 3850M 3925M. Assume suitable mud policy. **[18]**

Q2) a) Explain the graphical method to select casing setting point. **[10]**

b) Write a note on well integrity in brief. **[6]**

Q3) a) Describe Drill Stem Testing in detail. **[10]**

b) Write the various reservoir aspects to be considered in the selection of well trajectory. **[6]**

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

- a) Mud planning.
- b) Bit design.
- c) Exploratory wells.
- d) Rig selection.
- e) Cement properties.

P.T.O.

SECTION - II

- Q5)** a) Draw a typical layout for an offshore drilling rig-site. Indicate various features and explain important aspects of it. [10]
b) Discuss fracture gradient in brief. [8]
- Q6)** a) What is D-exponent? Using Dexponent Curve and bulk density plot find, pore pressure at 2400M, 2600M, 2800M, 3000M, 3200M normal pressure at 2400M is 1.30gm/cc. [10]
2600M is 1.35gm/cc
2800M is 1.50gm/cc
3000M is 1.60gm/cc
3200M is 1.72gm/cc
b) Discuss sub sea well completion program. [6]
- Q7)** Write short notes on : [16]
a) Horizontal wells.
b) Well Control.
c) Mud hydraulics.
d) MWD.
- Q8)** Describe in detail one case study pertaining to well planning of a multilateral well. Write various equations, show graphs to elaborate various factors considered in the design and planning of this well. Also write the merits of these wells. [16]



Total No. of Questions : 8]

[Total No. of Pages : 3

P1583

[4065]-829

**M.E. (Petroleum)
WELL CONTROL**

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

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 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) 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) Describe in detail indications and reasons of well kick and blow out. [12]
b) Explain the design considerations for a well to be drilled to stop the blow out at offshore location. [6]
- Q2)** a) Explain the difference between hydrostatic column pressure and formation pressure. [4]
b) Explain apparent and plastic viscosity of drilling fluid. [4]
c) Surface casing is to be set in 16" hole. Length = 960 ft., and of size 125/8". The slurry yield is 1.19 cubic ft/sack and 69% excess is needed. The cement slurry weight is 13.6 ppg and requires 6.2 gal/sack of water. Cement is circulated to the surface. Capacity of the annulus to be cemented is 0.42805 cubic ft/ft. Capacity 13 3/8" Casing is 0.1497 bbl/ft.
Calculate :
i) No. of sacks.
ii) Volume of water in bbl and in liters. [4]
d) Explain API types of drill pipes. [4]

P.T.O.

Q3) a) Write the types of drilling fluids and determine the height in feet of the influx in following case. [8]

Pit gain = 35 bbl

Hole size = 8.5 in

Drill collar OD = 6.5 in

Drill collar length = 590 ft.

Drill pipe OD = 5.0 in

b) Explain in brief, leak off test. [8]

Q4) Write short notes on : [16]

a) Bit planning.

b) Offshore Well completion.

c) Well kick through annulus.

d) Factors affecting penetration rate during drilling.

SECTION - II

Q5) Following data is available. [18]

Calculate,

a) Kill mud density.

b) Initial circulating pressure.

c) Final circulation pressure.

d) Time for one complete circulation.

e) Step down plan for driller's method.

f) Total annular volume.

Given data :

Hole size - 12.25" Hole depth 6800 ft TVD

Casing : 9-5/8" set at 5100 ft TVD

Drill pipe : 5" Capacity 0.0178 bbls/ft

Drill collar : 8.3", 530 ft long, capacity 0.0089 bbls/ft

Mud wt. : 13.4 ppg

Capacities :

Drill collar in open hole : 0.0837 bbl/ft

Drill pipe in open hole : 0.1216 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 = 470 psi

SICP = 370 psi

Pit-gain = 19 bbls.

- Q6)** a) Determine the type of influx using following data. [4]
SICP = 1084 psi
SIDPP = 660 psi
Height of influx = 429 ft.
Mud weight = 14.00 ppg.
- b) Explain in detail mud hydraulics. [12]
- Q7)** a) Discuss in brief general well control procedure and steps. [12]
b) Explain the classification of oil well cement. [4]
- Q8)** Write short notes on : [16]
a) Types of casing pipes.
b) Working of BOP.
c) Safety valves.
d) Applications of choke.



P1584

[4065] - 838

M.E. (Petroleum)

ADVANCED OFFSHORED TECHNOLOGY

(2008 Course) (Elective - IV) (512112(c))

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Explain in detail drilling and environmental forces acting on an offshore drilling platform and their calculations. [9]
b) What are the drilling difficulties in deep water drilling. Explain 'hole problems' in detail. [9]
- Q2)** a) Write the different types of offshore structures according to their specifications. Explain their working principle in brief. [12]
b) Draw the schematic sketch and indicate rotational forces and oscillating motions acting on a drill ship. [4]
- Q3)** Discuss the generalized procedure to drill the hole, casing lowering and cementing for 20 inch size of hole, its casing to be installed and its cementation during onshore drilling operations. Also draw the neat schematic sketches and write intermediate operations involved in brief. [16]
- Q4)** Write short notes on : [16]
a) Productive formation testing.
b) Choke line and kill line.
c) Primary well control.
d) Tension leg platform.

P.T.O.

SECTION - II

- Q5)** a) Describe the general design considerations for deep water oil well cementation program. [9]
b) Explain pipe line design considerations for the transportation of oil and natural gas. [9]
- Q6)** a) Discuss in detail subsea completion. [12]
b) What is drilling riser? Explain. [4]
- Q7)** Draw neat sketches and explain the basic principle, elements, merits and demerits of various methods of station keeping. [16]
- Q8)** Write short notes on : [16]
a) API Types of cement.
b) Diving system.
c) Offshore Safety.
d) Storage of gas.



P1586

[4065] - 855

M.E. (IT)

USER INTERFACE DESIGN

(514428 (d)) (2008 Course) (Elective - III)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) *Solve any three questions from each section.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn whenever necessary.*
- 4) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Describe three populations of users with special needs. For each of these populations, suggest three ways current interfaces could be improved to better serve them. [8]
- b) What are mental models, and why are they important in interface design? What can a system designer do to minimize the memory load of the user? [8]
- Q2)** a) Give a brief explanation of the Eight Golden Rules of Interface Design. State an example you have seen on a device, computer interface or web site that violates those rules. [8]
- b) What is requirement analysis? What are the methods involved in it? What is the impact of it on UI design? Explain. [8]
- Q3)** a) Dr. August Dvorak designed a keyboard for maximum typing efficiency called Dvorak keyboard. What are the disadvantages of this keyboard? How half-QWERTY keyboard were good alternative to Dvorak keyboard? [8]
- b) Do you think that today keyboard is well suited for blind people? If not what design alternative you suggest? [8]
- Q4)** a) What are the factors governing the choice of an appropriate evaluation method for different interactive systems? Give brief details. [8]
- b) Distinguish between principles, guidelines and standards, using examples of each to illustrate. [8]

P.T.O.

- Q5) a)** With suitable examples explain an application where menu selection and form fill-in are more appropriate than a direct-manipulation strategy. Also suggest ways that will refine the menu approach to accommodate expert or frequent users. [9]
- b)** The use of mobile devices has been increasing rapidly over the past few years. These devices typically feature much smaller screens than desktop computers. List two strategies of how you could successfully implement an interface to browse through a user's set of digital photographs on a small device. [9]

SECTION - II

- Q6) a)** What should be the significant features for a user interface of a system which supports the hearing impaired? Explain with the help of example system. [8]
- b)** Explain the features, their strength and weakness of the following three user interface styles: menu driven, natural language, direct manipulation. [8]
- Q7) a)** Currently from TV remote we can select a channel by a 2 digit number. By 2015 we might easily have 1000+ TV channels. Design the interaction of channel surfing when there are 1000+ TV channels. Show your work with suitable diagrammatic representation. [8]
- b)** Explain how the errors are reduced in UI by providing Guidance and assistance to user, with suitable examples. [8]
- Q8) a)** What is the need for usability test? What are the types of tests? Explain any two in detail. [8]
- b)** Explain how you might use of virtual world interface capabilities in a system for users to choose and book their holidays. [8]
- Q9) a)** Explain GOMS model. Create a GOMS description of task hierarchies for "cut and paste Word" in a word document. [8]
- b)** What is the need of migrating GUI to Object Oriented User Interfaces? What are its advantages? [8]
- Q10) a)** A company is designing a kiosk that can display weather information in public locations. The kiosk will feature a touchscreen so users can select a city by pointing on a map. Give three reasons why a touchscreen is an effective device for this application. [9]
- b)** Explain OAI model as applied to website design. Which different interface object metaphors and interface action handles are used while designing a webpage? [9]



P1587

[4065]-889

M.E. (Biomedical Instrumentation)
FUNDAMENTALS OF BIOMEDICAL INSTRUMENTATION
(2008 Course) (5061201 (A)) (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 answer books.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Figures to the right indicate full marks.*
- 5) Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Draw an arterial pressure wave indicating systole and diastole. Explain blood pressure measurement system based on korotkoff sound. [10]
b) Explain the basic types of bio electrodes with their materials. What is importance of Electrolytic Jelly in the biopotential measurement? [8]
- Q2)** a) Draw neat labeled spirogram. Draw and explain wedge type spirometer in detail. [10]
b) What is Evoked response? State any one application of it. [6]
- Q3)** a) Explain the function of the following in the cell : [8]
i) Mitochondria.
ii) Endoplasmic reticulum.
iii) DNA.
iv) Golgi Apparatus.
b) Discuss coulter counter method for counting of various blood cells associated with blood. [8]
- Q4)** a) Draw and explain detail block diagram of ECG machine. [8]
b) Draw and explain the block diagram of Heart Lung Machine with five pump heads. [8]

P.T.O.

SECTION - II

- Q5)** a) Explain Ultrasound blood flow measurement technique based on Doppler Shift principle and Transit Time principle. [10]
b) Draw and explain brain stem and its part with their functions. [8]
- Q6)** a) Draw and explain the structure of neuron. Define efferent and afferent nervous systems. [8]
b) Explain the EEG 10-20 montage system. Discuss mono polar and bipolar configuration of measurement. [8]
- Q7)** a) What are the three main sectors of Human Auditory System? Explain the function performed by inner ear in human hearing system. Name the instrument use to diagnose auditory system performance. [10]
b) What is intraocular pressure (IOP)? Explain the instrument used for measurement of IOP? [6]
- Q8)** a) Discuss the physiological effects of electric current on human body. [8]
b) Explain the process of urine formation. With simplified diagram explain the operation of hemodialysis. [8]



P1588

[4065]-893

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

ORGANISATIONAL BEHAVIOUR AND MANAGEMENT

(2008 Course) (5061110) (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.*

SECTION - I

- Q1)** Define Management. Explain various functions of management. Critically analyse effective Vs. successful managers and their role in a changing business environment. **[16]**
- Q2)** Define organisational behaviour with its key elements. State and explain Elton Mayo's contingency approach and Mc Gregor's system approach of OB. **[16]**
- Q3)** a) "Personality is a complex and multi-dimensional construct". Explain with reference to determinants of personality. **[8]**
- b) What is perception? What are the factors influencing perceptual process? Justify your answer that perception is a key factor in managerial effectiveness. **[8]**
- Q4)** Explain the following theories of Motivation : **[18]**
- a) Victor Vroom's theory and
- b) Maslow's need hierarchy theory.

SECTION - II

- Q5)** State and explain the stages of group development, group structure and group process. As a manager, how would you operate in the group to understand its dynamics and assess its effectiveness. **[18]**
- Q6)** a) What is Managerial Grid? Explain its importance. **[6]**
- b) Critically evaluate Fiedler's contingency theory of Leadership. **[12]**

P.T.O.

Q7) Define organisational structure with its key components. State and explain design, technology and human factors for successful functioning of the organisation. **[16]**

Q8) State and explain various causes of business conflicts and analyse the mechanism of conflict resolution. How contingency approach to conflict management is helpful in this context. **[16]**



P1589

[4065] - 903

M.E. (Biomedical Instrumentation)

BIO-IMAGING MODALITY

(2008 Course) (5061205(a)) (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 answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Explain Why use different methods of imaging and typical use of the different types of imaging? List out factors that determine image quality. **[12]**
- b) Specify the target material used in generation of x-ray. Give its technical reason for the used. Specify the factors deciding the quality of x-rays. **[6]**
- Q2)** a) What is the difference between diagnostic and screening mammography? What is magnification mammography? **[8]**
- b) How digital mammography does differ from standard mammography? What are benefits over standard mammography equipments? **[8]**
- Q3)** a) Explain the block diagram of CT-scanning. **[8]**
- b) Explain the two types of x-ray tubes in x-ray imaging system. List out the real time application of x-ray system. **[8]**
- Q4)** a) What are collimators? Enlist various Gamma camera collimators with their specific clinical applications. **[8]**
- b) Discuss the beam restrictors in details. **[8]**

P.T.O.

SECTION - II

- Q5)** a) Discuss the relationship between frequency of ultrasound and depth of penetration, resolution of ultra sound image. [8]
b) Specify the frequency ranges for abdominal, Brain Examination and for ophthalmic & pediatric study in M-scan mode. Explain the advantages of ultrasound imaging over the other imaging modalities. [10]
- Q6)** a) Explain the photon annihilation associated with PET imaging. What is the main advantage offered by PET over other medical imaging modality? Why NaI (Ti) is most popular in radionuclide imaging? What are the factors that decide the resolution in PET imaging system? [10]
b) Enlist clinical applications of SPECT and give the reason why SPECT is accepted insteady of conventional nuclear medical imaging. [6]
- Q7)** a) Explain basic imaging principle of MRI techniques. [8]
b) Give the advantages and diadvantages of MRI techniques. [8]
- Q8)** a) Which imaging modality is used for inflammation and other conditions? Conditions normally detected using same modality. [8]
b) Discuss various benefits of the thermal imaging. [8]



P1590

[4065]-913

M.E. (Polymer Engg.)

MOLD AND DIE DESIGN

(2008 Course) (509119) (Elective - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Attempt Q. No. 1 from section-I and Q. No. 6 from section-II. Attempt any other two questions from section-I and attempt any other two questions from section-II.*
- 2) Figures to the right indicate full marks.*
- 3) Answers to two sections must be written in separate answer books.*
- 4) Use of calculator is allowed.*
- 5) Assume suitable design data, if required.*

SECTION - I

Q1) Attempt any two :

[20]

- a) With neat sketches and the recommended tolerances, explain.
 - i) Vertical flash type semi-positive compression mould.
 - ii) Horizontal flash type semi-positive compression mould.
- b) Explain with neat sketches moulding of local under cuts using.
 - i) Straight action form pin.
 - ii) Angled action form pin.
- c) With a neat sectional view, explain the principle of operation of withdrawing type of rotating core used for ejection of internally threaded component.

Q2) Discuss dog-leg cam actuation for splits. With suitable example and sketches explain, sequence of operation. Give also relevant design formulae for opening movement, length of cam and the delay period. **[15]**

Q3) With neat sketches, explain split actuation using cam track machined into steel plate attached to the fixed mould half. Give also relevant formulae for calculating the distance traversed by each split, the length of cam track and the delay period. **[15]**

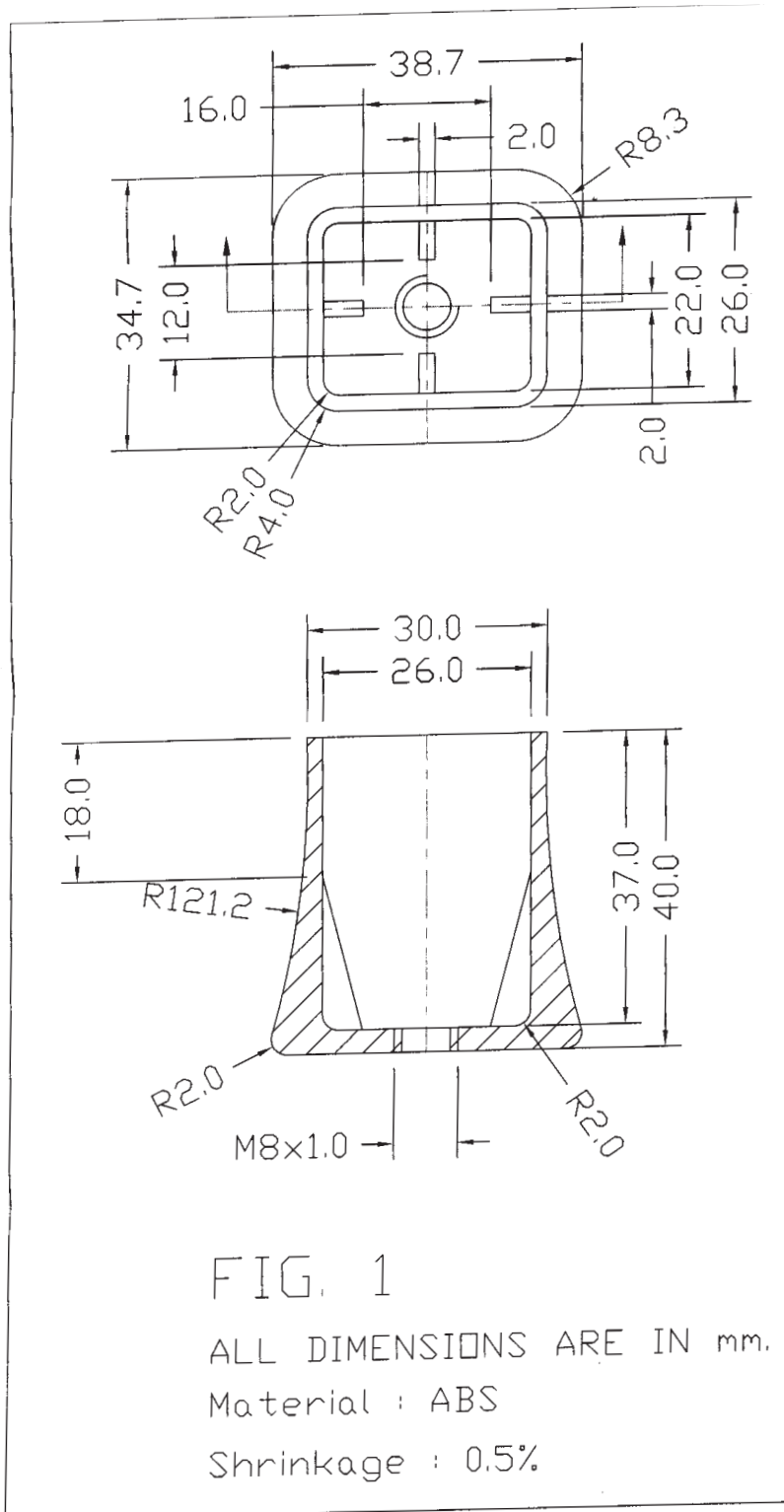
Q4) a) With neat sketches, explain following types of cooling systems for small core inserts. **[10]**

- i) Baffled hole system.
- ii) Bubbler system.

P.T.O.

b) Discuss 'TAB GATE'. Give empirical relationships for calculating dimensions of 'TAB GATE'. [5]

Q5) Explain with sketches, mechanism of ejection and cooling system that can be designed for the component shown in fig.1. Draw sectional views to illustrate your design scheme. [15]



SECTION - II

- Q6)** Attempt any four : **[20]**
- a) Explain the use of stack moulds with suitable example.
 - b) Explain various disadvantages associated with injection moulding process, injection moulding machine and the quality of the moulding itself if the parting line matching and parallelism of the mould halves is not upto the mark.
 - c) Explain use and application of reverse-tapered secondary sprue.
 - d) Draw a sketch of coat hanger flat film die.
 - e) Discuss in short the problems associated with expansion of metal while designing hot runner mould.
- Q7)** Discuss the principle of externally operated valve systems developed for use with nozzles, manifold secondary nozzles, hot runner secondary nozzles and hot plate systems. Give sketches of at least three types of systems. **[15]**
- Q8)** Discuss different heating methods adopted for heating of manifold in case of hot runner moulds. Discuss also external flow way heating systems and internal flow way heating systems for maintaining the melt temperature. Draw sketches to explain the principle of each type. **[15]**
- Q9)** a) With reference to a tape die or slit die, write formulae to calculate. **[10]**
- i) Pressure drop at entrance.
 - ii) Pressure drop in the wedge due to shear.
 - iii) Pressure drop in the wedge due to extensional flow.
 - iv) Pressure drop in the land section of the slit.
- b) Explain how film thickness can be calculated in terms of drawdown ratio and die gap. Discuss also the use of rotating tabular die for reducing thickness variation. **[5]**
- Q10)** a) Discuss design considerations for design of spider channels while designing dies for hollow sections like pipe die. Draw sketches of different spider channels and discuss mechanical and rheological considerations. **[10]**
- b) Discuss different types of core and cavity materials that can be used for PVC injection moulds. **[5]**



Total No. of Questions : 6]

[Total No. of Pages : 3

P1592

[4065]-462

M.E. (Civil-Structures)

PLASTIC METHOD FOR ANALYSIS AND DESIGN OF STEEL STRUCTURES

(2008 Course) (Elective - II) (501405 (c))

Time : 4 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) A simply supported beam of an unsymmetrical I section is subjected to sagging bending moment. Find the shape factor if permissible yield stress in compression and tension is 200 MPa and 240 MPa respectively. The I section has following dimensions :
- Top flange = 200mm × 20mm; Bottom flange = 120mm × 30mm;
Web = 10mm × 200mm (excluding flanges). **[12]**
- b) Explain elasto-plastic behaviour of a beam in flexure and obtain bending moment-curvature in non dimensional form. **[10]**
- c) Explain the concept of plastic hinge. **[3]**
- Q2)** a) A continuous beam ABCD is simply supported at A, B, C and D. Spans AB = 3m, BC = 4.5m, CD = 6m and AB:BC:CD = 1Mp : 2Mp : 3Mp. Span AB, BC and CD are subjected to ultimate loads of 60kN/m, 90kN/m and 120kN/m respectively. Find the plastic moment and draw BMD at collapse. **[13]**

P.T.O.

- b) Determine the collapse load W_c for the frame shown in Fig.1. Sketch all possible mechanisms. [12]

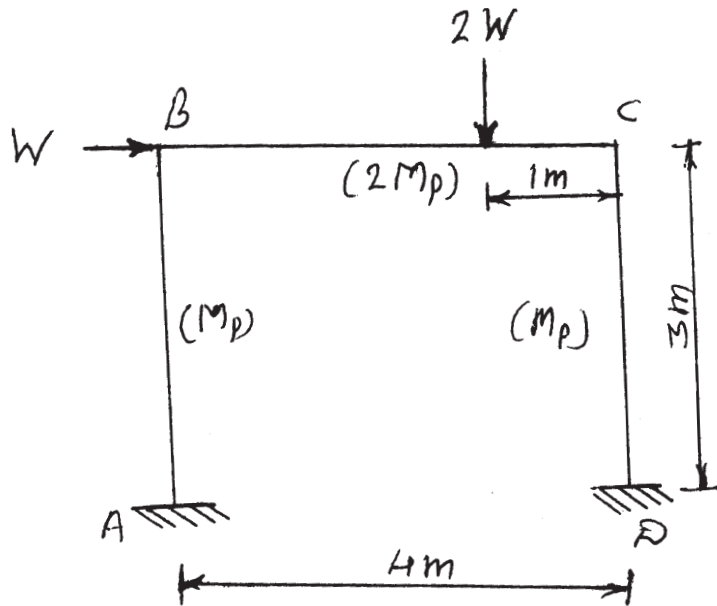


Fig. 1
(Q.26 and Q.5)

- Q3) A symmetrical gable portal frame ABCDE has bases A & E fixed, 15m apart. Vertical columns AB and ED, each 7m in height and apex C is 10m above base. It is subjected to horizontal load of 50kN at B and vertical load of 100kN at center of each gable beam. M_p is uniform.
- Draw all basic mechanisms and obtain M_p in each case.
 - Draw combined-sway + gable mechanism and obtain M_p . [25]

SECTION - II

- Q4) a) A simply supported beam of 8m effective span carrying factored load of 50kN/m on entire span and a point load of 25kN at midspan. The compression flange is laterally supported. Design the section as per IS 800-2007 and check for shear and deflection. [15]
- How the cross sections are classified in limit state theory? What is its significance? [5]
 - Explain the concept of factored load and partial safety factor for loads and materials. [5]

- Q5)** Design column AB of the frame given in Fig.1. as per IS 800-2007. Take $W = 40\text{kN}$. Check the section for, **[25]**
- a) Combined bending and shear.
 - b) Combined bending and axial force.
- Q6)** In a rectangular portal frame, a corner connection is to be designed. Bending moment at knee is 180kNm . The designed section for beams is ISMB 350 and for column is ISMB 400. Design the knee portion. Apply all checks and provide diagonal stiffener, if required. Draw detailed sketch. **[25]**



P1593

[4065] - 467

M.E. (Civil Structures)

EARTHQUAKE RESISTANT DESIGN OF STRUCTURES**(501411 (A))(2008 Course) (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 must be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of electronic pocket calculator is allowed.*
- 6) *Assume suitable data, if necessary.*
- 7) *Use of IS 1893 - 2002 (Part - 1) is permitted.*

SECTION - I

- Q1)** a) What are the causes and types of earthquake? [7]
 b) What are the different major plates? Explain the Plate Tectonic Theory in details? [8]
 c) Describe the approaches used to measure the size of an earthquake?[10]
- Q2)** a) What are the criteria or demands of seismic resistant design of structures? Explain the code based methods of seismic design of an earthquake?[5]
 b) What is “Seismo-resistant Building Architecture”? Explain the major aspects involved to avoid adverse effects of architectural design on seismo-resistant building constructions? [7]
 c) When is the possibility that building may be subjected to twisting moment in horizontal plane? Determine total shear and lateral forces at each floor for a three storey building with following data. L.L. = 3kN/m², Beam size 400 × 500 mm, Column size = 400mm × 600mm, Slab Thickness for all floors = 150 mm, Wall thickness 200mm at all floors, Height of Storey = 3m. Assume seismic zone III, soil type II, concrete grade M20 and steel Fe415 and damping ratio 5% Refer Fig. 2.1. [13]

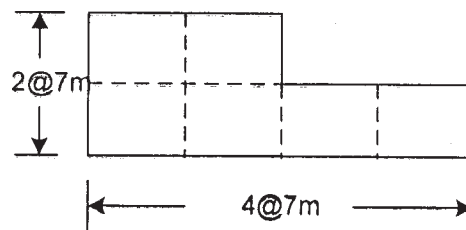


Figure 2.1

P.T.O.

- Q3)** a) Explain importance of Ductility in E.R.D? Give methods to improve Element and Structural Ductility? [7]
b) Explain with suitable sketches the concept and need of Base Isolation?[8]
c) Describe the types of structural Dampers used in construction? What is the difference between behavior of damping and base isolation? [10]

SECTION - II

- Q4)** a) Describe the steps by which the assessment of building is carried out to ascertain the requirement and level of retrofitting? [7]
b) Describe with suitable sketches various methods of retrofitting of RC buildings? [8]
c) Explain structural level retrofitting techniques used for masonry buildings? [10]
- Q5)** a) List the parameters influencing the liquefaction potential of soil at site? Explain the general methods of evaluating liquefaction and suggested measures to reduce the same? [10]
b) 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 - 0.3m, Unit weight of wall - 20 kN/m², Type of soil - Rocky. [15]
- Q6)** Write short notes on: [25]
a) Strengthening of Steel Buildings.
b) Effects of Non - Structures.
c) Behavior of Masonry Shear Wall.
d) Failure Mechanism of Infilled Frames.
e) Strength and Stiffness of RC Building.



Total No. of Questions : 6]

[Total No. of Pages : 2

P1594

[4065] - 471

M.E. (Civil Structures)

BIOMATERIALS & BIOMECHANICS

(2008 Course) (Elective - IV) (501412(a))

Time : 4 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Solve any 2 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) *Your answer will be valued as a whole.*

SECTION - I

Q1) Solve any three :

- a) Define “Bio-materials” and “Bio compatibility”. Give examples of bio materials used in body system. [8]
- b) Write a note on metallic bio materials. Give details of any two alloys used as bio. materials. [10]
- c) What is an “equilibrium diagram”? [7]
- d) What do you mean by pickling and passivation with reference to metallic bio materials? [7]

Q2) a) What is polymerization?

Define “thermoset” and “thermoplastics”. [7]

- b) What are polymer composites? Give details of various types of reinforcement used in composites. [8]
- c) Write down the mechanical properties of polymers. [10]

Q3) Solve any three :

- a) Explain joints of human skeletal system. [8]
- b) Write a note on composition of human bone by drawing a diagram. Write down mechanical properties of bone. [10]
- c) What is “Osteolysis”? [7]

P.T.O.

- d) What is “degradation” and “corrosion” of implant. [7]

SECTION - II

- Q4)** a) Explain with suitable example & illustrations the ‘isotropic, orthotropic and anisotropic behaviour of bone. [8]
- b) Explain experimental determination of elastic properties of bone. [8]
- c) Explain procedures & devices for measurement of motion and body forces. [9]
- Q5)** a) Explain equilibrium at ankle joint with suitable FBD and joint equation in terms of body weight. [8]
- b) What do you understand prosthesis. Give examples of prosthesis used in human body. [8]
- c) What is the design procedure & parameters considered in design of prosthesis? [9]
- Q6)** a) Explain human Gait and how it is measured. [8]
- b) Tabulate mechanical properties of bio materials cancellous bone, cortical bone titanium alloy, stainless steel cobalt chromium alloy. [8]
- c) Write a note on total joint replacement with reference to knee joint.[9]



P1595

[4065] - 474

M.E. (Civil) (Structures)

OPTIMIZATION TECHNIQUES

(2008 Course) (Elective - IV) (501412)

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 engineering applications of optimization and explain mathematical statement of optimization problem. [6]
- b) To design uniform column of rectangular cross section to avoid failure due to direct compression and buckling, formulate an optimization problem to minimize the mass of column for economy. Assume the permissible compressive stress to be σ_{\max} . [12]
- c) Find the maxima and minima of the function
 $f(x) = 12x^5 - 45x^4 + 40x^3 + 5$. [7]
- Q2)** a) State and explain decomposition principle. [6]
- b) Maximize $F = 6x_1 + 7x_2$ [10]
 Subject to
 $7x_1 + 6x_2 \leq 42$
 $5x_1 + 9x_2 \leq 45$
 $x_1 - x_2 \leq 4$
 $x_i \geq 0, i = 1, 2$
 Using Big-M technique.
- c) Maximize $F = 5x + 2y$ [9]
 $3x + 4y \leq 24, x - y \leq 3,$
 Subject to $x + 4y \leq 4, 3x + y \geq 3$
 $x \geq 0, y \geq 0,$
 Using simplex method.

P.T.O.

- Q3)** a) Find the value of x in the interval $(0, 1)$ which minimizes the function $f = x^3 - 10x - 2x^2 + 10$ to within ± 0.05 by Fibonacci method. [12]
- b) Perform two iterations of the cubic search method to minimize the function [13]
- $$f(x) = (x^2 - 1)^3 - (2x - 5)^4.$$

SECTION - II

- Q4)** a) What is the difference between random jumping and random walk methods? [5]
- b) Minimize $f = x_1^2 + x_2^2 - 2x_1 - 4x_2 + 5$ from the starting point $(1, 2)$ using the univariate method (two iterations only). [10]
- c) Minimize $f = 2x_1^2 + x_2^2$ by using the steepest descent method with the starting point $(1, 2)$. [10]
- Q5)** a) Complete one iteration of the reduced gradient technique for the following NLP problem [13]
- Minimize $x_1^2 + x_2^2$
Subject to $x_1x_2 - 9 = 0$
- Use a starting feasible solution $X_0 = \begin{Bmatrix} 2.0 \\ 4.5 \end{Bmatrix}$
- b) Minimize $f = x^2 - 2x - 1$ [12]
Subject to $g_1 = -x + 1 \geq 0$
Use the interior penalty function method.
- Q6)** a) Illustrate the working principles of Genetic Algorithms with an example of unconstrained optimization problem. [13]
- b) Write a note on Neural Network based optimization. [12]



P1597**[4065]-482**

M.E. (Civil) (Environmental Engineering)
PRINCIPLES AND DESIGN OF BIOLOGICAL TREATMENT
SYSTEM
(2010 Course) (Elective - II) (501505 (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) Assume suitable data if necessary.
- 5) Figures to the right indicate full marks.

SECTION - I

- Q1)** a) Draw neat sketch to show interrelationship of solids found in wastewater. Explain how various solids are determined in laboratory. **[8]**
- b) The BOD₅ of a waste has been measured as 600mg/l. If $K = 0.23/\text{day}$ (base e), what is the ultimate BOD (BOD_u) of the waste? What proportion of BOD_u would remain unoxidised after 20 days? Also differentiate between first stage BOD and second stage BOD. **[8]**
- Q2)** a) The cumulative flow of the wastewater reaching the treatment plant in a day varies as shown in table below. Determine the capacity of an equalization tank and its dimensions. **[8]**

Time (Hrs)	0	2	4	6	8	10	12	14	16	18	20	22	24
Cumulative flow, m ³	0	25	50	75	100	120	130	140	150	160	170	201	229

- b) Explain in detail bacterial growth in terms of bacterial number and growth in terms of bacterial mass. **[8]**
- Q3)** a) Draw flow sheet to show various unit operations and unit processes in waste water treatment. Also mention their applications. **[7]**
- b) Differentiate between : **[9]**
- i) Aerobic and anaerobic treatment.
 - ii) Attached growth and suspended growth processes.
 - iii) Grab sampling and composite sampling.

P.T.O.

- Q4)** Write short notes on : **[18]**
- a) Flow equalization.
 - b) Methods of Aeration.
 - c) Symbiotic relationship between bacteria and algae.

SECTION - II

- Q5)** a) An activated sludge system is to be used for secondary treatment of $10000\text{m}^3/\text{d}$ of wastewater. After primary clarification, the BOD is 150mg/L , and it is desired to have not more than 5mg/l of soluble BOD in the effluent. A completely mixed reactor is to be used, and pilot plant analysis has established the following kinetic values : $Y = 0.5\text{kg/kg}$, $k_d = 0.05$ per day. Assuming MLSS concentration of 3000mg/l and an underflow concentration of 10000mg/L from the secondary clarifier, determine :
- i) The volume of the reactor.
 - ii) The mass and volume of solids that must be wasted each day and
 - iii) Recycle ratio. **[8]**
- b) Explain with neat sketch the biological process involved in working of trickling filter. **[8]**
- Q6)** a) Clarify with the help of flow chart, various processes involved in sludge treatment and disposal. **[8]**
- b) Discuss the criterion for design of a septic tank. Also discuss the methods of disposal of septic tank effluent. **[8]**
- Q7)** a) Calculate the digester capacity required for the single stage floating cover digester for the sewage treatment of a city, with the following data. **[8]**
- | | |
|---|------------------------------|
| Population equivalent | = 7000 |
| Loading rate | = 0.09kg/capita/day |
| Volatile solids in the raw sewage | = 70 percent |
| Moisture content of raw sewage | = 96 percent |
| Digestion period | = 25 days |
| Volatile solids reduction during digestion | = 50 percent |
| Storage volume required for digested sludge | = 90 days |
- b) What do you know about UASB? Explain typical arrangement of a UASB plant for municipal sewage treatment. **[8]**

Q8) Write detailed notes on :

[18]

- a) Bio-filters.
- b) Sequencing batch reactor.
- c) Rotating biological contactor.



Total No. of Questions : 10]

[Total No. of Pages : 2

P1598

[4065] - 489

M.E. (Civil) (Environmental Engg.)

ENVIRONMENTAL SANITATION

(501511 (C)) (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 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) Enlist in a tabular format the different types of common communicable diseases along with their modes of transmission. [8]
b) What is meant by animal reservoir and nonliving reservoir of infection? [8]
- Q2)** a) Describe in detail the use of various types of disinfectants for control of insects and rodents. [8]
b) Comment on “Integrated Pest Management Program.” [8]
- Q3)** a) Explain the preventive measures to control breeding of mosquitoes. [8]
b) Explain how will you achieve an effective fly control program in eating establishments? [8]
- Q4)** a) What are the basic principles of industrial sanitation? [8]
b) How will you achieve sanitation in case of [8]
i) Schools.
ii) Swimming pools.
- Q5)** a) “Rodents and public health”. Discuss. [9]
b) Explain the commonly available insecticides in market. [9]

P.T.O.

SECTION - II

- Q6)** a) Discuss and explain common hazards in the workplace and their effects on the workers health. [8]
b) Explain in detail the various physical and ambient factors to be considered in order to avoid workplace hazard. [8]
- Q7)** a) “Poor sanitation practices are the main cause of water quality problems”. Discuss. [8]
b) What do you mean by “dry latrine and wet latrine”. Also write down their merits and demerits in relation to their use in Indian conditions. [8]
- Q8)** a) What are the precautionary measures for disposal of human waste at rural health centers during an epidemic? [8]
b) What are sulabh shauchalayas? Why are they finding increasing use in developing countries like India? [8]
- Q9)** a) What is worksite analysis? What help can OSHA provide? [8]
b) Explain the measures taken to prevent poisoning by industrial poisons.[8]
- Q10)** Write note on: [18]
a) Biomass power for rural development.
b) National Rural Health Mission.
c) Grey water reuse in rural schools.



P1600

[4065]-635

M.E. (E & TC) (VLSI & Embedded System)

EMBEDDED SIGNAL PROCESSING

(2008 Course) (504189) (Sem. - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer any three questions from each section.*
- 2) *Answer three questions from section-I and three questions from section-II.*
- 3) *Answer 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) Determine linear convolution of the sequences.
- i) $s(n) = 2^n u(-n)$ and $h(n) = u(n)$.
 - ii) $s(n) = A^n u(n)$ $h(n) = u(n)$. **[8]**
- b) Explain the terms : **[4]**
- i) Decimation in time.
 - ii) Decimation in frequency.
 - iii) Bit reversal.
 - iv) In-place computation.
- c) Explain important features of window functions. **[4]**
- Q2)** a) Explain how N-Point circular convolution can be obtained using DFT and IDFT. **[8]**
- b) Explain the differences between FIR and IIR filters along with their relevant applications. Which type is more used in practice? Why? **[8]**
- Q3)** a) What is STFT? Write its mathematical expressions and explain its significance with suitable example. **[4]**
- b) Explain different retiming techniques. **[8]**
- c) Find 4 point DFT of discrete time sequence $\{1, 0, 2, 3\}$. **[4]**
- Q4)** Write short notes on (any three) : **[18]**
- a) Pipelining and parallel processing of FIR filters.
 - b) Algorithms for computing Iteration Bound.
 - c) Signal flow graph.
 - d) IEEE floating point representation format.

P.T.O.

SECTION - II

- Q5)** 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 [8]
b) Explain the important features of DSP processor and superharvard architecture used in it. [8]
- Q6)** a) Compare DSP processor with conventional microprocessor architecture? what is the use of DAG 1 and DAG 2? List number of internal buses and memory pointers registers used in TMS 67 XX. [8]
b) Defing unfolding and unfold the DFG in Fig. using unfolding factors 3 and 4. [8]

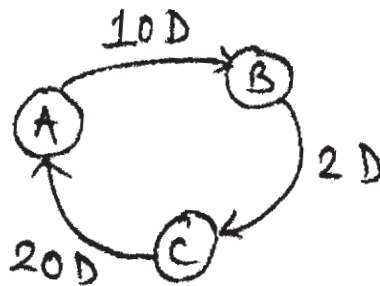


Fig. 1 DFG .

- Q7)** a) Discuss design steps of IIR filter using Bilinear transformation method? How frequency response is obtained? What is effect of warping on response. [8]
b) Explain how IIR filter can be employed in generation and detection of DTMF signal used by a touchtone phone. [8]
- Q8)** Write short notes on (any three) : [18]
a) Adaptive Filters.
b) VLIW Architecture.
c) DCT and IDCT.
d) Blackfin Processor.

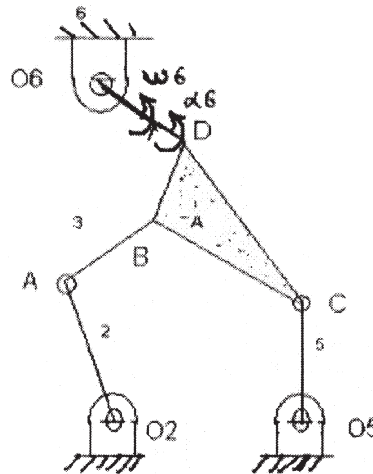
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P1603**[4065]-66****M.E. (Mech.) (D.E.)****ANALYSIS AND SYNTHESIS OF MECHANISMS****(2002 Course)***Time : 3 Hours]**[Max. Marks : 100**Instructions to the candidates:*

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

SECTION - I

- Q1)** a) In the mechanism shown in Figure No. 1, $\omega_2 = 10 \text{ rad/s}$ clockwise (constant). Determine ω_6 and α_6 . Given $O_2A = 7.5 \text{ cm}$, $AB = 5 \text{ cm}$, $BC = 7.5 \text{ cm}$, $O_5C = 6.25 \text{ cm}$ (and is vertical), $CD = 10 \text{ cm}$, $BD = 5 \text{ cm}$, $O_6D = 5 \text{ cm}$, $\angle O_2AB = 110^\circ$, $\angle ABC = 115^\circ$, $\angle O_6DB = 117^\circ$. Solve the problem by Auxiliary point method. **[12]**

**Figure No.1**

- b) Explain the method of normal acceleration. **[6]**
- Q2)** a) Explain matrix method for kinematic analysis of spatial mechanisms. **[10]**

P.T.O.

- b) Determine effective degrees of freedom for the mechanisms shown in Figure No.2. [6]

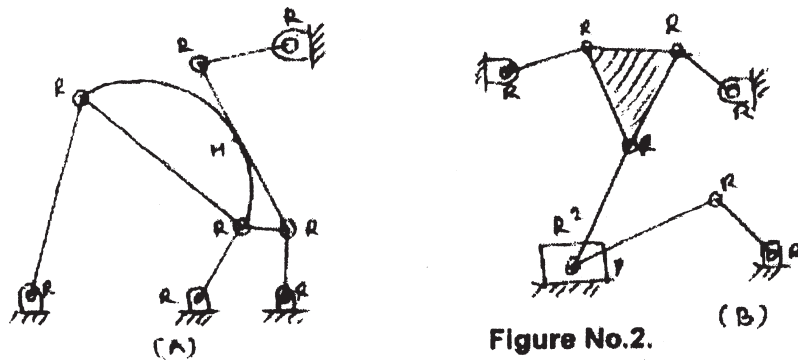


Figure No.2.

- Q3) The two ends of link is constrained to move in a guide as shown in Figure No.3. The link is uniform and weighs 196N. The sliders A & B weighs 98N each. The force of 294 N is applied to slider B as shown in figure if the instantaneous velocity of slider towards the left is 100cm/s. Determine instantaneous acceleration of Slider A. [16]

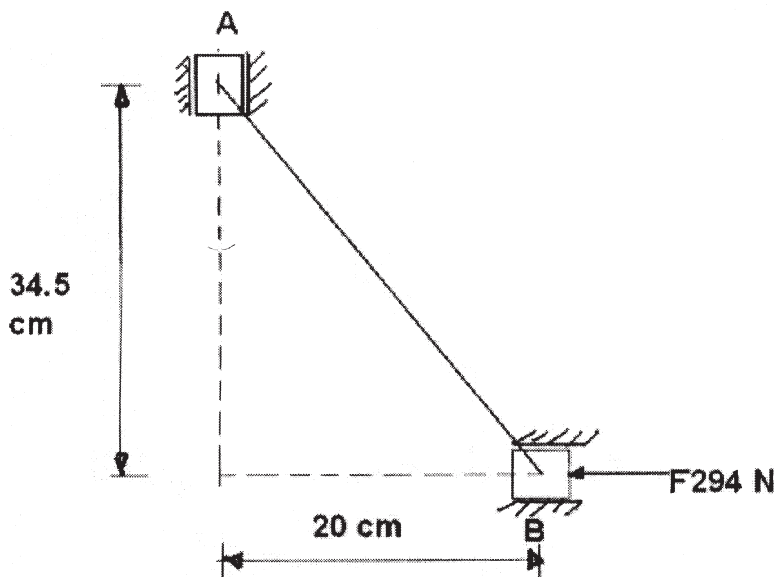


Figure No.3

- Q4) Write short notes on (any two) : [16]
- Fixed and moving centrodes.
 - 2 D-H parameters and its use in spatial Mechanisms.
 - Ball Point.

SECTION - II

- Q5)** a) Synthesize a function generator to solve $y = 1/x$, $1 \leq x \leq 2$ using three point method. [10]
b) Prove Freudensteins equation for Slider crank Mechanism. [8]
- Q6)** a) Explain and prove Euler's savary equation. [8]
b) Explain with neat sketch bobilliear construction for slider crank mechanism. [8]
- Q7)** Design a slider crank mechanism so that displacement of slider is proportional to square of crank rotation in the interval $45^\circ \leq \theta_2 \leq 135^\circ$. Use three point spacing. [16]
- Q8)** Write short notes on (any two) : [16]
a) Branch and order defects.
b) Bermester point.
c) Function generation and path generation.



P1605

[4065] - 700

M.E. (Production Engg.)

ADVANCED MANUFACTURING PROCESSES

(2008 Revised Course) (511103) (Sem. - I)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Explain the process of injection molding. Also explain the process control parameters which affect quality of molded product. [10]
b) Explain the process of grain growth in the structure. [6]
- Q2)** a) How the shrinkage defect occurs? How will it affect the performance of product? [8]
b) Explain the mechanism of solidification in fusion zone. [8]
- Q3)** a) Explain the methods of non-destructive testing in welding. [8]
b) Explain the fusion welding process with suitable diagram. [8]
- Q4)** a) Explain with suitable sketch the phenomenon of Electro Discharge machining. [8]
b) State the advantages, limitations & applications of Laser beam Machining. [8]

P.T.O.

Q5) Write short note on following (Any Three) : **[18]**

- a) Weld pool characteristics.
- b) ECM.
- c) Nano-technology.
- d) Ballistic Machining.
- e) Molecular dynamic analysis.

SECTION - II

Q6) a) Explain suitable numerical analysis method for material forming process. **[8]**

b) Explain the slip line field theory in material forming. **[8]**

Q7) a) Explain the process of explosive forming? State the applications of the same. **[8]**

b) How the process of high speed hot forging is carried out? **[8]**

Q8) a) Explain the characteristic features of high velocity extrusion process. **[8]**

b) Explain the process of High speed hot forging. **[8]**

Q9) a) Define formability. Explain the peen forming method in brief. **[8]**

b) Explain cup forming operation with its controllable parameters. **[8]**

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

- a) Fine Blanking.
- b) Electromagnetic Forming.
- c) Plastic instability in material forming.
- d) Ironing process.



Total No. of Questions : 8]

[Total No. of Pages : 2

P1608

[4065] - 52

**M.E. (Mech.) (Heat Power)
ADVANCED HEAT TRANSFER
(2002 Course) (502104)**

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Write down and briefly discuss all the possible types of boundary conditions encountered in heat conduction problems. [8]
- b) Determine the maximum temperature in a solid sphere of 10 cm radius which generates heat at the rate of 5 MW/m³. The conductivity of the material is 30 W/mk. The heat generated is convected over the outer surface to a fluid at 160°C, with a convective heat transfer coefficient of 750 W/m²k. Determine the maximum temperature in the material and the temperature at a radius of 5 cm. [8]
- Q2)** a) A thermometer well of 1 cm O.D. and 8 mm I.D. is made up of material with a thermal conductivity of 25 W/mk is exposed to gases at 2°C and the temperature of the wall of the well is 15°C. If an error of not more than 0.8°C is to be involved, determine the length of the well. Take heat transfer coefficient, $h = 50 \text{ W/m}^2\text{k}$. [8]
- b) Distinguish clearly between fin efficiency and fin effectiveness with examples. [8]
- Q3)** a) An instantaneous laser pulse of 10 MJ/m² is imposed on a slab of stainless steel having properties of $\rho = 7800 \text{ kg/m}^3$, $C_p = 0.460 \text{ kJ/kg k}$ & $\alpha = 0.44 \times 10^{-5} \text{ m}^2/\text{s}$. The slab is initially at a uniform temperature of 40°C. Estimate the temperature at the surface of the slab and at a depth 2 mm after a time of 2 seconds. [6]
- b) Explain the physical significance of : [10]
- i) Biot number
 - ii) Nusselt No.
 - iii) Peclet No.
 - iv) Stanton No.

P.T.O.

- Q4)** Write short notes on (any three) : **[18]**
- a) Pool boiling curve.
 - b) Crank Nicholson method.
 - c) Forced convection for flow boiling in a tube.
 - d) Reynold's Analogy.

SECTION - II

- Q5)** a) Sketch the velocity and thermal boundary layer profiles for the parallel of a fluid over a heated surface assuming laminar boundary layer over the entire length, for the following values of prandtl number : **[6]**
i) $Pr = 1.0$ ii) $Pr \ll 1.0$ iii) $Pr \gg 1.0$
- b) Explain the natural convection heat transfer from a heated vertical plate and formulate the problem by using integral method approach. **[10]**
- Q6)** a) Discuss the process of drop wise & film wise condensation. List the drop wise condensation promoters. **[8]**
- b) Explain the working of heat pipe. Also state its various applications.**[8]**
- Q7)** a) What are radiation shields? Explain its use in cryogenic storage vessels & temperature measurement. **[6]**
- b) Calculate the radiation equilibrium temperature of the roof of a house exposed to a solar flux of 300 W/m^2 and a surrounding temperature of 25°C , if the roof is : **[10]**
i) Made of white marble ($\alpha = 0.46, \epsilon = 0.95$)
ii) Coated with black paint ($\alpha = 0.97, \epsilon = 0.97$)
Neglect convection.
- Q8)** Write short notes on (any three) : **[18]**
- a) Radiation from gases and vapours.
 - b) Hottel's cross string method.
 - c) Fluidised bed combustion.
 - d) Ablation phenomenon.
 - e) Correlations for heated vertical plate and horizontal cylinder under natural convection.



P1615

[4065]-844

M.E. - IT

**REAL - TIME AND EMBEDDED SYSTEMS
(2008 Course) (Elective - I) (514404(B))**

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Explain embedded system design process with stages and the support tools available for the embedded system design processes at each stage? **[8]**
- b) What are the typical characteristics of embedded system and challenges in embedded system design? Discuss in brief. **[8]**
- Q2)** a) Draw the functional diagram of SHARC processor. Explain the functionality of each of the peripheral there in brief. **[8]**
- b) Explain the main features of ARM processor with core architectural block diagram. Explain R0–R15 register structure of ARM7 processor. What is the use of R16? **[8]**
- Q3)** a) Discuss SIMD computational engine of the SHARC processor with suitable block diagram. **[8]**
- b) List various interrupt sources in ARM processor according to their priority. Describe the interrupt mechanism in ARM processor briefly. **[8]**
- Q4)** a) What are the assumptions for priority driven scheduling of periodic tasks? Explain weighted round robin scheduling algorithm. What are the advantages over simple round robin scheduler? **[10]**
- b) Explain various components of embedded system with suitable block diagram and explain each in brief. **[8]**

P.T.O.

- Q5)** Write short note on ANY four : **[16]**
- a) Test and Debug support in ARM processor.
 - b) Dynamic versus static systems.
 - c) Applications of SHARC processor.
 - d) ARM Thumb Processor.
 - e) Instruction pipelining in the SHARC processor.

SECTION - II

- Q6)** a) Discuss and explain the difference between waterfall and spiral development module with respect to embedded system design. **[8]**
- b) Discuss the rules to compute effective release time and effective deadline for uni-processor system. **[8]**
- Q7)** a) What are the performance measures of a scheduler? Explain with examples. **[8]**
- b) Give classification of Scheduling algorithm. Explain rate monotonic scheduling algorithm in detail. **[8]**
- Q8)** a) Explain the message protocol in 12C bus with respect to master and slave bidirectional communication. What are the recent revisions in 12C bus? **[8]**
- b) Explain Myrinet with suitable Myrinet network diagram. Discuss the characteristics that distinguish Myrinet from other networks. **[10]**
- Q9)** a) Explain digital TV network with suitable diagram. Discuss the role of Set-Top Box. **[8]**
- b) Explain the terms feasible schedule, optimal schedule and a valid schedule in detail. **[8]**
- Q10)** Write short notes on ANY FOUR : **[16]**
- a) Periodic Task notations and their significance.
 - b) Aperiodic task handling in clock driven scheduling.
 - c) SHARC Link Ports.
 - d) Architecture of CAN controller.
 - e) Applications of 12C bus.



P1616

[4065]-909

**M.E. (Polymer Engineering)
POLYMER REACTION ENGINEERING
(2008 Course) (509118 (a)) (Elective - I)**

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Question Number 1 & 5 are compulsory. Out of the remaining attempt 2 questions from section-I and two questions from section-II.*
- 2) Draw neat diagrams wherever necessary.*
- 3) Numbers to the right indicate full marks.*
- 4) Assume suitable data, if necessary.*
- 5) Use of logarithmic table, electronic pocket calculator is allowed.*

SECTION - I

- Q1)** Methyl methacrylate is polymerized in perfectly mixed flow reactor at 70°C. The initial concentration of Methyl methacrylate is 10.35 gmole/lit, and the concentration of initiator is kept constant at 0.06 gmole/lit throughout the polymerization. The rate constant are as $k_o = 3 \times 10^{-6} \text{ sec}^{-1}$, $k_p = 176 \text{ lit/gmole}\cdot\text{sec}$, $k_c = 3.6 \times 10^7 \text{ lit/gmole}\cdot\text{sec}$. Volume of reacting mixture is 5000 liters and the reaction time of 300 min. Find the feed rate of the Initiator, percentage of monomer polymerized, polydispersity index. Assume same reaction is carried out in Batch reactor find out the change in number average and weight average molecular weight. **[18]**
- Q2)** a) Discuss in detail the applicable model of diffusion effects in step growth polymerization at high conversion. **[12]**
b) Distinguish between Chain Growth and Step Growth Polymerization. **[4]**
- Q3)** Define Instantaneous fractional degree of polymerization and weight degree of polymerization and derive the necessary expression for the Instantaneous fractional degree of polymerization and weight degree of polymerization under free radical polymerization. **[16]**
- Q4)** Explain the followings : **[16]**
a) Tromosdroff Effect.
b) Characterization of polymers.

P.T.O.

SECTION - II

- Q5)** Discuss in detail kinetics of emulsion polymerization based on Smith Ewart Model. [18]
- Q6)** a) Discuss the effects of micro and macro mixing on polymerization. [8]
b) Explain in detail Metallocene based Polymerization for olefins. [8]
- Q7)** a) Discuss in detail Emulsion Polymerization Reactor with one application. [10]
b) Explain with neat diagram LLDPE Fluid Bed reactor. [6]
- Q8)** Write a short note : [16]
a) Control engineering in polymerization process.
b) Design Consideration in Polymerization reactors.



P1617**[4065]-145****M.E. (Electronics) (Digital Systems and Computer)****D.S.P. AND APPLICATIONS****(2002 Course) (504302)***Time : 3 Hours]**[Max. Marks : 100**Instructions to the candidates:*

- 1) Answer any three question 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) State and prove the following properties of Z-Transform. [8]**

- i) Derivative in Z-Domain.
- ii) Convolution in Time Domain.

b) Compute the Inverse Z-Transform of the following: [8]

$$i) \quad X(Z) = \frac{Z^2}{(Z-1)(Z-0.2)}$$

$$ii) \quad X(Z) = \frac{Z^{-1}}{1-3Z^{-1}}, \quad \text{R.C: } |Z| < 3$$

Q2) a) An FIR filter is to be designed to meet the following specifications:[10]

Passband : 150 – 250 Hz

Transition width : 50Hz

Passband ripple : 0.1 dB

Stopband attenuation : 60 dB

Sampling frequency : 1 KHz

- i) Determine the order of the filter.
- ii) Select the appropriate window function.

b) Explain IIR filter design by frequency transformation. [8]

- Q3)** a) Explain forward linear prediction for predicting a future value of a stationary random process? [8]
 b) Explain Levinson and Durbin Algorithm in detail? [8]
- Q4)** a) Implement a two-stage Decimator for the following specifications. [10]
 Sampling rate of input signal : 20 KHz
 $M = 50$
 Passband : 0 to 40 Hz
 Transition band : 40 to 50Hz
 Passband ripple = 0.01
 Stopband ripple = 0.002
 b) Draw the basic structure of Two-Channel Quadrature mirror filter (QMF) bank and explain the synthesis of subband coding using QME. [6]

SECTION - II

- Q5)** a) What is Adaptive filter? Explain its use for noise cancellation? [8]
 b) Explain the use of the ARMA mode for power spectrum estimation? [8]
- Q6)** a) Draw the Architecture of ADSP 2100 DSP processor. Explain. [8]
 b) Explain Barrel shifter, MAC and ALU unit of ADSP 2100 DSP processor. [8]
- Q7)** a) Obtain the Power Density spectrum of the data sequence. [10]
 $x(n) = (0, 1, 0, 1, 0, 1, 0, 1)$ using Blackman Tukey method.
 b) Explain design steps of least square filter design of Predictive-Deconvolution. [8]
- Q8)** Write short notes on : [16]
 a) Gibbs phenomenon.
 b) Image compression.
 c) Finite word length effect.



P1627

[4065]-507

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

NON-CONVENTIONAL POWER PLANTS

(2008 Course) (50211(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 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 table is allowed.*
- 6) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Explain the potential available for renewable energy sources in India. [8]
b) Discuss social and economical issues in the implementation of renewable energy sources. [8]
- Q2)** a) Explain the design of solar photovoltaic system with its economics. [9]
b) Explain the procedure for mapping wind energy potential at proposed site. [5]
c) Draw a neat sketch of solar chimney. [4]
- Q3)** a) Explain the components of wind machines with neat sketch. [9]
b) Discuss the construction and working of biogas power plant. [9]
- Q4)** Write notes on : [16]
a) Global climate change.
b) Solar thermal conversion devices.
c) CO₂ reduction potential of renewable energy sources.
d) Social barriers in acceptance of renewable energy sources.

SECTION - II

- Q5)** a) Explain: Acidic fuel cell with a neat sketch. [8]
b) Explain liquid dominated geothermal power plant with T-s diagram. [8]
- Q6)** a) Discuss: Closed cycle ocean thermal energy power plant with its merits and demerits. [12]
b) Evaluate the feasibility of tidal energy source. [6]
- Q7)** a) Explain environmental impact of nuclear power plant. [8]
b) Enlist wave energy machines and explain any one of it's with a neat diagram. [8]
- Q8)** Write short notes on (Any Two) : [18]
a) Clean development mechanism [CDM]
b) Merits and demerits of Fuel cell.
c) Energy wheeling and banking.



P1629

[4065] - 579

M.E. (Electrical) (Control System)

INTELLIGENT CONTROL

(2008 Course) (503112(a)) (Elective - IV)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer 3 questions from Section - I and 3 question 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.*

SECTION - I

- Q1)** a) Explain Single-Input Neuron model and hence give various transfer functions with their MATLAB notations. [8]
- b) Explain with sketch Biological Neuron. How ANN is inspired from Biological Neuron. [8]

OR

- Q2)** a) Give Historical Introduction of Artificial Neural Network. [8]
- b) Given a two input neuron with the following parameters,
 $b = 1.2$, $w = [3 \ 2]$ and $p = [-5 \ 6]^T$, calculate the neuron output for the following transfer function. [8]
- i) A symmetrical hard limit transfer function.
 - ii) A saturating linear transfer function.
 - iii) A hyperbolic tangent sigmeid transfer function.

Q3) For a classification problem following are the four classes

$$\text{class 1 : } \left\{ P_1 = \begin{bmatrix} 1 \\ 1 \end{bmatrix}, P_2 = \begin{bmatrix} 1 \\ 2 \end{bmatrix} \right\}$$

P.T.O.

$$\text{class 2 : } \left\{ P_3 = \begin{bmatrix} 2 \\ -1 \end{bmatrix}, P_4 = \begin{bmatrix} 2 \\ 0 \end{bmatrix} \right\}$$

$$\text{class 3 : } \left\{ P_5 = \begin{bmatrix} -1 \\ 2 \end{bmatrix}, P_6 = \begin{bmatrix} -2 \\ 1 \end{bmatrix} \right\}$$

$$\text{class 4 : } \left\{ P_7 = \begin{bmatrix} -1 \\ -1 \end{bmatrix}, P_8 = \begin{bmatrix} -2 \\ -2 \end{bmatrix} \right\}$$

Design a perceptron network. [16]

OR

Q4) One variation of the perceptron learning rule is [16]

$$W^{\text{new}} = W^{\text{old}} + \alpha e p^T$$

$$b^{\text{new}} = b^{\text{old}} + \alpha e$$

where α is called learning rate. Prove convergencic of this algorithm. Does the proof requires a limit on the learning rate? Explain.

Q5) a) Explain energy function for BAM. [8]

b) Explain Vector Quantization. [6]

c) Define Generalized delta rule. [4]

OR

Q6) a) Explain ART 1 in detail and draw it's architecture diagram. [8]

b) Write paradigm of Associative Memory. [5]

c) Define competitive learning and hence explain it's relation with Hamming network. [5]

SECTION - II

Q7) a) Explain with the example of a Rule-base system in fuzzy logic. [8]

b) Explain with example about : [8]

i) Universal Fuzzy Set.

ii) Empty Fuzzy Set.

OR

Q8) a) Explain role of fuzzy logic in control system. [8]

b) What are different fuzzy numbers and various operations on fuzzy sets. [8]

Q9) a) Explain triangular and π function. [6]

b) Let M & N are the fuzzy set given by [12]

$$M = \{(0.5, a_1), (0.4, a_2), (0.7, a_3), (0.8, a_4), (1, a_5)\}$$

$$N = \left\{ \frac{0.45}{b_1}, \frac{0.54}{b_2}, \frac{0.67}{b_3}, \frac{0.78}{b_4}, \frac{0.95}{b_5} \right\}$$

Calculate (i) $M \cup N$ (ii) $M \cap N$
(iii) \bar{M} (iv) \bar{N}
(v) M/N (vi) N/M

OR

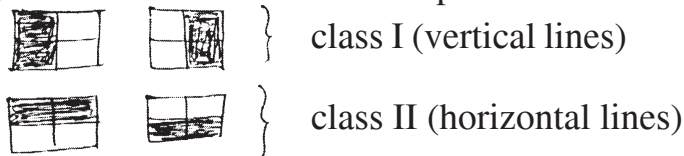
Q10)a) Interpret predicate logic formula and give its inference. [8]

b) What do you mean by fuzzy quantifier? What is defuzzification and hence explain mean of maxima (MOM) defuzzification. [10]

Q11) Explain Greg viot's fuzzy cruise controller. [16]

OR

Q12) Consider the two classes of patterns that are shown [16]



- a) Are these categories linearly separable.
b) Design a multilayer network to distinguish these categories.



P1631**[4065]-637****M.E. (E & TC) (VLSI and Embedded System)****FAULT TOLERANT SYSTEM DESIGN****(2008 Course) (Elective - III) (504191(a))***Time : 3 Hours]**[Max. Marks : 100**Instructions to the candidates:*

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

SECTION - I

- Q1)** a) Explain simulation process with block diagram and elaborate logic simulation types. [8]
- b) Map the truth table of the function, $f = abc + ab\bar{c} + \bar{a}b\bar{c} + \bar{a}\bar{b}c$ into binary decision diagram. [8]
- Q2)** a) Explain the concept of the unknown logic value. Use 3-valued compiled simulation to simulate the circuit starting with $Q = \mu$ for input vectors 01 & 11 for fig 1. [8]

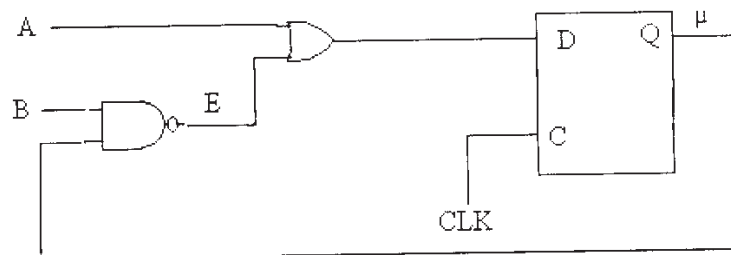


Fig. 1

- b) What is static hazard and dynamic hazard in combinational circuit? Explain 6-valued logic for static hazard analysis. [8]

P.T.O.

- Q3)** a) For the circuit shown in Fig.2, [9]
- i) Find the set of all tests that detect the fault a s-a-0.
 - ii) Find the set of all tests that detect the fault b s-a-0.
 - iii) Find the set of all tests that detect the multiple faults {a s-a-0, b s-a-0}

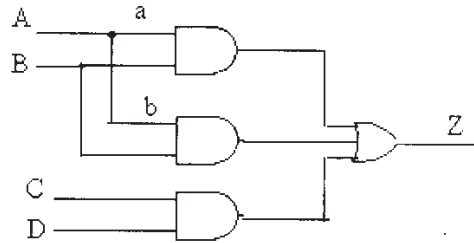


Fig. 2

- b) i) Find an example of a combinational circuit with two faults that are functionally equivalent under a test set but not functionally equivalent.
- ii) Prove that in a combinational circuit two faults functionally equivalent under a complete location test set are functionally equivalent. [9]

Q4) Write short notes on : [18]

- a) Fault Simulation in test generation.
- b) Fault Simulation Techniques.
- c) Fault dominance for combinational circuit.

SECTION - II

Q5) a) Generate a test sequence for fault f s-a-0 in the Fig. 3 shown below. [8]

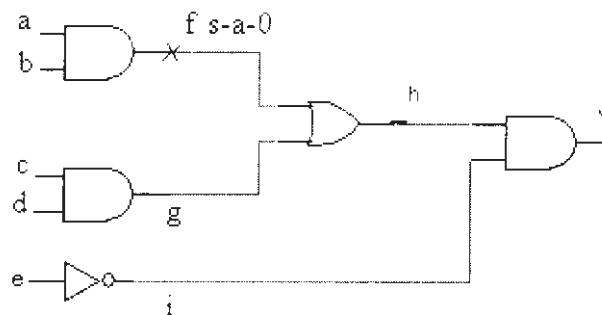


Fig. 3

- b) Explain generic form of centralized and separate BIST architecture. [8]

Q6) a) Find the signature for the circuit under test for Fig.4 using LFSR method. [14]

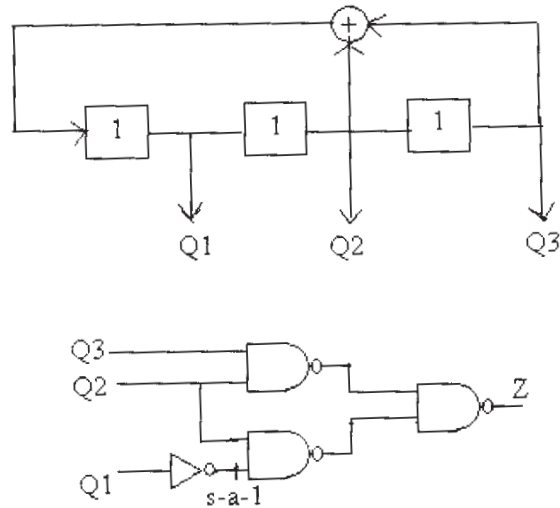


Fig. 4

b) List out several factors used for selection of BIST architecture. [4]

Q7) a) Explain the terms controllability, observability and predictability w.r.t. testability of the circuit. [8]

b) What is boundary scan? Draw and explain different modes of operations of boundary scan cell. [8]

Q8) Write short notes on : [18]

a) 9-V algorithm.

b) Bridging Fault.

c) Classification of Compression Techniques.



Total No. of Questions : 8]

[Total No. of Pages : 3

P1632

[4065]-708

M.E. (Production Engineering) (Manufacturing & Automation)

ENGINEERING ECONOMICS AND ACCOUNTING

(2008 Course) (Elective - II) (511105(d))

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Define managerial economics and point out its important characteristics. How is macro-economics useful to managerial economics? [8]
- b) Distinguish between macro-economics and micro-economics. How is macro-economics useful in managerial decision-making? [8]
- Q2)** a) Distinguish various types of price elasticity of demand. Discuss the factors on which the elasticity of demand depends? [8]
- b) What are different methods of demand forecasting? Outline the various steps which would be necessary if you were asked to forecast demand for a typical mass consumption item. [8]
- Q3)** a) What are the main features of pure competition? How does a firm adjust its policies to a purely competitive situation? [8]
- b) Define 'Oligopoly'. Explain how price and output decisions are taken under conditions of oligopoly? [8]
- Q4)** Write a short note on any three of the following : [18]
- a) Monopolistic competition.
 - b) Cross elasticity of demand.
 - c) Responsibilities of managerial economist.
 - d) Pricing in public sector undertakings.

P.T.O.

SECTION - II

- Q5)** a) Distinguish between cost control and cost reduction. What are the essentials for the success of a cost reduction programme? [8]
b) How costs are classified? Bring out the importance of this classification in business decision making. [8]

- Q6)** a) 'The objective of the break even chart is to indicate what happens to total costs and total revenues as output and sales change from one level to another'. Explain this statement by drawing a break-even chart and discuss its significance. [8]
b) Standard material and standard price for manufacturing one unit of a product is given below : [8]

	<i>Standard material</i>	<i>Standard Price</i>
Material A	5 kg	@ Rs.4
Material B	3 kg	@ Rs.6

The actual production of the product is 400 units

The actual material A 2500 kg @ Rs.3.90

B 1000 kg @ Rs.6.25

Calculate the materials sub-usage variance.

- Q7)** a) A company is planning for expanding its production operation. It has identified three different technologies for meeting the goal. The initial outlay and annual revenues with respect to each of the technologies are given below. Suggest the best technology which is to be implemented based on present worth method of comparison assuming 20% interest rate compounded annually. [8]

Technology	Initial outlay (Rs.)	Annual revenue (Rs.)	Life (Years)
A	1200,000	400,000	15
B	2000,000	600,000	15
C	1800,000	500,000	15

- b) Discuss in brief the following investment appraisal methods. [8]
i) Net present value method.
ii) Internal rate of return.

Q8) Write a short note on any three of the following :

[18]

- a) Depreciation Methods (any two).
- b) Steps in cost benefit analysis.
- c) Key factor and P/V ratio in CVP analysis.
- d) Usefulness and limitations of marginal costing.



Total No. of Questions : 8]

[Total No. of Pages : 2

P1634

[4065]-730

**M.E. (Production) (CAD/CAM)
CAD/CAM/CAE SOFTWARE DEVELOPMENT
(Course 2008) (511205 (d)) (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 answer books.*
- 3) *Figures to the right indicate full marks.*
- 4) *Neat diagrams must be drawn wherever necessary.*
- 5) *Use of non-programmable electronic pocket calculator and statistical tables is allowed.*
- 6) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Explain the meaning of CAD customization along with its benefits? Mention any two applications along with their approach for CAD customization? [8]
- b) Explain in detail the concept of script and the macro in the context of CAD customization along with appropriate example? Write a macro for the machining of cylindrical hole for Fanuc controller. [8]
- Q2)** a) Explain Object Oriented Programming and the concept of object with appropriate examples? What is inheritance of objects? [8]
- b) What is early binding and late binding in the context of OLE interface? What is GLUT and explain the programming approach using GLUT?[8]
- Q3)** a) Explain the structure of programming interfaces made available for Auto CAD. [8]
- b) Explain the structure of programming interfaces made available for Unigraphics. [8]
- Q4)** Write short notes on (any three) : [18]
- a) Type Library.
 - b) OLE Interfaces for CAD Software.
 - c) Pro Programming (ProE)
 - d) Role of Macro in CNC Manufacturing.

P.T.O.

SECTION - II

- Q5)** a) Explain with suitable example the Software Development Life Cycle Management? What are the different types of models of SDLC? [8]
b) What is the meaning of software prototyping? What are various methods of software prototyping? [8]
- Q6)** a) What is Rapid Application Development? Explain any two flavors of Rapid Application development along with their strengths and weaknesses. [8]
b) Explain schemes with appropriate sketches for representing 3D solid model? Explain the Euler Formula for Polyhedra along with two examples. [8]
- Q7)** a) Explain with appropriate sketches the typical interfaces available for the creation and modification of 2D entities in the CAD system? Assume CAD system, if required. [8]
b) Explain with appropriate sketches the implementation methodology for the automated dimensioning in the CAD system? Assume CAD system, if required. [8]
- Q8)** Write short notes on (any three) : [18]
a) Advantages and disadvantages of software prototyping.
b) Functionalities of systems engineer.
c) Extreme programming.
d) B-rep representation.



Total No. of Questions : 8]

[Total No. of Pages : 2

P1635

[4065]-752

**M.E. (Computer Engineering)
EMBEDDED SYSTEM DESIGN
(2008 Course) (510105(d)) (Elective - II)**

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answers to the two sections should be written in separate answer books.*
- 2) *Questions 1 and 5 are compulsory. Attempt any two questions from questions 2 to 4 in section I and attempt any two questions from questions 6 to 8 in section-II.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) What are the different design metrics for embedded systems? How will they affect the different aspects of design goals? [8]
b) Explain process of embedded system development. [8]
- Q2)** a) Explain different steps involved in programming on chip flash to store an application program. [6]
b) Explain data transfer mechanism in I2C protocol. Compare it with CAN and USB protocols, based on bit rate and area of application. [10]
- Q3)** a) Differentiate between 802.11, 802.15 and 802.16 based on MAC layer, QoS, data rate and area of application. [10]
b) Explain the complete development environment required for large scale embedded systems? [8]
- Q4)** a) Explain the components required to make IrDA communication between two devices. Also give the data rate for different range of coverage. [8]
b) Given : A microcontroller has 8 channel on chip 10-bit ADC. Three input channels of ADC, namely AIN0, AIN1 and AIN2 are used for an application. Write pseudo code to configure and read the digital outputs from these analog inputs. The digital output is available in ADDR register and configuration can be done using ADCR register. [8]

P.T.O.

SECTION - II

- Q5)** a) Explain the following for USB protocol : **[10]**
i) USB interconnect.
ii) USB device.
iii) USB host.
- b) What is ARM architecture? Compare ARM7 with ARM9. **[8]**
- Q6)** a) What are ASICs? Explain in detail the architectural features. **[8]**
b) What do you mean by programming of FPGA and CPLD? **[8]**
- Q7)** a) Explain the use of C++ in embedded system programming. **[5]**
b) What are the advantages of using Java for Embedded system programming? **[5]**
c) What are the different criteria, based on which RTOS is selected for an embedded system application? **[6]**
- Q8)** a) What are different RTOS functions? When do you require RTOS for your Embedded System? **[8]**
b) Describe different ways in which interrupt source calls are handled by RTOS. **[8]**



P1637

[4065]-770

**M.E. (Computer) (Computer Networking)
INFORMATION SECURITY AUDIT AND MANAGEMENT
(Elevtive - II) (2008 Course) (510305 (b))**

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Attempt any three questions from Section-I and three questions from Section-II.*
- 2) *Answer of Section-I and Section-II should be written on separate answer sheets.*
- 3) *Figures to the right indicate full marks.*
- 4) *Draw neat diagram wherever necessary.*
- 5) *Make suitable assumptions wherever necessary.*

SECTION - I

- Q1)** a) What is Security? Explain CNSS Security Model. [8]
b) Explain the different characteristics of Management. [8]
- Q2)** a) Explain the Security System Development Life Cycle with suitable scenario. [8]
b) Explain various components of Contingency Planning. [8]
- Q3)** a) Explain the various options for placing Information Security within an Organization. [8]
b) Explain the guidelines for Effective Information Security Policy. [8]
- Q4)** a) Explain the following Security Architecture Model : [10]
i) Bell-Lapadula Confidentiality Model.
ii) Clark-Wilson Integrity Model.
b) Explain various performance measures in Information Security Management. [8]

SECTION - II

- Q5)** a) Explain the various processes for risk identification. [8]
b) Explain the feasibility and Cost Benefit Analysis in Risk Management. [8]

P.T.O.

- Q6)** Explain the following network protection mechanisms. **[16]**
- a) Intrusion Detections and Protection Systems.
 - b) Remote Access Protection.
 - c) Wireless Networking Protection.
 - d) Scanning and Analysis Tools.
- Q7)** a) Explain the following Information Security Professional Credentials. **[8]**
- i) (ISC)² Certifications.
 - ii) ISACA Certifications.
 - iii) GIAS.
 - iv) CCE.
- b) Describe the Ethical Concepts in Information Security. **[8]**
- Q8)** Write short notes on any three : **[18]**
- a) Information Security Project Management.
 - b) Personnel Employment Policies and Practices.
 - c) Cryptography and Information Protection Mechanism.
 - d) Risk Control strategies.



P1638

[4065]-787

M.E. (Chemical)

PROCESS OPTIMIZATION

(2008 Course) (Elective - II) (509105 (b))

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Solve any three questions from each section.*
- 2) *Answers to the TWO sections should be written in SEPARATE answer book.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** Minimize $f(x) = x^2 + (2/x) + (1/x^3)$. Use (a) Fibonacci Search Method. (b) Secant Method. Write complete algorithm for these methods and demonstrate at least 3 steps towards finding optimized solution for the above function. Do not try to solve it completely. **[17]**
- Q2)** Write stepwise procedure to formulate a maximization problem for a binary distillation system as under. Benzene and toluene are fed to a distillation column to separate Benzene as the 'desired' product at the top. Assume data, if needed. Do not try to solve it. **[16]**
- Q3)** Maximize $f(x) = x^3 - 15x^2 + 2$ in the interval $[-1, 1]$. Use (a) Newton Raphson Method, (b) Internal halving Method. Write complete algorithm for these methods and demonstrate at least 3 steps towards finding optimized solution for the above function. Do not try to solve it completely. **[17]**
- Q4)** Write short notes (Any three) : **[16]**
- a) Sensitivity Analysis.
 - b) Convexity of a function.
 - c) Parameteric optimization.
 - d) Constraints on objective function.

SECTION - II

Q5) Minimize $f(x) = \frac{(x_1 - 2)^2}{36} + \frac{(x_2 - 3)^2}{16} - 1$ [17]

Subject to linear constraints.

$$x_1 \geq 0, x_2 \geq 0, 2 - x_1 - x_2 \geq 0, -3 + 3x_1 - x_2 \leq 0$$

Q6) State various conditions of definiteness of a function using Hessian matrix. Find whether the following function is strictly convex/strictly concave. [17]

$$f(x) = 4x_1^2 + 7x_1x_2 + 9x_1 - 7x_2 - 8x_2^2 + 9.$$

Q7) Explain the Simplex Search Method and demonstrate for minimization of $f(x) = 2x_1^2 + 5x_2^2 - 9$ starting at $(x^0)^T = [4 \ 3]$ in the direction $s^0 = [-1 \ -3]^T$. Perform 4 steps. [16]

Q8) Write short notes (Any three) : [16]

- a) Optimization parameters.
- b) Quadratic programming.
- c) Cubic Search Method.
- d) Multivariable Optimization.



P1639

[4065] - 856

M.E. (IT)

INTERNET ROUTING DESIGN

(2008 Course) (514439) (Elective - IV)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1) a) What is Internet Routing? Why the routers efficiency in switching a packet to the appropriate outgoing link factor is important. [8]
- b) Describes Performance Environment and Measures in network algorithmic with assumptions. [8]

- Q2) a) Identify and elaborate networking environments where path caching might be helpful that require either the shortest path or the widest path computation. [8]
- b) Consider the network topology in Figure 1. The number listed next to the links are assumed to be bandwidth. Determine the widest path from node 2 to node 5 using widest path algorithm. [8]

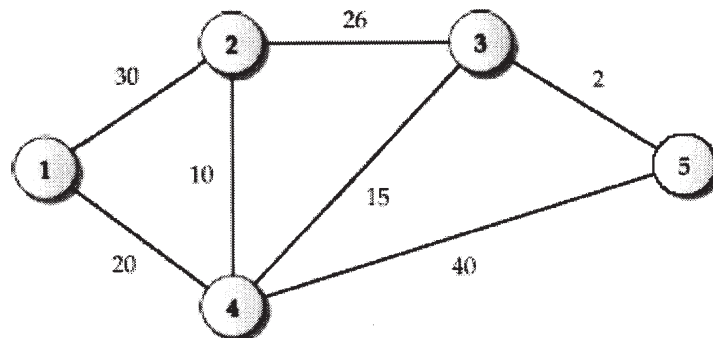


Figure 1: A 5-node example.

- Q3) a) Why do some routing protocols message identification at above the transport layer while some other do so directly over the IP layer? Explain. [8]

P.T.O.

- b) Consider a seven-node ring network. [10]
- i) If a distance vector protocol is used, determine how long it will take for all nodes to have the same routing information if updates are done every 10 sec.
- ii) If a link state protocol is used, how long will it take before every node has the identical link state database if flooding is done every 5 sec.
- Determine how many link state messages in total are flooded till the time when all nodes have the identical database.

- Q4)** 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 coverages. [8]
- b) Identify the functionality in OSPF that allows a static route to be injected into an OSPF domain. [8]

SECTION - II

- Q5)** a) For the prefixes in Table 1 shown below, construct a binary trie. Assuming each node in the binary trie requires a memory access, how many memory accesses will be required in the worst case during the search. [8]

Prefix Label	Prefix
P ₁	0*
P ₂	10*
P ₃	111*
P ₄	10001*
P ₅	1*
P ₆	1001*
P ₇	101000*
P ₈	1010000*

TABLE : 1

- b) For the prefixes in Table shown above, construct a path compressed trie. In this trie, how many memory accesses will be needed for looking up the 8-bit addresses 10011000 and 10100011? Do you see any improvement compared with the binary trie? [8]

- Q6) a)** Draw a set pruning trie for the rules shown in Table 2. How many memory accesses are required to classify a packet with $F_1 = 0011$ and $F_2 = 0011$? Compare it with the hierarchical trie. **[10]**

Table An example classifier with eight rules

Rule	F_1	F_2
R_1	00*	00*
R_2	0*	01*
R_3	0*	0*
R_4	10*	10*
R_5	11*	10*
R_6	11*	1*
R_7	0*	10*
R_8	*	11*

TABLE : 2

- b) Draw the geometric view of the rules in Table 2 and identify the number of distinct regions. **[6]**
- Q7) a)** How is QoS routing different from best-effort routing? Explain constrained shortest path routing and its variations when you consider different attributes. **[8]**
- b) A General Framework for source-based QoS routing with path caching. **[8]**
- Q8) Write short notes on any three :** **[18]**
- a) IGRP Protocol.
 - b) BGP/MPLS IP VPN.
 - c) Router Architecture.
 - d) D and Q Approach for packet classification problems.



P1640

[4065]-5

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

**CONSTRUCTION MATERIALS AND MATERIALS MANAGEMENT
(2002 Course) (501103)**

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) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** Discuss primary and secondary objectives of materials management with the help of practical examples from the construction sector. Discuss balancing of materials objectives and role of materials manager. **[18]**
- Q2)** Explain graphically EOQ concept. Discuss the practical limitations for the same. Derive the EOQ formula. Explain the method of optimising the inventory, in order to consider discounts offered by the supplier, effect of understocking and overstocking costs. **[16]**
- Q3)** Explain, with examples, the practical use of any 8 material indices in the godown management. **[16]**
- Q4)** With neat labelled sketches, explain the working, formulae, advantages and limitations of **[16]**
- a) Re-order level system.
 - b) Periodic Interval System, by giving an example from the construction field.

SECTION - II

- Q5)** Discuss various types of smart materials and their applications in Civil Engineering. **[18]**
- Q6)** Describe any 4 tests conducted on SCC with neat sketches, clearly mentioning their expected standard values. **[16]**

P.T.O.

Q7) Describe the various physical and chemical properties of silica-fume which is used in concrete. Discuss the various advantages and different applications of SFC. **[16]**

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

- a) CMRB use in pavements.
- b) CFRP applications in civil engineering.
- c) Glenium Concrete.
- d) Flyash-Methods of characterisation.



P1644

[4065] - 575

M.E. (Electrical) (Control System)
ADVANCED DIGITAL CONTROL TECHNIQUE
(2008 Course) (Sem. - II) (503110)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer any 3 questions from each section.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 4) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) Draw the block diagram to realize the following transfer function in direct form and cascade form [9]

$$G(z) = \frac{5(1 + 0.25z^{-1})}{(1 - 0.5z^{-1})(1 - 0.1z^{-1})}$$

b) Explain digital simulation with numerical integration. Explain the various methods used. [9]

Q2) a) Explain Warping and Prewarping in digital modeling. [8]

b) What are important considerations while selecting the Sampling Period. [8]

Q3) a) What are the necessary and sufficient conditions for Arbitrary Pole placement. [8]

b) Explain in detail phase lead lag controller in discrete data control system. [8]

Q4) a) Explain the digital control system with a dead beat observer. [8]

b) Design compensator by separation principal. [8]

P.T.O.

- Q5)** a) What are the advantages offered by digital control system over analog control system. [8]
b) Explain digital PD, PI and PID controllers. [8]

SECTION - II

- Q6)** a) Explain FIR form structure and IIR form structure. [9]
b) Explain advantages and disadvantages of Multirate Digital Signal Processing. [9]
- Q7)** a) Explain the effect of finite word length in digital filters. [8]
b) Explain the interpolation process with the help of neat block diagram and spectrum analysis. [8]
- Q8)** a) Explain in detail what is meant by Discrete wavelet transform. [8]
b) Explain what is fixed and floating point DSP. [8]
- Q9)** a) Explain instruction pipelining feature of TMS 320C54X DSP processor. [8]
b) Explain various addressing modes used in TMS 320C54X DSP processor. [8]
- Q10)** a) Explain Von Neuman and Harward architecture. Explain why Von Neuman architecture is not suitable for DSP operations. [8]
b) Draw and explain architecture of TMS 320C54X DSP processor. [8]



P1646

[4065]-53

**M.E. (Mechanical) (Heat Power Engineering)
I.C. ENGINES - I (SPARK IGNITION ENGINES)
(2002 Course) (502109) (Elective - I)**

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer any three questions from Section I.*
- 2) *Answer any three 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) *Assume suitable data, if necessary and mention it clearly.*

SECTION - I

- Q1)** a) What are the air fuel mixture requirements during the following range of operating conditions of IC engine. Idling and no load, normal power and maximum power range. **[6]**
- b) An engine working on otto cycle develops 30 kW and use C_8H_{18} as a fuel. The CV of fuel is 43000 kJ/kg. Air fuel ratio of a mixture is 15 and compression ratio is 8. Determine the maximum pressure and temperature reached in the cycle with and without molecular contraction. Assume $C_v = 0.71$ kJ/kg K, compression law $Pv^{1.3} = C$, and pressure and temperature of mixture at the beginning of compression 101 kPa and 67°C respectively. **[10]**
- Q2)** a) Discuss the effect of fuel volatility and sulphur content on the performance of SI engine. **[8]**
- b) Compare alcohol fuel with gasoline in terms of fuel suitability and engine performance. **[8]**
- Q3)** a) Discuss SI engine with respect to the followings : **[10]**
Combustion cycle, fuel, fuel injection system, ignition, compression ratio, speed, thermal efficiency, weight, air charging system.
- b) Can ethanol be an alternate fuel for SI engine? Explain its merits and demerits. **[6]**

P.T.O.

- Q4)** Write short notes on (any three) : **[18]**
- a) MPFI gasoline injection systems.
 - b) Alternate fuels for SI engine.
 - c) Modern trends in SI engine.
 - d) Dual fuel system.

SECTION - II

- Q5)** a) A single cylinder four stroke petrol engine has bore 75mm and stroke 100mm. The clearance volume is 70 cm³. The engine develops torque of 70 Nm at 3000 rpm. The mechanical efficiency is 80% and relative efficiency based on brake thermal efficiency is 45% and the heating value of the fuel is 42 MJ/kg. Calculate brake specific fuel consumption and mean effective pressure. **[10]**
- b) Give the material selection criteria for IC engine components. **[6]**
- Q6)** a) What are catalytic converters? How does it help to reduce emissions. **[8]**
- b) Why the compression ratio of SI engine is often reduced when the engine is redesigned to be used with a turbocharger? Explain the effect of reducing compression ratio on engine performance. **[8]**
- Q7)** a) Explain any two methods of air fuel ratio measurement. **[6]**
- b) Discuss the recent trends in IC engines. **[4]**
- c) Explain pulse turbocharging giving its advantages and disadvantages. **[6]**
- Q8)** Write short notes on (any three) : **[18]**
- a) Materials for IC engine.
 - b) Performance maps of SI engine.
 - c) Engine management system.
 - d) Supercharging.



P1647

[4065] - 442

M.E. (Civil) (Hydraulics Engg.)

SYSTEMS TECHNIQUES IN WATER RESOURCE ENGINEERING

(2008 Course) (501304(C)) (Elective - I)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 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) *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 the help of a sketch the difference between constraint surface and composite constraint surface. **[4]**

b) Find the extreme points of the function **[12]**

$$f(x_1, x_2) = x_1^3 + x_2^3 + 2x_1^2 + 4x_2^2 + 6$$

Q2) a) Write the dual of the following linear programming problem. **[4]**

$$\text{Maximize } f = 30x_1 + 200x_2$$

$$\text{Subject to } 2x_1 + x_2 \leq 1450$$

$$2x_1 + 5x_2 \leq 2000$$

$$2x_1 + 3x_2 \leq 700$$

$$x_2 \leq 200$$

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

b) What is the difference between a slack variable and a surplus variable? **[2]**

c) Solve the following linear programming problem using big M method **[10]**

$$\text{Minimize } Z = 5x_1 + 6x_2 + 7x_3$$

$$\text{Subject to } x_1 + x_2 + x_3 = 10$$

$$x_1 \leq 30$$

$$x_2 \geq 15$$

$$x_3 \geq 20$$

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

Q3) a) What are the steepest ascent and descent methods? [6]

b) Maximize $f(x) = \begin{cases} 3x & 0 \leq x \leq 2 \\ \frac{1}{3}(-x + 20) & 2 \leq x \leq 3 \end{cases}$ [10]

Q4) a) What are the applications of dynamic programming in water resources engineering? [4]

b) State and explain Kuhn-Tucket conditions. [4]

c) Use Lagrange Multiplier Technique to minimize [8]

$$z = 3x_1^2 + 4x_2^2 - 5x_1 x_2 - 8x_2$$

$$\text{Subject to } x_1 + x_2 = 4$$

d) What is Hessian matrix and explain its significance. [2]

SECTION - II

Q5) a) Explain the following terms : [4]

i) Present worth factor and

ii) Sinking fund factor.

b) A company is interested in investing in any of the following multipurpose water resources projects. The relevant data pertaining to the two projects is given below : [8]

State which option would be ranked best based on the B/C ratio.

Sr No.	Particulars	Project A	Project B
1	Initial investment (crore, Rs.)	32	48
2	Net annual benefits (crore Rs.)	7	9
3	Useful life (years)	35	27
4	Salvage value (crore Rs.)	1	2
5	Discount rate (%)	12	12

c) Define Annuity and explain different types of annuities. [4]

Q6) Pipes are to be transported from the sources to construction sites. The availability and requirement of the pipes and the unit cost of transport is given below : [18]

Source	Construction Sites					Quantity
	1	2	3	4	5	Available
A	16	11	8	10	13	50
B	15	18	12	7	19	70
C	23	24	22	14	21	80
Quantity required	20	30	40	50	60	200

Use VAM to find the initial feasible solution and determine the transportation policy which will minimize the total cost of transportation.

- Q7)** a) Explain the procedure of solving sequencing problem of three stations and n-junction. [6]
b) Explain Monte-Carlo simulation technique. What are its applications in water resources engineering. [6]
c) Describe briefly Markov process and Markov chain. [4]
- Q8)** Write short notes on any four of the following : [16]
a) Main components of queuing system and their characteristics.
b) Sensitivity analysis in linear programming.
c) Application of linear programming in Hydraulic Engineering.
d) Principle of decomposition.
e) Two-person zero-sum game and mixed strategy game.



P1652

[4065]-847

M.E. (IT)

NETWORK PROGRAMMING

(2008 Course) (Elective - II) (514422 (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) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Explain and illustrate UDP client-server programming model.
b) Describe simple echo client server along with the functions used for input and output. **[16]**
- Q2)** a) Compare the various socket address structure of IPV4, IPV6, Unix domain and Data link.
b) Explain the three types of operations which are supported on routing socket. **[16]**
- Q3)** a) Explain the socket primitives/functions in C.
b) Explain the structure of Data link/MAC addressing. **[16]**
- Q4)** a) Draw and explain the typical arrangement of client, resolver and name server.
b) Explain TCPConnect function in detail. **[18]**

P.T.O.

SECTION - II

- Q5)** a) Describe the steps that allow an IPV4 TCP Client to communicate with an IPV6 Server.
b) Explain the PreForking process in detail. **[16]**
- Q6)** a) Describe different forms of addressing supported by IPV4 and IPV6 along with TCP and UDP.
b) Differentiate between Unicast, Broadcast and Multicast with proper examples. **[16]**
- Q7)** a) Explain how simultaneous connections will be served by Web Server?
b) Explain significance of threads in network programming. **[16]**
- Q8)** a) Write a short note on TCP concurrent server.
b) Explain the significance of the source and code portability of IPV4 and IPV6. **[18]**



P1653

[4065]-729

**M.E. (Production) (CAD/CAM)
ENERGY MANAGEMENT
(2008 Course) (Elective - II) (511205 (c))**

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Discuss the special aspects of Indian Energy market, with reference to types of energy sources; consumption pattern for different sectors of economy and the growth pattern. **[9]**
- b) What is the difference between Energy Conservation and Energy Management? Discuss with suitable examples. **[9]**

OR

- Q2)** Write short notes on: **[18]**
- a) Life Cycle Cost,
 - b) Specific Fuel Consumption and its use in energy management,
 - c) Load Management as national need.
- Q3)** a) Water is considered to be a natural resource, which should be made available for energy generation. Do you agree with this statement? Justify your answer. **[8]**
- b) Explain the steps to be taken to undertake Energy Audit of a manufacturing plant, involved in producing die castings. **[8]**

OR

- Q4)** a) Which are the costs needed to be considered in finding out the cost of the electricity generated in thermal power station? [8]
b) Discuss any four important instruments commonly used for Energy Audit in brief, mentioning their purpose and approximate costs. [8]

- Q5)** a) Discuss the importance of testing of Boiler performance in an Industrial unit. Which are the factors need to be looked into to make sure that boilers are operated at optimum efficiency? [8]
b) What is the material of thermal insulation used in industry? How does it increase the energy efficiency? How the Economic Thickness of Insulation is decided? [8]

OR

- Q6)** a) Which are the factors affecting performance – energy efficiency - of a boiler? How can these be controlled? [8]
b) Discuss the importance of boiler efficiency. What is achieved by flue gas analysis? [8]

SECTION - II

- Q7)** Write short notes on: [3 × 6]
a) Demand side Management,
b) Power factor and its importance in energy management,
c) Energy efficient motors.

OR

- Q8)** Write short notes on: [3 × 6]
a) Variable speed drive as a tool for energy management,
b) Energy efficient illumination,
c) Incentives for demand side management.

- Q9)** a) Discuss any four measures to save energy in refrigeration and air conditioning systems. [8]
b) In process industry there is tremendous potential to save energy. Do you agree with statement? Justify. [8]

OR

- Q10)** a) Explain the importance of compressed air in manufacturing sector and the opportunities for energy savings. [8]
b) Discuss any four methods of energy saving in fans and pumps. [8]

- Q11)** a) Differentiate between Co-generation and Waste Heat Recovery. [8]
b) Explain different Heat Recovery systems and consideration while selecting these. [8]

OR

- Q12)** a) What are the different co-generation systems? How can one select co-generation system? [8]
b) Draw the characteristics of a typical pump and explain the concept of energy efficiency in these. [8]

* * *

P1660

[4065]-126

**M.E. (Electronics/E & TC)
(Common to DSD & Microwave)**

**MICRO ELECTRONICS
(2002 Course) (504205)**

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer any three questions from each section.*
- 2) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** Explain the regions of CMOS inverter in detail with suitable diagrams. Draw and explain various types of Inverter circuit diagrams, also highlight on issue of Bn/Bp ratio of transfer characteristics. **[16]**
- Q2)** a) Write VHDL code for 8: 1 Mux with SELECT, WHEN statements. **[8]**
b) What is Domino logic? Explain the Domino AND gate in detail, comment on inverter at the o/p of domino gate. **[8]**
- Q3)** a) Design CMOS logic gates for the following functions **[8]**
i) $F = \overline{((A + B + C).D)}$
ii) $F = \overline{(((A.B) + C).D)}$
b) What is mean by transmission gates design half adder using transmission gates. **[8]**
- Q4)** Write short notes on: **[18]**
a) Types of VHDL Modeling.
b) Dynamic Power dissipation.
c) Ultra fast VLSI circuit and system.

SECTION - II

- Q5)** a) Write VHDL for FSM which detect the sequence 10101 by mealy machine. [8]
b) What are the various CMOS parasitic? Explain in detail. [8]
- Q6)** a) What is use of attributes in VHDL? Discuss two attributes with example. [8]
b) Explain about the low power mode of CPLD also give the details of its architecture. [8]
- Q7)** a) Compare the selection criteria of CPLD and FPGA. [8]
b) Explain the schematic of antifuse SRAM and Flash technologies for PLD. [8]
- Q8)** Write short notes on: [18]
a) Design for testability, its need with example.
b) Limitations of current FPGA.
c) Types and essence of Test bench.

P1663

[4065]-670

**M.E. (Electronics) (Digital System)
MEMORY TECHNOLOGIES
(2008 Course) (504198) (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 indicates full marks.*
- 5) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) What are the parameters which should be taken into account while designing SRAMs? [8]
b) Draw the various SRAM cell structures? Explain one of them. [8]
- Q2)** a) Why we need application specific SRAMs? Enlist the application specific SRAMs. [8]
b) SRAM are said to be fast RAM as compared to DRAM, Justify. [8]
- Q3)** a) Draw the cell structure of DRAM; explain its operation in short. Discuss its pro and cones. [8]
b) What is the role of sense amplifier in DRAM. Draw typical circuit for sense amplifier. [8]
- Q4)** a) What do you mean by antifuse? Is it possible to use them in semiconductor memories, if yes explain it? [8]
b) What do mean by UVROM? What are its advantages and disadvantages of it? [8]
- Q5)** Draw the typical circuit for refreshing circuit, explain its operation with typical wave form. While designing refresh circuit, what point should be taken into account? [18]

P.T.O.

SECTION - II

- Q6)** a) What is Data retention fault? Explain it with suitable circuit diagram. [8]
b) What is Pattern sensitive fault? Explain it with suitable example? [8]
- Q7)** a) How the memory in embedded system can be tested? [8]
b) Explain basic March test with suitable Algorithm? [8]
- Q8)** a) What are the advantages and disadvantages of the FRAM? [8]
b) Explain the basic principle of analog memory. Enlist the applications of the same. [8]
- Q9)** a) Compare MRAM and FRAM. [8]
b) Why packaging of Semiconductor is required? Draw schematics for few of them used for packaging the semiconductor memories. [8]
- Q10)** Write short notes on: [18]
a) Reliability of Memory.
b) Radiation hardening for semiconductor memories.
c) MRAM.



P1668

[4065]-717

**M.E. (Production Engineering)
RESEARCH METHODOLOGIES
(2008 Course) (Elective - IV) (51112 (b))**

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

SECTION - I

- Q1)** a) Distinguish between historical, descriptive and experimental research. [6]
b) What are the problems encountered by researchers in India? [5]
c) Describe the ethical issues in research process. [5]
- Q2)** a) Develop the management-research question hierarchy citing management dilemma, management question and research question for each of the following : [10]
i) The Production Manager of a shoe factory.
ii) The Vice President of labour relations for an auto manufacturer.
b) What are the techniques involved in defining a problem? [6]
- Q3)** a) The diameters of steel shaft produced by certain process should have a mean diameter of 0.255 inches. The diameter is known to have a standard deviation of $\sigma = 0.0001$ inch. A random sample of 10 shafts has average diameter of 0.2545 inches. [8]
i) Setup appropriate hypothesis on the mean μ .
ii) Test hypothesis using $\alpha = 0.05$. What are your conclusions?
iii) Find the p value for this test.
iv) Construct a 95% confidence interval on the mean shaft diameter.
b) Explain the Latin square design method of formal experimental design. [8]

P.T.O.

- Q4)** a) Describe the characteristics of six major types of test markets with advantage and disadvantage of each. [6]
b) What are the types of data to be collected for research? [5]
c) Explain the difference between collection of data through questionnaires and schedules. [5]
- Q5)** Write short notes on any three of the following : [18]
a) Qualitative research methodologies.
b) The procedure for testing hypothesis.
c) Applications of case study method.
d) Comparison of probability sampling designs.
e) Measures of relationship.

SECTION - II

- Q6)** a) What do you mean by multivariate analysis? How does it differ from bivariate analysis? [6]
b) Describe briefly the commonly used sampling distributions. [5]
c) Given the following information : [5]
i) Universe with $N = 10,000$
ii) Variance of weight of cereal containers on the basis of past record = 8 kgs. Determine the size of sample for estimating the true weight of containers if estimate should be within 0.4 kg of true average weight with 95% probability (Given $z = 1.96$ from table of area under normal curve).
- Q7)** a) How is crossover operation performed in GA? What is the purpose of mutation? How is it implemented in GA? [6]
b) What is Chi-square test? What are the conditions for applying Chi-square test? [5]
c) Describe the Graph theory approach in decision making. [5]
- Q8)** a) Describe the Simulated annealing procedure with the help of flow chart. [8]
b) Below are given the yields per acre of wheat for six plots entering a crop competition. Three of the plots are being sown with wheat of variety A and three with variety B. [8]

Variety	Yield in the field per acre		
	1	2	3
A	30	32	22
B	20	18	16

Setup a table for analysis of variance and calculate F. State whether the difference between the yields of two varieties is significant taking 7.71 as table value of F at 5% level of $v_1 = 1$ and $v_2 = 4$.

- Q9)** a) Describe the steps in report writing. **[8]**
- b) “Interpretation is an art of drawing inference, depending upon the skill of the researcher”. Elucidate the given statement explaining the technique of interpretation. **[8]**

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

- a) Statistical estimation.
- b) F-ratio and its interpretation.
- c) Characteristics of a good research report.
- d) Applications of Analytical Hierarchy Process (AHP).
- e) Oral presentation of research findings.



Total No. of Questions : 8]

[Total No. of Pages : 3

P1700

[4065]-840 A

M.E. (Information Technology)

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) *Neat diagrams must be drawn whenever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Prove the following by contradiction.
- i) There are infinitely prime numbers.
 - ii) There exist 2 irrational numbers X and Y such the X^Y is rational. **[8]**
- b) Prove by mathematical induction.
- i) $n^3 < 2^n$.
 - ii) Every composite integer can be expressed as product of prime number. **[8]**
- Q2)** a) What is worst case, average case and best case time complexity of an algorithm? Write a the selection sort algorithm and analyze the same to find out its worst case, average case and best case complexity. **[10]**
- b) Solve the following recurrence using recurrence relation. **[6]**
- $$t_n = n \dots\dots\dots \text{if } n = 0, 1$$
- $$= 2t_{n-1} - 2 t_{n-2} \dots\dots\dots \text{otherwise.}$$
- Q3)** a) Demonstrate the action of insertion sort and selection sort on the given array $a [] = \{33, 2, 56, 23, 55, 78, 2, 98, 61, 108, 14, 60, 56, 77, 5, 3, 1\}$, For the above data, how many number of comparisons are needed in insertion sort and selection sort? **[8]**

P.T.O.

- b) Trace the action of binary search algorithm, including listing the value of Low, High and Mid after each iteration, for the list {2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37} for each of the following search elements.
- $X = 2$
 - $X = 24$
 - $X = 31$
 - $X = 13$

And give the number of comparison required in each case. [8]

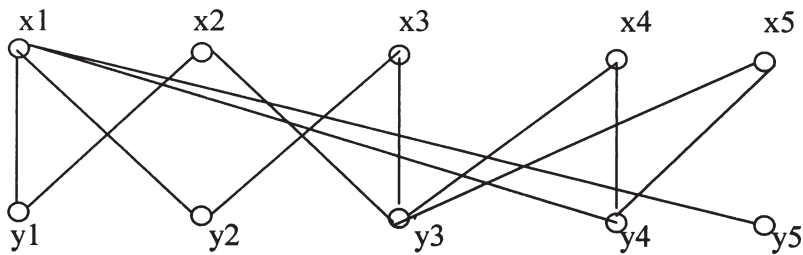
- Q4)** a) Calculate the average complexity $A(n)$ of linear search assuming that both of the following two assumptions about the input list $L [0 : n - 1]$ and search element X hold.

- The probability that X occurs in the list is $2/3$.
- Given that X occurs in the list, X is twice as likely to occur in the first half of the list (position 0 to $[n/2] - 1$) as in the second half. Further if X occurs in the first half of the list it is equally likely to occur in any position in the first half a similar assumption is made about the second half. [10]

- b) Discuss the randomized quick sort algorithm? And analyze this randomized quick sort algorithm for its complexity. [8]

SECTION - II

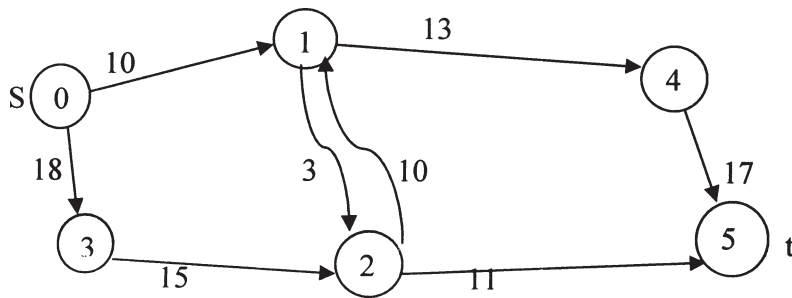
- Q5)** a) Consider the bipartite graph G . [10]



starting with given matching $M = \{x1, y1, x3, y3\}$, determine the perfect matching output by Hungarian. Show each augmenting path that is generated.

- b) Explain the following with respect to geometric algorithm. [6]
- Point location.
 - Convex hulls and voronoi diagram.

Q6) a) Find the maximum flow f in the following capacitated network N . [10]



b) Explain the following with respect to approximation algorithm. [8]

- i) Absolute approximation algorithms.
- ii) $f(n)$ - approximation algorithms.
- iii) ϵ - approximate algorithm.
- iv) Approximate scheme.

Q7) a) Find the optimal tour for the instance of travelling salesman problem given below in the matrix (8*8) by your own way.

And then generate the tour by 2-approximation algorithm.

Compare tour generated by your way and 2-approximation algorithm. [10]

0	19	14	16	17	13	18	20
19	0	17	12	11	19	15	15
14	17	0	18	16	12	16	16
16	12	18	0	10	20	11	20
17	11	16	10	0	16	10	14
13	19	12	20	16	0	18	15
18	15	16	11	10	18	0	17
20	15	16	20	14	15	17	0

b) What is an NP-hard and approximation algorithm? What is the relation between these two? Give suitable example. [6]

Q8) a) Discuss various parallel computational model and how do they achieve the parallelism in the algorithmic design. [6]

b) Write the CRCW and EREW Algorithms for parallel computers. [10]

