Total No. of Questions : 12] **[Total No. of Pages :3**

P1024

[3864] - 109
B.E. (Civil)
ARCHITECTURE AND TOWN PLANNING
(2003 Course) (Elective - I) (401005)

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 and Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12 from Section II.***
2) ***Write the answers on separate sheets for Section I and Section II.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Write a short note on qualities of an architect, giving suitable examples. **[8]**

b) What are the factors in architecture? Explain with examples. **[9]**

OR

Q2) a) Describe the features of Gothic Architecture in brief. **[8]**

b) Explain in brief architectural design aids. **[9]**

Q3) a) Explain how connectivity matrix influences the planning in case of a 200 bed hospital. **[8]**

b) Explain various planning aspects for Neighbourhood. **[9]**

OR

Q4) a) Write short notes on:

i) Three magnet concept.

ii) Garden City. **[8]**

b) Explain the role of Neighbourhood in urban planning. **[9]**

Q5) a) Mention the important aspects of Development Plan. **[8]**

b) Explain in detail contents of MRTP Act. **[8]**

OR

P.T.O.

Q6) a) Write a short note on. "Importance of ULC Act". **[8]**

b) Differentiate between various settlements (small towns, medium towns, large towns) in respect of population / ha, Land use , water supply in plain and hilly areas as per UDPFI guidelines. **[8]**

SECTION - II

Q7) a) 'Soft Landscape elements are effective tools for control of pollution in urban areas'. Explain with neat sketches. **[9]**

b) Describe following landscape elements in detail.

i) Outdoor lighting.

ii) Indoor plants. **[8]**

OR

Q8) a) 'Hard landscape elements should harmonise with building fascad' Elaborate with examples. **[8]**

b) Discuss the stages involved in preparation of landscape plan for a public building on undulating terrain. **[9]**

Q9) a) Enlist different land uses. Discuss their compatibility in Development Plan. **[9]**

b) Explain in detail:

i) Origin and Destination survey.

ii) Hierarchy of Roads in town planning. **[8]**

OR

Q10)a) What is 'Density'? Explain town planning methods for controlling density. **[8]**

b) Enlist various surveys to be carried out for preparation of Development Plan. Explain any two in detail. **[9]**

Q11)Write short notes on:

a) Data collection for D.P. using GIS techniques.

b) Remote sensing and its use in town planning.

c) Satellite imagery and their limitations in planning.

d) GPS segments. **[16]**

OR

Q12 a) 'Role of GIS in designing effective traffic management schemes.' Elaborate giving examples. **[8]**

b) 'Application of GIS for preparation of existing land use map of town'. Explain in detail. **[8]**

*****

P1255

[3864] - 135
B.E. (Mechanical)
PRODUCT DESIGN & DEVELOPMENT
(Elective - I) (2003 Course) (402045)

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

Instructions 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
Unit - I

Q1) a) Explain product development versus design . **[8]**

b) Explain modern product development process. **[8]**

OR

Q2) Explain different types of customer needs. Discuss various need gathering methods. **[16]**

Unit - II

Q3) Explain product teardown process in detail. Explain force flow diagram with suitable example. **[17]**

OR

Q4) a) Discuss Functional requirements versus constraints. **[9]**

b) What do you mean by product Architecture? Explain Integral & modular Architecture. **[8]**

Unit - III

Q5) a) Explain Brainstorming & memory maps in concept generation. **[9]**

b) Discuss directed search method for concept generation. **[8]**

OR

Q6) a) Explain generalised concept selection process. **[9]**

b) Explain the role of Failure modes and Effects Analysis in concept embodiment **[8]**

P.T.O.

SECTION - II

Unit - IV

Q7) a) Explain design for Assembly (DFA) guidelines. **[8]**

b) Discuss in detail manufacturing cost Analysis. **[8]**

OR

Q8) a) What are objectives of Design for Environment. Explain local & global issues. **[8]**

b) Explain design for recyclability & design for remanufacturing. **[8]**

Unit - V

Q9) a) Define optimization & explain. Discuss Fundamental concepts in optimization. **[9]**

b) Explain Pareto optimality in detail with suitable example. **[8]**

OR

Q10)Explain briefly.

a) Linear programming. **[5]**

b) Steepest descent method. **[4]**

c) Stopping criteria. **[4]**

d) Sensitivity Analysis. **[4]**

Unit - VI

Q11)a) What is Prototyping? Explain uses of prototypes. **[9]**

b) Explain in detail ' Design of experiments'. **[8]**

OR

Q12 a) Discuss in detail Quality design theory. **[9]**

b) Explain with neat diagram stereo lithography & selective laser sintering. **[8]**

*****

Total No. of Questions : 12] **[Total No. of Pages : 4**

P1040

[3864] - 143
B.E. (Mechanical)
INDUSTRIAL FLUID POWER
(2003 Course) (402049)

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

SECTION - I

Q1) a) Discuss any six important properties of hydraulic fluid. **[6]**

b) What are the different seals used in hydraulic system. **[8]**

c) Explain the bypass filter with its merits and demerits. **[4]**

OR

Q2) a) Explain the difference between flared fitting and a compression fitting. **[6]**

b) Explain the sources of contamination in hydraulic system. **[8]**

c) Write a note on schedule number of standard pipe. **[4]**

Q3) a) Explain with a neat sketch the working of Radial piston pump with its characteristics. **[10]**

b) What are the different accessories used in hydraulic systems? What are their functions? **[6]**

OR

Q4) a) Explain the different type of accumulators used in hydraulic circuit. **[8]**

b) What are the functions of reservoirs? Draw a neat sketch of standard reservoir by showing its internal and external features. **[8]**

Q5) a) State the advantages and disadvantages of meter -in circuit. **[6]**

b) Explain with neat sketch working of a counter balance valve and draw a circuit showing its application. **[10]**

P.T.O.

OR

Q6) a) Classify direction control valves. **[4]**

b) Draw a neat sketch and explain the working of a sequence value. **[8]**

c) Differentiate open centre and close centre valve position in direction control valves. **[4]**

SECTION - II

Q7) a) Classify different hydraulic actuators. **[6]**

b) A double acting cylinder is to be operated continuously to and fro. Draw a hydraulic circuit without solenoid valves and explain the operation. **[10]**

OR

Q8) a) Explain the following terms with respect to hydraulic motor.

i) Volumetric efficiency

ii) Mechanical efficiency

iii) Overall efficiency. **[6]**

b) Draw a regenerative circuit explaining its applications. **[10]**

Q9) a) A pneumatic cylinder is needed to press fit a pin in a hole. Design a circuit diagram with a pre condition that while actuating, both the hands of the operator should be engaged. **[8]**

b) Explain the purpose of quick exhaust valve in pneumatic system with a circuit. **[8]**

OR

Q10) a) Explain working of a filter, regulator and lubricator (FRL) unit used in pneumatics with the help of a sketch. **[8]**

b) Draw typical circuits of different speed regulating methods used in pneumatic circuits. **[8]**

Q11) A press requires a flow rate of 200 litres/min for high - speed opening and closing of the dies at a maximum pressure of 30 bars. The work stroke needs a maximum pressure of 400 bars, but a flow rate between 12 and 20 litres/min will be acceptable. The circuit uses a dual pump and an unloading valve. Draw the circuit. Calculate the discharges reguired for high pressure, low- volume pump and high - volume, low pressure pump. Also calculate the power required and power saved instead of an equivalent single pump. **[18]**

OR

Q12) A machine slide is moved by a cylinder. The motion required is as follows:

a) Initially the cylinder moves against a load of 2.5 kN till it reaches the workpiece at a speed of about 1.5 m/min.

b) The speed drops down to about 0.5 m/min as soon as the load increases to 12.5 kN.

c) The return motion is against a load of 2.5 kN. A meter out circuit is used. Draw a circuit which will fulfill these requirements. Select different components you have used in the circuit from the given data. Mention ratings of the components in case it is not available in the given data. **[18]**

DATA

1. Suction Strainer :

Model	Flow Capacity (/pm)
S_1	38
S_2	76
S_3	152

2. Pressure Gauge :

Model	Range (bar)
PG_1	0 - 25
PG_2	0 - 40
PG_3	0 -100
PG_4	0 - 160

3. Vane Pump :

Model	Delivery in / pm		
	at 0 bar	at 35 bar	at 70 bar
P_1	8.5	7.1	5.3
P_2	12.9	11.4	9.5
P_3	17.6	16.1	14.3
P_4	25.1	23.8	22.4
P_5	39.0	37.5	35.6

4. Relief Valve :

Model	Flow capacity (/ pm)	Max Working Pressure & bar
R_1	11.4	70
R_2	19	210
R_3	30.4	70
R_4	57	105

5. Flow control Valve :

Model	Working Pressure (bar)	Flow Range (/pm)
F_1	70	0-4.1
F_2	105	0-4.9
F_3	105	0-16.8
F_4	70	0-24.6

6. Directional Control Valve :

Model	Max working Pressure (bar)	Flow Capacity (/pm)
D_1	350	19
D_2	210	38
D_3	210	76

7. Check Valve :

Model	Max working Pressure (bar)	Flow Capacity (/pm)
C_1	210	15.2
C_2	210	30.4
C_3	210	76

8. Pilot Operated Check Valve :

Model	Max working Pressure (bar)	Flow Capacity (/pm)
PO_1	210	19
PO_2	210	38
PO_3	210	76

9. Cylinder-(Max Working Pressure-210 bar)

Model	Bore dia. (mm.)	Rod dia (mm)
A_1	25	12.5
A_2	40	16
A_3	50	35
A_4	75	45
A_5	100	50

10. Oil Reservoirs :

Model	Capacity (litres)
T_1	40
T_2	100
T_3	250
T_4	400
T_5	600

*****

Total No. of Questions : 12] **[Total No. of Pages :4**

P1141

[3864] - 155
B.E. (Mechanical S/W)
TRIBOLOGY
(2003 Course) (Elective - II) (402063)

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

Instructions to the candidates:

1) ***Answer 03 questions from section I and 03 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
UNIT - I

Q1) a) What are the different parameters which affect viscosity of oil? Discuss in brief . **[6]**

b) State physical and chemical properties of Lubricants. **[4]**

c) An Oil of viscosity of 50 cP and relative density of 0.9 is used for Lubrication convert the viscosity into Centistokes, SUS and Pascal second units. **[6]**

OR

Q2) a) Explain modes of Lubrication. **[6]**

b) What is role of additives in lubrication? What are different additives used in lubricating oils? **[4]**

c) Discuss in brief the role of tribology in industry. **[6]**

UNIT - II

Q3) a) Derive Archard's equation for volume of adhesive wear with assumptions made. State Laws of wear using above equation. **[8]**

b) Explain Ferrography technique for measurement of wear. **[4]**

c) Enumerate the factors affecting wear. **[4]**

OR

P.T.O.

Q4) a) What is mean by:- **[6]**

i) Contact area / contour area of contact.

ii) Real area of contact.

iii) Apparent area of contact.

b) Explain the following theories of friction :- **[8]**

i) Coulomb's classical theory.

ii) Electrostatic theory of friction.

iii) Tomlinson's theory of molecular attraction.

c) Explain stick - slip oscillations. **[2]**

UNIT - III

Q5) a) Derive the Renold's equation — **[10]**

$$\frac{\partial}{\partial x}\left[h^3 \frac{\partial p}{\partial x}\right] + \frac{\partial}{\partial y}\left[h^3 \frac{\partial p}{\partial x}\right] = -6\mu U \frac{\partial h}{\partial x}$$ with usual notations.

State the assumptions made in the equation. Show the axial and radial pressure distribution in the bearing.

b) Explain Boyd-Raimondi's method for analysis of Hydrodynamic Journal Bearing. **[8]**

OR

Q6) a) Derive an expression for pressure 'p' around a short journal bearing of length L as — **[10]**

$$p = \frac{3U\eta C\varepsilon \sin\theta}{RC^3(1+\varepsilon\cos\theta)^3}\left[\frac{L^2}{4} - y^2\right]$$ with usual notations.

b) Following data is given for a 360° Journal bearing: **[8]**

Journal diameter	= 50 mm
Bearing Length	= 50 mm
Radial load	= 3.2 kN
Journal Speed	= 1490 rpm
Radial Clearance	= 0.05 mm
Oil viscosity	= 25 cP

Assuming that the total heat generated in the bearing is carried away by the total oil flow in the bearing , calculate —

i) Minimum oil film thickness.

ii) The coefficient of friction.

iii) Flow requirement in litre/ min and.

iv) Power lost in friction.

$\left(\frac{l}{d}\right)$	ε	$\left(\frac{h_o}{c}\right)$	S	ϕ	$\left(\frac{r}{c}\right)f$	$\left(\frac{Q}{rcn_s l}\right)$	$\left(\frac{Q_s}{Q}\right)$	$\left(\frac{P}{P\max}\right)$
1	0	1.0	∞	(85)	∞	π	0	–––
	0.1	0.9	1.33	79.5	26.4	3.37	0.150	0.540
	0.2	0.8	0.631	74.02	12.8	3.59	0.280	0.529
	0.4	0.6	0.264	63.10	5.79	3.99	0.497	0.484
	0.6	0.4	0.121	50.58	3.22	4.33	0.680	0.415
	0.8	0.2	0.0446	36.24	1.70	4.62	0.842	0.313
	0.9	0.1	0.0188	26.45	1.05	4.74	0.919	0.247
	0.97	0.03	0.00474	15.47	0.514	4.82	0.973	0.152
	1.0	0	0	0	0	0	10	––

Table I : Dimensionless Performance Parameters for full journal bearings with side flow .

SECTION - II

UNIT - IV

Q7) a) Derive relation for flow rate of lubricating oil and load carrying capacity for a Circular step Bearing with neat sketch. **[8]**

b) Two reservoirs are connected by a slot 20 cm wide, 0.3 mm thick and 30 cm long. The reservoirs are filled with oil of 105cP. The pressures in the two reservoirs are 10 bar and 3 bar respectively. Determine the quantity of oil flowing. Assume relative density of 0.8. **[8]**

OR

Q8) a) Discuss different types of energy losses in hydrostatic bearings & derive an equation for the same. **[8]**

b) The hydrostatic step bearing consists of six pads as shown. Neglecting the flow over corners of each pad can be approximated as a circular area of outer and inner diameter of 500 mm and 200 mm resp. The total thrust load is 900 KN and the film thickness is 0.15mm. The viscosity and density of the oil are 30 cP and 0.9 gm/cc resp. The specific heat of the lubricant is 2.09 KJ/kg ^oC. If the shaft is rotating at 720rpm, calculate.

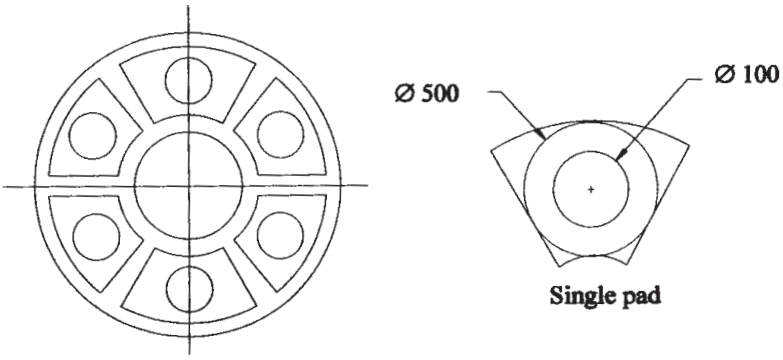
i) Supply pressure,

ii) Lubricant flow rate,

iii) Frictional power loss,

iv) Pumping power loss and,

v) Temperature rise. **[8]**



UNIT - V

Q9) a) Derive equations for load carrying capacity and time of approach for a rectangular plate near a plane under hydrostatic squeeze film Lubrication. **[10]**

b) Explain merits, demerits and applications of Gas bearings. **[6]**

OR

Q10)a) Explain the mechanism of squeeze film lubrication. Where does it occur? **[8]**

b) Two parallel plates 3 cm long and infinitely wide are separated by oil of viscosity 0.6 Ns / m^2 and are approaching each other. If a load of 30 KN per meter width is applied, what will be the film thickness after one second? Initial film thickness is 25 μ m. **[8]**

UNIT - VI

Q11)a) Derive an expression for load carrying capacity of Rayleigh step bearing which has entry zone gap of h_1 over a length of B_1 and exit zone gap of h_o over a length of B_0 and sliding with a velocity of U. **[10]**

$$\left(\frac{h_1}{h_0} = 1.87 \ \textit{and} \ \frac{B_1}{B_0} = 2.588 \right)$$

b) Discuss the mechanism of elasto - hydrodynamic lubrication and give its applications. **[8]**

OR

Q12 a) Write a short note on (Any Two) :- **[6]**

i) Plastic bearing materials.

ii) Sintered Metal bearings.

iii) Bi and Tri metal bearings.

b) Explain different types of gaskets and oil seals in brief. **[6]**

c) Explain different patterns of oil grooves in case of sliding contact bearings. **[6]**

*****

Total No. of Questions : 12] **[Total No. of Pages :2**

P1043

[3864] - 171
B.E. (Production)
PRODUCTION MANAGEMENT
(2003 Course)

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

Instructions to the candidates:

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

SECTION - I
Unit - I

Q1) a) What are the duties of production manager in modern manufacturing industry? **[8]**

b) Explain the concept of concurrent engineering. **[8]**

OR

Q2) a) Define clearly production and production management. Discuss scope and objectives of production management. **[8]**

b) Explain briefly the historical development of production and operation management. **[8]**

Unit - II

Q3) a) Discuss the factors considered while selecting location for an foundary plant? **[8]**

b) Explain unit load concept in detail. **[8]**

OR

Q4) a) Define plant layout with its types and explain the situation when this problem arise in industry. **[8]**

b) What are the different principles of material Handling? Explain any three in brief. **[8]**

P.T.O.

Unit - III

Q5) a) What are the different manpower forecasting techniques? Explain any two in brief. **[9]**

b) Explain when management has to go for PIP (Productivity Improvement programme)? Explain different internal factors that affect enterprise productivity. **[9]**

OR

Q6) a) Explain in detail the concept of capacity in industry. **[9]**

b) Explain long term and short term capacity strategies. **[9]**

SECTION - II

Unit - IV

Q7) a) Explain in brief the evolution of WCM - World Class Manufacturing. **[8]**

b) Compare emerging business trends in information age with industrial age. **[8]**

OR

Q8) a) Explain manufacturing excellence through value added manufacturing. **[8]**

b) Explain with block diagram Gunn's model of World Class Manufacturing(WCM). **[8]**

Unit - V

Q9) a) What is work Authorization and control in industrial maintenance? Explain in brief. **[8]**

b) Explain different types of maintenance. How the performance of maintenance function is evaluated. **[8]**

OR

Q10)a) What is TPM - Total Productive Maintenance? What are the objectives of TPM? **[8]**

b) What are the different factors considered while estimating maintenance costs? **[8]**

Unit - VI

Q11)a) Explain the concept of walk through energy audit. **[9]**

b) Explain the responsibilities of industrialists towards Environment and Ecology. **[9]**

OR

Q12 a) Discuss Green production (Sustainable manufacturing) in brief. **[9]**

b) Explain what is Lean Manufacturing? **[9]**

*****

Total No. of Questions : 12] **[Total No. of Pages :3**

P1051

[3864] - 181
B.E. (Production)
CAD/CAM/CIM
(2003 Course)

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

Instructions to the candidates:

1) ***Attempt one question from each unit from each section - 1& section - II***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Assume suitable data, if necessary.***

SECTION - I
Unit - I

Q1) a) Perform the following transformation if the co-ordinates of the vertices of the square are A(2,2), B(2,6),C(6,6),D(6,2) **[8]**

i) Scale the square by factor = 2 in x & y direction.

ii) Rotate the scaled square about A by 45^{o} in counter clockwise direction.

b) Give an example of surface modelling and show it's disadvantages. How these disadvantages are overcome in solid modelling. **[8]**

OR

Q2) a) Write a note on - **[10]**

i) Image writing methods.

ii) Homogeneous Transformation.

b) Draw the sketches and write the equations for the primitives used in solid modelling. **[6]**

P.T.O.

Unit - II

Q3) a) What is FMS? Discuss the FMS based on flexibility criteria. **[9]**

b) Explain with neat diagram CNC & DNC along with their characteristics. **[9]**

OR

Q4) a) Explain different drive system in CNC. State G and M code used in CNC programming along with suitable example. **[9]**

b) Explain the different elements of FMS. Draw layout arrangements in FMS. **[9]**

Unit - III

Q5) a) Explain any two module based on manufacturing for CIM. **[8]**

b) Write note on - **[8]**

i) CIM data files.

ii) MRP - I and its in put and out put reports.

OR

Q6) a) Explain the role of computer in production management system. **[5]**

b) What are advantages of AGVS over the other material handling system? What is meant by automated storage and retrieval system. **[6]**

c) Explain the robot configuration. **[5]**

SECTION - II

Unit - IV

Q7) a) Draw neat sketches and label it and write down the highlights of it's **[8]**

i) Solid based curing.

ii) Steriolithography.

b) Explain with neat sketch a fused deposition method of RP. **[7]**

OR

Q8) a) State and explain characteristics of a product manufactured by RP. **[7]**

b) Explain how a product manufactured by a laminated object manufacturing techniques. **[8]**

Unit - V

Q9) a) Explain the concept of Group technology along with their advantages. Also explain how it should be implemented in manufacturing company. **[8]**

b) State and explain the various types of boundary conditions used in Engineering problems. **[7]**

c) Write a note on cellular manufacturing. **[5]**

OR

Q10)a) Consider the bar shown fig no. 1. Determine the nodal displacement, element stresses and reactions –

Assume E = 200 X 10^9 N / mm^2.

A_1 = 150 mm^2 A_2 = 50 mm^2. **[12]**

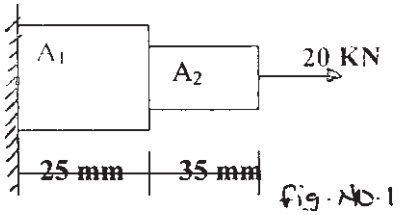


Fig. No. 1

b) Group - technology manufacturing cell can be classified into.

i) Single machine cell.

ii) Group - machine layout.

iii) Flow line design.

Draw simple line sketches to indicate above system and name their important elements of the system. **[8]**

Unit - VI

Q11)a) What is concurrent engineering? Explain its importance in today's manufacturing era. **[7]**

b) Explain IBM model with neat sketch and data, work flow integration in it. **[8]**

OR

Q12 a) Explain the scope of integration of CIM model of Digital Equipment Corporation (DEC). **[7]**

b) Explain the concept of "Design for Quality" and its effect on various stages of design and manufacturing. **[8]**

*****

Total No. of Questions : 12] **[Total No. of Pages :2**

P1144

[3864] - 241
B.E. (Electronics)
COMPUTER NETWORK
(2003 Course)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) Explain the following for LAN. **[10]**

i) Topologies.

ii) Wired & Wireless LAN.

iii) Hidden and Exposed station problem.

b) Distinguish between broadcast and point - to - point Communication. **[8]**

OR

Q2) a) Explain the design issues of any three. Layers of OSI - Model. **[10]**

b) Distinguish between OSI and TCP / IP. **[8]**

Q3) a) Compare the performance of various transmission media used for data communication. **[10]**

b) Explain GEO and MEO comparing their applications. **[6]**

OR

P.T.O.

Q4) a) Explain the network components. **[9]**

i) Switches.

ii) Modem.

iii) Hub.

b) Explain the various switching techniques used for data communication. **[7]**

Q5) a) State and explain the protocols for collision avoidance. **[10]**

b) Explain the sliding window protocols. **[6]**

OR

Q6) a) Explain the framming controls. **[6]**

b) Explain the frame - formate for IEEE 802.3. **[6]**

c) State and explain DQDB. **[4]**

SECTION - II

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

b) Explain how number of switches affects the routing. **[10]**

OR

Q8) a) Differentiate virtual circuit and datagram services. **[6]**

b) In a network using a token bucket scheme for traffic shaping. A new token is put into bucket every 5 - μ sec. What is the maximum sustainable net data rate (exclude the header bit). **[10]**

Q9) a) Describe the security issues for internet. **[8]**

b) State and explain the suitable protocol for 64 - bit data encryption and decryption. **[10]**

OR

Q10)a) Explain the DNS in detail. **[8]**

b) Explain the video on Demand. **[10]**

Q11)a) Compare IPV - 4 and IPV - 6. **[8]**

b) Explain : FTP and telnet protocol. **[8]**

OR

Q12)a) Explain IP Addressing. **[8]**

b) Explain SNMP & RARP. **[8]**

*****

Total No. of Questions : 12] **[Total No. of Pages :3**

P1145

[3864] - 261
B.E. (E & Tc)
COMPUTER NETWORKS
(2003 Course) (404214)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) Give the detailed comparison of OSI and TCP/IP Reference models for Networks. **[8]**

b) Explain how and when a Hub, Switch and Routers are used to expand a network. **[4]**

c) Explain Client Server Model. **[4]**

OR

Q2) a) Explain the TCP/IP model with protocols at each layer **[8]**

b) Explain in brief physical address, network address and port number. **[4]**

c) Differentiate between wired and Wireless network. **[4]**

Q3) a) What is dial up modem technology? Explain in brief V .32 and V .90 modem standards with data rates. **[8]**

b) What is the maximum data rate for a telephone line with BW 3.1 kHz and 30db SNR? **[4]**

c) Give the brief description of the application and limitations of the twisted pair cable, coaxial cable, fiber optic cable and microwaves. **[4]**

OR

P.T.O.

Q4) a) Explain the cable TV network. Also explain in brief how video signal and internet data can be send over the same cable. **[8]**

b) Explain bandwidth division in ADSL and the Discrete Multitone modulation technique used in ADSL. **[4]**

c) What is the maximum bit rate for a telephone line with BW 3500Hz and 30db SNR? **[4]**

Q5) a) Draw & Explain the HDLC & PPP frame format. **[8]**

b) Explain Go Back N ARQ protocol and Selective Repeat ARQ protocol. **[6]**

c) What is the framing concept in Data Link Layer?. Explain any one in details. **[4]**

OR

Q6) a) Consider a 64 Kbps geostationary satellite channel is used to send 512 byte data frames in one direction, with a very short acknowledgement coming back the other way. What is the maximum throughput for window size of 1, 7, 15 and 127 using sliding window protocol? **[8]**

b) Explain CSMA and CSMA/CD **[6]**

c) Explain 802.3 MAC frame. **[4]**

SECTION - II

Q7) a) In token bucket system calculate the required parameters in following two different cases.

i) Computer system on a 6Mbps network is regulated by a token bucket is filled at a rate of 2Mbps. it is initially filled to capacity 12Mbit . How long can the computer system transmit at full rate of 6Mbps.

ii) Network processing computer on a 10 Mbps network is regulated by a token bucket. It is initially filled to capacity 18Mbit. Time taken by Network processing computer to transmit at full rate of 10 Mbps is 3 sec. At what rate the token bucket should be filled up? **[8]**

b) Explain the link state routing in detail. **[4]**

c) What are different static routing algorithms? Explain any one in detail. **[4]**

OR

Q8) a) What are different transport service primitives? Also explain the five main categories of the transport layer functions. **[8]**

b) Explain QoS at transport layer. **[4]**

c) Define delay, congestion, throughput & jitter. **[4]**

Q9) a) Draw and explain basic encryption model. What is Transposition cipher? **[8]**

b) What is DNS? What are three main components of DNS? **[4]**

c) What is the function of SMTP and POP-3 protocols in Email system? **[4]**

OR

Q10)a) Compare public key and private key security algorithm. Explain RSA algorithm in detail. **[8]**

b) Write a short note on "WWW". **[4]**

c) What is HTML? How to write web page in HTML? **[4]**

Q11)a) Write short note on IPv6. **[6]**

b) Explain Telnet and FTP in detail wrt server & Client communication. **[6]**

c) Explain ARP and RARP in detail. **[6]**

OR

Q12)a) What are the different types of private IP addresses according to IANA? Give multicasting IP address range & write its applications? **[6]**

b) Explain ICMP, IGMP & SNMP briefly. **[6]**

c) Explain TFTP, BOOTP & RPC briefly. **[6]**

*****

Total No. of Questions : 12] **[Total No. of Pages :4**

P1147

[3864] - 263
B.E. (E & T/C)
ELECTRONIC PRODUCT DESIGN
(2003 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 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 bathtub curve for reliability indicating all its regions. Also explain how failures in different regions are reduced? **[8]**

b) What are the different types of transient suppressors? What is the selection criteria to select TVS for any application. **[8]**

c) Define shielding effectiveness & state on which factor it depends. **[2]**

OR

Q2) a) With the help of neat block schematic explain the different stages of an electronic product development. What will be the effect on development if any one of the stage is skipped? **[12]**

b) State the different basic ergonomics requirements for any product design. **[6]**

Q3) a) Explain the main factors to be considered for signal conductors in: **[8]**

i) High frequency amplifiers / oscillators.

ii) Low level signal amplifiers.

P.T.O.

b) Estimate the parasitic values for the following geometries of PC tracks:

i) Resistance of 150mm long copper track with 0.8mm width on standard 35 micron copper clad laminate. (Assume resistivity of Cu = 1.72×10^{-6} Ω - cm)

ii) Capacitance of two 0.15 cm wide tracks on opposite face of double sided PCB, each with a track length of 15 cm. The thickness of PCB laminate is 1.6 mm and relative permittivity is 4.2. **[8]**

OR

Q4) a) Discuss which factors should be carefully considered while designing high - speed boards? **[8]**

b) A twisted pair wire is used to carry a signal. The dimensions of twisted pair are as follows: **[8]**

i) Diameter of conductor = 0.02 inch.

ii) Separation between centers = 0.1 inch.

iii) Length of twisted pair = 2.0 inch.

iv) Relative dielectric constant of medium between wires $\in_r = 2.5$.

Calculate -

1) Characteristic impedance.

2) Propagation delay offered by wire.

Q5) a) What is signal integrity? What are the issues to be considered while ensuring signal integrity in high - speed design? **[8]**

b) Explain with justification & schematic arrangement the type of instrument that should be used to find faults in following circuits:

i) Combinational logic circuit producing glitches.

ii) Sequential logic circuit producing erratic o/p due to slow rising edge of CLK. **[8]**

OR

Q6) a) Explain the use and limitations of : **[8]**

i) Operating point analysis.

ii) AC analysis.

b) Compare simulation with prototyping. **[4]**

c) What are the capabilities of MSO. **[4]**

SECTION - II

Q7) a) With the help of real life microprocessor based product justify how all the recommended steps in a software development are implemented. **[8]**

b) A software is to be developed for ECG system. Explain the factors that determine the choice between assembly language and high level language. **[8]**

OR

Q8) a) Explain the different stages in software development at which bugs may enter. List the common bugs and how to overcome these bugs. **[8]**

b) What are the desirable features of : **[8]**

i) Assemblers.

ii) Cross Compilers.

Q9) a) What is CE Marking? What is the need of CE marking? What are the different objectives of CE marking? **[8]**

b) Specify with justification the choice of environmental tests to be carried out on following products: (any two) **[8]**

i) CNC Machine.

ii) Domestic washing machine.

iii) Vacuum cleaner.

OR

Q10)a) Explain the importance of shielded room when EMI/EMC tests are conducted. **[8]**

b) Explain the different temperature tests carried out on industrial product. Also indicate the various parameters related to each test. **[8]**

Q11)With suitable electronic product, draw/prepare the following documents: (any four) **[18]**

a) PCB fabrication drawing.

b) Wiring diagram.

c) Product test specifications.

d) Bill of material.

e) Interconnection diagram.

OR

Q12)a) Justify :

i) Engineering note book is foundation of any engineering work. **[9]**

ii) Documentation is integral part of any product.

iii) Bill of material is considered to be the basic product document.

b) Explain in detail (any two) **[9]**

i) User manual of TV.

ii) Application manual for a software product.

iii) Service manual of oscilloscope.

*****

Total No. of Questions : 12] **[Total No. of Pages :5**

P1154

[3864] - 273
B.E. (E & TC)
ADVANCED COMMUNICATION SYSTEMS (404225)
(2003 Course)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) With the help of appropriate schematic diagram describe operational principle of WDM. **[8]**

b) Explain in brief WDM standards. **[4]**

c) Find spectral bandwidth of optical fiber system when usable spectral band, $\Delta\lambda$=100 nm and centre wavelength is 1420 nm. **[4]**

OR

Q2) a) With help of block schematic explain basic star coupler for splitting or combining optical powers. **[6]**

b) With help of appropriate mathematical expressions, explain in brief following terms.

i) Splitting ratio.
ii) Excess loss.
iii) Insertion loss.
iv) Return. **[6]**

P.T.O.

c) For a 2 x 2 coupler, input power level is 300 microwatts. An output power at port 1 is, 100 microwatts, at port 2 is 95 microwatts and at port 3 is 5 nanowatts.

Find:

i) Coupling ratio (in %).

ii) Excess loss.

iii) Insertion loss.

iv) Return loss. **[4]**

Q3) a) Explain optical link power budget. **[4]**

b) A Long Haul optical fiber link is operating at 512 Mbps, with bit error rate 10^{-9}. A 1550 nm Laser Diode Transmitter launches optical power of + 3dBm. Two receivers with following sensitivity figures are available for installation on this link.

i) RecA ; -32 dBm.

ii) RecB; -51 dBm

Connectors at receiver and transmitters have a loss of 1 dB per connector. Splice loss is estimated to be 0.1 dB per splice per km. The optical link available has loss coefficient of 0.35 dB/km. A jumper cable, if desired to be used, is available in 1 mtr link length and has a loss coefficient of 0.0065 dB per mtr. However connectors need to be connected to this jumper. The system margin allowed is 5 dB and extinction ratio penalty is 2 dB. Find out optimum link length for both receivers. Prepare a power budget & represent it graphically. **[14]**

OR

Q4) Write short notes on:

a) Optical power meter. **[6]**

b) OTDR. **[12]**

Q5) a) Explain what the terms centrifugal and centripetal mean with regard to a satellite in orbit around the earth. Support your answer with the help of suitable diagram & mathematical equations. **[4]**

b) What are the differences, between a geosynchronous satellite and a geostationary satellite orbit? What is the period of a geostationary satellite? What is the name given to this orbital period? What is the velocity in km/sec of a geostationary satellite in its orbit? **[4]**

c) Satellite is in a 322 km high circular orbit. Determine:

i) The orbital angular velocity in radians per second.

ii) The orbital period in minutes.

iii) The orbital velocity in meters per second. **[8]**

OR

Q6) a) Describe in brief five major subsystems required on a satellite. **[8]**

b) A geostationary satellite provides service to a region which can be covered by the beam of an antenna on the satellite with a beam width of 1.8^{o}. The satellite carries transponders for Ku band and Ka band, with separate antennas for transmit and receive. For center frequencies of 14.0/11.5 GHz and 30.0/20.0 GHz. Determine the diameters of the four antennas on the satellite. **[8]**

SECTION - II

Q7) a) Define and explain the following terms. **[8]**

i) Pre - emphasis and De - emphasis.

ii) Sampling and Quantizing.

b) A standard NTSC signal has a base band video bandwidth of 4.2 MHz and is transmitted over the satellite link in an RF bandwidth of 30 MHz using Frequency Modulation and standard Pre - emphasis and De - emphasis. At the receiving earth station the C/N ratio in clear sky conditions is 15 dB. Calculate the base band Signal to Noise ratio for the video signal. Assume a de - emphasis improvement of 9 dB and a subjective improvement factor of 8 dB in the base band signal to noise ratio. **[8]**

OR

Q8) a) Define and explain the following terms. **[8]**

i) Bit and Symbol Error rate.

ii) Compression and Expansion.

b) A Single Channel Per Carrier - Frequency Modulation satellite link has an RF channel bandwidth of 36 kHz and a base band maximum frequency of 4 kHz. De - emphasis provides a subjective improvement in base band S/N ratio of 8 dB. Calculate the base band S/N ratio for the voice channel for a receiver C/N ratio of 15 dB. If the FM demodulator has an FM threshold at 8 dB, what is the link margin for this system? **[8]**

Q9) a) Derive step by step, the power received by an earth station P_r, from a satellite transmitter in terms of P_t - power transmitted, G_r, G_t - Gain of transmitting & receiving antenna, respectively, losses associated with transmitting & receiving antenna & attenuation in atmosphere. **[8]**

b) Explain the terms Noise temperature & Noise figure. State the relation between them. **[6]**

c) What is the significance of G/T ratio and explain how does it affect C/N ratio for satellite communication system. **[4]**

OR

Q10) A C -band earth station has an antenna with a transmit gain of 54 dB. The transmitter output power is set to 100 W at a frequency of 6.100 GHz. The signal is received by a satellite at a distance of 37,500 km by an antenna with a gain of 26 dB. The signal is then routed to a transponder with a noise temperature of 500 K, a bandwidth of 36 MHz, and a gain of 110 dB. signal is then retransmitted towards ground terminals with transmitting antenna with gain of 24.0 dB at frequency of 3.85 GHz. Calculate the following.

i) The path loss at 6.1 GHz.

ii) The power received at the satellite, in dBW,

iii) The noise power at the transponder input, in dBW,

iv) The C/N ratio, in dB, at the input of the transponder.

v) The carrier power, in dBW and in watts, at the transponder output.

vi) The power flux density received at ground terminals in dBW/mt^2.

[18]

Q11)a) Compare TDMA & CDMA techniques used in satellite communication system. **[8]**

b) Three identical earth stations access 54 MHz bandwidth transponder using FDMA. The saturated output of the transponder is 60 w and transponder is operated with 3 db output backoff. The bandwidth of earth station signals are .

Station A	25 MHz
Station B	15 MHz
Station C	10 MHz

Determine power level at the output of the transponder in dBw for each earth station signal.
(Assume the transponder is operating in its linear region) **[8]**

OR

Q12)a) Draw and explain various network architectures for a VSAT network. **[4]**

b) Draw & explain block diagram of DBS - TV receiver. **[6]**

c) A VSAT system operating at 14.02 GHz / 11.72 GHz is at a range of 38,500 Km. It uses BPSK, with transmitted bit rate of 256 Kbps. System noise temperature is 600dBK at transponder and Boltzman's constant $K = 1.38 * 10^{-23}$ J/K (-228.6 dBw/K/Hz). Calculate.

i) Noise power at the transponder input in dBm units.

ii) Free space uplink & downlink path loss. **[6]**

*****

P1155

[3864] - 274
B.E. (E & TC)
DIGITAL IMAGE PROCESSING
(2003 Course)

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

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if required.***

SECTION - I

Q1) a) Explain simultaneous contrast effect.

b) Distinguish between mask processing and point processing.

c) In case of 'BMP' image file explain the purpose of color table or color palette in the file header.

[18]

OR

Q2) a) Explain Mach band effect.

b) What is salt & pepper noise? How we can remove it.

c) Explain the types of pixel adjacency observed in an image.

[18]

Q3) a) Explain how arithmetic and logic operations can be used for image Enhancement. **[8]**

b) For the 5 X 5 image matrix given, find the output of. **[8]**

i) 3 X 3 mean filter.

ii) 3 X 3 median filter.

iii) 3 X 3 Laplacian filter

at the center (circled) location.

3	7	6	2	0
2	4	6	1	1
4	7	**(2)**	5	4
3	0	6	2	1
5	7	5	1	2

P.T.O.

OR

Q4) a) Explain power law transformation. What is the effect of this transformations on contrast of the image. **[8]**

b) What is unsharp masking. State its application. **[8]**

Q5) a) Give forward and inverse transform equations, properties and applications of two dimensional DCT. **[8]**

b) Calculate IDCT of the given 2 X 2, DCT coefficient matrix. Show that DCT transform preserves signal energy. **[8]**

$$\text{DCT matrix} = \begin{matrix} 2 & 0 \\ 0 & 0 \end{matrix}$$

OR

Q6) a) Explain edge base segmentation of color image. **[8]**

b) Give properties of KL transform. What are the applications of KL transform. **[8]**

SECTION - II

Q7) a) Define compression ratio. Explain how we can achieve image compression using run length coding. **[8]**

b) Explain baseline JPEG compression technique. **[8]**

OR

Q8) a) Describe the type of redundancies observed in an image. How we remove these redundancies to achieve compression. **[8]**

b) Explain bit plane coding. **[8]**

Q9) a) What is Hough transform. How it can be used for Boundary representation. **[8]**

b) Discuss the use of Laplacian mask for image segmentation. **[8]**

OR

Q10)a) With suitable example, explain how chain code can be used for boundary representation. How we can make this code starting point invariant? **[8]**

b) Explain morphological 'Thinning' operation. **[8]**

Q11) Write short notes on: **[18]**

a) Image fidelity criteria.

b) Image acquisition devices.

OR

Q12) a) Explain methods of estimating degradation function for image restoration. **[9]**

b) Explain character recognition using image processing. **[9]**

*****

Total No. of Questions : 12] **[Total No. of Pages :3**

P1156

[3864] - 275
B.E. (E & T/C)
BIO - MEDICAL ENGINEERING
(2003 Course) (404225)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) With neat diagram discuss important points of Man - Machine Interface in case of Bio medical instruments. **[10]**

b) Explain.

i) Accuracy.

ii) Precision.

iii) Repeatability. **[6]**

OR

Q2) a) With neat diagram explain material, properties and applications of.

i) Glass Micro Electrodes.

ii) Fiber optical temperature sensors. **[10]**

b) Explain.

i) Sensitivity.

ii) Linearity.

iii) Hysterisis. **[6]**

P.T.O.

Q3) a) With neat diagram explain the necessity principle of operation and features of. **[10]**

i) Bio - signal Amplifiers.

ii) Filters used in signal processing.

b) Lead I amplitude is 5 mm.

Lead II amplitude is 9 mm.

What is lead III amplitude?

If sensitivity is 50 mm / mV calculate aV_R, aV_L and aV_F. **[6]**

OR

Q4) a) Draw a neat diagram and explain different controls and indications on an ECG Machine. **[10]**

b) Cause, effects of Artifacts and remedies in bio - signal measurements. **[6]**

Q5) a) Explain how leakage currents are generated in bio medical instruments? What are the safety thresolds? **[8]**

b) Explain PC Based Intelligent Bio - medical system. **[10]**

OR

Q6) a) Draw and explain typical circuit to detect QRS signal and heart rate measurement. **[10]**

b) With a circuit diagram explain the operation of DC - Defibrillator **[8]**

SECTION - II

Q7) a) Explain Blood pH measurement. What is the range of pH in a healthy human being. **[8]**

b) With the help of diagram and material used the electrode operation to measure blood CO_2. **[8]**

OR

Q8) a) Compare operation of Flame photo meter with a conductivity meter with respect to different parameter measurements of blood. **[8]**

b) Write a detailed note on Autoanalyzer. **[8]**

Q9) a) Explain the working, features and applications of X-Y Recorder in Bio - medical field. **[8]**

b) Explain R' Triggered and Demand mode in case of a pace - maker. **[8]**

OR

Q10) a) Explain 21 Electrode EEG signal measurement method. **[8]**

b) Explain principle of blood cell counting using laser beam. **[8]**

Q11) a) Draw a diagram, explain different parts and working of an X - Ray tube. **[8]**

b) What are the wavelengths and types of Lasers used in Dermatology and skin treatment? **[10]**

OR

Q12) Write short notes on:

a) CO_2 Laser.

b) CT Scan Machine.

c) MRI Technique. **[18]**

*****

P1348

[3864] - 322
B.E. (Chemical)
CHEMICAL REACTION ENGINEERING - II
(2003 Course)

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

Instructions to the candidates:

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

SECTION - I

Q1) For the fluid particle reaction, derive the expression for unreacted core model, where chemical reaction is a rate controlling step. Draw a suitable sketch. **[16]**

OR

Q2) Two small samples of solids are introduced into a constant environment oven and kept there for 1hr under these conditions the 4mm particles are 58% converted, 2 mm particles are 87.5 % converted.

a) Find the rate controlling mechanism for the conversion of solids.

b) Find the time needed for complete conversion of 1mm particles in this oven. **[16]**

Q3) a) Discuss eight different types of interface behavior for a liquid phase reaction. **[8]**

b) CO_2 is to be removed from air by counter current contact with water at 25°C.

i) What are the relative resistances of gas and liquid films for this operation.

ii) What simplest form of equation would be used for tower design.

iii) For this removal operation would you expect reaction with absorption to be helpful and why.

Data : For CO_2 between air and water
kg.a = 80 mol / hr. lt.atm
kl.a = 25 / hr
H = 30 atm. lt / mol. **[10]**

P.T.O.

OR

Q4) Tower for straight absorption in which the concentration of undesirable impurity A is to be reduced from 0.1 % to 0.02 % by absorption in pure water. Find the height of tower required for counter current operation.

Data for packing used :

$K_{Ag}.a = 32000$ mol/hr. m^3 atm

$K_{Al}.a = 0.1$ /hr

The solubility of A in pure water is

$H_A = 125 \times 10^{-6}$ atm. m^3 / mol

$L = L' = 7 \times 10^5$ mol / hr . m^2

$G = G' = 1 \times 10^5$ mol / hr . m^2 at $\pi = 1$ atm

molar density of liquid is $C_T = 56000$ mol / m^3. **[18]**

Q5) a) Explain the determination of surface area using BET method. **[8]**

b) Explain different types of adsorption isotherms observed in case of heterogeneous catalytic chemical reactions. **[8]**

OR

Q6) a) The catalytic decomposition $A \longrightarrow R$ is taking place in a packed bed reactor filled with 2.4 mm pellets and using a very high recycle rate of product gases. The reaction data is given as.

t hr	0	2	4	6
X_A	0.75	0.64	0.52	0.39

Data : $D_e = 5 \times 10^{-10}$ m^3 / m - cat . sec

$\rho_s = 1500$ kg / m^3 - cat

$T' = 4000$ kg . s / m^3

Find kinetics of reaction and deactivation, when there exists strong pore diffusion resistance. **[8]**

b) Explain deactivated catalytic reaction. Discuss general design aspects. **[8]**

SECTION - II

Q7) a) Derive expression for concentration of reactant within a pore (Single catalytic) and obtain an expression for effectiveness factor. **[12]**

b) Write note on catalyst poisoning. **[6]**

OR

Q8) The catalytic reaction $A \longrightarrow 4R$ is studied in a plug flow reactor using various amounts of catalyst and 20 liter / hr of pure A feed at 3.2 atm and 117°C. The concentrations of A in the effluent stream is recorded for the various runs as follows.

Runs	1	2	3	4	5
Catalyst used, kg	0.020	0.040	0.080	0.120	0.160
$C_{A_{Out}}$ mol / lit	0.074	0.060	0.044	0.035	0.029

a) Find the rate equation for this reaction using integral method of analysis.

b) Find rate equation using differential method of analysis. **[18]**

Q9) Write a short note on :

a) Heat effects in packed bed reactor. **[8]**

b) Optimum two stage packed bed reactor. **[8]**

OR

Q10) Write a short note on :

a) Basket type experimental mixed reactor. **[8]**

b) Experimental Recycle reactor. **[8]**

Q11) Explain the design of stage adiabatic reactor. Draw a neat sketch and state all necessary equation. **[16]**

OR

Q12) Discuss in detail about the design of : **[16]**

a) Fluidized bed Reactor.

b) Fermentars.

*****

Total No. of Questions : 12] **[Total No. of Pages :4**

P1263

[3864] - 325
B.E. (Chemical)
ENVIRONMENTAL ENGINEERING
(2003 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) ***Figures to the right indicate full marks.***
4) ***Your answers will be valued as a whole.***
5) ***Use of logarithmic tables, slide ruler, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Compare the conventional and high efficiency cyclones in terms of efficiency and dimensions. **[4]**

b) State three adverse effects of population growth on environment. **[3]**

c) Write expressions for the following. **[3]**

i) Relationship between PPM and Volume concentration of pollutant.
ii) Mass - volume concentration.

d) Water is used in a spray chamber to treat standard air containing particles with a density of 1000 kg /m^3 . The flow rate of air is 120 m^3 /min and that of water is 0.3 m^3 / min. The average drop size is 1000 μm. The spray chamber has a diameter of 1m and a height of 3m. What is the overall collection efficiency of chamber if the average particle size is 2.5μm. The individual drop collection efficiency and the terminal velocity of drop are 9.0 % and 3.82 m/s respectively. **[8]**

OR

Q2) a) Classify air pollutants according to the source types. **[6]**

b) Give the source and harmful effects on the human health on the particulate pollution created by lead, nickel and mercury. **[6]**

c) Discuss source correction methods for control of pollution with suitable example. **[6]**

P.T.O.

Q3) a) What are the sources and the ambient air quality standard for NO_X pollution. **[2]**

b) Discuss how NO_X emission is controlled in the combustion operation by the following means : **[8]**

i) Low excess air.

ii) Two stage combustion.

iii) Flue gas circulation.

iv) Injection of water and steam.

c) i) Draw neat figure of settling chamber. **[3]**

ii) Write an expression to calculate the minimum particle size (dp min) that can be removed with 100% efficiency, explaining the notations. **[3]**

OR

Q4) a) List and compare different particulate emission control techniques. **[6]**

b) With neat sketches explain the working principle and equation of efficiency for. **[10]**

i) Electrostatic precipitator.

ii) Ventury scrubber.

Q5) Before the installation of an ESP, the stack gas of a power plant contained 6.0 gm particulates per m^3 of gas. The gas flow rate is 350 m^3 / min and the new precipitator can move 2500 kg particulates per day. **[16]**

a) What is the emission rate of particulates before and after pollution control in kg /day.

b) What is the efficiency of the ESP.

c) Will the new system meet an emission standard of 0.7 gm / m^3.

OR

Q6) A venturi scrubber is used to collect open hearth steel furnace fumes. The gas pressure drop is 50 cm of water gauge and the scrubber water pressure drop is 1 atm. The gas flow rate is 1500 m^3 / min and the water flow rate is 5000 lit / min estimate the fume collection efficiency of the scrubber. **[16]**

SECTION - II

Q7) a) Discuss how least squares method can be used to calculate the BOD constants for waste water. **[8]**

b) The following BOD results are obtained on a sample of untreated waste water at 20 ^{o}C **[8]**

t (days)	2	4	6	8	10
BOD, mg/l	11	18	22	24	26

i) Plot BOD Curve.

ii) Compute the reaction constant K and the ultimate first stage BOD using least square method.

OR

Q8) a) Define and explain the significance of the following parameters in activated sludge process. **[12]**

i) Volumetric loading rate (VL).

ii) Food to mass ratio (F/M).

iii) Hydraulic retention time.

iv) Mean cell residence time.

v) Recycle ratio.

vi) Mixed liquor suspended ratio.

b) Discuss how process control is carried out in activated sludge process. **[4]**

Q9) a) What are nine categories of water pollutant discuss in brief. **[8]**

b) Explain primary, secondary and tertiary treatment of waste water. **[8]**

OR

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

a) Oxygen sag curve and critical oxygen deficit.

b) Trickling filters.

c) Nitrogen removal in waste water treatment.

d) Chemical oxidation in disinfection of waste water.

Q11) A large stream has a rate of deoxigenation $K_1 = 0.23\ d^{-1}$ and the rate of reaeration $K_2 = 0.55 d^{-1}$. The dissolved oxygen (DO) deficit of the mixture of stream water and waste water at the point of reference, DO is 4.0 mg/L and the ultimate BOD of the waste water, Lu is 75 mg/L Calculate: **[18]**

a) Do deficit at a point one day distant from the point of reference.

b) Critical time.

c) Critical deficit.

OR

Q12) Write short notes on (any 3): **[18]**

a) Sludge treatment & disposal.

b) Membrane separation.

c) Incineration process in solid waste treatment.

d) Ion-exchange process in tertiary treatment of waste water.

*****

Total No. of Questions : 12] **[Total No. of Pages :3**

P1264

[3864] - 332
B.E. (Chemical)
PROJECT COSTING AND APPRAISAL
(2003 Course) (409350)

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

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two 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 ruler, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the concept of market survey and compare it with market research. **[8]**

b) What is meant by project evaluation? Explain. **[8]**

OR

Q2) a) Explain the terms in detail. **[8]**

i) Break even chart.

ii) Techno-economic feasibility.

b) What are the factors of production? **[8]**

Q3) a) Discuss the statement of income and expenditure in detail **[8]**

b) What is ratio analysis discuss various ratios. **[8]**

OR

Q4) a) Discuss with example the concept of journal and ledger entries. **[8]**

b) Explain the balance sheet with detailed analysis. **[8]**

P.T.O.

Q5) a) What are the basic factors involved in equipment costing? **[8]**

b) Explain the terms. **[10]**

i) Basic concept of cost.

ii) Cost Index.

OR

Q6) a) What are the different methods to calculate the cost of any equipment. **[8]**

b) Explain how the allocation of over heads of various cost elements is worked out. **[10]**

SECTION - II

Q7) a) Write in detail about various methods for raising the finance. **[8]**

b) Explain the terms : **[8]**

i) Fixed capital.

ii) Shares & debentures.

OR

Q8) Write note on any four. **[16]**

a) 6/10 factor rule.

b) Bonds.

c) Types of interest.

d) Shares & debentures.

e) Insurance.

Q9) a) Explain in detail cash flow diagram. **[8]**

b) Explain the terms : **[8]**

i) Capitalized cost.

ii) Types of taxes.

OR

Q10)a) Discuss the concept of marginal additional investment. **[8]**

b) Explain the concept of taxes and their types. **[8]**

Q11)a) Define depreciation and discuss its need and significance with limitations. **[8]**

b) Discuss various methods of determining depreciation charge. **[10]**

OR

Q12) The original value of a piece of equipment is Rs. 2200 completely installed and ready for use. Its salvage value is estimated to be Rs 200at the end of a service life estimated to be 10 years. Determine the asset (or book) value of the equipment at the end of 5 years using : **[18]**

a) Straight - line method.

b) Textbook declining - balance method.

c) Double declining - balance (200 percent)

*****

Total No. of Questions : 10] **[Total No. of Pages :3**

P1266

[3864] - 347

B.E. (Petroleum Engineering)

ENVIRONMENT, SAFETY AND HEALTH IN PETROLEUM INDUSTRY

(2003 Course) (Elective - I (3))

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

Instructions to the candidates:

1) ***Answer three questions from each section.***
2) ***Que 5 & Que 10 are compulsory.***
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 non programmable, electronic pocket calculator is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Discuss classification of Air pollutants in details. **[6]**

b) Discuss the impact of natural gas flaring on Environment in details. What are the majors taken to reduce the impact. **[6]**

c) What are the types of solids contained in waste water? Give detailed classification. **[6]**

OR

Q2) a) What is HAZOP Analysis? What are merits and demerits of HAZOP? **[6]**

b) Discuss hazardous materials used in petroleum industry. **[6]**

c) What are characteristics of produced waters in Petroleum industry? How are these harmful to environment? **[6]**

Q3) a) What are Indian and international produced water discharge standard with reference to petroleum industry. **[8]**

b) Write note on Accidental discharges of petroleum fields to environment. **[8]**

OR

P.T.O.

Q4) a) Explain any four important parameters used internationally to assess quality of produced wastewater. **[6]**

b) What are physical principles used in following equipment plate condensers, Gas / Air filtration units, hydro cyclones , skim pipes. **[6]**

c) Draw a simple flow sheet showing all aspects of produced water treatment. **[4]**

Q5) a) Design skimmer TPI std. tank followed by DGF & (20 mg / lit) skim pile. **[6]**

Input = 50,000 bbl / day

Maximum = 2 % oil

Oil = 40^{o} API & 20^{o} API

Water salinity = 35,000 ppm

Rainfall = 2 inch / hr

Deck area = 1000 m^2

(Finding $\mathbf{d}_m$ is discretionary)

b) What are equipment used for treatment of produced water. What are demerits of DGF equipment? **[6]**

c) What are methods to curb noise pollution from **[4]**

i) Seismic operations.

ii) Compressions.

SECTION - II

Q6) a) Write short note on OHSAS 18001 .**[4]**

b) What are Safety audits? What are benefits of safety audits? **[6]**

c) What are the procedures for onshore / offshore well abandonment? **[6]**

OR

Q7) a) Write short notes on : **[9]**

i) Work permit system.

ii) Root cause analysis.

iii) Job safety analysis.

b) What are objectives of well abandonment and plugging? **[3]**

c) Write merits and demerits of FMEA, JSA, what -if analysis. **[4]**

Q8) a) What are environmental aspects of oil field operations with respect to **[6]**

i) Seismic.

ii) Drilling.

iii) Production.

iv) Offshore.

b) What are the different types of primary & secondary treatment available for wastewater treatment? Write in details about any two treatments. **[6]**

c) What are effects of emulsification on the oil spills. **[6]**

OR

Q9) a) What are reactive / proactive system models of HSE management? **[6]**

b) What are common legislation applicable to oil field operations. **[6]**

c) What are effects of oil spills on aquatic life. **[6]**

Q10)a) Discuss "Biochemical Oxygen demand and Chemical Oxygen demand" in details. **[6]**

b) Define term "Sludge volume index" and give formula to calculate the same. Also , give values for good as well as poor sludge. **[6]**

c) Discuss factors affecting oil spill movements. **[4]**

*****

Total No. of Questions : 8] **[Total No. of Pages :3**

P1161

[3864] - 363
B.E. (Petrochemical)
REACTION ENGINEERING - II
(2003 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 two separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data wherever necessary.***
5) ***Use of electronic calculator is allowed.***

SECTION - I

Q1) A catalytic reaction A $\rightarrow$ 2 R is studied in a plug flow reactor using various amounts of catalyst and 20 lit/hr of pure A feed at 3.2 atm and 117°C. The following data is recorded.

Run No.	1	2	3	4	5
W kg cat	0.020	0.040	0.080	0.120	0.160
$C_{A\,out}$ mol/lit	0.074	0.060	0.044	0.035	0.029

Calculate weight of the catalyst needed for 55% conversion of A in

a) Isothermal fixed bed reactor and

b) An isothermal fluidized bed reactor both operating at 117°C for feed flow rate of 2000 m^3/hr and feed containing 40% of A at 7atm total pressure. **[18]**

Q2) a) Gas phase catalytic reaction A + B <=> 2 R takes place in the presence of an inert carrier material I that can get adsorbed on the catalyst surface without poisoning it. Find the rate expression when surface reaction controls. **[8]**

b) Discuss in brief a method each for measuring surface area and bulk voidage of a porous catalyst. **[8]**

P.T.O.

Q3) Laboratory data collected on a first order catalytic decomposition of A is over a particular catalyst is given below. Examine the data and give your estimates on. **[16]**

a) Relative proportion of external and internal mass transport resistances.

b) Maximum possible temperature difference across the gas film.

c) Maximum possible temperature difference along the pellet radius.

Data:

$d_p = 2.5$ mm $\quad D_e = 2.3 \times 10^{-5}$ m^3/hr m cat (effective diffusivity)

$k_{eff} = 0.55$ kcal/hr m cat ^oK (effective thermal conductivity)

$h = 90$ kcal/hr m^2 cat ^oK (heat transfer coefficient).

$K_g = 150$ m^3/hr m^2 cat (mass transfer coefficient)

$\Delta H_R = -100$ kcal/mol A (exothermic heat of reaction)

$C_{Ag} = 20$ mol/m^3 (bulk gas concentration of A)

$-r_{Aobs} = 5 \times 10^5$ mol/hr m^3 cat (observed rate).

Q4) a) A first order catalytic reaction 2 A $\rightarrow$ products is taking place along with slow first order (and concentration independent) deactivation of the catalyst. Derive relationship between concentration of A and time for the case of Batch solids Mixed constant flow of fluid. **[8]**

b) Describe in adequate detail different mechanisms of deactivation of catalysts. **[8]**

SECTION - II

Q5 Derive conversion-time relationships for a gas -solid non-catalytic reaction for the following control regimes: **[16]**

a) Constant size spherical solid particle with reaction controlling the overall rate.

b) Shrinking solid sphere (small enough in size to assume Stoke's regime) with external mass transport controlling the overall rate.

Q6) Explain with reference to gas-liquid reactions.

a) Design for minimum tower height in case of an instantaneous reaction between gas and liquid reactants. **[6]**

b) Suitability of employing liquid side reaction for mass transport enhancement in case of very high and very low Henry's constant systems. **[4]**

c) Choice of reactors for gas-liquid reactions. **[6]**

Q7) An impurity A in a gas is to be reduced from 3.5% to 1 ppm by counter current contact with an aqueous solvent containing a reactant B. The reaction $A + 2B \rightarrow$ product is almost instantaneous. What incoming concentration of B would give the minimum height of tower? What is this height? **[16]**

Data:

$K_{Ag}\, a = 10000$ mol/hr m^3 atm.

$K_{Al}\, a = K_{Bl}\, a = 0.65$/hr.

$L = 9 \times 10^5$ mol/hr m^2, $G = 2 \times 10^5$ mol/hr m^2

$H_A = 2.7 \times 10^{-3}$ atm m^3/mol.

Q8) Write notes.

a) Reactors for refinery conversions. **[6]**

b) Models for nonideal flow. **[6]**

c) Design of non-adiabatic fixed bed reactor. **[6]**

*****

Total No. of Questions : 12] **[Total No. of Pages :3**

P1267

[3864] - 382
B.E. (Polymer)
POLYMER PROCESSING OPERATIONS - I
(2003 Course)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) Explain method of calibration of outside diameter of pipe. **[4]**

b) With neat sketch, explain manufacturing of twisted rod by using. **[7]**

i) Twisting bushing. ii) Crossing belts on puller.

c) With neat sketch, explain tentering frame & even arrangement used to produce biaxially oriented film or sheet. **[7]**

OR

Q2) a) Enlist different downstream equipments used in the production of pipes & tubes. Discuss each in short. **[5]**

b) Draw neat sketch of processing line used to orient stripper sheet by rolling. **[5]**

c) Explain the effect of orientation on properties of material. Explain effect of ultra orientation or highly oriented extruded material on optical properties. **[5]**

d) Explain merits of gear pump / melt pump in case of extrusion. **[3]**

Q3) a) Discuss the effect of molecular structure on melt rheology with reference to blow molding. **[5]**

b) Explain how transparency is achieved in PET injection stretch blow molding. **[5]**

c) Draw cycle time chart & explain accumulator base or continuous extrusion blow molding process. **[6]**

P.T.O.

OR

Q4) a) Explain why water cooled blow pin helps in improving productivity. **[2]**

b) Bringout difference between convergent & divergent die & mandrel. **[4]**

c) Give benefit of parison programming. **[3]**

d) Draw neat sketch of any one parison die head assembly & explain rheological significances of individual part. **[7]**

Q5) a) Write in short about prototype molding & production mold with reference to thermoforming. **[4]**

b) Explain use and significances of plug used in thermoforming. **[4]**

c) List the mathematical model used to analyze stretching behaviour of sheet during thermoforming. **[4]**

d) Write in short about "texturing" with reference to thermoforming. **[4]**

OR

Q6) a) Explain following process with neat sketch (Any Two). **[6]**

i) Dripforming.

ii) Slipforming.

iii) Plug assist vacuum forming.

b) Explain difference in processing by thermoforming of crystalline & amorphous material. **[5]**

c) Give complete sequence of operation in the form of cycle time chart with reference to thermoforming. **[5]**

SECTION - II

Q7) a) Discuss any two processing problem encounter in processing of thermoset injection molding & suggest remedies for the same. **[5]**

b) Discuss following processing parameter in thermoset injection molding & compare it with thermoplastic injection molding. **[5]**

i) Injection rate.

ii) Screw speed & barrel temperature.

c) With neat sketch discuss different design & sequence of injection torpedo used in pattern making machine. Discuss how pattern is generated. **[8]**

OR

Q8) a) Explain the principle & different methology of injection molding over fabric, textile as used in automobile industries. **[8]**

b) Write in short about Reaction injection molding. **[5]**

c) Discuss principle of flow injection molding. **[5]**

Q9) a) Define compression molding? Explain the compression molding process & various stages of compression molding using cycle time diagram. **[6]**

b) Discuss the trouble shooting guide for compression molding process. **[8]**

c) List the different types of compression mold. **[2]**

OR

Q10)a) Explain in brief the various materials used in compression molding & processing parameters of different material used in compression molding. **[6]**

b) Discuss the factors to be considered while designing compression mold used in case of thermoset material. **[6]**

c) Explain in brief Intra - red heater used in compression molding with neat sketch. **[4]**

Q11)a) What are different types of molds used in transfer molding? Explain any one mold with neatsketch. **[6]**

b) Discuss in brief processing of sheet molding compound using transfer molding. **[6]**

c) Differentiate between integral pot type and plunger type transfer molding process. **[4]**

OR

Q12)a) Explain the transfer molding process with reference to pressure - temperature diagram. **[6]**

b) Discuss the effect of following processing parameter on quality of transfer molding (Any Four). **[8]**

i) Amount of charge .

ii) Molding pressure.

iii) Clamping speed.

iv) Mold temperature.

v) Charge temperature.

vi) Cycle time.

c) List any four product manufactured by transfer molding process. **[2]**

*****

Total No. of Questions : 12] **[Total No. of Pages : 5**

P 1031

[3864] - 120

B.E. (Civil)

TRANSPORTATION ENGG. - II

(2003 Course) (401009)

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

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 from Section I and 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, electronic pocket non-programmable calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) State the objects of Highway planning. Discuss the classification of highways according to 3rd 20 year road plan. **[2 + 4 = 6]**

b) Write an explanatory note on Highway - planning surveys. **[4]**

c) Discuss in brief about Road side interview and Return post card methods in context of O & D studies. **[2 + 2 = 4]**

d) Write a short note on "Fly overs" as a sort of remedial measure to reduce the traffic jam with reasons. **[3]**

OR

Q2) a) Describe the following term w.r.t. traffic engineering. **[4 x 2 = 8]**

i) Road user characteristics

ii) Traffic signals

iii) Spot speed studies

iv) Intersections.

b) Discuss with suitable examples for the preparation of "Master plan" during highway development programme, undertaken by you. **[5]**

c) Draw illustrative sketches of any 2 types of road patterns. Also state the significance of each. **[2 + 2 = 4]**

P.T.O.

Q3) a) Discuss the various "other factors" which control the alignment besides to obligatory points. **[4]**

b) Carry out the analysis of stopping sight distance by stating also the meanings of important key words. **[5]**

c) Determine the design length of transition curve and the shift from the following data given. **[8]**

V = Design speed = 65 kph.

R = Radius of circular curve = 220 mtr.

C = Allowable rate of change of centrifugal acceleration $C = \frac{80}{70 + V}$ m/sec^3.

Allowable rate of introduction of super elevation assuming that the pavement rotated about the centreline = 1 in 150.

Pavement width including extra Widening = 7.50 mtr.

OR

Q4) a) Discuss the importance of Highway drainage and also, state how these are achieved? **[4]**

b) With the aid of a neat sketch, carryout the analysis of super elevation on horizontal curves. **[5]**

c) Determine the safe overtaking sight distance for both ONE WAY traffic and TWO WAY traffic sitations, for a design speed of 96 kph. Assume all other data suitably as per IRC recommendations only. **[8]**

Q5) a) State clearly the requirements of design of pavements. Also discuss the various factors. **[2 + 2 = 4]**

b) Briefly narrate the construction procedure of Water Bound Macadam (WBM) roads. **[4]**

c) Describe the terms :

i) Radius of relative stiffness.

ii) Radius of resisting section.

Also, state the formula you use for these. **[2 + 2 = 4]**

d) Draw an illustrative sketches of the following

i) Aggregate crushing value test apparatus with accessories.

ii) Sofeting point test apparatus with accessory used to carryout this test on Bitumen sample. **[2 + 2 = 4]**

OR

Q6) a) State clearly the IRC recommendations for the CBR method of design. **[4]**

b) Explain these terms
   i) ESWL.
   ii) Modulus of Subgrade reaction.
   Also, state the significance of each. **[2 + 2 = 4]**

c) Write an explanatory notes on
   i) Temperature stresses in case of C.C. Pavements.
   ii) Joints in C.C. pavements. **[2 + 2 = 4]**

d) State the validity of the test results which you have obtained in the Laboratory when the tests performed on aggregate and Bitumen samples w.r.t. the following
   i) Impact value.
   ii) Elongation and Flakiness index.
   iii) Softening point.
   iv) Flash & Fire points. **[1 each = 4]**

SECTION - II

Q7) a) Explain the following terms :
   i) Hangars and Aprons.
   ii) Aircraft weights.
   iii) Minimum Cirding Radius.
   iv) Calm period. **[4 x 1 $\frac{1}{2}$ = 6]**

b) Write a short note on :
   i) Airport capacity.
   ii) Wind Rose type II. **[3 + 3 = 6]**

c) Clearly define the term "effective gradient" and hence determine the effective gradient of runway from the following data, which refers to the proposed longitudinal section of runway. You may take 1 metric chain = 20 m.
   Also, draw the sketch of longitudinal section of runway by stating the total length. **[1 + 4 = 5]**

End to End of Runway	Gradient
0.0 to 5.0 chains	+1.0%
5.0 to 15.0 "	–1.0%
15.0 to 30.0 "	+0.8%
30.0 to 40.0 "	+0.2%

OR

Q8) a) Explain the following terms
i) Minimum Turning Radius.
ii) Cross wind component.
iii) Separation clearance.
Draw suitable sketches also. **[3 x 2 = 6]**

b) Give detail classification of Airports. **[5]**

c) The length of Runway under standard conditions is 1620 mtr. The Airport site has an elevation of 270 mtr above mean sea level. Its reference temperature is 32.90°C. If the runway is to be constructed with an effective gradient of 0.20%, Determine the corrected runway length. Also, carryout the usual checks as per ICAO. Report the correct length to the nearest 10 mtr. **[6]**

Q9) a) Draw an illustrative sketch of R.C.C. bridge showing various elements w.r.t.
i) Plan.
ii) Sectional Elevation.
iii) Sideview. **[$1\frac{1}{2}$ + 2 + $1\frac{1}{2}$ = 5]**

b) Write short note on :
i) IRC class AA loading.
ii) Ill effects of Scour. **[2 + 2 = 4]**

c) Draw neat sketches of the following. Also, label the parts.
i) Column bents.
ii) Abutment for an arch bridge. **[2 + 2 = 4]**

d) The approximate costs of one pier and one super-structure span for a multiple span bridge for various lengths of span are given under. Determine the economic span. **[4]**

Span (m)	Cost of one pier (Rs.)	Cost of one super structure (Rs.)
10	25000	7000
15	28000	13815
20	32500	31000
25	33700	36000
30	34800	41400

OR

Q10)a) How do you estimate the design discharge by Indirect method? Explain. **[5]**

b) Describe the following terms
i) Economic span.
ii) Height of afflux.
iii) Lacey's silt factor.
iv) Water way of a bridge. **[4 x 1 = 4]**

c) The normal velocity of flow in a river is 1.50 m/sec. The normal and the artificial waterway under the bridge respectively are 8000 m^2 and 7000 m^2. Determine the height of afflux using Molesworth's formula. Also find the increase in velocity due to afflux. Assume g = 9.81 m/sec/sec. **[4]**

d) Enlist and describe in brief the different loads that are acting on an abuttment of a bridge. **[4]**

Q11) a) Draw an illustrative sketches of the following :

i) Cable stayed bridges.
ii) Cut boat bridges.
iii) Knuckle bearings.
iv) Bascule bridges. **[4 x 1 $\frac{1}{2}$ = 6]**

b) Write a detail note on Maintenance of bridges. **[4]**

c) Discuss the various types of culverts w.r.t. their suitability of use in the field. **[3]**

d) Differentiate between

i) Cantilever bridges and Bascule bridges.
ii) Fixed bearing and Free bearing.
iii) Movable span and Fixed span bridges. **[3]**

OR

Q12) a) Differentiate between

i) Rocker and Roller bearing & Expansion bearing.
ii) Slab culvert and Box culvert.
iii) Suspension and cable stayed bridges. **[3]**

b) Discuss the various types of movable span super structures with respect to their suitability only. **[3]**

c) Write a detail note on the different errection methods employed during construction of bridges. **[4]**

d) Draw an illustrative sketches of the following : **[4 x 1 $\frac{1}{2}$ = 6]**

i) Flying bridges.
ii) Scuppers.
iii) Elastomeric bearing.
iv) Pipe culvert.

Total No. of Questions :12] **[Total No. of Pages :3**

P1516 **[3864]-137**

B.E. (Mechanical)

ALTERNATE ENERGY SOURCES

(Elective - I) (2003 Course)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) Presently more use of non conventional sources of energy is preferred and advised. Why? Discuss its merits and demerits in detail. **[10]**

b) What is solar constant? Intensity of solar energy received on earth surface is much less than the intensity with which it is beamed from surface of sun. Discuss various possible factors responsible for same. **[8]**

OR

Q2) a) Define following terms with neat sketch.

i) Zenith angle ii) Solar azimuth angle iii) Surface azimuth angle iv) The hour angle v) Declination. **[10]**

b) Determine the local solar time and declination δ at a location 23^{o} 15'N, longitude 77^{o} 30' E at 12.30' IST on June 19. Equation of time correction is given from standard chart is (-1'01") Indian standard time is based on 82. 50^{o}E. **[8]**

Q3) a) What is insulation? Discuss working of following instructions with neat sketches.

i) Pyrometer ii) Pyrheliometer iii) Sunshine meter. **[10]**

P.T.O.

b) What is air mass? Discuss in brief the spectral distribution of extra terrestrial solar radiation graphically? What are limitations of solar energy? **[6]**

OR

Q4) Calculate the angle made by beam radiation with the normal to a flat collector on December 1at 9.00 A. M Solar time for location at 28^{o} 35' N. The collector is tilted at angle of latitude plus 10^{o} with the horizontal and is pointing due south. **[16]**

Q5) a) What is solar still? Explain anyone type with neat sketch. Mention its uses. **[8]**

b) Solar drying is superior to traditional drying, explain in brief. Draw neat sketch of forced circulation dryer, explain its working. **[8]**

OR

Q6) a) What is solar pond? How density gradient is maintained in it. Explain its working and method of energy extraction from it. **[8]**

b) Advantages and limitations of concentrating solar collector over flat plate type collector. Define aperture, concentration ratio and acceptance angle for concentrating collectors. **[8]**

SECTION - II

Q7) a) Explain mechanism of direct conversion of solar energy into electric current in case of photovoltaic cells. Explain its advantages, disadvantages and various applications. **[10]**

b) Discuss various types of wind machines with performance characteristics and limitations. Which type of wind you will recommend for commercial use. **[8]**

OR

Q8) a) What is fuel cell? Which may this is different from storage battery? Explain working of any one type of fuel cell. Mention its merits and demerits with future scope. **[10]**

b) Explain the limitations of tidal power. Why it is not very popular method for non conventional sources of energy. **[8]**

Q9) a) Explain the basic principle of OTEC. Describe open cycle OTEC system. **[8]**

b) How power is produced from liquid dominated geothermal power plant. **[8]**

OR

Q10) a) Describe the important factors in selection of site for wind power generation. What is cut in speed and furling speed in case of wind considered while operating wind mill? **[8]**

b) How cooling of space is done in summer by passive method using solar energy. **[8]**

Q11) a) Draw schematic diagram of downdraft grassfire. Describe various zones with temperature and chemical reaction taking place in each zone. **[10]**

b) What modifications are necessary if biogas is used in IC engine as a fuel? **[6]**

OR

Q12) a) Explain with neat sketch the working of biogas plant. Discuss important factors affecting the working of plant. How reaction is imitated in new biogas plant. **[10]**

b) Explain the difference in construction of Dome type and fixed dome type of biogas plant. Advantages and disadvantages of each. **[6]**

■■■

Total No. of Questions : 12] **[Total No. of Pages : 2**

P1355 **[3864]-157**

B.E. (Mechanical Sandwich)

COMPUTATIONAL FLUID DYNAMICS

(Elective) (2003 Course)

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

Instructions to the candidates:

1) ***Assume suitable data, if required.***
2) ***Figures to the right indicate full marks.***
3) ***Use of calculators is allowed.***

SECTION - I

Q1) a) What is CFD? Explain CFD methodology by giving steps in a CFD simulation. **[10]**

b) What is substantial Derivative, explain its physical meaning? **[6]**

OR

Q2) a) Explain impact of CFD in today's engineering activity by giving minimum four practical examples. **[8]**

b) What is divergence of velocity? Explain its physical meaning. **[8]**

Q3) a) Solve the system of equations using Runge-Kutta method $\frac{dy}{dx} = x + yz, \frac{dz}{dx} = x^2 - y^2$ subject to $x_0 = 0, y_0 = 1 \quad z_0 = ½$ to find y&z at $x = 0.2$ taking $h = 0.2$. **[8]**

b) Explain adaptive step size in Runge-Kutta method. **[8]**

OR

Q4) List full procedure for the solution of Blasius equation using shooting method. **[16]**

Q5) Discuss in detail explicit and implicit approaches for obtaining solution in CFD. Also discuss advantages and disadvantages of these methods over each other. **[18]**

P.T.O.

OR

Q6) a) Identify and classify the following PDE's into elliptic, parabolic, hyperbolic equations. Give one practical example for each type. **[12]**

i) $\frac{\partial T}{\partial t} = \alpha \frac{\partial^2 T}{\partial x^2}$ ii) $\frac{\partial^2 \phi}{\partial x^2} + \frac{\partial^2 \phi}{\partial y^2} = 0$ iii) $\frac{\partial u}{\partial t} + c\frac{\partial u}{\partial x} = 0$

b) List any two types of errors encountered in numerical methods. Indicate how the error occur. **[6]**

SECTION - II

Q7) Develop the solution algorithm for one dimensional transient heat conduction problem based on; **[16]**

a) Implicit Scheme.

b) Explicit Scheme.

OR

Q8) Develop the solution methodology for thermally developing flow inside a two dimensional channel. Assume hydrodynamically fully developed flow. **[16]**

Q9) Develop CFD solution algorithm for subsonic-supersonic isentropic nozzle flow. **[18]**

OR

Q10) Write notes on; **[18]**

a) Stability criteria.

b) Mac-cormack method.

c) Quasi-one dimensional flow.

Q11) a) Explain in detail the philosophy of pressure correction method. **[8]**

b) Write Navier-stokes equations for in compressible flow and explain each term. **[8]**

OR

Q12) Explain finite volume method for CFD. **[16]**

■■■

Total No. of Questions :12] **[Total No. of Pages : 3**

P1046 [3864]-176

B.E.(Prod.)

POWDER METALLURGY

(Elective - I) (2003 Course) (411085)

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

Instructions to the candidates:

1) ***Answer Three questions from Section I and Three questions from SectionII.***
2) ***Answers to the two 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 in brief some of the modern developments in powder production, compacting & sintering. **[8]**

b) What is meant by metal powder characteristics? Discuss the chemical,physical, & technological characteristics of metal powders.**[8]**

OR

Q2) a) What is meant by size distribution of metal powders? Discuss its importance in field of P/M. **[8]**

b) Describe briefly - Internal porosity of powders, compression ratio, flow rate. **[8]**

Q3) a) Explain the role of different factors on the degree of compaction of a metal powder. To what extent can the theoretical density be approached by compacting. **[9]**

b) What are the factors that are required to be considered for a die design? Does the die design impose any limitation on the compacting load?**[9]**

OR

P.T.O.

Q4) a) What are the advantages of isostatic pressing? Describe the wet & dry bag tooling methods of isostatic pressing. **[8]**

b) Describe the sizing & coining. **[5]**

c) Describe briefly the role of lubricants. **[5]**

Q5) a) What specific role is played by diffusion during sintering of a metal powder compact? How it is different from diffusion in metals attained by casting? **[8]**

b) Explain, "It is necessary to have three distinct zones in a continuous sintering furnace". **[8]**

OR

Q6) a) What physical changes take place during sintering? Discuss the role of recrystallisation & grain growth in sintering **[8]**

b) Discuss in brief about hot & cold pressing. **[8]**

SECTION - II

Q7) a) Explain powder forging stating clearly the difference between powder forging & conventional fasing. **[8]**

b) Explain the advantages, disadvantages & applications of Hot isostatic pressing. **[8]**

OR

Q8) Write short note on- **[16]**

i) Role of polymer blends

ii) Roll compaction

iii) P/M forging

iv) Hot compaction

Q9) a) What is self lubricating action? Describe the different steps involved in producing porous bearings. **[8]**

b) Critically discuss the shaping methods used for production of cemented carbide parts. Also describe in brief the applications of cemented carbide tools. **[8]**

OR

Q10) With the help of a neat flow chart describe production of following, depicting all important features- **[16]**

i) Ferrites

ii) Friction materials

Q11) a) Why has machining of P/M parts become a necessity? outline the general rules you would adopt for machining of the sintered parts. **[9]**

b) Write an essay on the surface treatments of sintered P/M parts. **[9]**

OR

Q12) Write short note on (any three): **[18]**

i) Production of nano-composites by P/M.

ii) Heat treatment of P/M parts.

iii) Near net shape production of P/M parts.

iv) Energy conservation in P/M.

■■■

Total No. of Questions :12] **[Total No. of Pages : 3**

P1048 [3864]-178

B.E. (Production & Industrial Engg.)

MATERIAL HANDLING TECHNOLOGY AND EQUIPMENT DESIGN

(2003 Course) (Elective -I) (411085) (Theory)

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 table, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Unit - I

Q1) a) Explain various steps (approach) for solving material handling problem. **[8]**

b) Explain basic storage methods and equipments used for storing. **[8]**

OR

Q2) a) Explain 'Unite load' concept. What are the different types of material handling equipment which can handle a unit load. **[8]**

b) Explain various factors are to be considered while selecting M.H.equipment. **[8]**

Unit - II

Q3) a) Explain various principles of material handling. **[8]**

b) Explain 'Area restricted' M.H. Equipments and state their applications.

P.T.O.

OR

[8]

Q4) a) Explain unrestricted type of material handling system. **[8]**

b) Explain the gravity principle of material handling system with illustration. **[8]**

Unit - III

Q5) a) Explain Kwo's principle in the design of closed loop recirculating conveyor system with one loading station and one unloading station. **[10]**

b) Explain drag and flight conveyor system with neat sketch. State their applications. **[8]**

OR

Q6) Write short notes on: **[18]**

a) Chutes

b) Industrial trucks.

c) Types of crane.

SECTION - II

Unit -IV

Q7) a) Explain the different factors are to be consider during automation in material handling system. **[8]**

b) Explain the applications of actuators used in material handling system. **[8]**

OR

Q8) a) Explain robot assisted material handling system. **[8]**

b) Explain hydraulic, pneumatic and electrical drive used to operate material handling system. **[8]**

Unit -V

Q9) a) An automated guide vehicle system has an average travel distance per delivery = 500 ft. and average empty travel distance = 300 ft. The system must take a total of 75 deliveries/h. The load and unload times are both 0.5 min. and the speed of the vechicles = 150 ft/min. The

traffic factor for the system = 0.85. **[8]**

Determine

i) The average total time per delivery, The handling system efficiency and the average number of deliveries per hour for a vehicle.

ii) How many vehicles are required to satisfy the 75 deliveries/h.

b) Explain various types of AS/RS system. **[8]**

OR

Q10) a) The operation of unit load AS/RS that uses on S/R machines for each aisle of the system. The length of the storage aisle is 400 ft. and its height is 100 ft. The horizontal and vertical speeds of the S/R machines are 250 ft/min. and 80 ft/min. respectively. The S/R machine requires 0.6 min. to accomplish a P&D operation. Determine the single command and duel command cycle times for the storage system. **[8]**

b) Explain vehicle guidance technology of AGV'S. **[8]**

Unit -VI

Q11) a) What are the safety precautions to be taken during operating material handling equipment? **[6]**

b) What is machine vision system? Explain how it can be used in material handling system. **[6]**

c) Explain role of computer in different areas of material handling system. **[6]**

OR

Q12) Write short notes on: **[18]**

a) ADC technology.

b) Bar code printing technology.

c) Productivity improvement with the help of material handling.

■■■

Total No. of Questions : 12] **[Total No. of Pages : 3**

P 1052

[3864] - 182

B.E. (Production Engg.)

ROBOTICS

(2003 Course) (Elective - II) (411090)

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

Instructions to the candidates:

1) ***Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 from Section I and 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.***

SECTION - I

Q1) a) What is the basic structure of Industrial Robot? What are advantages of this structure for its applications? **[8]**

b) Explain the six degrees of freedom associated with the manipulator. **[8]**

OR

Q2) a) Explain classification of 'Robots' with neat sketches of their work volumes. **[12]**

b) How are accuracy and repeatability of any robot decided? **[4]**

Q3) a) For a pick and place type of robot, the link parameters table is given below :

i	α_{i-1}	a_{i-1}	d_i	θ_i
1	0	0	2	0^o
2	–90	0	0	30^o
3	0	5	2	90^o

Determine the location of the end point of the link 3 with respect to the base. **[8]**

b) Explain the forward kinematics associated with planar 3R manipulator. **[8]**

OR

P.T.O.

Q4) a) For a pick and place type of robot, the link parameters table is given below :

i	α_{i-1}	a_{i-1}	d_i	θ_i
1	0	0	0	60^o
2	-90^o	0	3	-90^o
3	0	2	0	45^o

Determine the location of the end point of the link 3 with respect to the base. **[8]**

b) Explain the Inverse kinematics associated with planar 3R manipulator. **[8]**

Q5) a) Describe Force and Torque sensors used in robot. **[8]**

b) Explain the concept of low vision and high vision associated with robot vision system. **[10]**

OR

Q6) a) With neat sketch explain any two electro-mechanically actuated grippers. **[8]**

b) The following data represent a 8X8 array of pixel. Each element in array indicates the gray level of pixel.

10	17	17	19	19	17	19	12
13	17	18	19	19	19	18	13
14	15	11	19	19	15	10	14
13	10	11	2	20	11	11	13
12	12	12	2	21	12	11	12
11	12	12	19	19	12	10	12
12	18	18	18	20	18	19	11
12	19	19	18	22	20	19	12

Convert it into black and white image. **[10]**

SECTION - II

Q7) a) Explain the programming methods applied for robots. **[10]**

b) Describe the concept of Machine Intelligence. **[6]**

OR

Q8) a) Explain 'WAIT', 'DELAY', 'SIGNAL', 'DEPART' commands. **[8]**

b) Describe the structure of any robot programming language with example. **[8]**

Q9) a) With neat sketch explain interfacing of robot with PC. **[8]**

b) Describe the following applications of robot : **[8]**

i) Spray painting.

ii) Machine loading and unloading.

OR

Q10)a) What is handshaking? Explain software handshaking of robot. **[8]**

b) How will you check economic viability of industrial robot? **[8]**

Q11)Write a note on : **[18]**

a) One legged Robot.

b) Distance controlled robots.

OR

Q12)Write a note on : **[18]**

a) Underwater robots.

b) Handling radioactive materials with robots.

Total No. of Questions : 12] **[Total No. of Pages : 2**

P 1053 **[3864] - 184**

B.E. (Production)

ADVANCED MATERIAL PROCESSING

(1997 & 2003 Course) (Elective - II)

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

Instructions to the candidates:

1) ***Attempt one question from each Unit in 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.***

SECTION - I

Unit - I

Q1) a) Explain with neat sketches the development in geometry for any one cutting tool for higher productivity? **[8]**

b) Explain machine tool requirements for high speed machining. **[8]**

OR

Q2) a) Explain with suitable example an ultrasonic vibration assested machining along with advantages and limitations. **[8]**

b) Explain with neat sketch the principle behind interrupted grinding. State the factors affecting on MRR & surface finish in stock removal grinding process. **[8]**

Unit - II

Q3) a) Explain the principle and factors affecting on MRR & surface finish for ultrasonic impact grinding. **[8]**

b) Explain with neat sketches the defect seen in product if it is machined by chemical milling. **[8]**

OR

Q4) a) Explain RC circuit in EDM. Compair this circuit with other type of circuit used in EDM for discharging & charging of dielectric fluid. **[8]**

b) Explain with neat sketch the thermal energy method. **[8]**

Unit - III

Q5) a) What is powder forging? Explain the factors affecting the quality of forged part by powder forging. **[9]**

b) Explain different motion for die in orbital forging. State advantages limitation and application of orbital forging. **[9]**

P.T.O.

OR

Q6) a) Write a note on : **[10]**

i) Ring Rolling.

ii) Magneto forging.

b) Suggest & explain a suitable forming process to manufacture a container to carry liquid or a gas. **[8]**

SECTION - II

Unit - IV

Q7) a) Explain direct chill process with suitable sketch. **[8]**

b) Explain with neat sketch injection casting process along with advantages, limitation, application. **[8]**

OR

Q8) a) Explain factors affecting the quality of casted parts by continuous casting process. **[8]**

b) Explain how dish of brass material is made with sketch. **[8]**

Unit - V

Q9) a) Explain the different joining methods used in joining plastic, glass. **[8]**

b) Suggest and explain suitable process for making plastic sheet. **[8]**

OR

Q10)a) With neat sketch explain how mug of plastic material is manufactured. **[8]**

b) Explain how flower plot of ceramic material is manufactured with sketch. **[8]**

Unit - VI

Q11)a) Write a note on : **[10]**

i) LIGA Process

ii) Importance of paint coating.

b) What is ceramic coating? State the selection criteria for it. List the different coating materials and methods. **[8]**

OR

Q12)a) Explain the steps in MEMS. **[8]**

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

i) PVD as a coating process.

ii) Importance of Nano surface machining & factors affecting on it.

Total No. of Questions : 12] **[Total No. of Pages : 2**

P 1054 **[3864] - 185**

B.E. (Production Engg.)

ADVANCED PRODUCTION TECHNOLOGY

(2003 Course) (Elective - II)

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

Instructions to the candidates:

1) ***Attempt one question of each unit from Section - I & Section - II.***
2) ***Answer to the questions should be written in separate books.***
3) ***Draw neat diagram wherever necessary.***
4) ***Assume suitable data if required.***

SECTION - I

Unit - I

Q1) a) What is KANBAN? Explain the frame work of the information system supporting it. **[8]**

b) Explain the basic frame work of Toyota production system. **[8]**

OR

Q2) a) Differentiate Toyota production system and other production system. **[8]**

b) Explain the philosophy of Toyota production system. **[8]**

Unit - II

Q3) a) What is benchmarking? State the findings with suitable example. **[8]**

b) What is performance metrics of manufacturing? Explain how performance metrics is prepared. **[8]**

OR

Q4) a) Explain the role of business process re-engineering in today's manufacturing era. **[8]**

b) What is SMED? Explain it with suitable example. **[8]**

Unit - III

Q5) a) What is productivity? Explain different types of factor productivity indices. **[9]**

b) Explain with suitable example how you will improve the productivity in medium scale industry. **[9]**

OR

P.T.O.

Q6) a) Explain Productivity measurement models. **[9]**

b) Explain the different advanced techniques for productivity improvements. **[9]**

SECTION - II

Unit - IV

Q7) a) Explain the process interaction approach in simulation. **[8]**

b) Explain the role of an Artificial Intelligence in manufacturing. **[8]**

OR

Q8) a) What is mean by expert system? Explain its importance in today's manufacturing era. **[8]**

b) Explain the different terminology used in simulation and need of simulation. **[8]**

Unit - V

Q9) a) What is System design? Explain the steps in system design. **[9]**

b) What is feasibility analysis? Explain the importance of it with suitable example. **[9]**

OR

Q10)a) Explain the concept of product design based on surface topology, dimensional tolerance, customer references. **[9]**

b) Explain the concept of functional analysis of design with suitable example. **[9]**

Unit - VI

Q11)a) Define the technology? Explain different levels of it. **[8]**

b) State the different factors for surviving the industry in today's globalisation. **[8]**

OR

Q12)a) Compare technology management with other management. **[8]**

b) Explain with suitable example the effect of change in technology on industry. **[8]**

Total No. of Questions : 12] **[Total No. of Pages : 4**

P 1055

[3864] - 192

B.E. (Production S/W Engg.)

MECHATRONICS & ROBOTICS

(2003 Course) (411121)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) Represent and explain in detail the following terms of a mechanical system; using basic building blocks : **[9]**

i) Stiffness

ii) Friction and

iii) Inertia.

b) Compare and Contrast the control system for the domestic central heating system involving a bimetallic thermostat and that involving a microprocessor. **[9]**

OR

Q2) a) Differentiate between Low-pass Passive Filter and Low-pass Active Filter. **[2]**

b) Discuss the following with neat sketches : **[16]**

i) Instrumentation amplifier

ii) Optoisolators

iii) Comparators

iv) Pulse amplitude modulation.

Q3) a) Draw a neat sketch of 8085 internal architecture. **[4]**

b) Explain the following : **[12]**

i) Karnaugh maps

ii) Digital Comparator

iii) D flip-flop.

P.T.O.

OR

Q4) a) Draw a neat block diagram of Microcomputer and explain each block. **[10]**

b) Explain the functions of : **[6]**

i) Program Counter

ii) Stack Pointer

iii) General Registers.

Q5) a) What do you understand by 'Assembly Language'? Define mnemonics. **[4]**

b) Explain the following instructions with an example : **[12]**

i) MOV destination register, Source register

ii) LXI B, memory location

iii) LDA memory location

iv) MVI destination register, data value.

OR

Q6) a) What do you understand by one byte, two byte and three byte instructions? Give example of each. **[6]**

b) Explain the functions of the Pins : **[4]**

i) Hold

ii) Trap

iii) Ready

iv) X_1 and X_2.

c) Write an Assembly language program in 8085 to add 2-8 bit numbers. **[6]**

SECTION - II

Q7) a) Devise a circuit that could be used with a conveyor belt which is used to move an item to a work station. The presence of the item at the work station is detected by means of breaking a contact activated by a beam of light to a photosensor. There it stops for 100s for an operation to be carried out before moving on and stops the conveyor. The motor for the belt is started by a normally open start switch and stopped by a normally closed switch. **[8]**

b) A thermocouple element when taken from a liquid at 50°C and plunged into a liquid at 100°C at time t = 0, gave the following e.m.f. values. Determine the 95% response time. **[2]**

Time (s)	0	20	40	60	80	100	120
e.m.f. (mV)	2.5	3.8	4.5	4.8	4.9	5.0	5.0

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

i) Tachogenerator

ii) PVDF Tactile Sensor

iii) Phototransistors

iv) Pneumatic Proximity Sensor.

OR

Q8) a) Explain the following with respect to PLC : **[8]**

i) Input/Output Processing

ii) Cascaded Timers

iii) Counters

iv) Starting of multiple outputs.

b) Explain the following with neat figure and application : **[8]**

i) Turbine Flowmeter

ii) Bimetallic Thermostat

iii) Strain Gauges

iv) Rotary Variable Differential Transformer.

Q9) Explain following with neat diagram : **[16]**

a) Relays

b) MOSFETs

c) Control of d.c. motors

d) Cam and Cam followers.

OR

Q10) Explain following with neat diagram : **[16]**

a) Valve symbols

b) Process Control Valves

c) Journal bearings

d) Fluid control system through Current to Pressure converter.

Q11)a) Discuss in detail; any four Sensors and Actuators used in Robots with appropriate applications. **[16]**

b) Define Yaw, Roll and Pitch of a Robot wrist? **[2]**

OR

Q12)a) What is a pay load? State its role in Robot design. **[6]**

b) With a neat sketch explain the following Robots and mention their applications : **[12]**

i) Gantry Robot

ii) Cylindrical Robot

iii) Polar Robot.

Total No. of Questions : 12] **[Total No. of Pages : 3**

P 1056 **[3864] - 195**

B.E. (Production / SW)

DIE AND MOULD DESIGN

(2003 Course) (Elective - I) (411122)

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

Instructions to the candidates:

1) ***From Section I solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, and from Section II solve Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12.***
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

Unit - I

Q1) a) Explain with neat sketch planetary roll mill. **[6]**

b) Explain Hydrostatics Extrusion with its application. **[6]**

c) How stock is prepared in tube drawing? **[4]**

OR

Q2) Write short note on any three : **[16]**

a) Lubricants in Extrusion.

b) Wire drawing machines.

c) Neutral point and angle of bite.

d) Tresc's criterion.

Unit - II

Q3) a) Explain the principle of metal cutting in press tool. And what is the effect of clearance on cutting? **[8]**

b) How presses are classified on the basis of frame used? Explain with neat diagram. **[8]**

OR

Q4) a) Draw neat sketch of compound die. **[6]**

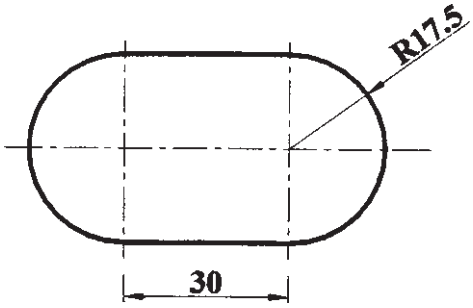
b) What is strip layout? Which factors are considered for laying out strip layout? **[6]**

c) What is press break? **[4]**

P.T.O.

Unit - III

Q5) Design simple die for the component shown in fig.1 **[18]**



Material: 1mm thick
Shear strength: 280MPa
Fig:- 1

OR

Q6) Progressive die design.

a) Draw assembly drawing with locating element of a progressive die for the component shown in fig. 2. **[8]**

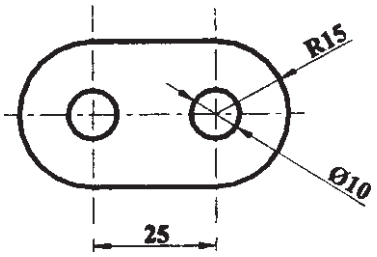


Fig: 2
Material: Al, 2mm thick
Shear strength 190MPa

b) Draw strip layout and find out material utilization. **[5]**

c) Find out cutting force at each station and press tonnage. **[5]**

SECTION - II

Unit - IV

Q7) a) Explain in detail how the stock size is calculated in a impression die forging. **[8]**

b) Explain briefly the following with neat sketch **[8]**

i) Shot blasting & tumbling process.

ii) Isothermal forging.

OR

Q8) a) Explain the following forging operation with neat sketch. **[8]**

i) Fullering. ii) Edging.

iii) Blocking. iv) Finishing.

b) What is parting line? What are the different factors to be considered while selecting the parting line? **[8]**

Unit - V

Q9) Explain with neat sketch (any Three) **[16]**

a) Blow moulding.

b) Transfer moulding.

c) Compression moulding.

d) Injection moulding for thermo setting.

OR

Q10)a) Explain different types of core and cavity inserts. And also explain the method of holding it to bolster. **[8]**

b) What is local insert? And when it will be used? **[4]**

c) Explain the function of sprue bush and register ring with neat sketch. **[4]**

Unit - VI

Q11)Design single impression injection mold for the PVC component shown in figure 7. **[18]**

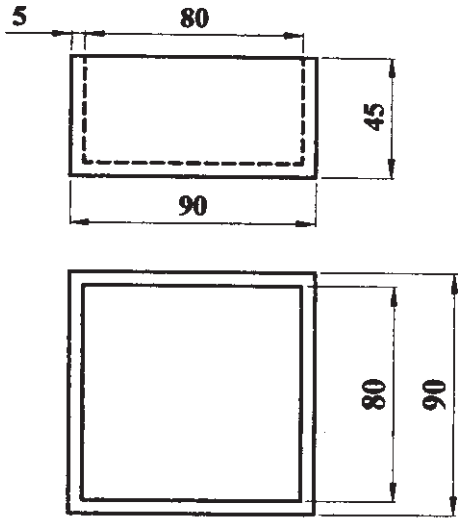


Fig. 7 : Injection moulding job

OR

Q12)a) Explain different methods of mould cooling in injection moulding.**[10]**

b) Write short note on CAD application in mould design. **[8]**

Total No. of Questions : 6] **[Total No. of Pages : 2**

P 1057 **[3864] - 196**

B.E. (Production / SW)

ADVANCE PRODUCTION TECHNOLOGY

(2003 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) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***
6) ***All questions are compulsory.***

SECTION - I

Q1) a) Mention the benifits of JIT system & sketch any two JIT layouts. **[10]**

b) Explain the philosophy behind TPS. **[8]**

OR

a) Explain the KANBAN rules with their sub rules. **[9]**

b) Describe the various situations involved in fine tuning of production through KANBAN. **[9]**

Q2) a) Discuss the various types of BenchMarking. **[8]**

b) How to identify BenchMarking partners? Give examples for BM partners in any six field / area of business. **[8]**

OR

a) Discuss the Generic BM methodology based on PDCA Cycle. **[8]**

b) With schematic diagram, explain SMED. **[8]**

Q3) a) Explain with suitable examples, difference in productivity, performance & OEE. **[8]**

b) Explain with suitable example, difference in production, productivity & efficiency. **[8]**

OR

P.T.O.

a) Explain the 'basic work content' & 'added work content' in productivity measurement. **[8]**

b) Discuss the various Hard & Soft factors of an Organisation for productivity improvement. **[8]**

SECTION - II

Q4) a) Define simulation & explain steps involved in it. **[8]**

b) List various simulation packages available. Explain anyone in detail. Also mention the recent trends in simulation software. **[9]**

OR

a) Define AI. List & explain task domain of AI. **[8]**

b) Explain the use of 'Proportional logic' and 'Predictate logic' as a way of representing knowledge by giving a specific example. **[9]**

Q5) Explain in brief the 'Product Design specifications' & brief the importance of PDS. **[17]**

OR

Explain in brief the characteristics matrix with suitable example. **[17]**

Q6) Explain four different Research & Development strategies. **[16]**

OR

Explain four phases of 'Technology Transfer Process'. **[16]**

Total No. of Questions : 6] **[Total No. of Pages : 2**

P 1058

[3864] - 198

B.E. (Production / SW)

SUPPLY CHAIN MANAGEMENT

(2003 Course) (Elective) (411125)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) Identify cycles & push-pull boundry in supply chain when you are purchasing LINOVA Laptop PC from a computer dealer in city. **[9]**

b) What are competitive & supply chain strategies of an organisation? What is strategic fit? **[8]**

OR

a) Discuss the process of understanding supply chain uncertainity. **[8]**

b) Discuss in brief the drivers affecting supply chain performance & mention the obstacles in it. **[9]**

Q2) a) Discuss in brief steps involved inforecasting the demand. **[8]**

b) Which type of information is needed to aggregate planner? Which decisions are based on this information? **[9]**

OR

a) By managing capacity & inventory how the firm can control the 'Supply'? **[7]**

b) Mention the steps involved in 'adaptive' forecasting. **[5]**

c) A two wheeler manufacturing company's last 4 months sales were 1200, 1270, 1140 & 1220 units. Forecast the demand for 5^{th} month using four-period moving average. What is the forecast error if the demand in 5^{th} month turns out to be 1300 units. **[5]**

P.T.O.

Q3) a) Differentiate between lot size based & volume based quantity discounts in supply chain. When quantity discounts are justified? **[8]**

b) Discuss the role of safety inventory in supply chain. How the appropriate level of safety stock is decided? **[8]**

OR

a) What is product availability? Describe two types of replenishment policies. **[8]**

b) Explain Managerial Levers to improve the supply chain profitability. **[8]**

SECTION - II

Q4) a) Mention the various factors affecting the design of supply chain network. Discuss any two factors affecting the location decision in supply chain. **[9]**

b) Discuss the role of Transportation in SC Network. Mention various modes of transportation with their strengths & weakness. **[9]**

OR

a) Discuss the importance of information & IT in supply chain. **[9]**

b) Discuss the role of IT in forecasting & in inventory management. **[9]**

Q5) a) List the major obstacles for co-ordination in supply chain. Discuss in brief. **[8]**

b) What is bull whip effect? How it relates to lack of co-ordination in SC. **[8]**

OR

a) How the design of distribution network has been affected due to evolution of E-business? **[8]**

b) Discuss the actions taken by Manager to overcome the obstacles & to achieve co-ordination in supply chain. **[8]**

Q6) a) Discuss the role & importance of Revenue Management in SC. **[8]**

b) Discuss - Supply chain cost get affected by changing distribution network. **[8]**

OR

a) What is 'Decision Tree'? Summarise basic steps in decision tree analysis. **[8]**

b) What is DCF analysis? Why it is used in SCM. **[8]**

Total No. of Questions : 12] **[Total No. of Pages : 3**

P 1059 **[3864] - 221**

B.E. (Electrical)

POWER SYSTEM OPERATION AND CONTROL

(2003 Course) (403141)

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

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two 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 with diagram the equal area criterion of stability for sudden increase in mechanical input to the generator. **[10]**

b) Explain the effect of clearing time on stability of power system. Also discuss the concept of critical clearing angle and critical clearing time. **[6]**

OR

Q2) a) A 50 Hz, three phase synchronous generator capable of supplying 300 MW of power is connected to a large system and is delivering 120 MW when a three phase fault occurs at its terminals, determine **[8]**

i) The time in which fault must be cleared, if the maximum power angle is to be 80^{o}. Assume H = 10 MJ/MVA.

ii) The critical clearing angle.

b) Discuss the point by point method for solution to swing equation. **[8]**

Q3) a) Explain the concept of Unit Commitment. Enlist the methods for Unit Commitment. **[6]**

b) Discuss the dynamic programming method used for Unit Commitment. **[10]**

OR

Q4) a) Explain priority list method used for Unit Commitment. **[8]**

b) Discuss various constraints in case of thermal and hydro generators. **[8]**

P.T.O.

Q5) a) Explain the concept of control area in case of single area system and two area system. **[9]**

b) Explain with schematic diagram the speed governing system used for the turbogenerators. **[9]**

OR

Q6) a) Explain with the block diagram representation, the two area load frequency control. **[10]**

b) Two generators rated 200 MW and 400 MW are operating in parallel. The droop characteristics of their governors are 4% and 5% respectively from no load to full load.

Assume that generators are operating at 50 Hz at no load. How would load of 600 MW to be shared between them? Also assume the free governor action. **[8]**

SECTION - II

Q7) a) Explain with the functional block diagram the real time control of power system. **[8]**

b) Explain the concept of real time monitoring of a power system. **[8]**

OR

Q8) a) Discuss functions of following load control centers. **[8]**

i) National load control center.

ii) Regional load control center.

iii) State control center.

iv) Area and local control center.

b) Draw a neat block diagram schematic for a typical SCADA system. Explain function of each block. **[8]**

Q9) a) Draw a loading capability curve of a synchronous generator and explain reactive power generation and absorption by the unit. **[10]**

b) Explain static reactive power compensation system used for a power system. **[8]**

OR

Q10)a) What is a series compensation? Explain the necessity of series compensation in the power system. What are the problems associated with the series compensation? **[9]**

b) Discuss various types of FACTS controllers used for reactive power control. **[9]**

Q11)a) Discuss advantages of interconnected power system. Explain economy interchange between interconnected utilities. **[8]**

b) How interutility economy energy evaluation is carried out? Discuss the concept of interchange evaluation with unit commitment. **[8]**

OR

Q12)Write short notes on : **[16]**

a) Capacity Interchange.

b) Diversity Interchange.

c) Energy Banking.

d) Inadvertent Power Exchange.

Total No. of Questions : 12] **[Total No. of Pages : 3**

P 1060 **[3864] - 222**

B.E. (Electrical)

UTILIZATION OF ELECTRICAL ENERGY

(2003 Course)

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

Instructions to the candidates:

1) ***Answer 03 questions from Section I and 03 questions from Section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are the factors which decide the frequency and voltage of dielectric heating? Derive an expression for the heat produced in a dielectric material. **[8]**

b) Describe the construction and working of Ajax Wyatt induction type furnace. **[8]**

OR

Q2) a) Discuss the methods of temperature control of resistance ovens. **[8]**

b) The power required for dielectric heating of a slab of resin 150 cm^2 in area and 2 cm thick is 200 watts. Frequency of 30 MHz. The material has a relative permitivity of 5 and pf. 0.05. Determine the voltage necessary and current flowing through the material. If the voltage is limited to 600 V, what will be the value of the frequency to obtain the same heating. **[8]**

Q3) a) Explain briefly extraction and refining of metals by electrolysis. **[8]**

b) What is electro deposition & explain in detail various factors which have effect on the appearance and quality of the deposited surface. **[8]**

OR

P.T.O.

Q4) a) Describe the process of electro-extraction of Zinc and Aluminium. **[8]**

b) Draw electric circuit of refrigerator and explain its working. How can temperature inside the refrigerator be adjusted. **[8]**

Q5) a) Discuss the requirement of good lighting. **[8]**

b) Explain the working of a high pressure mercury vapour lamp giving its circuit diagram. Give its advantages, disadvantages and applications. What is the usual value of power factor for this lamp. **[10]**

OR

Q6) a) What are the general principles that are usually employed in the design of street lighting & explain. **[8]**

b) A hall 30 m long and 12 m wide is to be illuminated and illumination required is 50 meter candle. Five types of lamps having lumen outputs as given below are available

Watts	:	100	200	300	500	1000
Lumens	:	1615	3650	4700	9950	21500

Taxing a depreciation factor of 1.3 and utilisation coefficient of 0.5, calculate the number of lamps needed in each case to produce required illumination. Out of the above five types of lamps select most suitable type and design a suitable scheme and make a sketch showing location of lamps. Assume a suitable mounting height and calculate space-height ratio of lamps. **[10]**

SECTION - II

Q7) a) Explain different systems of electric traction existing in our country. **[8]**

b) Compare the DC and AC systems of railway electrification from the point of main line and sub urban line railway service. **[8]**

OR

Q8) a) Explain current collection system in electric traction. **[8]**

b) What are the advantages of electric traction over other types of traction systems. **[8]**

Q9) a) Draw and explain a typical speed-time curve for an electric train and explain what do you understand by crest speed, average speed and schedule speed. **[8]**

b) An electric train has quadrilateral speed-time curve as follows :

i) Uniform acceleration from rest at 2 kmphps for 30 seconds.

ii) Coasting for 50 seconds.

iii) Uniform braking to rest for 20 seconds.

If train is moving a uniform up gradient of $\frac{10}{1000}$, train resistance is 40 N/tonne rotational inertia effect 10% of dead weight and duration of stop 30 seconds. Find schedule speed. **[8]**

OR

Q10)a) Derive an expression for specific energy output on level track using a simplified speed-time curve. **[8]**

b) An electric train is to have acceleration and braking retardation of 0.8 kmphps and 3.2 kmphps respectively. If the ratio of maximum to average speed is 1.3 and time for stops 26 seconds. Find schedule speed for a run of 1.5 km. Assume simplified trapezoidal speed-time curve. **[8]**

Q11)a) Give the essential electrical and mechanical characteristics of traction motors. **[8]**

b) What are the advantages and disadvantages of regenerative braking & explain how regenerative braking can be obtained in dc locomotives.**[10]**

OR

Q12)a) Compare shunt and bridge transition? **[8]**

b) A motor coach weighing 150 tonnes is equipped with four 600 V motors for series parallel control. If during series - parallel starting the current per motor is maintained at 300 Amp.

Calculate :

i) The duration of starting period.

ii) The speed of train at transition.

iii) The Rheostatic losses during

1) Series

2) Parallel steps and start.

At 300 A, 600 V, the tractive effort is 15000 N per motor and the train speed is 30 kmph. Assume the train is started up a gradient of 1% and train resistance is 10 N/tonne. Allow 10% for the effect of rotational inertia. Each motor has a resistance of 0.1 Ω. **[10]**

Total No. of Questions : 11] **[Total No. of Pages : 4**

P 1061

[3864] - 223

B.E. (Electrical)

INDUSTRIAL DRIVES AND CONTROL

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

Instructions to the candidates:

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

SECTION - I

Q1) a) What is an Electric drive? Discuss, essential parts of Electric Drive with the help block diagram. **[6]**

b) Write a brief note on, speed-torque characteristics of drive operated in all four quadrants. Use the example of hoist load. **[6]**

c) State the reasons for using load equalisation in Electrical Drives. Also discuss the role of Fly wheel in load equalisation method. **[6]**

OR

Q2) a) What is steady state stability of an electric drive? Discuss how we arrive at the criteria for steady state stability $\frac{dT_L}{dw} - \frac{dT_M}{dw} > 0$

where T_L - Load torque
T_M - Motor torque
W - Speed of the drive **[8]**

b) As shown in fig 2b, for different motor-load combinations (Ex : A & B), discuss wheather drive system is unstable or stable. **[4]**

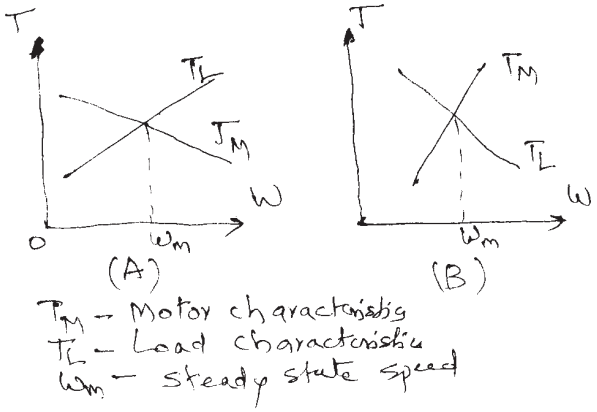


Fig 2b

P.T.O.

c) A motor develops a torque given by the relationship $T_M = aw + b$, where a and b are positive constants. This motor is used to drive a load whose torque is expressed as $T_L = cw^2 + d$, where c and d are some other positive constants. The total inertia of the rotating masses is J.

i) Calculate the equilibrium operating speed.

ii) Find wheather the drive is stable at this speed. **[6]**

Q3) a) Draw motor connection circuits and characteristics to explain Regenerative braking principle for dc shunt and separately excited motors. Write all the necessary equations for motoring and braking actions. **[8]**

b) A 220V dc shunt motor has an armature resistance of 0.062 ohm and with full field, has an emf of 215 V at a speed of 960 rpm. The motor is driving an overhauling load with a torque of 172 N-m. Calculate the minimum speed at which motor can hold the load by means of regenerative braking. **[8]**

OR

Q4) a) Explain with neat circuit diagram and characteristics (both motoring & braking), the following braking methods used for 3 phase induction motor.

i) Regenerative braking.

ii) Plugging.

iii) D.C. Dynamic braking. **[12]**

b) Discuss merits and disadvantages associated with three braking methods mentioned in part (a) of this question. **[4]**

Q5) a) Explain with necessary diagram, full converter fed dc separately excited motor. How speed change is achieved by varying firing angle. Write also the output voltage equations with a sketch of voltage and current waveforms available at the armature terminals of dc motor. **[8]**

b) A 230 V, 650 rpm 100 A separately excited dc motor has armature circuit resistance and inductance of 0.08Ω and 8 mH respectively. Motor is controlled by a single-phase half-controlled rectifier with source voltage of 230 V, 50 Hz. Identify the modes and calculate speeds for

i) $\alpha = 60^o$ and torque = 1000 N-m

ii) $\alpha = 120^o$ and torque = 1000 N-m. **[8]**

OR

Q6) a) Explain chopper controlled speed control of dc series motor. Draw the motor voltage and current waveforms. **[8]**

b) A dc motor is controlled by a dual converter. Draw the necessary diagrams and characteristics and explain speed control technique using a dual converter. **[8]**

SECTION - II

Q7) a) What is the principle behind V/f speed control strategy? Explain with necessary diagram of a scheme to implement V/f control method using power control devices. **[8]**

b) Draw circuit diagram for transistorised stator control method for 3-phase induction motor. Explain working principle and voltage & current waveforms at stator of induction motor. **[8]**

OR

Q8) a) Sketch a closed loop control scheme for speed control of 3 phase induction motor using a current source inverter. Explain the speed control strategy. **[8]**

b) A 3 phase, 400 V, 50 Hz, six pole, 925 rpm star-connected, induction motor has the following parameters.

$r_1 = 0.2\Omega \quad r_2' = 0.3\Omega, \; x_1 = 0.5\Omega \quad x_2' = 1.0\Omega$

The motor is fed from a voltage source inverter with a constant voltage to frequency, V/f ratio.

Calculate the maximum torque T_m and the corresponding speed N_m for 50 Hz and 20 Hz. **[8]**

Q9) a) What are the possible reasons for the energy loss in Electric drive system? **[4]**

b) Explain the factors on which the energy loss in induction motor during starting depends and hence derive an expression relating a moment of inertia of rotor with the energy lost during starting of induction motor. **[10]**

c) What are the reasons for energy loss during running of a induction motor. How energy can be saved? **[4]**

OR

Q10)a) Discuss different methods used to calculate the power rating of motor used for continuous duty with variable load applications. **[6]**

b) Calculate the power rating of a motor used to drive a load at 730 rpm. Motor duty is as mentioned in fig shown in fig. 10 b.

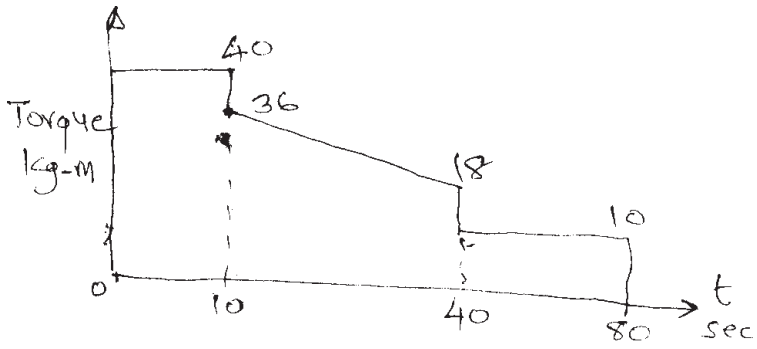


Fig 10 b

[8]

c) Write a brief note on thermal model of motor and hence explain heating & cooling curves. **[4]**

Q11)Write short notes on : **[16]**

a) Drives used in sugar mills.

b) Drives used in Machine tools.

In the short notes, mention the load requirements like power rating, speed, duty cycle etc.

Total No. of Questions : 12] **[Total No. of Pages : 2**

P 1062 **[3864] - 228**

B.E. (Electrical Engg.) (Sem. - II)

PROJECT MANAGEMENT

(2003 Pattern) (403143) (Elective - I) (Theory)

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

Instructions to the candidates:

1) ***Section I & Section II should be solved on separate answer sheets.***
2) ***Figures to the right indicate maximum marks for the respective questions.***

SECTION - I

Q1) Define & Explain project management, its scope & importance in today's era of modernization? **[16]**

OR

Q2) Explain various types of project organisations with suitable examples? **[16]**

Q3) Explain the concept of 'Project Scheduling'? Explain various method & techniques of project scheduling? **[16]**

OR

Q4) Write short notes :

a) Project selection. **[6]**

b) Costs Associated with project. **[5]**

c) Return on Investment. **[5]**

Q5) Write short notes :

a) Critical path method. **[6]**

b) Project cost control. **[6]**

c) Gantt chart. **[6]**

OR

Q6) a) Discuss the various causes of Project failure? **[9]**

b) Explain the concept of crashing the Network with suitable examples? **[9]**

P.T.O.

SECTION - II

Q7) Define Material Management? Explain its scope, importance & functions in today's world? **[16]**

OR

Q8) a) Explain various methods of Buying with examples? **[8]**

b) Explain various types of Tenders with examples? **[8]**

Q9) a) Explain meaning of Inventory & types of Inventory with suitable examples? **[8]**

b) Write short notes :

i) Inventory management. **[4]**

ii) Stock taking. **[4]**

OR

Q10)a) Elaborate vendor Rating concept in detail. **[8]**

b) Explain 5 'R's of purchasing. **[8]**

Q11)a) Explain Adjusted Discount Rate method of Risk? **[9]**

b) Explain Capital Asset Pricing Model (CAPM)? **[9]**

OR

Q12)Define Risk Management? Why measurement of risk is necessary? Explain various types of risks? **[18]**

Total No. of Questions : 12] **[Total No. of Pages : 3**

P 1063

[3864] - 231

B.E. (Electrical)

SWITCHGEAR & PROTECTION

(2003 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.***

SECTION - I

Q1) a) What do you mean by zones of protection? Explain what is primary protection & backup protection? **[8]**

b) Explain the concept of directional over current protection and explain the principle, construction of directional over current relay. **[8]**

OR

Q2) a) What are the essential qualities of protective relaying? **[8]**

b) Derive the torque equation in induction type relay. **[8]**

Q3) a) Explain high & low resistance principles of arc interruption. **[8]**

b) Define and derive RRRV. **[8]**

OR

Q4) a) Explain the resistance switching in case of circuit breaker. **[8]**

b) Explain what is current chopping. **[8]**

Q5) a) Describe in detail the terms related to circuit breaker **[9]**

i) Making capacity.

ii) Breaking capacity.

iii) Rated interrupting duties.

b) Draw the neat sketch & explain in detail the construction & working principle of SF_6 circuit breaker. **[9]**

P.T.O.

OR

Q6) Write short notes on : **[18]**

a) Autoreclosing.

b) Vaccume Circuit Breaker advantages and disadvantages.

c) Air circuit breaker.

SECTION - II

Q7) a) Draw a neat sketch of Buchholz relay and explain with reference to its operation, installation, merits and limitations. **[8]**

b) A 11 kV, 3 phase alternator has full load rated current of 200 A. Reactance of armature winding is 15 percent. The differential protection system is set to operate on earth fault currents of more than 200A. Find the neutral earthing resistance, which gives earth fault protection to 90% of stator winding. **[8]**

OR

Q8) a) What are different types of faults occuring in an alternator? Explain each in short. **[8]**

b) Explain the Merż-Price protection scheme for protection of power transformer which are connected in star-delta configuration. **[8]**

Q9) a) Explain the carrier current protection scheme for long transmission lines. Draw its block diagram and explain working of each block. How is the frequency selected in power line carrier system. **[9]**

b) Draw the necessary sketches for 3 zone distance protection scheme for transmission lines and explain it. **[7]**

OR

Q10)a) What do you mean power swings and arc resistance? Explain the effect of power swings and arc resistance on the performance of the distance relay. **[8]**

b) Explain the principle of distance relaying as applied for the protection of transmission lines. Distinguish between the impedance, reactance and admittance relays as regards to their application in distance protection. **[8]**

Q11) a) Draw a neat block diagram of static relays and explain function of each block. Also compare static relays with conventional relays. **[8]**

b) Describe the realisation of over current relay by using a microprocessor. **[5]**

c) Give justifications for preferring half cycle data window over full cycle data window for numerical protective relaying. **[5]**

OR

Q12) Write short notes (on any three) : **[18]**

a) Sampling theorem.

b) Principle of Duality.

c) Amplitude and phase comparator.

d) Rationalised Haar Transform (RHT).

e) Walsh-Hadamard Transform Technique.

Total No. of Questions : 12] **[Total No. of Pages : 4**

P 1064

[3864] - 232

B.E. (Electrical)

DIGITAL CONTROL SYSTEMS

(2003 Course) (403149)

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

Instructions to the candidates:

1) ***Answer any one question from each pair of questions Q.1 & Q.2, Q.3 & Q.4, Q.5 & Q.6, Q.7 & Q.8, Q.9 & Q.10 and Q.11 & Q.12.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicates full marks.***
5) ***Use of logarithmic tables, slide rules, electronic unprogrammable pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the various standard discrete input test signals with neat diagrams. **[6]**

b) Consider the discrete time sequence as given below : **[10]**

$$x(n)=\left\{1,\ -1,\ \underset{\uparrow}{4},1,2\right\}$$

Explain in detail and draw graphs for :

i) Compress the sequence by 2 samples.

ii) Delay the sequence by 2 samples.

iii) Fold the sequence and advance by one sample.

iv) Attenuate the sequence by amplitude scale 2.

v) Prove that folding and time delay operations are not commutative.

OR

Q2) a) Explain sampling and reconstruction process. State Sampling theorem and give its importance. **[6]**

b) Classify the following sequences as static / dynamic, time-invariant / time-variant, linear / non-linear, Causal / non-causal, stable / unstable giving detail justification.

i) $y(n)=\sum_{k=-\infty}^{n+1} x(k)$

ii) $y(n) = x(n).\cos(w_0 n).$ **[10]**

P.T.O.

Q3) a) Explain what do you understand by Direct Form - I and Direct Form - II structure representations of a discrete-time system; in detail. **[8]**

b) Obtain Linear convolution of following sequences by Tabulation and Multiplication method. **[8]**

$$x(n)=\left\{1,1,\underset{\uparrow}{0},1,1\right\} \qquad h(n)=\left\{1,-2,-3,\underset{\uparrow}{4}\right\}$$

OR

Q4) a) Draw a neat sketch of speed control scheme and explain its working. **[8]**

b) Discuss the various methods of obtaining the convolution of discrete time systems. **[8]**

Q5) a) State and prove Initial value Theorem and Final value Theorem in discrete-time systems. **[8]**

b) Find the one sided Z-transform of the following discrete sequences :

i) $F(k) = Ka^{(k-1)}$

ii) $F(k) = K^2$ **[10]**

OR

Q6) a) State the properties and theorems of the Z-transform. Give the proof of the "Final Value Theorem". **[8]**

b) Determine the Inverse Z-transform of : **[10]**

i) $$F(z)=\frac{4z^2-2z}{z^3-5z^2+8z-4}$$

ii) $$F(z)=\frac{z-0.4}{z^2+z+2}$$

SECTION - II

Q7) a) Define 'Pulse Transfer Function'. Obtain the pulse transfer function for error sampled unity feedback control system with forward path linear transfer function G(*s*). **[6]**

b) A certain unity feedback error sampled data control system has ; $G(s)=\frac{1}{s(s+1)}$; $Z_{0H}.G_h(s)=\frac{1-e^{-ST}}{s}$ and sampling period T = 1 sec. For unit step input, determine

i) The Z-transform of the output.

ii) The output response at sampling instants. **[10]**

OR

Q8) a) Explain the concept of stability of discrete-data control system. **[4]**

b) What is Bilinear transformation? How it is used for testing the stability of discrete-time control system? **[4]**

c) By applying Jury's test examine the stability of the discrete-data system represented by characteristic polynomial,

$F(z) = z^4 - 1.368z^3 + 0.4z^2 + 0.08z + 0.002$ **[8]**

Q9) a) Define state Transition Matrix for the discrete data system. For the system represented by the discrete state model,

$$x(k+1)=\begin{bmatrix}1 & 1\\ 0 & 1\end{bmatrix}\begin{bmatrix}x_1(k)\\ x_2(k)\end{bmatrix}+\begin{bmatrix}0\\ 1\end{bmatrix}u(k)$$

Find the state transition matrix $\phi(t)$. **[9]**

b) Find the Z-transfer function for the following discrete-time system.

$$\begin{bmatrix}x_1 & (k+1)\\ x_2 & (k+1)\end{bmatrix}=\begin{bmatrix}0 & -2\\ -1 & 3\end{bmatrix}\begin{bmatrix}x_1(k)\\ x_2(k)\end{bmatrix}+\begin{bmatrix}2\\ 1\end{bmatrix}u(k)$$

$$y(k)=\begin{bmatrix}3 & -2\end{bmatrix}\begin{bmatrix}x_1(k)\\ x_2(k)\end{bmatrix}$$ **[9]**

OR

Q10)a) Explain any one method for finding the state transition matrix $\phi(t)$ for a discrete time system of the form with usual notations

$x(k + 1) = Fx(k) + Gu(k)$

$y(k) \quad = Hx(k)$ **[6]**

b) Draw the state variable diagram in phase variable canonical form and determine the discrete time state variable model for a system having pulse transfer function : $\frac{Y(z)}{U(z)}=\frac{z^2+z}{z^3-0.8z^2-0.21z+0.01}$ **[12]**

Q11)a) Discuss the following methods of the realization of the pulse transfer function into a discrete state model form,

i) Parallel decomposition.

ii) Cascade decomposition. **[8]**

b) Explain the PID controller for a digital control system. Draw the relevant block diagram. **[8]**

OR

Q12)a) Define eigen values and obtain the same for the discrete-data system represented in state space form : **[4]**

$$x(k+1)=\begin{bmatrix}0 & 1 & 0\\ 0 & 0 & 1\\ 0 & -0.5 & 1.5\end{bmatrix}\begin{bmatrix}x_1(k)\\ x_2(k)\\ x_3(k)\end{bmatrix}+\begin{bmatrix}0 & 1\\ 1 & 0\\ 2 & 1\end{bmatrix}\begin{bmatrix}u_1(k)\\ u_2(k)\end{bmatrix}$$

Also comment on the system stability.

b) Define the concepts 'Controllability and observability of discrete-data Control System'. **[4]**

c) Investigate the controllability and observability of the following system :

$$x(k+1)=\begin{bmatrix}-1 & 1\\ 0 & -1\end{bmatrix}\begin{bmatrix}x_1(k)\\ x_2(k)\end{bmatrix}+\begin{bmatrix}0\\ 1\end{bmatrix}x(k)$$

$$y(k)=\begin{bmatrix}1 & 1\end{bmatrix}.x(k)$$ **[8]**

Total No. of Questions : 12] **[Total No. of Pages : 2**

P 1065

[3864] - 233

B.E. (Electrical)

VLSI DESIGN

(2003 Course) (Elective - II) (403150)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) Draw and explain 4 bit Decade Up / Down counter. **[8]**

b) Draw and explain 4 bit Universal Shift Register. **[8]**

OR

Q2) a) i) Differentiate Mealy and Moore machine modelling. **[4]**

ii) Draw state diagram for "10101" detector. Use Mealy model. **[4]**

b) i) Draw multiplexer tree to implement 16 : 1 mux using 4 : 1 mux. **[4]**

ii) Draw and explain 3 x 8 Decoder along with its truth-table. **[4]**

Q3) a) Explain EDA tool design flow in detail. **[9]**

b) Define the following terms : **[9]**

i) Entity

ii) Architecture

iii) Configuration.

OR

Q4) a) Write VHDL code for 2 x 4 Decoder and also draw its functional diagram and truth table. **[9]**

b) Explain various types of Architectures along with its example in VHDL. **[9]**

P.T.O.

Q5) a) What is a package? Explain along with its example in VHDL. **[8]**

b) Explain various data-types and data objects in VHDL. **[8]**

OR

Q6) a) Differentiate function and procedure along with example in VHDL. **[8]**

b) What is the difference between concurrent statement and sequential statements? Explain with example. **[8]**

SECTION - II

Q7) a) Explain the following terms w.r.t. CMOS.

i) FAN in ii) FAN out

iii) Power Dissipation iv) Propagation Delay. **[8]**

b) Implement basic gates using CMOS. **[8]**

OR

Q8) a) Explain the Enhancement type MOSFET construction. **[8]**

b) Explain the voltage transfer characteristics for CMOS. **[8]**

Q9) a) Draw and explain the architecture of CPLD in detail. **[9]**

b) Explain the meaning of

i) Simulation ii) Synthesis

iii) Place & Route iv) Boundry Scan. **[9]**

OR

Q10)a) Differentiate PLD, CPLD, FPGA. **[8]**

b) With neat schematic explain the architectural building blocks of FPGA. **[10]**

Q11)a) Write VHDL code for 8x 8 RAM and explain. **[8]**

b) Explain in detail ALU with ADD, SUB, INC, DEC and basic logical operations. **[8]**

OR

Q12)a) Write down VHDL code for 8 bit binary to integer converter. **[8]**

b) Draw state diagram and explain along with VHDL code 3 bit UP counter. **[8]**

Total No. of Questions : 12] **[Total No. of Pages : 3**

P 1066 **[3864] - 234**

B.E. (Electrical)

HIGH VOLTAGE ENGINEERING

(2003 Course)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) What is ionization? Explain different reasons of ionization in gaseous dielectric material. **[8]**

b) Define Townsend's first and second ionization coefficients. What is Townsend's breakdown criterion? **[8]**

OR

Q2) a) Describe positive corona and negative corona in non-uniform electric field. **[8]**

b) What is Paschen's law? What the significance of minimum breakdown voltage value under different P-d conditions? **[8]**

Q3) a) Explain following theories of breakdown in liquid dielectric material

i) Suspended particle theory.

ii) Cavitation and bubble theory.

iii) Stressed oil volume theory. **[10]**

b) What is composite dielectric? Explain any one method of breakdown in composite dielectrics. **[6]**

OR

Q4) Explain following breakdown mechanisms in solid dielectrics. **[16]**

a) Intrinsic breakdown.

b) Electromechanical breakdown.

c) Thermal breakdown.

P.T.O.

Q5) a) What is insulation co-ordination? Explain statistical method of insulation co-ordination. **[9]**

b) Discuss various causes of over voltage due to switching surges and also explain means to overcome switching surges in the power system. **[9]**

OR

Q6) a) Explain with schematic diagram, the development of lightning stroke between cloud and ground. **[9]**

b) Explain with illustrative example, the co-relation between with stand voltage level of solid insulating material and protective level of protective devices. **[9]**

SECTION - II

Q7) a) Explain basic waveform and specifications of the impulse voltage with neat sketch diagram of Marx circuit, explain working of multistage impulse generator. **[10]**

b) Explain any one method of controlling of the tripping of impulse current generator. **[6]**

OR

Q8) a) Explain the working of 3-cascade connected transformers used for generation of a.c. voltages. **[8]**

b) Explain different circuits used for generation of impulse current in laboratory. **[8]**

Q9) a) Explain the effect of following factors on sparkover voltage of sphere gap unit.

i) Nearby earthed object.

ii) Atmospheric condition.

iii) Irradiation.

iv) Polarity and rise time of voltage waveform. **[8]**

b) Draw a neat sketch and explain the basic principle of operation of series capacitor peak voltmeter used for the measurement of peak value of a.c. voltages. **[8]**

OR

Q10)a) Draw a neat diagram showing electrostatic voltmeter. Discuss basic principle of operation of electrostatic voltmeter. **[8]**

b) Discuss the method of balanced detection for locating partial discharges in electrical equipment. **[8]**

Q11)a) Explain the power factor test and partial discharge measurement test on bushing. **[9]**

b) Explain different tests on high voltage cables. **[9]**

OR

Q12)a) Explain the following short circuit tests on circuit breaker.

i) Direct test.

ii) Synthetic test. **[9]**

b) Explain various tests conducted on insulator in high voltage testing laboratory. **[9]**

Total No. of Questions :12] **[Total No. of Pages : 3**

P1067 **[3864]-235**

B.E. (Electrical)

DIGITAL SIGNAL PROCESSING

(2003 Course) (Elective - II) (Sem. - II)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) Explain the following terms related to discrete signals. **[9]**

i) Energy and power signals.

ii) Periodic and non-periodic signals.

iii) Even and odd signals.

b) Determine auto-correlation of following signal. **[9]**

i) $x(n) = 2^n$ for $-3 \leq n \leq 0$.

ii) $x(n) = n^2$ for $0 \leq n \leq 3$.

OR

Q2) a) Explain the following terms related to discrete time system. **[9]**

i) Shift invariant and shift variant system.

ii) Causal and non-causal systems.

iii) Stable and unstable system.

P.T.O.

b) Compute convolution of following LTI system using tabulation method. **[9]**

i) $x(n) = 2^n$ for $-3 \le n \le 0$, otherwise $x(n) = 0$

$h(n) = 1$ for $0 \le n \le 3$, otherwise $h(n) = 0$

ii) $x(n) = n^2$ for $0 \le n \le 3$, otherwise $x(n) = 0$

$h(n) = 1$ for $-3 \le n \le 0$, otherwise $x(n) = 0$

Q3) a) Explain the partial fraction method for inverse z-transform. **[6]**

b) Determine the z-transform of following discrete time signal with ROC. **[10]**

i) $x(n) = a^n \cos(\omega_o n)\, u(n)$

ii) $x(n) = a^n \sin(\omega_o n)\, u(n)$

OR

Q4) a) How the causality and stability of discrete time system is determined in terms of z-transforms. **[6]**

b) The system function of the LTI system is given by **[10]**

$$H(z) = \frac{\left(3 - 4z^{-1}\right)}{1 - 3.5z^{-1} + 1.5z^{-2}}.$$

Specify the ROC of H(z) and determine unit sample response of h(n) for stable condition.

Q5) a) Explain computational complexity of DIT-FFT algorithm as compared to direct computation of DFT. **[8]**

b) Compute 4-point DFT of following sequence using matrix method $x(n) = \{0101\}$ **[8]**

OR

Q6) a) Explain Goertzel algorithm for DFT calculation. **[8]**

b) Draw the signal flow graph of Radix-2 DIF-FFT algorithm for N= 8. **[8]**

SECTION - II

Q7) a) Explain direct form-I realization of IIR filter. **[8]**

b) The system function of an analog filter is given by **[10]**

$$Ha(s) = \frac{s+0.1}{(s+0.1)+16}.$$

Obtain the system function of the digital filter using bilinear transformation which is resonant at $\omega_r = \Pi/2$.

OR

Q8) a) Explain FIR filter design using rectangular window. **[9]**

b) Explain design of IIR filter using Bilinear transformation method. **[9]**

Q9) a) What are the desirable features of DSP processor? **[8]**

b) Compare digital signal processor with general purpose microprocessor. **[8]**

OR

Q10) a) Explain Harvard and Modified Harvard architecture of digital signal processor. **[8]**

b) Explain the functions of DAG and barrel shifter in digital signal processor. **[8]**

Q11) a) Explain how the DFT is suitable for extraction of harmonics from a given signal. **[8]**

b) Explain induction motor control using DSP with neat block diagram. **[8]**

OR

Q12) a) Explain power spectrum analysis using DSP. **[8]**

b) Explain vibration analysis in machines using DSP. **[8]**

■■■

Total No. of Questions : 12] **[Total No. of Pages : 3**

P 1068 **[3864] - 236**

B.E. (Electrical)

ANN & IT'S APPLICATION IN ELECTRICAL ENGG.

(2003 Course)

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

Instructions to the candidates:

1) ***Answer 3 questions from Section I and 3 questions from Section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answers will be valued as a whole.***

SECTION - I

Q1) a) Define Artificial intelligence. **[2]**

b) List Activation function with input, output limit. **[8]**

c) What are the different architecture neural network, explain any one in detail with neat sketch. **[8]**

OR

Q2) a) Write the topology for a simple model of an artificial neural network mimic with human brain. **[10]**

b) Compare, knowledge based system, fuzzy system, ANN and evolution computing. **[8]**

Q3) a) Draw Hebbian Network and Hence discuss it's advantages & drawbacks in learning the Neural Nets. **[8]**

b) Explain in detail about learning tasks. **[8]**

OR

Q4) a)

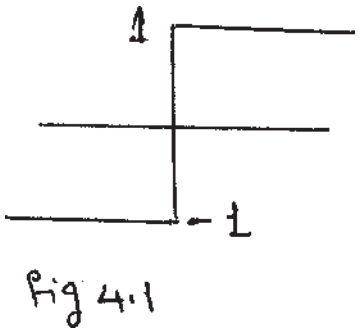


fig 4.1

Explain Transfer function shown in fig 4.1. Explain it's applicability with example. **[8]**

b) Write in detail about learning without teacher. **[8]**

P.T.O.

Q5) a) Draw single layer feedforward N/W with four inputs and three outputs. **[4]**

b) Draw perceptron architecture and hence discuss about role of weight matrix. **[6]**

c) Write short notes on learning curves. **[6]**

OR

Q6) a) What are the learning rate Annealing techniques. **[6]**

b) $P^0 = [1 \quad 0.2 \quad 0.5]^T$; $W = \begin{bmatrix} 1 & 0.5 \\ 0.5 & 1 \\ 2 & 1 \end{bmatrix}$; b = 0.5 apply perceptron network to get target output 0 for apple and target output 1 for mango.

Train with $P^1 = [0.8 \quad 0.7 \quad 0.2]$

$P^2 = [0.5 \quad 0.6 \quad 0.4]$

$P^3 = [0.2 \quad 0.9 \quad 0.6]$ **[10]**

SECTION - II

Q7) Consider five training sets as shown in table 1.

Table 1 - Training sets

Sr. No.	Inputs		Outputs O
	I_1	I_2	
1	0.4	–0.7	0.1
2	0.3	–0.5	0.05
3	0.6	0.1	0.3
4	0.2	0.4	0.25
5	0.1	–0.2	0.12

Draw MFNN architectures. Find the updated weights if initially

$$V^0 = \begin{bmatrix} 0.1 & 0.4 \\ -0.2 & 0.2 \end{bmatrix}; \quad W^0 = \begin{bmatrix} 0.2 \\ -0.5 \end{bmatrix}$$

Assume $\eta = 0.6$. **[16]**

OR

Q8) a) Explain Back-propagation learning with Input, Hidden and Output layer computations. **[8]**

b) Explain method of steppest descent. How it is used to evaluate learning rate coefficient. **[8]**

Q9) Write short notes with neat sketches and their learning / training set for the following : **[18]**

a) Recurrent Network.

b) Hopfield Network.

OR

Q10)a) Define the term resonance and hence give the details of cluster structure in Adoptive Resonance theory with the help of vector quantization.**[10]**

b) Draw and explain architecture of ART1. **[8]**

Q11)Develop algorithms in back-propagation to learn and train Neural Network for the reactive power dispatch program in the feeder substation of 33 KV with 50 MW balanced linear loud. KvAr varies between 0 to 16 MvAr in each feeder. **[16]**

OR

Q12)Considering radial distribution system with five branches, develop algorithm for service restoration and hence apply Hebbian learning Neural Network to verify service restoration algorithm to find optimization of sectionalizing switches connected between branches. **[16]**

Total No. of Questions :12] **[Total No. of Pages :4**

P1333 **[3864]-242**

B.E. (Electronics)

ELECTRONIC PRODUCT DESIGN

(2003 Course)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) With the help of suitable block diagram explain in detail the different stages of an electronic product development. Discuss the implications of skipping particular stage in development. **[10]**

b) An electronic circuit consists of 4 resistors, 4 capacitors, 1 transistor, 4 diodes and a power transformer. The failure rate of each components are 0.1, 0.01, 0.8, 0.25 and 0.6 per 10^6 hrs respectively. Calculate -

i) The MTBF of the circuit.

ii) The reliability at t = 1000 hrs. **[5]**

c) In the far field a 50 dB shielding effectiveness using conductive coating is to be obtained at enclosure level. Calculate the value of coating impedance to achieve this value of SE. **[3]**

OR

Q2) a) State the various objectives of Ergonomics. Also explain how the ergonomics and aesthetic design considerations are satisfied for mobile phone. **[8]**

b) Discuss the different noise coupling mechanisms and ways to reduce the noise being coupled with suitable sketches. **[8]**

c) Calculate the value of a decoupling capacitor, if the current is 50 mA and the voltage is changing at the rate of 0.1v/5ns. **[2]**

P.T.O.

Q3) a) Discuss the PCB design considerations for the microcontroller based circuits. **[8]**

b) Estimate:

i) Resistance of 25 cm long copper track with 1.0 mm width on standard 35 micron copper-clad laminate. (Assume $\rho = 1.72 \times 10^{-6}\ \Omega$.cm).

ii) Capacitance of two tracks on opposite side of double sided PCB with width 2.0 mm, length 15 cm, laminate thickness 1.6 mm and relative permittivity is 4.5. **[8]**

OR

Q4) a) Discuss in detail the various PCB design practices recommended for:

i) Power supply & ground routing.

ii) Decoupling. **[8]**

b) Estimate the characteristic impedance for stripline geometry when the PCB laminate thickness is 1.6 mm, the width of embedded track is 1.5 mm, the track thickness is 35 microns and the relative permittivity is 4.5. **[4]**

c) Explain the different termination schemes to avoid reflections in high speed PCB designs. **[4]**

Q5) a) State the different capabilities of DPO. With suitable schematic how DPO can be used to observe the eye pattern. **[8]**

b) With the help of any one circuit explain the use and limitations of operating point analysis and AC analysis. **[8]**

OR

Q6) a) Define signal integrity. Discuss in detail the significance of signal integrity and the factors on which signal integrity is dependent. **[8]**

b) An eight channel DAS is designed with 89C51 microcontroller. How will you test:

i) The A to D converter is working properly?

ii) The different control and data signals. **[8]**

SECTION - II

Q7) a) What are the goals of software design? Discuss the different phases of software design with the help of neat diagram. **[8]**

b) Discuss the advantages and limitations of the following methods/tools of software debugging: **[10]**

i) Break points.
ii) Software simulators.
iii) IDE.
iv) Emulators
v) Single stepping.

OR

Q8) a) Explain the different phases of bugs introduction in the software and how to debug these bugs. **[8]**

b) Explain how the ASM method can be used to design a washing machine. Draw the detailed ASM chart. **[10]**

Q9) a) Justify the need of different tests to be carried out on following products:

i) Laptop.
ii) Mobile Phone.
iii) UPS.
iv) PLC. **[8]**

b) Explain the importance of shielded room while conducting EMI/EMC testing. **[4]**

c) What is CE marking? What are the objectives of CE marking? **[4]**

OR

Q10) a) In order to test the suitability of an instrument for a typical application which different tests are to be carried out on the instrument. Also discuss the effect and action taken for each test. **[10]**

b) Differentiate between conducted EMI and radiated EMI. **[6]**

Q11) a) Explain the role of documentation in product design and development. **[5]**

b) What are the different types of documentation? State the features of each type of documentation. **[8]**

c) Justify - the bill of materials is considered to be the basic product cost.

[3]

OR

Q12) a) Explain in detail:

i) Service manual for radio plus tape recorder.

ii) User manual of mobile phone. **[10]**

b) Justify:

i) Engineering notebook is foundation of any engineering task.

ii) Bare board testing is essential for high track density PCB's. **[6]**

■■■

Total No. of Questions : 12] **[Total No. of Pages : 3**

P 1276 **[3864] - 253**

B.E. (Electronics)

REAL TIME OPERATING SYSTEMS

(2003 Course) (Elective - II) (404212)

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

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer books.***
2) ***In Section-I attempt Q.1 or Q.2, Q.3 or Q.4 and Q.5 or Q.6 in Section-II attempt Q.7 or Q.8, Q.9 or Q.10 and Q.11 or Q.12.***
3) ***Neat diagrams, flow charts must be drawn and well commented pseudo code written wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Discuss the memory requirements in foreground / background and multi tasking system. **[8]**

b) Explain clock tick in multitasking system. What are the constraints in selection of the clock tick in multitasking system? How accurate time this can give? **[8]**

OR

Q2) a) What is RMS theorem? How it is useful in assigning tasks priorities? Check whether the following set of periodic real-time tasks is schedulable under RMS on a uniprocessor system : $T_1 = (e_1 = 20, p_1 = 100)$, $T_2 = (e_2 = 30, p_2 = 150)$, $T_3 = (e_3 = 60, p_3 = 200)$. **[8]**

b) Discuss interrupt and interrupt timings for foreground / background, non-preemptive and preemptive kernel. **[8]**

Q3) a) Explain, Locking and unlocking of scheduler in uCOSII, Nesting of scheduler lock, Possible situation and precautions while using scheduler lock/unlock. **[8]**

b) What is the use of following members of OS_TCB? And how they are manipulated? **[8]**

```
INT8U   OSTCBX;
INT8U   OSTCBY;
INT8U   OSTCBitX;
INT8U   OSTCBitY;
```

OR

P.T.O.

Q4) a) Explain, what is ready list in uCOSII? How uCOSII add the task in the ready list? How uCOSII remove a task from ready list? **[8]**

b) What are different events handled using ECB in uCOSII. Explain data structure OS-EVENT. **[8]**

Q5) a) Write short note on any two : **[6]**

i) Semaphore management in uCOSII.

ii) Mutual exclusion semaphore in uCOSII.

iii) Event flag management in uCOSII.

b) Explain in detail OSMutexCreate(). **[6]**

c) Enlist different MUTEX services. What configuration constants provided to configure MUTEX? **[6]**

OR

Q6) a) Explain Event Flag Group data structure OS_FLAG_GRP and OS_FLAG_NODE. **[6]**

b) Write short note on any two : **[6]**

i) Semaphore management in uCOSII.

ii) Mutual exclusion semaphore in uCOSII.

c) What is relationship between Task, ISR and Semaphore in uCOSII? **[6]**

SECTION - II

Q7) a) How to use Mailox as binary semaphore? Explain by using pseudo code. **[6]**

b) What is relationship between Task, ISR and Message Queue in uCOSII? **[6]**

c) What are message queue services in uCOSII? How Message Queue services enabled/disabled in uCOSII. **[6]**

OR

Q8) a) Explain the relationship between tasks, ISR and message queue. **[6]**

b) What are the features of message queue in uCOSII? **[6]**

c) Explain Mailbox services and configuration in uCOSII. **[6]**

Q9) a) Explain Memory Control Block data structure OS_MEM. **[4]**

b) Explain memory partition and multiple memory partition in uCOSII. **[4]**

c) Define porting of uCOSII. What requirements the processor should satisfy to run uCOSII. **[4]**

d) What is testing of port? What are the steps to follow for testing of port? **[4]**

OR

Q10) a) Explain the need of memory management services by OS as compare to compiler functions. **[4]**

b) What are memory management services in uCOSII? Explain any one of them. **[4]**

c) How OS_CPU.H makes uCOSII processor and implementation specific? **[4]**

d) Explain uCOSII hardware/software architecture. **[4]**

Q11) Answer the following by considering the implementation of temperature controller.

a) Define the hardware architecture for the system. **[4]**

b) Define the tasks for the system and assign the tasks priority and explain. **[4]**

c) Enlist the services of uCOSII required in the system. **[4]**

d) Write the application software for the system. **[4]**

OR

Q12) Answer the following by considering the implementation of chocolate vending machine.

a) Define the hardware architecture for the system. **[4]**

b) Define the tasks for the system and assign the tasks priority and explain. **[4]**

c) Enlist the services of uCOSII required in the system. **[4]**

d) Write the application software for the system. **[4]**

Total No. of Questions :12] **[Total No. of Pages : 2**

P1075

[3864]-265
B.E. (E&TC)
EMBEDDED SYSTEMS DESIGN
(2003 Course)

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

Instructions to the candidates:

1) ***Answer three questions from section I and three questions from sectionII.***
2) ***Answers to the two 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 Real time systems? Explain challenges of implementing Real time systems on general purpose system. **[8]**

b) Explain in detail how connection is established using Bluetooth protocol. Provide complete details of pico NET and scatter NET. **[10]**

OR

Q2) a) What are the different functions of SDP and L2 CAP. **[8]**

b) Explain the tranceiver section of IrDA in complete details with functionality. Explain in detail OBEX protocol using IrDA. **[10]**

Q3) a) What are the different criteria used while selecting memory for embedded system. **[8]**

b) What are the special functions required in processors for digital camera system with still photography and streaming video. **[8]**

OR

Q4) a) Explain with example how shared data problem occurs when interrupt arrives. What are different ways to avoid it. **[8]**

b) List the differences between the process, task and thread. **[8]**

[P.T.O.

Q5) a) Give the features and functionality of UART device driver for μC/OS II. **[8]**

b) Explain states of task. Explain in detail the transitions from one state to another in a task. **[8]**

OR

Q6) a) What is scheduling. Explain the various scheduling algorithms. **[8]**

b) Explain the different tools used for developing software. **[8]**

SECTION - II

Q7) a) Explain in detail different types of semaphore and usage of each type in different operations by giving examples. **[8]**

b) Write C code for implementing Message mailbox in RTOS. How does a mailbox message differs from a queue message. **[10]**

OR

Q8) a) Write C code for implementing pipes in RTOS. **[10]**

b) Is RTOS a must for all embedded system applications? Justify your answer. **[8]**

Q9) a) Explain in detail the following functions of RT Linux os. **[8]**

i) IPC function. ii) Mutex Management function.

b) Explain in detail the interprocess communication in QNX. **[8]**

OR

Q10) a) Compare QNX with NUCLEUS. What are the applications of NUCLEUS. **[8]**

b) What are the different phases and models of software development cycle. **[8]**

Q11) Explain the design and implementation of car cruise control system with block diagram and C code. **[16]**

OR

Q12) Explain the design and implementation of RFID based system for asset tracking with block diagram and C code. **[16]**

■■■

Total No. of Questions :12] **[Total No. of Pages :4**

P1076 **[3864]-268**

B.E. (E&T/C)

ARTIFICIAL NEURAL NETWORKS (ANN)

(404218) (2003 Course)

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

Instructions to the candidates:

1) ***Answer Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6 from section - I, Q. 7 or Q. 8, Q.9 or Q. 10, Q. 11 or Q. 12 from section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain biological neural network with neat diagram and compare its performance with artificial neural network. **[8]**

b) A neural network has 2 - input neurons with the following weight matrix W = [3 2] and I = $[-5\ 7]^t$ and the required output is 0.5.

i) Find out the bias that will do the job, if linear transfer function is used.

ii) Find out the bias, that will do the job, if log sigmoid function is used. **[4]**

c) Draw and explain the following structures of ANN. **[6]**

i) Group of instars.

ii) Group of out stars.

iii) Auto associate memory.

OR

Q2) a) Design OR gate using MP neuron model. Explain the drawbacks of MP neuron model. **[4]**

b) Explain the difference between activation dynamic models and synaptic dynamic models. **[6]**

P.T.O.

c) Explain the difference between stability and convergence. **[4]**

d) What is supervised learning? Mention the different supervised algorithms. **[4]**

Q3) a) If $I_1 = [\ 1 \quad 1\ ]^t$, $t_1 = 1$ and $I_2 = [\ 1 \quad -1\ ]^t$, $t_2 = -1$ represents the input and output target pairs. find out the new weights using perceptron learning for one epoch. Initial weight = [0 0], learning rate = 0.5 **[6]**

b) Explain the term linear separability. Explain wheter E_{xoR} gate is linearly separable or not. **[4]**

c) Explain the training algorithm used in adaline and explain how the decision boundary of adaline differs from that of perceptron learning. **[6]**

OR

Q4) a) Explain the training algorithm used in BPN (Back propogation network). Explain how BPN with momentum differs from that of BPN. **[8]**

b) A back propogation network with 2i/p neurons, 2 hidden neurons and 1 output neuron is given.

Input X = [0.1 0.7] t = 1 learning rate = 1.

Weight matrix between input and hidden layer is W.

$$W = \begin{bmatrix} 0.1 & 0.3 \\ 0.2 & 0.5 \end{bmatrix}$$

Weight matrix between hidden and output layer is V

V = [0.2 0.1]

Find the new weight matrix W and V after 1 epoch of training. **[8]**

Q5) a) Design a Hopfield network for 5 bit bipolar patterns. The training patterns are $S_1 = [\ 1\ 1\ 1\ 1\ 1\ ]$, $S_2 = [\ 1, -1, -1, 1, -1\ ]$

$S_3 = [\ -1\ 1\ -1\ -1\ -1\ ]$. Find the weight matrix and energy for three samples. **[8]**

b) Explain what is feedback network. **[4]**

c) Explain the concept of simulated annealing and explain how it is used in neural networks. **[4]**

OR

Q6) a) Draw the architecture of Boltzmann machine and explain how it is different from Hopfield network. **[6]**

b) Explain the term energy associated with Hopfield n/w. **[2]**

c) What is a state transition diagram for a feedback network? Explain how to derive it for a given network. **[8]**

SECTION - II

Q7) a) Explain the architecture of self organised feature map (SOFM) network. Explain the training algorithm used for the same. **[8]**

b) Explain the architecture and application of Maxnet in unsupervised learning. **[6]**

c) What is learning vector quantization? **[2]**

OR

Q8) a) Explain ART1 architecture. **[4]**

b) Explain the training algorithm used in ART1 network. **[8]**

c) Explain plasticity stability dilemma. **[4]**

Q9) a) Explain TAM and MAM with the help of neat diagrams. **[6]**

b) Explain the principle of Neocognitron for pattern variability tasks. **[6]**

c) Explain the architecture of RBF network with the help of neat diagram. **[4]**

OR

Q10) a) Design a BAM for the following input and output pairs. **[10]**

i) Find the weight matrix.

ii) Verify the operation of BAM in X and Y direction.

$I_1 = (\ 1, -1, -1, 1\ )$ $t_1 = (-1, 1, 1)$

$I_2 = (-1, 1, 1, -1\ )$ $t_2 = (1, -1, 1)$

I_1 and I_2 are inputs.

t_1 and t_2 are target outputs.

b) Explain the architecture of hetero associative net and explain the training algorithm used for the same. **[6]**

Q11) a) What is the problem in the recognition of hand written digits? **[6]**

b) Explain the difficulties in the solution of travelling salesman problem by a feedback neural network. **[8]**

c) Explain how an image smoothing problem can be solved by principles of neural network. **[4]**

OR

Q12) a) Explain how neural network principles are useful for a texture classification problem. **[6]**

b) Explain how neural network principles are useful in control applications. **[6]**

c) What is the significance of neural networks in the NET talk application. **[6]**

■■■

Total No. of Questions : 6] **[Total No. of Pages : 2**

P 1277 **[3864] - 295**

B.E. (Instrumentation)

PROCESS MODELING & OPTIMIZATION

(2003 Course)

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

Instructions to the candidates:

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

SECTION - I

Q1) Explain uses of mathematical model, principles of formulation and types of models. **[18]**

OR

a) Find the mathematical model of field control DC motor. **[18]**

b) Find the model of liquid systems shown in Fig. 1
Assume : L = length of exit line; Ap = Exit line cross-sectional area and At = tank cross-sectional area.

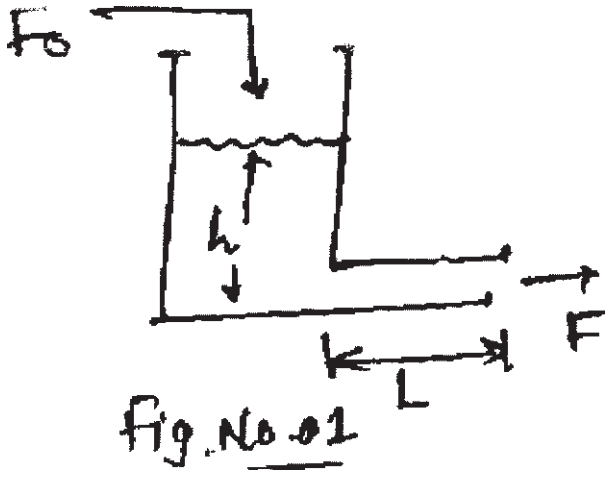


Fig. No. 01

Q2) Obtain the model of ideal binary distillation column. **[16]**

OR

Obtain the model of non isothermal C.S.T.R. **[16]**

P.T.O.

Q3) Explain pulse testing, sine wave testing in system identification. **[16]**

OR

Write short note on **[16]**

a) ATV identification method.

b) Off-line and On-line identification.

SECTION - II

Q4) Explain Niederlinski index for analysis of stability. Consider a system. **[18]**

$$\begin{bmatrix} x_D \\ x_B \end{bmatrix} = \begin{bmatrix} \dfrac{12.8.e^{-s}}{1+16.7s} & \dfrac{-18.9.e^{-3s}}{1+21s} \\ \dfrac{6.6.e^{-7s}}{1+10.9s} & \dfrac{-19.4.e^{-3s}}{1+14.4s} \end{bmatrix} \begin{bmatrix} \mathrm{R} \\ \mathrm{V} \end{bmatrix}$$

Find RGA and NI.

OR

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

a) Resiliency and Morari resiliency index.

b) Inverse Nyquist array.

Q5) Explain the following : **[16]**

a) Concave, convex functions and continuity of a function.

b) Gradient of a function and Hessian matrix.

OR

Determine the optimum values of the following functions and state whether they are minimum or maximum. **[16]**

a) $f(x) = 3x_1^2 - 4x_1x_2 + 2x_2$.

b) $f(x) = \dfrac{x_1^2}{4} + \dfrac{2}{x_1x_2} + 4x_2$.

Q6) a) Explain the procedure of scanning and bracketing for optimization. **[8]**

b) Explain Newtons method for optimization of multivariable functions with the help of flow chart. **[8]**

OR

Explain Newton, Quasi-Newton and secant methods for single variable optimization. **[16]**

Total No. of Questions : 6] **[Total No. of Pages : 2**

P 1278

[3864] - 303

B.E. (Printing Engineering)

OFFSET MACHINES - II

(2003 Course)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Answers to the two sections should be written in separate books.***

SECTION - I

Q1) a) State and explain splice cycle of zero speed splicer. **[8]**

b) With neat diagrams explain different types of reel stands used for web offset presses. **[8]**

OR

a) Explain the significance of a suitable splice pattern for reels used on web offset presses. Explain any 3 types with neat diagrams. **[8]**

b) Explain use of clamp truck in web offset press. **[8]**

Q2) a) What is the significance of using an automatic plate changing mechanism on web offset machines in newspaper industry? Explain the mechanism in brief. **[8]**

b) Why blanket cylinder has a low gap in web offset machines. Draw a neat construction of blanket used on web presses stating the hardness desired on web offset. **[8]**

OR

a) Compare brush dampening system and continuous dampening system with neat figures. **[8]**

b) Explain keyless inking system used on web offset presses. **[8]**

Q3) Explain the process of drying on heatset weboffset press. Describe different types of dryers used for this process. **[18]**

OR

a) Describe chill roll plumbing. **[9]**

b) Explain one type of folder used in newspaper industry on web offset machines. **[9]**

P.T.O.

SECTION - II

Q4) Explain the term 'Web Control'. State and explain the mechanical factors affecting web control. **[16]**

OR

a) What is dancer roller and RTF roller? How do they monitor tension and in which units? **[8]**

b) Explain parameters to be monitored during a press run of a web offset machine. **[8]**

Q5) Write short notes on : **[16]**

a) Remoisturising unit.

b) Web break detectors.

c) Side lay sensors.

d) Web cleaners.

OR

a) Explain preventive and breakdown maintenance. **[8]**

b) Describe checklist for maintenance of folders. **[8]**

Q6) Explain the phenomenon of consumption ink and dampening solution of the following substrates : **[18]**

a) LWC. b) SCA. c) SCB.

d) WFC. e) INP. f) NP.

Explain w.r.t. to ink densities and dot gain.

OR

Explain different problems occurring on print due to : **[18]**

a) Cylinder pressures.

b) Out of round reel.

c) Incorrect Chill roll temperature.

d) Paper lint.

e) Dryer temperature profile incorrect.

f) Blanket wrap.

Total No. of Questions : 6] **[Total No. of Pages : 2**

P 1279 **[3864] - 304**

B.E. (Printing)

ELECTRONIC IMAGE SETTING

(2003 Course)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Write Section I & Section II on different answer sheets.***

SECTION - I

Q1) Mention in details the basic objectives & functions of raster image processor. **[16]**

OR

Compare between the raster image processor settings required for printing of following job through :

a) Sheetfed offset process.

b) Screen printing process.

Job details :	Colour	:	4 colour - C, M, Y, K
	Paper	:	Maplitho 80 gsm.
	Image	:	Halftone image in 4 col. &
	Text	:	Text in single colour
	Size	:	100% enlargement (same size) **[16]**

Q2) Write short notes on : **[18]**

a) Trapping (Spreads & Chokes).

b) Spot size & resolution.

OR

Write down fundamental steps in digital image processing & elements of digital image processing system. **[18]**

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

a) Display file.

b) Display processor.

OR

P.T.O.

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

a) Shadow mask CRT.

b) Beam Penetration CRT.

SECTION - II

Q4) Draw neat & labelled diagram of internal drum imagesetter, external drum imagesetter & explain their working. **[18]**

OR

Draw & explain the different beam deviation technologies used for capstan imagesetters. **[18]**

Q5) a) What is PDF file? How does it differs from Ps & Prn? Explain the main advantages & uses of PDF File.

b) What are different types of PDF files? What are their specific applications? Explain any 2 types of PDF files & their specific applications. **[16]**

OR

What is PDF workflow? Write down in greater details. **[16]**

Q6) What is Pre-flight check? What is its purpose? How is it performed in production environment? **[16]**

OR

What are different types of file formats for storing vector files & raster files? Compare between these types of formats. **[16]**

Total No. of Questions :6] **[Total No. of Pages : 2**

P1308 **[3864]-307**

B.E. Printing
SECURITY PRINTING
(Elective) (2003 Course)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) What is Security Printing? **[16]**

OR

b) Optical document security purpose and importance.

Q2) a) Designing security documents considerations to be taken into account. **[16]**

OR

b) Security Printing used and describe in detail any one.

Q3) a) What is RFID technology. When did it start and what is the present scenario of the same. **[18]**

OR

b) Define Smart Cards, Club Cards, Credit/Debit Cards.

Which of these have direct financial implications. And how.

SECTION - II

Q4) a) Define MICR printing. Since when did it start in India. What is the use of the same? **[16]**

OR

b) Explain the layout of the MICR cheque as used in India explaining the code line.

P.T.O.

Q5) a) What are the Substrates used in Security Printing.
Importance of special inks and watermarks on substrates. **[18]**

OR

b) Various testing methods and the deterrence measures used in security printing.

Q6) a) What is the importance of Brand security and brand protection. **[16]**

OR

b) Use of invisible document security.

■■■

Total No. of Questions : 12] **[Total No. of Pages : 6**

P 1088

[3864] - 321

B.E. (Chemical)

PROCESS DYNAMICS & CONTROL

(2003 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) ***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) i) With neat sketch explain feedback control strategy for controlling temperature of liquid inside a steam-heated stirred-tank heater by manipulating flow rate of steam. Identify CV, MV, DV for this system. **[8]**

ii) If a direct-acting controller is used, whether you will select a air-to-open or air-to-close type control valve on steam line. **[2]**

b) With reference to the control system described in Q.1-a, explain the objectives of the control system. **[8]**

OR

Q2) a) Explain mathematical languages (methods) used for analysis and design of control systems in China, Russia, England, Greece and German. Also state the types of mathematical models used for analysis as the outcome of these languages. **[8]**

b) For a stirred-tank heater system explained in Q.1-a, sketch and explain the following

i) The control system for controlling level of liquid inside the tank by manipulating the flow rate of exit liquid stream.

ii) The control system for controlling flow rate of liquid entering the tank. **[10]**

Q3) a) A cylindrical liquid tank has 1 m^2 cross-sectional area with a control valve with resistance 10 min/m^2 installed in the liquid outlet line. Liquid enters into the tank at a rate 0.2 m^3/min. **[8]**

P.T.O.

i) Find steady-state level of liquid in the tank corresponding to flow rate of 0.2 m^3/min.

ii) Find the transfer functions of the system.
$\overline{H}(s)/\overline{Q}_i(s)$ & $\overline{Q}_o(s)/\overline{Q}_i(s)$ where Q_i, Q_o & H represent inlet, outlet flow rates and level of liquid in deviation form.

iii) If input flow rate is given unit step change (increase), derive the time-response equations for liquid level and outlet flow rate. Also find level of water after 30 seconds and new level attained.

iv) Find the time required for achieving 80% change in level.

b) A cylindrical liquid tank 'A' having cross-section area 1.2 m^2 is connected to another cylindrical tank 'B' having cross-section area 0.8 m^2 in the non-interacting arrangement. If the resistances in the flow lines between the tanks and that leaving from tank B are 8 m^2/min & 6 m^2/min respectively. Then find - **[8]**

i) Individual transfer functions $G_1(s)$ & $G_2(s)$ of tanks A & B in the form $\overline{H}(s)/\overline{Q}_i(s)$.

ii) The overall transfer function of the combined non-interacting tank system. Also find the poles of this transfer function and hence predict the nature of its dynamic response for step change in input flow rate to tank 'A'.

iii) If initial input flow rate F_i to tank 'A' is 0.3 m^3/min, find the corresponding steady-state levels of liquid in tanks 'A' & 'B'.

iv) If a unit step change (decrease) is given to input flow rate F_i find the expression for time-response of liquid level in tank 'B'.

OR

Q4) a) A mercury thermometer having time constant 30 sec. shows steady-state temperature of 27°C which is suddenly immersed in hot liquid maintained at 200°C. **[8]**

i) Assuming unit static gain, state the transfer function $\overline{T}_m(s)/\overline{T}(s)$ for the thermometer system where T & T_m are temperature outside the bulb and measured temperature respectively. (In deviation form).

ii) Find the temperature reading after 10 sec.

iii) Find time required for 90% change in temperature reading.

b) i) What are inverse response systems? Explain inverse response of liquid level in a boiler system.

ii) If a first-order process having transfer function $G_1(s) = K_1/\tau_1 s + 1$ is connected in opposition to a pure integrator process having transfer function $G_2(s) = K_2/s$, find the overall transfer function G(s). Also find the boles & zeros of G(s). Derive the condition for inverse response behaviour.

iii) Sketch the step responses of outputs of the individual processes having transfer functions $G_1(s)$, $G_2(s)$ and the combined process G(s). **[8]**

Q5) a)

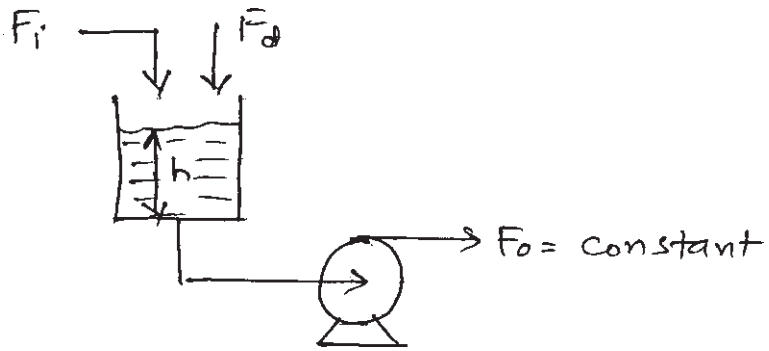


Figure-1

A liquid tank system shown in Figure 1 has cross-section area A. For this system. **[8]**

i) Derive differential equation model based on mass balance around the tank.

ii) Derive the Laplace domain open-loop model for the system in the form -

$$\bar{h}'(s) = G_P(s)\bar{F}_i'(s) + G_d\bar{F}_d'(s),$$

Where h', F_i', F_d' are deviation variables corresponding to h, F_i & F_d respectively.

iii) If liquid level in the tank is to be controlled at set-point h_{sp} using feedback controller having transfer function $G_C = K_C$, construct block diagram for this system assuming unity transfer functions for the measuring element and final control element. Find servo and regulator transfer functions for this closed-loop system.

b) For liquid level control system shown in Figure 1, if P-controller having gain K_C is used find time response equation for height h of liquid for a unit step change in

i) Set-point h_{sp}.

ii) Disturbance flow F_d.

Find the offset in both the cases. **[8]**

OR

Q6) a) Consider a second-order system having transfer function

$$G_P(s) = \frac{\bar{y}(s)}{\bar{m}(s)} = \frac{K_P}{\tau^2 s^2 + 2\tau\zeta s + 1}.$$

i) If a P-controller having transfer function K_C is used to maintain output y near to the set-point y_{sp}, find closed-loop servo transfer function assuming $G_m = G_f = 1$.

ii) Find output response $\bar{y}(s)$ for unit step change in set-point $\bar{y}_{sp}(s)$. Find the closed-loop response characteristics and compare them with open-loop response characteristics K_p, τ & ζ.

iii) Find the value of offset in the value of y. **[8]**

b) A system having transfer function $G_P(s) = \frac{1}{10s^3 + 2s^2 + s - 5}$ is feedback controlled using a P-controller having gain K_C.

i) Find the characteristic equation assuming $G_m = G_f = 1$.

ii) Find the range of values of K_C that produce stable closed-loop responses (using Routh-Hurwitz criterion).

iii) Also find the value of gain K_C at which the closed-loop system is at the verge of instability. Find corresponding roots of characteristic equation and hence the frequency of oscillations. **[8]**

SECTION - II

Q7) a) The output of a process having transfer function $G_P = 1/(s^2 + 2s)$ is feedback controlled using a P-controller with the measuring element having transfer function $G_m = 1/(s+1)$. Assuming $G_f = 1$. **[10]**

i) Find closed-loop servo transfer function of the control system.

ii) Draw block diagram.

iii) Sketch root locus for the system.

iv) Find the range of values of gain K_C for which the system will be stable and unstable.

v) Find the value of K_C at which the system undergoes sustained oscillations.

Also find the corresponding frequency of oscillations.

b) i) Sketch asymptotic Bode plot for the control system having open-loop transfer function $G_{0L} = \frac{5e^{-5s}}{(2s+1)(s+1)}$.

ii) Find the phase margin & gain margin alongwith corresponding crossover frequencies. On the basis of these values, comment on stability of the system. **[8]**

OR

Q8) a) Draw the root locus of a closed-loop system with

$$G_H = \frac{k}{s(s+4)(s^2+4s+20)}$$ **[8]**

b) i) Sketch the Bode plot for a control system consisting of a process having K = 1, $\tau = 1$, t_d = 1 the measuring element having K = 0.95, $\tau = 0.01$, the P-controller having gain 10 and the final control element having unity transfer function.

ii) Find the values of PM & GM with corresponding cross-over frequencies with these values comment on stability of the system. **[10]**

Q9) a) Explain split-range control system for controlling the pressure inside the gas phase reactor by manipulating flow rates of reactant and product streams. Draw neat graph showing % opening of the valves on inlet and outlet sides at different controller output signals. **[8]**

b) i) Compare the performance of feedforward and feedback controllers.

ii) Explain feedforward control of a jacketed CSTR to achieve constant temperature and composition within the reactor by controlling feed stream temperature and concentration with manipulation of coolant flow rate entering jacket and the rate of product withdrawal from the reactor. **[8]**

OR

Q10)a) Two reactants streams A & B enter the CSTR in certain fixed proportion R. Draw and explain ratio control system for CSTR which will maintain the ratio of A & B constant at the desired value R_D by manipulating flow rate of B, while A is used as wild stream. **[8]**

b) What is adaptive control system? State its applications in chemical processes. Draw and explain block diagram of programmed adaptive control system used for changing controller parameters based on auxiliary process measurement. **[8]**

Q11)a) Draw and explain control system for batch reactor used to control the following variables **[8]**

i) Flow rates of reactant streams A & B.

ii) Pressure inside the reactor by manipulating the flow rate of vent stream.

iii) Temperature inside the reactor is controlled using split-range control system on the hot and cold water flow lines entering the jacket. Explain how the temperature is achieved and maintained during start-up, reaction period and shut-down period.

b) i) Explain feedback control strategy for controlling temperature of cold fluid outlet from a counter-current shell and tube heat exchanger by manipulating flow rate of entering hot fluid.

ii) Explain cascade control strategy consisting a primary temperature controller described above along with a secondary controller for controlling flow rate of entering hot fluid. What are the advantages of using cascade control over single-loop feedback control? **[8]**

OR

Q12)a) Explain control scheme for a two-product distillation column used to control the following **[8]**

i) Flow rate of binary feed (A + B, A being more volatile component).

ii) Level of liquid in the condensate accumulator.

iii) Composition of top product.

iv) Level of liquid in the reboiler.

v) Composition of bottom product.

b) Write short note on the following : **[8]**

i) Selective control systems.

ii) Cohen-Coon method of tuning of controllers.

Total No. of Questions : 12] **[Total No. of Pages : 3**

P 1089

[3864] - 323

B.E. (Chemical Engg.)

CHEMICAL PROCESS SYNTHESIS

(2003 Course) (409344)

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

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Assume suitable data, if necessary.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Synthesize a detailed process for acetone production from isopropanol with hydrogen as a byproduct, considering :

i) Formulation of design problem,

ii) Hierarchy and

iii) Approaches to chemical process design. **[12]**

b) Explain grassroot design. **[4]**

OR

Q2) a) Discuss in detail the onion model of process design. **[8]**

b) Explain the role of catalyst in the choice of reactor. **[8]**

Q3) a) Benzene is produced from toluene according to the reaction $C_6H_5CH_3 + H_2 \rightarrow C_6H_6 + CH_4$. Some of the benzene formed undergoes a secondary reaction in series to an unwanted byproduct diphenyl, according to the reaction $2C_6H_6 \leftrightarrow C_{12}H_{10} + H_2$. The following table gives the composition of the reactor feed and effluent streams. Calculate the conversion, selectivity and reactor yield with respect to

i) Toluene feed and ii) Hydrogen feed. **[12]**

Component	Inlet flow rate (kmol/h)	Outlet flow rate (kmol/h)
H_2	1858	1583
CH_4	804	1083
C_6H_5	13	282
$C_6H_5CH_3$	372	93
$C_{12}H_{10}$	0	4

b) Explain reaction system for multiple reactions in series producing byproduct. **[4]**

P.T.O.

OR

Q4) a) Explain idealized reactor model for ideal batch reactor, mixed and plug flow reactor. **[10]**

b) Derive the correlation to explain the effect of temperature on selectivity and reactor volume. **[6]**

Q5) a) Explain the behaviour of mixtures during azeotropic distillation. **[10]**

b) Explain the concept of degrees of freedom in the design of evaporator. **[8]**

OR

Q6) a) Discuss principle, working and construction of fluidized bed catalytic reactor. **[10]**

b) Explain the effect of various parameters on the performance of absorption. **[8]**

SECTION - II

Q7) a) Explain heat integration in sequencing of simple distillation column. **[8]**

b) Discuss thermal coupling for direct and indirect distillation sequencing. **[8]**

OR

Q8) a) Explain the optimization of reducible structure. **[8]**

b) Discuss the possible alternative sequences for the separation of five component mixture by distillation sequencing. **[8]**

Q9) a) Explain composite curves for following heat recovery system. **[10]**

Stream	Type	Supply temperature T_s, ^oC	Target temperature T_T, ^oC	ΔH MW	Heat capacity C_p $MW.k^{-1}$
R1	Cold	20	180	32	0.2
R2	Hot	250	40	-31.5	0.15
R3	Cold	140	230	27	0.3
R4	Hot	200	80	-30	0.25

b) Explain criteria of utility selection. **[6]**

OR

Q10)a) Explain composite curve for two streams heat recovery system. **[8]**

Stream	Type	Supply temperature T_s ^oC	Target temperature T_T ^oC	ΔH MW
1	Cold	30	100	14
2	Hot	150	30	-12

b) Explain graphically heat recovery pinch. **[8]**

Q11)a) Explain the intensification of hazardous materials. **[8]**

b) Compare the fire and explosion hazards in the process involving benzene inventory of 1000 kmol at 120 and 160^{o}C, based on theoretical combustion energy resulting from catastrophic failure of the equipment. The normal boiling point of benzene is 80^{o}C, the latent heat of vaporization is 31,000 kJ/kmol, the specific heat capacity of 150 kJ/(kmol.^{o}C) and the latent heat of combustion is 3.2×10^6 kJ/kmol. **[10]**

OR

Q12)Write short note on **[18]**

a) Integration of refrigeration cycle.

b) Explosion.

c) Attenuation of hazardous materials.

Total No. of Questions : 12] **[Total No. of Pages : 3**

P 1090

[3864] - 326

B.E. (Chemical Engg.)

BIOPROCESS ENGINEERING

(2003 Course) (409341) (Elective - 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) ***Assume suitable data, if necessary.***
3) ***Neat diagrams must be drawn wherever necessary.***

SECTION - I

Q1) Write short notes on the following : **[16]**

a) Protist kingdom.
b) Ammylase.
c) Co-enzyme.
d) Specific growth rate of bacteria.

OR

Q2) Write short notes on the following : **[16]**

a) Structure of steroids.
b) Role of DNA in cell life cycle.
c) Limiting nutrient.
d) Apo-enzyme.

Q3) Explain the manufacturing process for **[16]**

a) Vitamin A and
b) Lactic Acid.

OR

Q4) Explain the manufacturing process for **[16]**

a) Penicillin and
b) Vinegar.

Q5) Derive the kinetic expression for the following :

$E + S \Leftrightarrow ES;$ K_m (1)

$ES \xrightarrow{k} E + P;$ (2)

$E + P \Leftrightarrow EP;$ K_p (3)

P.T.O.

Where K_m and K_p are the thermodynamic dissociation constants for reversible reactions 1 and 3 respectively. 'k' is the kinetic constant for reaction 2. What type of kinetics is represented by the above equations? **[18]**

OR

Q6) Data for the enzyme catalyzed reaction S $\rightarrow$ P is as follows :

[S] (M)	6.25×10^{-6}	7.50×10^{-5}	1.00×10^{-4}	1.00×10^{-3}	1.00×10^{-2}
v (nmoles.lit^{-1}. min^{-1})	15.00	56.25	60.00	74.90	75.00

a) Estimate V_{max} and K_m.

b) What would 'v' be at [S] = 2.5×10^{-5} M and at [S] = 5.0×10^{-5} M?

c) What would 'v' be at 5.0×10^{-5} M if the enzyme concentration were doubled?

d) How will you verify that 'v' represents a true initial velocity? **[18]**

SECTION - II

Q7) Derive mathematical expressions with the help of Michaelis-Menten inhibition enzymatic kinetics for :

a) Noncompetitive inhibition

b) Competitive inhibition. **[16]**

OR

Q8) a) Explain how balanced growth of microbes is needed to be maintained for chemostat and prove that for sterile feed, D = μ. **[6]**

b) Operation of a typical CSTR follows the Monod kinetics where $\mu_{max} = 0.5h^{-1}$ and K_s = 2 g/l.

i) At steady state with no cell death, if S_0 = 50 g/l and Y = 1 (g cells / g substrates), what dilution rate 'D' will give the maximum total rate of cell production?

ii) For the same value of 'D' using tanks of the same size in series, how many vessels will be required to reduce the substrate concentration to 1 g/l? **[10]**

Q9) a) A marine microorganism contains an enzyme that hydrolyzes glucose-6-sulphate (S). The assay is based on the rate of glucose formation. The enzyme in a cell-free extract has kinetic constants of $K_m = 6.7 \times 10^{-4}$ M and $V_{max} = 300$ nmoles.lit^{-1}.min^{-1}. Galactose-6-sulphate is a competitive inhibitor (I). At 10^{-5} M galactose-6-sulphate and 2×10^{-5} M glucose-6-sulphate, 'v' was 1.5 nmoles. lit^{-1}.min^{-1}. Calculate K_i for galactose-6-sulphate. **[12]**

b) Calculate the peak oxygen consumption of specific yeast population in g/(lit.h). Actively respiring yeast population requires 0.32 g oxygen / (hr.g of dry cell mass). Cell population density is 10^9 cells per ml and single cell volume is 10^{-10} ml. 80% of active cell mass is water. **[4]**

OR

Q10) The steady state substrate and biomass concentrations for a continuous stirred tank fermenter operated at various dilution rates are given below. Given that the fresh feed concentration is 700 mg/l, calculate the values of the Monod constants μ_m and K_s, the yield coefficient Y and the endogenous respiration coefficient K_d. **[16]**

Dilution rate (hr^{-1})	0.3	0.25	0.2	0.12	0.08
Substrate concentration (mg/l)	45	41	16	8	3.8
Biomass concentration (mg/l)	326	328	340	342	344

Q11) Explain in brief the following : **[18]**

a) Reactor dynamics.

b) Immobilization of enzymes.

c) Ion exchange chromatography.

OR

Q12) Explain in brief the following : **[18]**

a) Bubble column bioreactor.

b) Fluidized bed bioreactor.

c) Continuous sterilization of bioreactor.

Total No. of Questions :12] **[Total No. of Pages :4**

P1517 **[3864]-327**

B.E. (Chemical Engineering)
ENERGY CONSERVATION
(Elective - I) (2003 Course)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) Data for a flat plate collector used for heating the buildings are given below:

Factor	Specification
Location and latitude	Baroda, 22^{o} *N*
Day and time	January 1, 11:30 - 12:30 (IST)
Annual Average intensity of solar radiation	0.5 langley/min
Collector tilt	Latitude + 15^{o}
No. of glass covers	2
Heat removal factor for collector	0.810
Transmittance of glass	0.88
Absorption of glass	0.90
Top loss coefficient for collector	7.88 $W/m^2\ ^oC$ (6.80 kcal/hr. $m^2\ ^oC$)
Collector fluid temperature	60 ^oC
Ambient temperature	15 ^oC

P.T.O.

Calculate:

i) Solar altitude angle.

ii) Incident angle.

iii) Collector efficiency. **[8]**

b) Discuss about solar distillation and solar drying? **[8]**

OR

Q2) a) Explain principle and working of solar ponds with neat diagram? **[8]**

b) Give the principle and application of the following energy sources: **[8]**

i) Geothermal energy.

ii) Tidal energy.

Q3) a) Explain the concept 'energy plantation'? What are its advantages and disadvantages? **[8]**

b) What are the different methods for hydrogen storage? Describe their advantages and disadvantages. **[8]**

OR

Q4) a) Discuss in detail the classification of Biomass Gasifiers. **[8]**

b) Explain the factors considered while designing the optimum size of a biogas plant? **[8]**

Q5) a) What are types of recuperators for waste heat recovery? Explain any two in detail? **[10]**

b) Discuss the Heat transformers used to boost temperature of industrial waste heat? **[8]**

OR

Q6) a) Explain the advantages of cogeneration with example of sugar industry? **[6]**

b) Write short note on following (any two): **[12]**

i) Direct contact heat exchangers.

ii) Principle and Working of incinerator.

iii) Thermal wheel.

SECTION - II

Q7) a) Explain the energy performance assessment of Heat exchanger and Turbines (Gas, Steam)? **[10]**

b) Justify that Fluidized bed combustion of coal is efficient method of combustion? **[8]**

OR

Q8) a) Explain with suitable diagram and description that "Steam pressure reducing station" help in energy optimization? **[8]**

b) Following data are provided for a typical oil fired boiler. Find out the efficiency of the boiler by indirect method and Boiler Evaporation ratio.

- Type of boiler : Oil fired
- Ultimate analysis of Oil
  C : 84%, H_2 : 12.0%, S : 3.0%, O_2: 1%
- GCV of Oil : 10200 kcal/kg
- Steam Generation Pressure : 7 kg/cm^2(g)- saturated
- Enthalpy of steam : 660 kcal/kg
- Feed water temperature : 60 ^oC
- Percentage of oxygen in flue gas : 7
- Percentage of CO_2 in flue gas : 11
- Flue gas temperature (T_f) : 220 ^oC
- Ambient temperature (T_a) : 27 ^oC
- Humidity of air : 0.018 kg/kg of dry air. **[10]**

Q9) a) Explain the energy conservation policy of State & Central Government? **[8]**

b) Justify that "Steam trap" and "Pressure Reducing Valves" (PRV) are energy conservation devices? **[8]**

OR

Q10) a) Enlist the energy consumption units in petroleum refinery. Discuss how energy can be conserved? **[8]**

b) Explain the features of energy conservation act of Govt. of India (2001)? **[8]**

Q11) a) Explain benchmarking of energy consumption and plant energy performance (PEP)? **[8]**

b) Distinguish between 'Preliminary Audit' and 'Detailed Audit' with suitable example? **[8]**

OR

Q12) Write short note on following (Any three) : **[16]**

a) Condensate recovery systems.

b) Sanky diagram and it's use.

c) Energy conservation in paper and pulp industry.

d) Hydrogen Technology Development in India.

■■■

Total No. of Questions : 12] **[Total No. of Pages : 2**

P 1091

[3864] - 328

B.E. (Chemical)

POLYMER TECHNOLOGY

(2003 Course) (409341) (Elective - I)

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

SECTION - I

Q1) What is polymer? Classify the different polymers based on structure and source, crystallinity etc. Give suitable examples for each case. **[16]**

OR

Q2) a) Classify the different polymers based on there properties **[8]**

i) Thermoplastic and thermosetting polymers.

ii) Linear and cross linked polymers.

b) What are factors influences the polymer properties? **[8]**

Q3) What are different polymerization techniques are used for synthesis of polymer. Explain in detail batch polymerization alongwith limitations in Engineering aspect point of view. **[16]**

OR

Q4) a) Explain suspension polymerization in detail along with engineering aspects and examples to use these techniques in Industries. **[8]**

b) What is difference between suspension and emulsion polymerization. Explain merits of emulsion polymerization to form monodispersed mini emulsion small size latex synthesis. **[8]**

Q5) a) What do you mean by polydispersity index? Explain number average molecular wt, viscosity avg mol. wt and degree of polymerization. **[8]**

b) Explain effect of molecular wt on Engg. properties of polymers. **[10]**

OR

P.T.O.

Q6) Along with neat diagram explain vapour phase osmometry and Gel permiation chromatography to determine molecular wt and it's distribution. **[18]**

SECTION - II

Q7) Explain kinetics of free radical polymerization by considering initiation, propagation and termination as elementary steps to find rate of polymerization R_p. What are different initiators are used in free radical polymerization, Explain role of initiator which affects conversion and rate of polymerization. **[16]**

OR

Q8) a) Explain kinetics of step growth polymerization. **[8]**

b) Explain kinetics of coordination polymerization. **[8]**

Q9) What are different additives used in compounding process? Explain role of antioxident, filler, UV stabilizers, lubricants in compounding process. **[16]**

OR

Q10) Explain different methods used in compounding process especially for thermoplastics and thermosets. With neat diagram explain injection molding process along with temperature zones and screw configurations. **[16]**

Q11) With neat flowsheet diagram explain typical manufacturing process of polyethylene synthesis and polystyrene synthesis. **[18]**

OR

Q12) Write a note on (any three) : **[18]**

a) Nylon synthesis.

b) Applications of Epoxies and Phenolics.

c) Natural Rubbers and Synthetic Rubbers.

d) Ziegler Natta polymerization for polyolefin synthesis.

Total No. of Questions : 12] **[Total No. of Pages : 3**

P 1092

[3864] - 329

B.E. (Chemical Engg.)

CATALYSIS

(2003 Course) (409341) (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) ***Assume suitable data, if necessary.***
3) ***Neat diagrams must be drawn wherever necessary.***

SECTION - I

Q1) a) Discuss the mechanism of homogeneous catalysis with two examples. **[8]**

b) Explain catalytic reaction feasibility with respect to activation energy and temperature. **[8]**

OR

Q2) a) Explain the role of supports in heterogeneous catalysis. **[8]**

b) Derive the relationship between size, number and total surface area of the crystallites. **[8]**

Q3) a) Explain the important characteristics of catalyst and their industrial significance. **[8]**

b) Solid catalyzed reaction $A \rightarrow 3R$ is conducted at 10 atm and 800°C in a basket type mixed reactor of 0.7 lit volume and containing 1g of catalyst of diameter d_p = 3 mm. Pure 'A' is fed at various rates into the reactor. Partial pressure of 'A' in the exit stream is measured for each feed rate. Find the rate of reaction using the following kinetic results : **[10]**

Feed rate, lit/hr	100	22	4	1	0.6
$P_{A, out} / P_{A, in}$	0.8	0.5	0.2	0.1	0.05

OR

Q4) a) Explain Eley-Rideal mechanism for surface reaction. **[8]**

b) The catalytic reaction $A \rightarrow 3R$ is run at 3 atm and 215°C in a PFR which contains 9 g of catalyst and uses a feed consisting of the partially converted product of 0.3 lit/min of pure unreacted 'A'. Assuming the reactor to be a differential reactor, find a rate equation to represent this reaction, using the following results :

P.T.O.

Run	1	2	3	4
$C_{A, in}$ (mol/lit)	0.100	0.080	0.060	0.040
$C_{A, out}$ (mol/lit)	0.084	0.070	0.055	0.038

[10]

Q5) a) Write a brief note on mass transfer in catalysis. **[6]**

b) The reaction A $\rightarrow$ 2R in an experimental packed bed reactor using various amounts of catalyst and a fixed feed rate F_{Ao} = 10 kmol/hr gives the following results.

W (kg catalyst)	1	2	3	4	5	6	7
X_A	0.12	0.20	0.27	0.33	0.37	0.41	0.44

i) Find the reaction rate at 50% conversion.

ii) In designing a large packed bed reactor with feed rate F_{Ao} = 500 kmol/hr, how much catalyst would be needed for 50% conversion?

iii) How much catalyst would be needed in part (ii) if the reactor employed a very large recycle of product stream? **[10]**

OR

Q6) a) Explain the reaction mechanism in phase transfer catalysis. **[5]**

b) Explain concept of Thiele's Modulus and its application in catalysis. **[6]**

c) Compare and contrast alumina and silica as catalyst support/carrier. **[5]**

SECTION - II

Q7) a) What is pore volume distribution? Describe the mercury penetration method for its measurement. What is N_2 desorption method? **[8]**

b) Derive the mathematical model for kinetics of catalyst deactivation. **[8]**

OR

Q8) a) Derive mathematical equation for determining catalyst surface area by BET method. **[8]**

b) Describe the general method of preparation of metal catalysts. **[8]**

Q9) a) Estimate k, the first order rate constant, for an enzyme preparation with V_{max} of 4.8 μ mole/(lit.min) under the given experimental conditions. $K_m = 2 \times 10^{-6}$ M. **[6]**

b) An enzyme was assayed at an initial substrate concentration of 2×10^{-5} M. In 6 min, half of the substrate has been used. The K_m for the substrate is 5×10^{-3} M. Calculate **[10]**

i) k,

ii) V_{max} and

iii) the concentration of product produced after 15 min.

OR

Q10) Data for the enzyme catalyzed reaction S $\rightarrow$ P is as follows : **[16]**

[S] (M)	6.25×10^{-6}	7.50×10^{-5}	1.00×10^{-4}	1.00×10^{-3}	1.00×10^{-2}
v ($nmoles.lit^{-1}.min^{-1}$)	15.00	56.25	60.00	74.90	75.00

a) Estimate V_{max} and K_m.

b) What would 'v'be at [S] = 2.5×10^{-5} M and at [S] = 5.0×10^{-5} M?

c) What would 'v' be at 5.0×10^{-5}M if the enzyme concentration were doubled?

d) How will you verify that 'v' represents a true initial velocity?

Q11) Write short notes on the following : **[18]**

a) Strong acid catalysts.

b) Silica as a support.

c) Protein.

OR

Q12) Write short notes on the following : **[18]**

a) Cracking catalyst.

b) ZSM-5.

c) Shape selectivity in zeolites.

Total No. of Questions : 12] **[Total No. of Pages : 2**

P1356

[3864]-331
B.E. (Chemical)
PETROLEUM REFINING
(2003 Course)

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

Instructions to the candidates:

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

SECTION - I

Q1) Discuss in details on formation of crude oil. Enlist oil reserves in the world and explain the oil exploration mechanism. **[16]**

OR

Q2) Note the specifications of following petroleum products: **[16]**

a) LPG b) Gasoline

c) Diesel Oil d) Kerosene

Q3) With neat diagram, explain the Crude Distillation Unit. **[18]**

OR

Q4) What is the necessity of Vacuum Distillation? Write in details about various products obtained from VDU along with process. **[18]**

Q5) Noting chemical reactions with diagram, explain Reforming. **[16]**

OR

Q6) Explain Hydro-cracking with neat sketches. **[16]**

P.T.O.

SECTION - II

Q7) a) What is Hydro-desulphurization? Explain. **[8]**

b) Discuss in details : HDA. **[8]**

OR

Q8) What is Acid Refining? Explain its necessity along with detailed process. **[16]**

Q9) Petroleum Refinery is a good source for power generation. Express your views on methodology for integration of refinery and a power plant. **[18]**

OR

Q10) Along with safety norms, write details on safety measures implied in refineries. **[18]**

Q11) What are various steps used in Pre-refining? Explain in details any two operations. **[16]**

OR

Q12) a) What are various applications of Lube Oils? **[8]**

b) Enlisting the names, explain use of catalysts in petroleum refining. **[8]**

■■■

Total No. of Questions : 12] **[Total No. of Pages : 4**

P 1265

[3864] - 334

B.E. (Chemical)

PROCESS MODELING & SIMULATION

(2003 Course)

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

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***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) Attempt the following : **[8]**

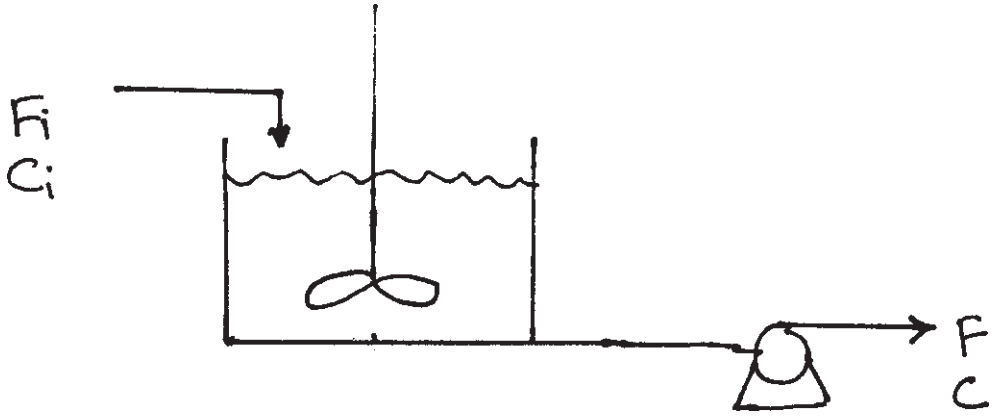
i) What is process model?

ii) Why develop a process model?

iii) How to determine the form of a model, give the typical form of models?

iv) What is the difference between lumped parameter and distributed parameter systems, give examples of each.

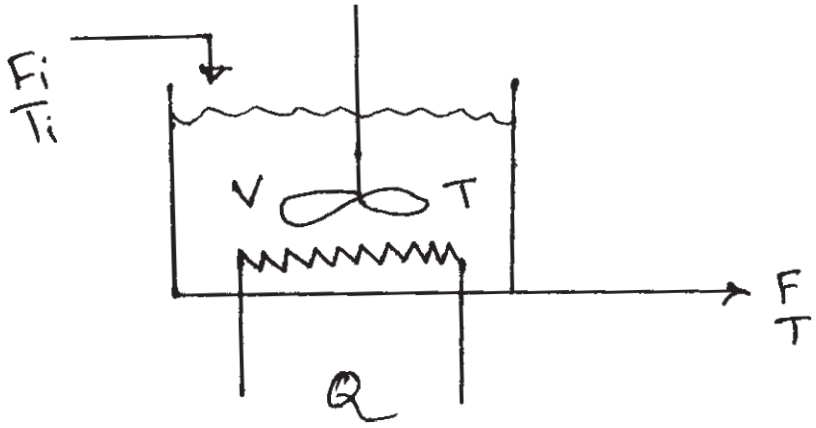
b) Assume that two chemical species A and B are in a solvent feed stream entering a liquid phase chemical reactor that is maintained at a constant pressure. The two species react irreversibly to form a third species, P. Develop a model to find out the reactor concentration of each species as a function of time. **[8]**



State your assumptions clearly.

OR

Q2) Consider a perfectly mixed stirred tank heater, with a single feed stream and a single product stream as shown below. Assuming that the flow rate and temperature of the inlet stream can vary, that the tank is perfectly insulated, and the rate of heat added per unit time (Q) can vary, develop a model to find out the tank temperature as a function of time. State your assumptions. **[16]**



Q3) A component material balance around a chemical reactor yields the following steady state equation

$$O = \frac{F}{V} C_{in} - \frac{F}{V} C - KC^3$$

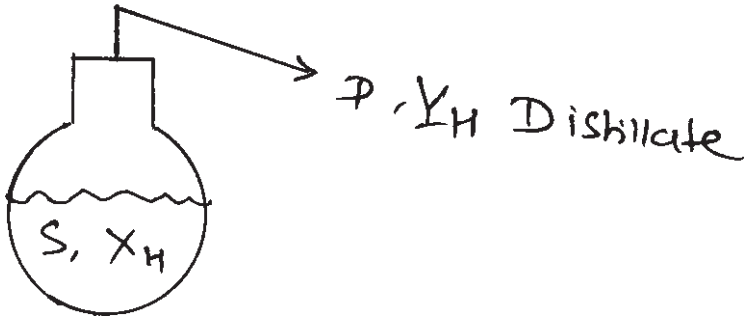
where $\frac{F}{V} = 0.1 \text{min}^{-1}$, C_{in} = 1.0 Kg mol/m^3, K = 0.05 m^6 / Kg mol^2.min.

a) How many steady state solutions are there?

b) Write two different direct substitution methods and assess the convergence of each. **[16]**

OR

Q4) The batch still shown in figure initially contains 25 moles of n-octane and moles of n heptane. If the still is operated at a constant pressure of 1 atmosphere, compute using Euler's method, the final mole fraction of n-heptane $X_{H_j}^f$ if the remaining solution in the still, S^f, total 10 moles.



Data : At 1 atmosphere pressure the relationship between X_H and the mole fraction of n-heptane in the vapour phase, Y_H is $Y_H = \frac{2.16 X_H}{1 + 1.16 X_H}$. **[16]**

Q5) A reservoir discharging through sluices at a depth *h* below the water surface has a surface area A for various values of *h* as given below

h in meter	10	11	12	13	14
A in sq. meter	950	1070	1200	1350	1530

If *t* denotes the time in minutes, the rate of fall of the surface is given by

$$\frac{dh}{dt} = \frac{48}{A}\sqrt{h}$$

Estimate the time taken for the water level to fall from 14 meter to 10 meter above sluices. **[18]**

OR

Q6) The reaction $3A \rightarrow 2B + C$ is carried out in an isothermal semibatch reactor. Product B is the derived product. Product C is very volatile by product that must be vented off to prevent a pressure buildup in a reactor. Gaseous C is vented off through a condenser to prevent any A & B to go out with C. Assume that from condenser only pure C is vented off. The reaction is first order. The relative volatilities of A and C to B are α_{AB} and α_{CB}. Assume perfect gases and constant pressure system. Write the equations describing the system. List all assumptions. **[18]**

SECTION - II

Q7) 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 of the wall is negligible but the wall has finite heat capacity. **[16]**

OR

Q8) Develop the equations describing a batch distillation column during the start-up period when no product is withdrawn and the column is coming to equilibrium conditions. Reflux drum and tray holdups are not negligible but can be assumed constant. **[16]**

Q9) Derive the governing balance equations (Heat and mass transfer equations) for counter current rotary dryer which operates continuously. Assume that only moisture is removed from wet solids by means of heating medium. Explain briefly the procedure to evaluate total number of transfer units. **[16]**

OR

Q10) Benzene is nitrated in an isothermal CSTR in three sequential irreversible reactions.

$$\text{Benzene} + HNO_3 \xrightarrow{K_1} \text{nitrobenzene} + H_2O$$

$$\text{Nitrobenze} + HNO_3 \xrightarrow{K_2} \text{dinitrobenzene} + H_2O$$

$$\text{Dinitrobenzene} + HNO_3 \xrightarrow{K_3} \text{trinitrobenzene} + H_2O$$

Assuming each reaction is linearly dependent on the concentrations of each reactant, derive a dynamic mathematical model of the system. There are two feed streams, one pure benzene and one concentrated nitric acid (98 wt%). Assume constant densities and complete miscibility. **[16]**

Q11) A semi-batch reactor is run at constant temperature by varying the rate of addition of one of the reactants, A. The irreversible exothermic reaction is first order kinetics A and B; $A + B \xrightarrow{K_1} R$. Tank is filled to 40% level initially and pure B is charged into reactor. Maximum cooling water flow is begun to keep temperature constant. Derive model equations. **[18]**

OR

Q12) a) State the law of mass action.

b) Give different uses of mathematical model.

c) What are limitations of mathematical models. Give examples.

[18]

Total No. of Questions : 12] **[Total No. of Pages : 3**

P 1349 **[3864] - 339**

B.E. (Chemical Engineering)
PIPING DESIGN & ENGINEERING
(2003 Course) (Elective - II)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) Water at 20°C flows in a 80 mm pipe at Reynolds number 80000. The pipe is estimated to have an equivalent sand grain roughness of size 0.16 mm. Determine the head loss expected in 300 m length of the pipe. How much head loss would be expected if this pipe were smooth, kinematic viscosity of water at 20°C is 10^{-6} m^2/s. **[8]**

b) Define economic velocity? Explain briefly the considerations in economic velocity for following piping systems

i) Hot liquid flow.

ii) Slurry flow. **[8]**

OR

Q2) a) Explain in detail pipe line networks and their analysis for flow in branches. **[8]**

b) Discuss the procedure in determining pipe diameter for specified height of pipe wall roughness and the discharge? **[8]**

Q3) a) Explain the desirable properties of piping materials for low temperature and high temperature services? **[8]**

b) Explain the various types of pipe fittings in detail? **[10]**

OR

P.T.O.

Q4) a) List out the major standards providing engineering bodies in piping? Discuss the different sections of ASME B31 code for pressure piping? **[10]**

b) Discuss the various types of gasket according to ASME B16.5 and B16.47 for flanges? **[8]**

Q5) a) State and explain the factors to be considered in selecting valves? **[8]**

b) Discuss the sizing methodologies for rupture disc? **[8]**

OR

Q6) a) Describe the construction and principle of operation for the following types of valve actuators : **[8]**

i) Electric motor.

ii) Pneumatic.

iii) Hydraulic.

iv) Solenoid.

b) Explain the steps followed during sizing of control valve? **[8]**

SECTION - II

Q7) a) What is the nominal size of a portable compressor unit required for compressing 1,600,000 standard cubic ft of gas per 24 hours at a temperature of 85°F from 40 psig pressure to 600 psig pressure? The altitude above sea level is 2500 ft. The N value of gas is 1.28. The suction temperature of stages other than the first stage is 130°F. **[8]**

b) Explain the correct piping arrangement with the help of submergence laws for centrifugal pump? **[8]**

OR

Q8) a) Discuss the steam pipe sizing criteria based on flow rate, velocity, steam pressure and pressure loss? **[8]**

b) Explain the design principles and line sizing of pneumatic conveying systems? **[8]**

Q9) a) What are factors considered when the designer is locating equipment in the plot plan? **[8]**

b) Develop the piping system layout considerations for storage tanks and heat exchangers? **[10]**

OR

Q10) a) From a properly made P & ID, piping engineer should obtain all essential details required for piping? Make a list of all such details which should be available from a properly prepared P & ID? **[10]**

b) Explain the concept bill of material? **[8]**

Q11) a) What are the most common insulation material classifications to the industrial and commercial piping industry? **[8]**

b) Derive the expression for critical thickness of insulation? **[8]**

OR

Q12) Write short notes on **[16]**

a) Different types of two phase flow in piping.

b) List of documents for preparation of layout for a process plant.

c) High alloy steel & its usage in piping.

d) Selection criteria for insulation in hot and cold piping.

Total No. of Questions :8] **[Total No. of Pages : 2**

P1357 [3864]-345

B.E. (Petroleum Engineering)

REFINING AND PETROCHEMICAL TECHNOLOGY

(2003 Course)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) Describe with flowsheet the absorption method for production of LPG. **[10]**

b) Define and mention importance of cloud point and pour point. **[4]**

c) Explain any one method used for dewaxing of lube oil. **[4]**

Q2) a) Mention the reactions involved in hydrocracking and advantages of hydrocracking. **[8]**

b) Describe with flowsheet the process of delayed coking. **[8]**

Q3) a) Mention significance of desalting of crude oil and describe single and two stage desalting systems. **[10]**

b) Write a note on chemical composition of petroleum. **[4]**

c) Explain API Gravity. **[2]**

Q4) a) Explain hydrotreating and describe with flowsheet the process of catalytic hydrodesulfurization. **[10]**

b) Mention types, properties and applications of petroleum coke. **[6]**

P.T.O.

SECTION - II

Q5) a) Describe with flowsheet the process for manufacture of ethylene oxide from ethylene and oxygen. **[12]**

b) Mention health and handling precautions and applications of acetic acid. **[6]**

Q6) a) Describe with flowsheet the oxidation dehydrogenation process for conversion of methanol to formaldehyde. **[10]**

b) Mention end uses of acetic anhydride and acetone. **[6]**

Q7) a) Describe with flowsheet the process of indirect hydration for conversion of propylene to isopropanol. **[10]**

b) Mention health and handling precautions and applications of methanol. **[6]**

Q8) a) Describe with flowsheet the process for manufacture of acetic acid from acetaldehyde by oxidation. **[10]**

b) Mention end uses of acetylene, ethylene oxide and formaldehyde. **[6]**

■■■

Total No. of Questions :12] **[Total No. of Pages :3**

P1314

[3864]-386
B.E. (Polymer)
RUBBER TECHNOLOGY
(Elective) (2003 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) Define Compounding. List various ingredients used in rubber compounding. Give the role of each ingredient with suitable examples. **[16]**

OR

Q2) Show the various steps in dry rubber technology with the help of a block diagram. Explain coagulation, pale crepe, smobed sheet and mastication in detail. **[16]**

Q3) What is vulcanisation? Explain the process of vulcanisation giving chemical reactions of at least 3 commercial elastomer materials. **[16]**

OR

Q4) List the factors affecting the process of vulcanisation. Discuss in detail various techniques of vulcanisation. **[16]**

Q5) Answer the following:

a) List the molecular criteria for a material to behave as an elastomer. **[4]**
b) Classify rubber materials in suitable groups. **[3]**
c) List the changes in the rubber material after vulcanisation. **[4]**

P.T.O.

d) What are different selection criteria of rubber materials. **[3]**

e) Justify the statement: Rubber elasticity is entropy driven. **[4]**

OR

Q6) Draw neat labelled diagrams of:

a) Stress-strain curve of elastomers and explain long range elasticity. **[9]**

b) Cure curve for 'S' vulcanisation and explain 'scorch' and "reversion". **[9]**

SECTION - II

Q7) a) List the different types of roll arrangements used in calendaring. Explain roll chambering. **[6]**

b) Explain the process of injection molding of rubbers. **[6]**

c) List the different types of extruders used with rubbers. Explain the different methods of vulcanisation of extrudates. **[6]**

OR

Q8) a) Explain the process of compression molding of rubbers. Which rubber articles are manufactured by this method? What are the advantages of compression molding? **[6]**

b) What is "roll-bending" in calendaring process? What are the remedies to over come the same? **[6]**

c) What are the advantages and disadvantages of injection molding as compared to compression molding in rubbers? **[6]**

Q9) a) List the various components forming a tyre structure and explain the function of each component. List the rubbers used in tyre manufacture. **[6]**

b) Explain the process for manufacture of cables. How are cables cured ? **[5]**

c) With the help of a neat sketch list the various constructional elements of a cable slating the function of each element. **[5]**

OR

Q10) a) With a neat sketch explain the constructional elements of a rubber hose. What is the criteria for selection of material for hoses? **[6]**

b) State the 3 different types of latex dipping processes. Explain the process of coagulant dipping used for rubber gloves. **[5]**

c) Explain the construction, manufacture of a conveyer belt. What are its applications? **[5]**

Q11) a) List the tests carried out on unvulcanised rubbers. Explain any 2 indetail. **[8]**

b) Define "fatigue". List the 2 types of tests to find fatigue in a rubber sample. Explain any one of there. **[8]**

OR

Q12) a) State 2 applications in which the rubber product is tested for abrasion. Explain the procedure to carry out the test. **[8]**

b) List the electrical tests carried out on rubbers. Explain surface and volume resistivity w.r.t. rubbers. **[8]**

■■■

Total No. of Questions : 12] **[Total No. of Pages : 3**

P 1269 **[3864] - 390**

B.E. (Polymer Engg.)

POLYMER PROCESSING OPERATIONS - II

(2003 Course)

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

Instructions to the candidates:

1) ***Answer Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6 from Section I. Answer Q. 7 or Q. 8, Q. 9 or Q. 10, Q. 11 or Q. 12 from Section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***
5) ***Use of pocket calculator and graph paper is allowed.***

SECTION - I

Q1) a) Draw a pressure profile through calender and explain why point of maximum pressure falls prior to nip. **[8]**

b) Discuss different heating systems used in calendering. **[4]**

c) Draw neat sketch of embossing and liminating lines. **[4]**

Q2) a) Discuss different methods of taking core of roll bending and roll deflection. **[5]**

b) Discuss merits and demerits of cored rolls and drilled rolls. **[5]**

c) What is meant by 'Friction ratio'? **[3]**

d) Discuss different materials used for calendering rolls. **[3]**

Q3) a) Derive an equation for time taken to heat rotational moulding mould after it enters oven. **[6]**

b) Discuss with neat sketches following type of rotational moulding machines **[4]**

i) Flexible arm rotational moulding m/c.

ii) Rock & roll type.

c) Explain how will you find out that the article is formed and is cooled properly from graph of internal air temperature Vs. time, in case of rotational moulding. **[8]**

P.T.O.

Q4) a) Discuss various materials used for construction of rotational mould. **[3]**

b) Write a short note on 'Rotational moulding of Nylons'. **[5]**

c) Explain how application of pressure and vacuum can be used for removal bubbles during rotational moulding. **[4]**

d) Discuss particle size and particle size distribution with reference to polyethylene rotational moulding. **[6]**

Q5) a) Which techniques are used to import metallic finish to plastic products? Explain any one in detail. **[8]**

b) Name the processes used for printing on plastic films. Describe any one in detail. **[8]**

Q6) a) Explain the process of screen printing. **[4]**

b) Explain the process of corona treatment used for polyethylene films. **[6]**

c) Explain slush moulding and dip moulding. Give methods of process control. **[6]**

SECTION - II

Q7) a) What is meant by 'Filament denier'? Explain with example. **[4]**

b) Explain in detail with a sketch 'Wet spinning technique' of fiber spinning. **[6]**

c) Enlist drawbacks of synthetic fibers. **[4]**

d) Why stretching and drawing is required after fiber spinning stage? **[4]**

Q8) a) Explain the manufacturing technique for Viscose Rayon fiber. **[5]**

b) Why is it necessary to carry out annealing of fibers? How it is done? **[5]**

c) Explain in detail 'solution spinning' technique of fiber spinning. **[8]**

Q9) a) Write in short about washing and recycling of contaminated waste. **[5]**

b) Write in short about metal detection and separation in plastic recycling. **[5]**

c) List different equipment used for recycling of plastics and discuss any one with neat sketch. **[6]**

Q10)a) Explain primary, secondary and tertiary methods of recycling of plastics. **[10]**

b) Discuss recycling of PET. **[6]**

Q11)a) Discuss any two of the following assembly techniques used for plastic parts **[6]**

i) Press fit assembly.

ii) Adhesive bonding.

iii) Mechanical fastening.

b) Explain various types of joints used for ultrasonic welding of plastics. **[5]**

c) What are the product design considerations taken into account while machining of plastics. **[5]**

Q12)a) Write a short note on 'hot gas welding'. **[5]**

b) Explain various considerations taken into account for injection moulding of cantilever snap joints. **[6]**

c) Explain laser machining of plastics. **[5]**

Total No. of Questions : 12] **[Total No. of Pages : 6**

P1293 [3864]-391

B.E. (Polymer)

INDUSTRIAL MANAGEMENT AND PROCESS ECONOMICS

(2003 Course)

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

Instructions to the candidates:

1) ***In Section-I attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6.***
   In Section-II attempt Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12.
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is the structure of manufacturing organisation? Explain its need. **[8]**

b) Explain: **[9]**

i) Margin of safety

ii) Break even sales

Alpha Company Limited had sales of Rs.1,00,000. The variable cost was Rs.60,000 and fixed cost was Rs.30,000. Find break even point and margin of safety.

OR

Q2) a) Explain the objectives and principles of a good plant layout. **[8]**

b) Explain: **[9]**

i) Marginal cost

ii) Contribution

P.T.O.

For a product X, sales and total cost are given for two different periods:

Period	Sales (Rs.)	Total cost (Rs.)
Period 1	39,000	34,800
Period 2	43,000	37,600

Calculate variable cost, fixed cost and contribution for each period.

Q3) a) A project requires an outlay of Rs.1,00,000 and earns the annual cash inflows of Rs.35,000, Rs.40,000, Rs.30,000 and Rs.50,000. Calculate profitability index, assuming the discounting rate of 15%. **[5]**

b) Explain the term "Working Capital" and discuss about its sources. **[6]**

c) Explain the difference between equity shares and preference shares. **[6]**

OR

Q4) a) What are the limitations of Capital Budgeting? **[5]**

b) The original cost of a machine is Rs.80,000 and its book value is Rs.50,000. Assuming the normal tax rate to be 50% and capital gain tax to be 40%, find the net cash inflow if the machine can be sold for

i) Rs.20,000

ii) Rs.50,000

iii) Rs.90,000

[6]

c) What are the advantages and disadvantages of Debentures. **[6]**

Q5) a) Describe the aims of budgeting. **[6]**

b) The cost of a machine is Rs.1,10,000 and its estimated scrap value is Rs.10,000. The estimated number of units to be produced during the life of the asset is 50,000 units. If 7,000 units are produced in a particular year, find the depreciation value using production unit method. **[5]**

c) Explain Joint factor method for depreciation. **[5]**

OR

Q6) a) A company produces and sells 100 units of a product X per month at Rs.20 each. Marginal cost per unit is Rs.12 and fixed cost is Rs.300 per month. It is proposed to reduce price by 20%. Find the additional sales required to earn the same amount of profit as before. **[5]**

b) What are the merits of budgetary control? **[6]**

c) The following data is available : **[5]**

Cost of asset — Rs.3,00,000

Estimated scrap value — Rs.20,000

Estimated life — 10 years

Calculate the amount of depreciation using straight line method.

SECTION - II

Q7) a) Solve the following LP problem using Simplex method. **[9]**

Maximize $z = 3x_1 - x_2$

Subject to $x_1 - 2x_2 \leq 2$

$2x_1 - x_2 \leq 4$

$x_1 + x_2 \leq 5$

$x_1, x_2 \geq 0$

b) There are five jobs, each of which must go through the two machines A and B in the order AB. Processing times are given in the table given below. **[8]**

	Processing time (hours)				
Job	1	2	3	4	5
Time for A	5	1	9	3	10
Time for B	2	6	7	8	4

Determine a sequence for five jobs that will minimize the elapsed time T. Calculate the total idle time for the machines in this period.

OR

Q8) a) Solve the following transportation problem. **[9]**

		To					
		D	E	F	G		
	A	11	13	17	14	250	
From	B	16	18	14	10	300	Availability
	C	21	24	13	10	400	
Requirement		200	225	275	250		

b) Solve the following assignment problem. **[8]**

		Contractor			
		A	B	C	D
	I	15	13	14	17
Sub-assembly	II	11	12	15	13
	III	18	12	10	11
	IV	15	17	14	16

Q9) a) A project schedule has the following characteristics. **[9]**

Activity	Time	Activity	Time
(1-2)	2	(4-8)	8
(1-4)	2	(5-6)	4
(1-7)	1	(6-9)	3
(2-3)	4	(7-8)	3
(3-6)	1	(8-9)	5
(4-5)	5		

i) Construct the PERT network and find critical path and time duration of the project.

ii) Total float for each activity.

b) A producer of boats has estimated the following distribution of demand for a particular kind of boat:

No. demanded :	0	1	2	3	4	5	6
Probability:	0.14	0.27	0.27	0.18	0.09	0.04	0.01

Each boat cost him Rs.7000 and he sells them for Rs.10,000 each. Any boat that are left unsold at the end of the season must be disposed off for Rs.6000 each. How many boats should be in stock so as to maximize his expected profit? **[8]**

OR

Q10) a) Find the saddle point and hence solve the following game. **[7]**

$$\begin{array}{cc} & \begin{matrix} B_1 & B_2 & B_3 & B_4 \end{matrix} \\ \begin{matrix} A \\ \\ \end{matrix} & \begin{bmatrix} A_1 & 1 & 7 & 3 & 4 \\ A_2 & 5 & 6 & 4 & 5 \\ A_3 & 7 & 2 & 0 & 3 \end{bmatrix} \end{array}$$

b) A project consists of a series or tasks labelled A, B, … H, I with the following relationships (W < X, Y, means X and Y cannot start until W is completed, X, Y < W means W cannot start until both X and Y are completed) with this notation, construct the network diagram having the following constraints:

A < D, E; B, D < F; C < G; B < H; F, G < I

Find also the optimum time of completion of the project, when time in days of completion of each task is as follows: **[10]**

Task:	A	B	C	D	E	F	G	H	I
Time:	23	8	20	16	24	18	19	4	10

Q11) a) For a fixed order quantity system, find out (i) Economic order quantity (ii) Optimal buffer stock (iii) Reorder level, for an item with the following data:

Annual consumption D = 10,000 units, cost of one unit = Re.1.00

C_3 = Rs.12.00 per production run, C_1 = Re.0.24 per unit.

Past lead times: 15 days, 25 days, 13 days, 14 days, 30 days, 17 days. **[8]**

b) A manufacturing company purchases 9000 parts of a machine for its annual requirements, ordering one month usage at a time. Each part costs Rs.20. The ordering cost per order is Rs.15, and the carrying charges are 15% of the average inventory per year. Suggest a more economic purchasing policy for the company. What advice can be offered, and how much would it save the company per year? **[8]**

OR

Q12) a) Find the optimal order quantity for a product for which the price breaks are as follows:

Quantity	Unit cost (Rs.)
$0 \leq q_1 < 500$	10.00
$500 \leq q_2$	9.25

The monthly demand for a product is 200 units, the cost of storage is 2% of unit cost and the cost of ordering is Rs.350. **[8]**

b) Explain in details ‘Always Better Control’ (ABC) Analysis. **[8]**

❐❐❐

Total No. of Questions : 12] **[Total No. of Pages : 3**

P 1286

[3864] - 393

B.E. (Polymer)

FIBER TECHNOLOGY

(Backlog) (2003 Course) (Elective)

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

Instructions to the candidates:

1) ***Answers to Section I and Section II should be written on separate answer book.***
2) ***Solve 3 questions from Section I and 3 questions from Section II.***
3) ***Neat diagrams should be drawn whenever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***
6) ***Use of electronic pocket calculator is allowed.***

SECTION - I

Q1) a) Comment about molecular requirements of fiber forming polymers. **[8]**

b) Write a short note on "High Speed Spinning" process in fiber manufacture. **[5]**

c) Enlist advantages and drawbacks of synthetic fibers over natural fibers. **[5]**

OR

Q2) a) Explain the terms - Yarn, Filament, Tex, Denier, Tenacity, Staple fiber. **[6]**

b) Write a short note on "Melt Spinning" process to manufacture fiber. **[8]**

c) Comment on Effect of Spinning Speed on Morphology of fiber. **[4]**

Q3) a) What are the various sources of natural and synthetic fibers? **[6]**

b) What are the drawbacks of DEG presence in PET polymers? **[4]**

c) What are the raw materials used to synthesize aromatic polyamide PPTA (Kevlar®)? **[2]**

d) Explain in brief Catalysts used in synthesis of PET by transesterification route. **[4]**

OR

Q4) a) What are the raw materials for obtaining PET and PBT fibers? **[4]**

b) Explain how Viscose Rayon is obtained. **[4]**

c) Enlist the factors which contribute to DEG formation in PET synthesis. **[4]**

d) Comment on advantages and disadvantages of Integrated Continuous process used to synthesize Nylon6 polymer for fiber spinning application. **[4]**

P.T.O.

Q5) a) What are the functions of Spin finish used in fiber spinning operation? **[3]**

b) With neat diagram explain the Dipping Roller Method used for Spin finish application. **[6]**

c) Why is it necessary to carry out stretching or drawing of fibers? **[2]**

d) Explain in detail Sequential Draw Texturing Process. **[5]**

OR

Q6) a) What are the chemical constituents of Spin finish? **[5]**

b) Explain in brief the effect of Spin finish on dyeing. **[3]**

c) Enlist various Drawing Conditions in fiber drawing stage. **[3]**

d) Explain in detail Stuffer Box Texturing Process. **[5]**

SECTION - II

Q7) a) Explain in details the production of Filament Yarn and Staple Yarn. **[10]**

b) Comment about the significance of heat setting. Explain how it is carried out. **[6]**

c) Name two methods of identification and analysis of fibers. **[2]**

OR

Q8) a) What do you understand by Staple Fibers? Explain in detail Direct Spinning process for staple fiber production. **[8]**

b) Explain the structural changes taking place during spinning, drawing and heat setting operation during fiber manufacture. **[5]**

c) Explain 3-phase model of fiber structure. **[5]**

Q9) a) Why it is difficult to dye polyester fibers? Enlist various techniques used to dye polyester fibers. Explain any one in detail. **[8]**

b) Write short notes on Thermosol Process and High Temperature dyeing. **[8]**

OR

Q10)a) Explain in detail “Mass Colouration” fibers alongwith its advantages, disadvantages as well as enlist various methods of mass colouration. **[8]**

b) Write a short note on “Dyeability of Synthetic Fibers”. **[5]**

c) Why are PP fibers difficult to dye? **[3]**

Q11) a) What causes necessity to modify synthetic fibers? Explain in brief "Low Pilling Polyester". **[6]**

b) Write a short note on "Flame Retardants used in Fibers". **[6]**

c) What are the advantages of bicomponent acrylic fibers. **[4]**

OR

Q12) a) How hydrophilic acrylic fibers are prepared? **[6]**

b) Write a short note on "Optical Fibers". **[5]**

c) Briefly explain Fibers obtained by Nanotechnology. **[5]**

Total No. of Questions : 12] **[Total No. of Pages : 4**

P 1102

[3864] - 406

B.E. (Computer Engg.)

ADVANCED DATABASES

(2003 Course) (Elective - I) (410445)

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

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data, if necessary.***
4) ***Section I : Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6.***
5) ***Section II : Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12.***

SECTION - I

Q1) a) Explain Parallel Hash Join with suitable example. **[5]**

b) Explain design issues in Parallel Database System. **[6]**

c) Explain any two Parallel Database Architectures. **[6]**

OR

Q2) a) Evaluate how well partitioning techniques support the following types of data access **[9]**

i) Scanning the entire relation.

ii) Locating tuple associatively.

iii) Locating all tuples such that the value of given attribute lies within a specified range.

b) Write a short note on **[8]**

i) Cash Coherency Protocol.

ii) Parallel Query Optimization.

Q3) a) If we are to ensure atomicity, all the sites in which a transaction T executed must agree on the final outcome of the execution T must either commit at all sites, or it must abort at all sites. Describe the technique or protocol used to ensure this property in detail. **[7]**

b) Write a short note on Persistent Messaging in Distributed Transaction Processing. **[5]**

c) Explain Heterogeneous distributed databases. **[5]**

OR

Q4) a) Define semi-join. Compute semi-join r α s for the relations r and s. **[7]**

Relation r		
A	B	C
1	2	3
4	5	6
1	2	4
5	3	2
8	9	7

Relation s		
C	D	E
3	4	5
3	6	8
2	3	2
1	4	1
1	2	3

b) Describe the voting and read-any-write-all approaches to synchronous replication. **[5]**

c) Explain Optimistic methods for Distributed Concurrency Control. **[5]**

Q5) a) Consider following DTD for bibliography **[12]**

<?xml version= "1.0" encoding = "UTF-8"?>

<!ELEMENT bib (book*)>

<!ELEMENT book (title, (author^{+} | editor^{+}), publisher, price)>

<!ATTLIST book year CDATA #REQUIRED>

<!ELEMENT author (last, first)>

<!ELEMENT editor (last, first, affiliation)>

<!ELEMENT title (#PCDATA)>

<!ELEMENT last (#PCDATA)>

<!ELEMENT first (#PCDATA)>

<!ELEMENT affiliation (#PCDATA)>

<!ELEMENT publisher (#PCDATA)>

<!ELEMENT price (#PCDATA)>

Create XML document, XML Schemas and solve the following queries in XQuery on the bibliography fragment.

i) List books published by Addison-Wesley after 1991, including their year and title.

ii) Find pairs of books that have different titles but the same set of authors (possibly in a different order).

iii) For each book in the bibliography, list the title and authors, grouped inside a "result" element.

b) Explain advantages and disadvantages of the Web-DBMS approach. **[4]**

OR

Q6) a) Consider following DTD for bid

```
<?xml version = "1.0" encoding = "UTF-8"?>
<!ELEMENT bids (bid_tuple*)>
<!ELEMENT bid_tuple (userid, itemno, bid, bid_date)>
<!ELEMENT userid  (#PCDATA)>
<!ELEMENT itemno  (#PCDATA)>
<!ELEMENT bid  (#PCDATA)>
<!ELEMENT bid_date  (#PCDATA)>
```

Create XML document, XML Schemas and solve the following queries in XQuery on the bibliography fragment.

i) List the item number and description of the item(s) that received the largest number of bids, and the number of bids it (or they) received.

ii) List item numbers and average bids for items that have received three or more bids, in descending order by average bid. **[8]**

b) Describe the various issues for efficient evaluation of XML Queries. **[8]**

SECTION - II

Q7) a) Explain Data Reduction and Data Decretization preprocessing in Data Warehouse. **[5]**

b) Explain cube and rollup extended aggregation operation with suitable example. **[5]**

c) Explain Kimball's nine steps design for Data Warehouse. **[7]**

OR

Q8) a) Explain different conceptual schemas design for data warehouse with suitable example. **[10]**

b) Explain different indexing techniques in Data Warehouse. **[7]**

Q9) a) Consider following training set **[12]**

Outlook	Temperature	Humidity	Wind	Class Attribute
Sunny	Hot	High	False	N
Sunny	Hot	High	True	N
Overcast	Hot	High	False	P
Rain	Mild	High	False	P
Rain	Cool	Normal	False	P
Rain	Cool	Normal	True	N
Overcast	Cool	Normal	True	P
Sunny	Mild	High	False	N
Sunny	Cool	Normal	False	P
Rain	Mild	Normal	False	P
Sunny	Mild	Normal	True	P
Overcast	Mild	High	True	P
Overcast	Hot	Normal	False	P
Rain	Mild	High	True	N

Write ID3 Classification algorithm. Construct a decision tree based on above training set using ID3.

b) Write a short note on Text Mining. **[5]**

OR

Q10)a) Consider following data set **[9]**

Object	**Attribute 1**	**Attribute 2**	**Attribute 3**
A	1	1	2
B	3	2	4
C	3	4	6
D	4	6	3

Write K-means clustering algorithm. Find the cluster for the objects in data set with K = 2.

b) Consider following training data set **[8]**

Age	Income	Student	Credit_rating	Buys_Computer
<=30	high	no	fair	no
<=30	high	no	excellent	no
31...40	high	no	fair	yes
>40	medium	no	fair	yes
>40	low	yes	fair	yes
>40	low	yes	excellent	no
31...40	low	yes	excellent	yes
<=30	medium	no	fair	no
<=30	low	yes	fair	yes
>40	medium	yes	fair	yes
<=30	medium	yes	excellent	yes
31...40	medium	no	excellent	yes
31...40	high	yes	fair	yes
>40	medium	no	excellent	no

Write Naïve Bayesian Classifier algorithm. Consider Buys_Computer as a Class Attribute with values yes and no classes. Find the class label for data sample X = (age <=30, Income = medium, Student = yes Credit_rating = Fair) using Naïve Bayesian Classifier.

Q11)a) Define Information Retrieval System. Describe how it is differ from database system. **[6]**

b) Write short notes on **[10]**

i) Signature Files.

ii) Ranking Document Similarity.

OR

Q12)a) Explain any two techniques that support the evaluation of Boolean and Ranked queries. **[6]**

b) Write short notes on **[10]**

i) Web Crawler. ii) Precision and Recall.

Total No. of Questions : 12] **[Total No. of Pages : 3**

P 1103

[3864] - 407

B.E. (Computer Engg.)

ARTIFICIAL INTELLIGENCE

(2003 Course) (410445)

Time : 3 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 books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is Logic programming? Explain backward and forward reasoning with an example. List the applications of Artificial Intelligence. **[8]**

b) List and explain the seven characteristics of problems in AI. For any of the two problems, list out the problem characteristics : **[8]**

i) Chess. ii) Water Jug.

iii) 8 Tile Sliding Puzzle. iv) Travelling Salesman.

OR

Q2) a) What are intelligent agents? Explain the architecture of a typical agent and give at least two examples where agents are used. **[8]**

b) For the following problem have a state space representation and show how the farmer got everything across the river.

A farmer wants to cross the river along with the fox, goat and cabbage. The boat has a capacity to carry a person and either of the three accompanying him. The fox-goat or goat-cabbage combination if left unattended may cause the problem of being eaten by the other. Taking these constraints into account, use a state space approach and solve the problem. **[8]**

Q3) a) Define Heuristics. Define a heuristic for 8 Sliding Tile puzzle problem and explain the A* algorithm to solve the problem. **[10]**

b) Apply constraint satisfaction method to solve the following crypt arithmetic problem :

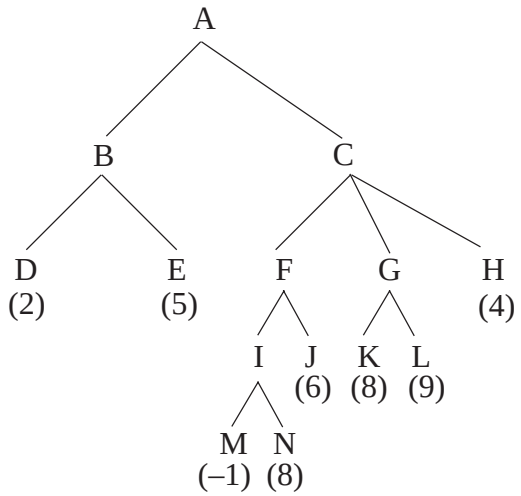
TWO + TWO = FOUR **[8]**

OR

P.T.O.

Q4) a) Explain Hill Climbing algorithm. Explain plateau, ridge, local maxima and global maxima. **[8]**

b) Explain alpha beta cut off for the following example and show which nodes are cut off and solve considering A is maximizing node. **[10]**



Q5) a) Consider the following sentences and translate the sentences into formulas in predicate logic and clause form. Prove "John likes Peanuts" using resolution. **[8]**

- John likes all kinds of food.
- Apples are food.
- Chicken is food.
- Anything anyone eats and isn't killed by is food.
- Bill eats peanuts and is still alive.
- Sue eats anything Bill eats.

b) Write a script of going to a multiplex to watch a movie. **[8]**

OR

Q6) a) Represent the following in semantic networks : **[8]**

A collage has a department Computer Engineering and Ravi is the head of the department. Varsha and Ruma are staff members of the department. Varsha is married to Ajay. Ajay is a Software Programmer. They have two children and they live on MG Road. Varsha wears glasses and is 5 feet 3 inches tall.

b) Represent the following sentences in conceptual dependency : **[8]**

i) Bird flew.

ii) Joe ate some soup with a spoon.

iii) Jane gave Tom an ice cream cone.

iv) Charlie drove the pickup fast.

SECTION - II

Q7) a) Describe any of the two learning methods : **[8]**

i) Rote Learning.

ii) By taking advice.

iii) By parameter adjustment.

iv) Learning from example.

b) Consider the following representation of block world : **[10]**

Start : ON (C, A) ^ ONTABLE (A) ^ ONTABLE (B)

Goal : ON (A, B) ^ ON (B, C) ^ ONTABLE (C)

Show how STRIPS (Goal Stack Planning) will solve this problem.

OR

Q8) a) Explain Waltz's algorithm with an example. Comment on the limitations of Waltz algorithm. **[8]**

b) Consider the following representation of block world : **[10]**

Start : ON (A, B) ^ ON (C, D) ^ ONTABLE (D) ^ ONTABLE (B)

Goal : ON (C, B) ^ ON (D, A) ^ ONTABLE (B) ^ ONTABLE (A)

Show how TWEAK (Non-Linear Planning) will solve this problem.

Q9) a) Explain in brief the various steps in natural language processing. **[8]**

b) Give the grammar and show the parse tree for **[8]**

i) John wanted to go to the movie with Sally.

ii) Print the file on the printer.

OR

Q10)a) Explain the Robot architecture. **[8]**

b) Explain an ATN with an example, Trace it for a sentence "The long file has printed". **[8]**

Q11)a) Give detailed architecture of Expert System and explain its components. **[8]**

b) Explain in details artificial neural network architecture. **[8]**

OR

Q12)a) Give any two applications of neural network. **[8]**

b) Explain the characteristics of Expert Systems and explain the expert systems ELIZA & MYCIN. **[8]**

Total No. of Questions : 12] **[Total No. of Pages : 3**

P1336 [3864]-416

B.E. (Information Technology)

INFORMATION SYSTEMS SECURITY

(Revised 2003 Course) (414441) (Sem. - VII)

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

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6 in Section-I and Q7 or Q8, Q9 or Q10, Q11 or Q12 in Section-II.***
3) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Categories Attacks, Defense and Security services. **[10]**

b) Among the Security goals such as Integrity, Secrecy, Authentication, Access Control, Non Repudiation, Availability, Identify and state which Security Goal(s) are affected. **[8]**

1) Stock broker receives request from his client to buy shares of ABC Ltd, He buys the shares but looking at benefit he him self keeps the shares and tells the client, he could not help him.
2) Revati, Renuka and Meghmala entered into Company Premises. Revati was supposed to visit only sales department. Renuka was supposed to visit only Sales and Marketing departments. Meghmala was supposed to visit Production and Purchase department of the company. But each of them could visit all the departments.
3) Rekha is downloading trial accounting software from a well known Web site. But Mr. trudy implanted some malicious code inside the software before the software was delivered to the Rekha. After that, Rekha could not install it on her computer because key was not available for installation.
4) Ms. Basanti helped the police officer to find Mr. Gabber. She was not aware that police officer was a fake police officer.

P.T.O.

OR

Q2) a) State in one line 4 physical controls and 4 software control for security purpose. **[10]**

b) You are a Security Manager to define policies. Write security policies for Email, Internet Surfing, Password and social conduct. (2 policies for each) **[8]**

Q3) a) State and Illustrate Biba Integrity Model. **[8]**

b) Illustrate necessity of Trust for end to end security of a business system. **[8]**

OR

Q4) a) Explain the Design and implementation details of Access controls. Give simple case. **[8]**

b) Compare Chinese Wall Model and Bell-Lapadula Model. **[8]**

Q5) a) List and State four important key managements issues. **[8]**

b) Write steps of RSA algorithm. (Key Generation, Encryption, Decryption) **[8]**

OR

Q6) a) List and State 8 fields used for public key certificate X509. **[8]**

b) Does IPSEC support all the goals such as Integrity, Availability, Secrecy, Non Repudiation, Authentication, Reliability, Scalability? Identify and justify. **[8]**

SECTION - II

Q7) a) Consider an Example of Secure communication of large message file between CID officer 1 to CID office 2 with integrity and Authentication, Non repudiation in mind. Show how to use hybrid cryptography model including Symmetric Key, Public Key and Hash Algorithms to achieve this. Draw diagram. **[10]**

b) State two appealing advantages and Disadvantages of Symmetric key systems. Also list State the four Commercially used Symmetric Key algorithms. **[8]**

OR

Q8) a) Which OSI layers are responsible to loose Location Privacy and Spoofing. Name the Layers and Why it is so? **[10]**

b) List and state eight principles used to design Symmetric Cryptography Algorithm. **[8]**

Q9) a) List and state (one line) 8 design guidelines or security system principles. **[8]**

b) Illustrate concept of Identity. What is it, in case of Human being, Computers, Software? Elements, Physical controls, Networking Devices, Servers in the context of Security. **[8]**

OR

Q10) Write short notes on.

a) Capabilities and Implementation of capabilities. **[8]**

b) Software Tools for Security. **[8]**

Q11) a) Write short note on Security Audit standard. **[8]**

b) Discuss in detail penetration studies. **[8]**

OR

Q12) a) With a neat diagram explain the architecture of Intrusion detection system. (host based and Network based) **[8]**

b) List Firewall characteristics, Firewall types and State the Disadvantages of Firewall. **[8]**

❐❐❐

Total No. of Questions : 11] **[Total No. of Pages : 3**

P 1282 **[3864] - 418**

B.E. (IT)

SOFTWARE TESTING AND QUALITY ASSURANCE

(2003 Course) (414444)

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

Instructions to the candidates:

1) ***Answer question number 1 or 2, 3 or 4, 5 or 6 from Section I.***
2) ***Answer question number 7 or 8, 9 or 10, 11 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) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Is complete testing possible? When to stop testing? Explain the difference between random testing and testing using error guessing. **[8]**

b) Explain in short any four methods of System Level Testing. **[8]**

OR

Q2) a) Define any four of the following terms : **[8]**

i) Failure. ii) Faults.

iii) Test Bed. iv) Defects.

v) Errors. vi) Software Quality.

b) Differentiate between software verification and software validity. **[8]**

Q3) a) Explain in detail Test Plan Template. **[8]**

b) Draw control flow graph for the code given below. Clearly label each node so that it is linked to its corresponding statement. Calculate it's cyclomatic complexity. How can this value be used to measure testability? Describe how cyclomatic complexity number and the flow graph be used to design a set of white box tests for this module that would at least cover all its branches.

```
module foo() / *a[ ] and b[ ] are global variables * /
begin
int i,x
i = 1
read(x)
while (i < x) do begin
```

P.T.O.

```
a[i] = b[i] * x
if a[i] > 50 then
print ("array a is over the limit")
else
print ("ok")
i = i + 1
end
print ("end of nonsense")
end.
```
[8]

OR

Q4) a) Explain unit test planning in details. **[8]**

b) Explain in detail different functions (responsibilities) to be handled in a testing life cycle or process. **[8]**

Q5) a) Explain with example the GQM method for identifying software measures. **[10]**

b) Write short notes on : **[8]**

i) Product quality metrics.

ii) In-process quality metrics.

OR

Q6) a) Explain the importance of the metric - *percentage delinquent fixes* in context with software maintenance. Also calculate *percentage delinquent fixes* (pdf)_ if number of fixes delivered in a specified time are 40 and the number of fixes that exceeded the response time criteria by severity level are 80. **[10]**

b) Write a note on Control Flow Structures. Also focus on sequencing and nesting of flow graphs. **[8]**

SECTION - II

Q7) a) Enumerate Ishikawa's seven basic quality tools. Explain any two in detail. **[8]**

b) Illustrate with examples the use of following techniques in improving quality : **[8]**

i) Code inspection.

ii) Project Planning.

OR

Q8) a) What does SQA ensure? What are the goals of SQA activity? **[6]**

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

i) Scatter diagrams.

ii) Cause and effect diagrams.

Q9) a) Explain with example the six-sigma measure of software quality. **[8]**

b) Draw a neatly labeled Cleanroom process. Explain how step wise refinement process helps in improving the quality. **[8]**

OR

Q10)a) Explain the Software Project Tracking & Oversight (SPTO) KPA of the CMM level 2. **[8]**

b) Describe in brief Software Configuration Management (SCM). **[8]**

Q11)Write short notes on any three : **[18]**

a) Class Testing.

b) Functional testing of Web-site.

c) Client-Server Testing techniques.

d) Importance of code review in software security testing.

Total No. of Questions : 12] **[Total No. of Pages : 2**

P 1283 **[3864] - 439**

B.E. (Biotechnology)

ANALYTICAL BIOTECHNOLOGY

(2003 Course) (Sem. - I) (416287)

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

Instructions to the candidates:

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

SECTION - I

Q1) What is PCR? Discuss in detail the technique and its optimization. **[18]**

OR

Q2) Write notes on **[18]**

a) Snager's DNA sequencing.

b) Southern blotting.

Q3) Describe in detail following DNA modifying enzymes **[16]**

a) DNA ligase.

b) DNA polymerase.

OR

Q4) State the experiment leading to invention of restriction enzymes. How many types of restriction enzymes are known? Which of these have a role in cloning? Briefly describe the role of enzyme. **[16]**

Q5) What are Plasmids and Cosmids? Describe both in terms of structure and function. **[16]**

OR

Q6) Explain the following **[16]**

a) BAC vectors.

b) Expression Vectors.

P.T.O.

SECTION - II

Q7) How is C-DNA synthesis achieved *in-vitro*? Depict the steps and include a flowchart. What is unique feature of a C-DNA library? **[18]**

OR

Q8) What are different methods of screening a recombinant clone? Discuss in detail. **[18]**

Q9) What are various methods employed for gene transfer? Explain chemical transformation. **[16]**

OR

Q10) Write notes on **[16]**

a) Conjugation.

b) Transfection.

Q11) What is the role of factor VIII in human physiology? How a recombinant factor VIII is produced? Describe in detail. **[16]**

OR

Q12) Discuss

a) AFLP. **[6]**

b) Humulin. **[10]**

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1098

[3864] - 371

B.E. (Petrochemical)

CATALYSIS TECHNOLOGY & FLUIDIZATION ENGINEERING

(2003 Course) (412411)

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

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two 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) With help of suitable example explain principle of Homogeneous Catalysis. **[6]**

b) Discuss methods and means to regenerate activity of spent catalyst. **[6]**

c) What are the Adsorption Isotherms? Explain their significances. **[4]**

Q2) a) Differentiate between Riedel Model and Langmuir Hinshelwood Model for catalytic reaction. **[5]**

b) What are promoter in catalysis - Discuss their functions. **[5]**

c) What is Sintering? Explain with help of neat sketch. **[4]**

d) Write a short note on catalyst support. **[4]**

Q3) a) Describe precipitation method of catalyst manufacture with help of suitable examples. **[6]**

b) How Characterization of Commercial Catalyst is done - Discuss in details. **[6]**

c) What is dual activity catalyst - Explain with help of suitable example. **[4]**

P.T.O.

Q4) a) With help of neat sketch explain industrial manufacture of ammonia. Discuss in details on the catalyst used and the reactor type and geometry employed. **[8]**

b) What are Zeolites? With help of neat sketch explain their shape selectivity. With help of real life example, explain how Zeolites have increased industrial production many - fold. **[8]**

SECTION - II

Q5) a) Write down six major advantages of fluidization and discuss them. **[6]**

b) Discuss important parameters for classifying the fluidizing particles. **[4]**

c) With help of diagram explain the fluidization process and how void fraction and pressure drop across bed changes during the process. **[6]**

Q6) a) With help of Kuni - Levenspiel model explain inter-mixing and circulation within fluidized bed. **[6]**

b) Qualitatively discuss Davidson's model for bubble with help of neat diagram. **[4]**

c) With help of suitable diagram explain the different phenomena and regimes occurring in a fluidized bed with increase in gas velocity. **[6]**

Q7) a) Explain the principle of immersed tube fluidized bed heat transfer medium. Highlight its advantage and disadvantages. **[8]**

b) With help of neat sketch explain operational principle of modern FCC unit. Highlight its catalyst properties and operating conditions. **[8]**

Q8) a) With help of suitable diagrams explain different types of fluidized bed dryers along with their applications. **[6]**

b) What are the advantages of fluidized bed dryers over conventional ones? Explain each of them. **[6]**

c) Write a short note on Particle Transport with major emphasis on carry-over. **[6]**

Total No. of Questions :12] **[Total No. of Pages : 3**

P1109

[3864]-427
B.E. (Information Technology)
REAL TIME SYSTEM
(2003 Course) (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.***

SECTION - I

Q1) a) Describe any specific real time application. Draw neat block diagram of application **[8]**

b) What are the varies factor, that are to be consider while estimating the program run time. **[8]**

OR

Q2) a) Describe in brief the effect of the following in estimation the run time of a program : **[10]**

i) A pipelined architecture.

ii) Use of Cache.

b) What is performability ? Explain with a suitable example. **[6]**

Q3) a) State the assumption made for the implementation of the Rate Monotonic Scheduling algorithm. What is the easy schedulability test for this algorithm? **[6]**

b) Consider the following set of periodic tasks : **[6]**

T_1 = (Release Time, Deadline, Execution Time) =(0,5,3)

T_2 = (Release Time, Deadline, Execution Time) =(2,4,1)

T_3 = (Release Time, Deadline, Execution Time) =(6,10,3)

Assigned tasks using Preemptive Earliest Deadline first

c) Describe in brief the myopic offline scheduline algorithm. **[6]**

P.T.O.

OR

Q4) a) Write short note on <u>any two</u> : **[10]**

i) The Buddy strategy for task assignment

ii) Focused Addressing and Bidding (FAB) Algorithm for task assignment.

b) Consider the following set of periodic tasks : **[4]**

T_1 = (Period, Execution Time) = (3, 1)

T_2 = (Period, Execution Time) = (5, 3)

Assigned tasks using Rate Monotonic scheduling.

c) Describe the classification of IRIS (Increase Reward Increase Service). **[4]**

Q5) a) Using example explain the different data typing features that could be usefull in a real time programming language. **[8]**

b) Describe the skeleton and optimistic algorithm under the two phase approach to improve predictability of real time transaction. **[8]**

OR

Q6) a) Why main memory database faster then disk–based database for single processor system? **[4]**

b) Differentiate Real Time database and General purpose database. **[4]**

c) Describe the Adaptive earliest deadline (AED) algorithm used in transaction priorities. **[8]**

SECTION-II

Q7) a) Explain the VTCSMA Protocol using a suitable example. Draw the VCRC Trajectory for this example for n =2. Discuss the performance of this algorithm. **[10]**

b) Describe the Timed token Protocol. Why this protocol is attractive for RTS. **[8]**

OR

Q8) a) Discuss the Window Protocol with suitable example. Discuss the performance of this algorithm. Where is the Contention Protocol most suitable. **[10]**

b) Describe the Stop - and - Go multihop Protocol and Comment on its performance. **[8]**

Q9) a) Describe the following Capabilities of real -time operating system. **[8]**

i) Split Interrupt Handling.

ii) Memory management through virtual memory mapping and memory locking.

iii) Early demultiplexing to identify the receiver of an incoming message.

b) Write short notes on : **[8]**

i) VX Works.

ii) RT Linux.

OR

Q10)a) Describe the following capability of real time operating system. **[8]**

i) External- Internal interrupt handling.

ii) Memory management through virtual memory mapping.

b) Describe scheduling service that an operating system can provide to simplify the implementation of the following algorithm. **[8]**

i) Fixed-Priority scheduling.

ii) EDF Scheduling.

Q11)a) Describe the classification of faults according to their behavior. Explain 'Fault and Error Containment Zone'. **[8]**

b) Describe the following structures for hardware redundancy. **[8]**

i) Static Pairing.

ii) Shift-out Redundancy.

OR

Q12)a) Explain the Byzantine's algorithm for fault tolerance with an example. Also specify the interactive consistency Condition. **[8]**

b) Describe in detail Fault- Tolerant synchronization in hardware and Fault Tolerant synchronization in software. **[8]**

⌘⌘⌘⌘

Total No. of Questions : 12] **[Total No. of Pages : 2**

P1335

[3864]-340A
B.E. (Chemical)
PETROCHEMICAL ENGINEERING
(2003 Course)

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

Instructions to the candidates:

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

SECTION - I

Q1) Discuss in details about the main building blocks of Petrochemical Industry. **[16]**

OR

Q2) Explain the flow diagram for obtaining Naptha, Kerosine, and Lubricating oils. **[16]**

Q3) Give classification of Hydrocarbons, and discuss Olefinic petrochemicals with applications. **[16]**

OR

Q4) With neat sketches, explain production of Aromatics. **[16]**

Q5) What is Hydrocracking? Write in details with diagram. **[18]**

OR

Q6) Draw neat diagram and explain moving Fludized bed catalytic cracking unit. **[18]**

SECTION - II

Q7) With suitable flow diagrams, explain the production of amines. **[16]**

OR

Q8) Note the complete process for obtaining Glycol as a raw material for production of Nylon fibres. **[16]**

P.T.O.

Q9) Explain with neat diagrams the process for manufacturing poly-ethylene. **[18]**

OR

Q10) With flowsheet, discuss production of poly-propylene. **[18]**

Q11) Discuss in details various safety aspects in petrochemical plants. **[16]**

OR

Q12) What are the methods for reduction in pollution through petrochemical plants? **[16]**

⊙⊙⊙⊙⊙

Total No. of Questions : 12] **[Total No. of Pages : 4**

P1019

[3864]-101
B.E. (Civil)
HYDROLOGY AND IRRIGATION
(2003 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) Differentiate between : **[8]**

i) Tropical cyclone and extratropical cyclone.

ii) Convectic precipitation and orographic precipitation.

b) A rainfall of depth of 300 mm had a return period of 50 years. Determine the probability of a one day rainfall having depth equal to or greater than 300 mm occuring. **[8]**

i) Once in 25 successive years.

ii) Two times in 10 successive years.

iii) At least once in 15 successive years.

OR

Q2) a) Differentiate between : **[8]**

i) Symon's raingauge and weighing bucket raingauge.

ii) Mass curve of rainfall and Hyetograph.

P.T.O.

b) The isohyets due to a storm were having following details :

Isohyets (mm)	Area (km^2)
150	40
170-150	150
150-140	70
140-130	200
130-110	25

Find the weighted precipitation for the total catchment area. **[8]**

Q3) a) What are 3 analytical methods of evaporation estimation? Explain any one of them. **[8]**

b) State any 3 methods of reducing evaporation and explain any one of them. **[8]**

OR

Q4) a) Explain how evapotranspiration is measured with help of : **[8]**

i) Lysimeters

ii) Field plot method.

b) Differentiate between transpiration and evapotranspiration. **[8]**

Q5) a) Give analogy for infiltration with help of sketch and thereby differentiate between infiltration capacity and field capacity. **[8]**

b) Define unit hydrograph. State factors affecting the unit hydrograph. Explain the components of unit hydrograph with help of sketch. **[10]**

OR

Q6) a) State any 3 direct methods of measuring stream flow. Explain any one of them. **[8]**

b) The peak of a flood hydrograph due to a 5 Hours effective storm is 300 m^3/sec. The mean depth of rainfall is 6 cm. Assuming an average infiltration loss of 0.2 cm/hr. and a constant base flow of 25 m^3/sec, estimate the peak of 5 Hours unit hydrograph. **[10]**

SECTION - II

Q7) a) Explain the terms - Delta and Base period. A crop of wheat requires about 75 mm of water after every 32 days. If the base period for wheat is 160 days, determine delta for wheat. **[8]**

b) Derive the relation between duty and delta. If delta is 100 cm for a crop having base period 45 days, find its duty. **[8]**

OR

Q8) a) Estimate the number of days required between two waterings for a crop having following specifications : **[8]**

i) Field capacity of soil = 30%

ii) Permanant wilting point = 15%

iii) Apparent density of soil = 1.5

iv) Effective depth of root zone = 755.55 mm

v) Daily consumptive use of water for crop = 10 mm.

b) What do you mean by crop rotation? What are its advantages? State the period of kharif, rabi and hot weather season. Name the crops which are grown in rotation. **[8]**

Q9) a) Differentiate between : **[8]**

i) Unconfined aquifer and perched aquifer.

ii) Coefficient of transmissibility and hydraulic conductivity.

b) A 30 cm diameter well is pumped at a uniform rate of 3 m^3/min in a 30 m thick aquifer. Drawdown observations taken at 2m and 200 m distance from centre of well are 10m and 0.5m respectively. Determine aquifer constant of water bearing stratum. **[8]**

OR

Q10)a) Draw a layout of lift irrigation scheme. Show all the components and state their functions. **[8]**

b) State assumptions in Dupuit's theory. **[8]**

Q11)a) Differentiate between - Drip irrigation and sprinkelar irrigation. **[8]**

b) What are drains? What are advantages of drains? State different types of drains. **[10]**

OR

Q12)Write short notes (any - 3) : **[18]**

a) Global water partnership.

b) Salient features of National Water Policy.

c) Different irrigation acts and their features.

d) G.I.S. and R.S. in crop area assessment.

e) Participatory irrigation management.

❖ ❖ ❖ ❖

Total No. of Questions : 8] **[Total No. of Pages : 5**

P1020

[3864]-104
B.E. (Civil)
STRUCTURAL DESIGN - III
(2003 Course)

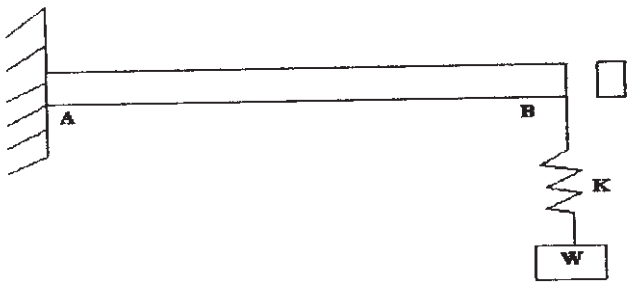
Time : 4 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4 in Section - I.***
2) ***Answer Q.5 or Q.6, Q.7 or Q.8 in 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 IS 1343, IS 456, IS 3370 & non programmable calculator is allowed.***
6) ***Neat diagrams must be drawn wherever necessary.***
7) ***Assume any other data if necessary & mention it at the starting of the answer.***
8) ***Mere reproduction from IS code as answer, will not be given full credit.***
9) ***Assume any other data if required.***

SECTION - I

Q1) a) A mild steel plate of cross section 12 mm × 60 mm, of length 1.5 m is supporting a load of 160 N through a spring having stiffness k = 100 N/mm as shown in fig(1). Calculate the natural frequency of the system if modulus of elasticity of mild steel is 200 Gpa. **[8]**



Fig(1)

P.T.O.

b) A post tensioned prestressed concrete beam section has top flange 450 × 150, web 120 × 450 and bottom flange 300 × 250 mm, is simply supported over a effective span of 16 m and carries a super imposed load of 13 kN/m over entire span. Calculate extreme fiber stresses in concrete at midspan at initial and final stage. The 3 No. of 12/7 Freyssinet cables having zero eccentricity at supports and c.g. area of steel at 90 mm from soffit of the section and are stressed to initial prestress of 930 Mpa. Take loss ratio as 0.85 and unit weight concrete as 25 kN/m^3. **[17]**

OR

Q2) a) Explain in brief with sketches **[8]**

i) Multiple degree of freedom system.

ii) Critical damping.

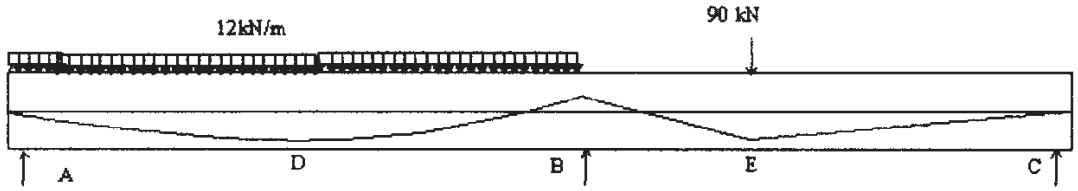
b) A post tensioned prestressed concrete beam section has top flange 500 × 150, web 125 × 550 and bottom flange 280 × 250 mm, is simply supported over a effective span of 17m. The beam is prestressed with 5 No. of 12/5 Freyssinet parabolic cables with their c.g. at 100 mm from extreme bottom fiber, stressed one at a time from only one end. Calculate total loss of prestress at the age of 90 days, if initial prestress is 1030 Mpa, coefficient friction = 0.28, k = 0.0026/m length of cable, slip of anchorage = 1.5mm, Cc = 2.0, Es = 2 × 10^5 Mpa, concrete grade = M45, Creep and relaxation of steel = 2% of initial prestress. **[17]**

Q3) Design a post tensioned prestressed concrete rectangular or 'I' section beam for flexure to carry a live load of 14kN/m over entire simply supported span of 14.6m with M40 grade of concrete and Freyssinet cables of 12/5(fy = 1750 Mpa) or 12/7(fy = 1500 Mpa), including the design of end block. Draw sketches showing cable profiles and end block reinforcement details. Checks for deflection and shear are required. **[25]**

OR

Q4) a) Write a short note with sketches losses in balanced cantilever PSC beams. **[8]**

b) A post tensioned prestressed concrete continuous beam ABC as shown in fig(2) is prestressed with initial prestressing force of 1180 kN. The cross section of the beam is 250 mm × 850 mm the loads shown are exclusive of dead load. Locate centerline of thrust under prestress plus dead load also & make it concordant stating the shift of cable at salient points find the stresses in concrete at extreme fibers at intermediate support take loss ratio of 0.82, AD = DB = 10m and BE = 8m EC = 12m. The eccentricities at A & C = 0, at D = 230 mm (downwards), at B = 160 mm (upwards), and at E = 280 mm (downwards). **[17]**

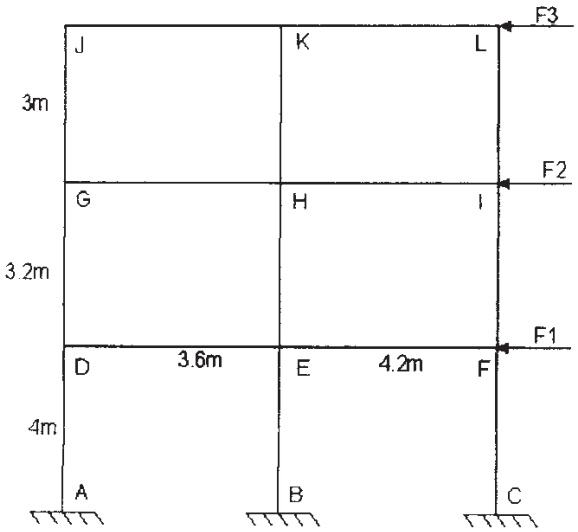


Fig(2)

SECTION - II

Q5) a) Write detailed note on Substitute frame methods of analysis. **[8]**

b) Analyze a rigid jointed frame shown in fig(3) by portal method for lateral loads. Flexural rigidity for all members is same. Analyze beam GHI using proper substitute frame, if it is subjected to vertical ultimate live & dead load incl. of its self wt. intensities of 14kN/m & 12kN/m on GH and 16kN/m & 13kN/m on HI respectively. The horizontal forces are F1 = 24 kN, F2 = 18 kN & F3 = 12kN. Calculate max. span moment for span HI and support moment at H. Design section for combined effect of vertical and horizontal loads. Adopt 15% redistribution of moments for vertical load moments Use M20, Fe500. **[17]**

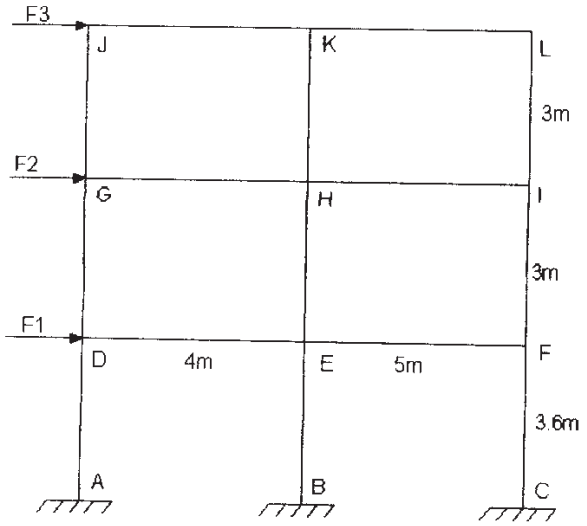


Fig(3)

OR

Q6) a) Write detailed note on method of calculation of earth quake forces on building. **[8]**

b) Analyze a rigid jointed frame shown in fig(4) by cantilever method for lateral loads. Flexural rigidity for all members is same. Analyze beam GHI using proper substitute frame, if it is subjected to vertical ultimate live & dead load incl. of its self wt. intensities of 20 kN/m & 18 kN/m on GH and 15 kN/m & 13 kN/m on HI respectively. The horizontal forces are F1 = 20 kN, F2 = 16 kN & F3 = 10 kN. Calculate max. span moment for span HI and support moment at H. Design section for combined effect of vertical and horizontal loads. Adopt 10% redistribution of moments for vertical load moments Use M20, Fe500. **[17]**



Fig(4)

Q7) a) Draw exaggerated bent shape of long wall of water tank fixed at base & vertical sides and free at top showing faces having bending tension. **[5]**

b) Design reinforced concrete combined rectangular footing for two columns A & B carrying working loads 450 kN and 650 kN respectively. Column A is 300 mm × 300 mm size and column B is 300 mm × 400 mm size. Centre to centre distance of columns is 3.5 m safe bearing capacity 180 kN/m^2. Use M20 and TMT steel. Draw all details of reinforcements. **[20]**

OR

Q8) Design a 'T' shaped retaining wall for slopping backfill with the following data.
Height = 5m above GL,
Slope backfill = 15°, Angle of friction of backfill = 30°, unit weight of backfill = 18 kN/m^3
Safe bearing capacity of the underlying strata = 170 kN/m^2
Material M20 TMT steel
The coefficient friction between the base slab and the underlying strata = 0.55.
Draw lateral pressure diagram and details of reinforcement of stem and base showing curtailment if any. **[25]**

❖❖❖❖

Total No. of Questions : 12] **[Total No. of Pages :5**

P1021

[3864] - 106
B.E. (Civil)
SYSTEMS APPROACH IN CIVIL ENGINEERING
(1997 & 2003 Course) (Elective - I)

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

Instructions to the candidates:

1) ***Answer three questions from Section - I and three questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Fiqures 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) Minimize $Z = x_1 + x_2 + 3x_3$ **[12]**

S.t

$3x_1 + 2x_2 + x_3 \leq 3$

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

$x_1, x_2, x_3 \geq 0$

Use Big M Method.

b) What is an infeasible solution? **[4]**

OR

Q2) a) Solve the problem in Q1(a) above using Two - Phase Method. **[12]**

b) What are slack variables and artificial variables? **[4]**

Q3) The unit cost of transporting construction material from three sources to four construction sites is given below, along with the availability at each source and the requirement at each site. **[18]**

a) Find the Initial Feasible solution by

i) N-W Corner Method

ii) VAM

P.T.O.

Source	Sites				Supply
	A	B	C	D	
1	25	17	25	14	300
2	15	10	18	24	500
3	16	20	8	13	600
Demand	300	300	500	500	

b) Using the solution obtained by VAM, find the distribution policy which will minimize the cost of transportation.

OR

Q4) a) Five contractors have submitted their proposals for executing four projects. The likely profits to be earned by each contractor for each of the projects is given below. If one project is to be allocated to one contractor only

i) Find the optimal allocation that will maximize profits. **[10]**

ii) Find the maximum value of the profits. **[2]**

Contractor	Projects			
	1	2	3	4
A	62	71	87	48
B	78	84	92	64
C	50	61	111	87
D	101	73	71	77
E	82	59	81	80

b) Explain when degeneracy occurs in a Transportation problem. **[2]**

c) Explain how a transportation model is a Linear programming model. **[4]**

Q5) a) Use Fibonacci method to find the minimum value of the function $Z = x^2 + \frac{128}{x}$, in the range 0 to 10, to an accuracy of 0.5%. Carry out computations for the first four stages only. **[10]**

b) Explain local and global optima. **[6]**

OR

Q6) a) Use Newton's method to maximize $f(x) = 9x_1 - x_1^2 + 8x_2 - 2x_2^2$
Take the starting point as (0, 0) **[10]**

b) Explain the algorithm of steepest Gradient Method. **[6]**

SECTION - II

Q7) a) Use Lagrange Multiplier Technique to minimize **[6]**
$Z = x_1^2 + 2x_2^2 + 3x_1 + 7x_2$.
subject to $x_1 + x_2 = 5$

b) Equipment is to be transported from destination X to destination Y. Various routes are available for this transport. The travel distances along various routes, between nodes is given below, in Km.
Use dynamic programming to determine the shortest route between X and Y. **[12]**

From	To	Distance
X	A	9
X	B	7
X	C	13
X	D	14
A	E	11
A	F	5
B	E	7
B	G	11
C	F	12
C	G	1
D	F	5
D	G	8
E	I	2
E	J	14
F	H	7
F	I	3
F	K	14
G	I	14
G	J	8
H	Y	15
I	Y	5
J	Y	9
K	Y	1

OR

Q8) a) Solve the problem given in Q7(a) above using Dynamic Programming. **[12]**

b) Explain Forward Recursion and Backward Recursion. **[6]**

Q9) a) Find the sequence that minimizes the total time required for performing the following jobs on three machines in the order A-B-C. **[10]**

Job	Processing Times in Minutes.		
	A	B	C
1	8	3	8
2	3	4	7
3	7	5	6
4	2	2	9
5	5	1	10
6	1	6	9

Find the total elapsed time and idle times of machines B & C

b) Explain the various components of a Queue and their characteristics. **[6]**

OR

Q10) The inter arrival time and the service time in a waiting line model have the following frequency distribution based on 100 such arrivals. **[16]**

Inter arrival time in minutes	1	2	3	4	5	6	7
Frequency	4	10	13	22	30	14	7

Service time in minutes	1	2	3	4	5	6
Frequency	3	8	25	39	16	9

Estimate the average customer waiting time and the percentage waiting time, average idle time and percentage idle time of the service facility and the average queue length by simulating 10 arrivals. Use the following random numbers.

Arrivals : 23, 58, 56, 44, 80, 36, 97, 26, 71, 62,

Service : 60, 21, 68, 76, 52, 08, 25, 84, 38, 05

Q11)a) Explain the assumptions in a Two -Person - Zero Sum Game. **[3]**

b) Explain the theory of Dominance. **[3]**

c) The payoff matrix in a game between A and B is as follows. Determine the strategies of each player and the value of the game. The payoffs are for player A. **[10]**

	B_1	B_2	B_3	B_4	B_5
A_1	3	–2	–2	0	6
A_2	–4	2	–1	7	–4
A_3	2	–5	–4	1	–1
A_4	0	–3	–3	–1	–1

OR

Q12)a) What are the factors affecting the choice of a project from amongst various alternatives. **[6]**

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

Particulars	Project A	Project B
Investment in Rs. lakh.	50	58
Useful life in years	15	12
Annual Benefits in Rs. lakh	10	12
Discount Rate	10%	10%

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

✪✡✪✡

Total No. of Questions : 12] **[Total No. of Pages : 4**

P1022

[3864]-107

B.E. (Civil)

FINITE ELEMENT METHOD

(2003 Course) (Elective)

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

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6 from Section - I & Q7 or Q8, Q9 or Q10, Q11 or Q12 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 electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Determine half band width of overall stiffeness matrix of truss shown in fig. 1(a). **[4]**

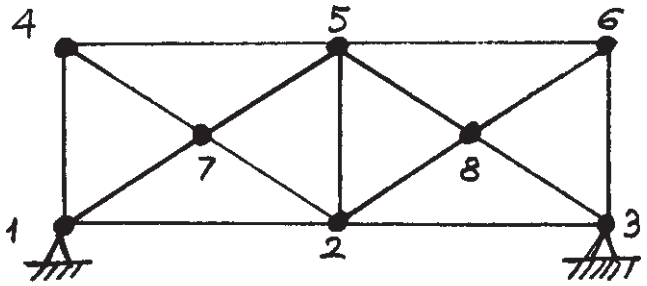


FIGURE 1(a)

b) Is it possible to minimise above half band width? If yes, then suggest alternative node numbering scheme & hence half band width. **[8]**

c) Using direct approach, obtain [k] for bar element with axial deformation as DOF at end nodes. **[6]**

OR

P.T.O.

Q2) a) A beam element having uniform EI = 4000 kNm^2 is of length l = 2m. For unit anticlockwise rotation 'θ' at left node, obtain nodal forces developed. **[6]**

b) A prismatic beam ABC is loaded & supported as shown in fig. 2(b). Using member approach, analyse for nodal unknowns & hence draw B.M. diagram. **[12]**

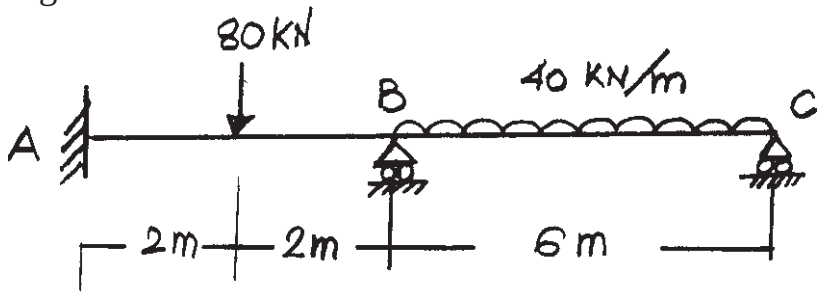


FIGURE 2(b)

Q3) a) Taking example of plane portal frame, explain 'member approach' & 'structure approach' for analysis. Draw neatly sketches showing the difference in approach. **[6]**

b) Analyse for nodal unknowns of portal frame shown in fig 3(b). EI is uniform. Determine member end moments & draw B.M. diagram. **[10]**

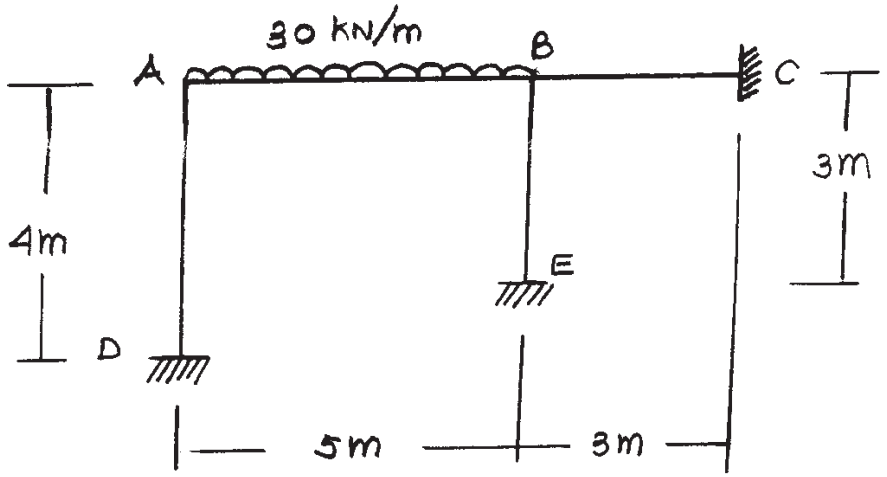


FIGURE 3(b)

OR

Q4) a) State & explain stiffeness matrix for grid element using its local axes. **[8]**

b) What is 'Transformation Matrix'? With a neat sketch derive [T] for grid element. **[8]**

Q5) a) Explain with neat sketches requirements of polynomial displacement functions for convergence. **[8]**

b) Using proper polynomial displacement function for two noded beam element, state [A] matrix & obtain $[A]^{-1}$. **[8]**

OR

Q6) a) Using first principles, establish relation between global & local stiffeness matrices. **[6]**

b) A three noded triangular element is used in plane elasticity problem. Coordinates at nodes are 1(0, 0), 2(4, 0) & 3(2, 2). If u_1, u_2 & u_3 are nodal displacements, find α_1, α_2 & α_3 & hence shape functions. **[10]**

SECTION - II

Q7) Write in brief following :

a) Serendipity elements & shape functions. **[9]**

b) Jacobian Matrix. **[9]**

OR

Q8) Explain concept of isoparametric element taking examples of :

a) Four noded quadrilateral. **[9]**

b) Eight noded quadrilateral with four corner nodes and four midside nodes. **[9]**

Q9) Enlist all 2D & 3D elements known to you write polynomial displacement functions for each element. Explain Geometric isotropy of element state which element satisfies the quality of geometric isotropy. **[16]**

OR

Q10) What is known as aspect ratio of element. How aspect ratio affects the accuracy of finite element solution. Explain with example. **[16]**

Q11) Explain practical applications in which 3D element plays important role using Tetrahydron element, obtain [A], [B] & [D] matrices. **[16]**

OR

Q12) Explain axisymmetric problems. Selecting polynomial displacement functions, obtain [A], [B] & [D] matrices in case of triangular axisymmetric element. **[16]**

❖❖❖❖

Total No. of Questions : 8] **[Total No. of Pages : 3**

P1023

[3864]-108

B.E. (Civil)

STRUCTURAL DESIGN OF BRIDGES

(2003 Course) (401005) (Elective - I)

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

Instructions to the candidates:

1) ***From Section - I answer Q1 or Q2; Q3 or Q4 and from Section - II answer Q5 or Q6; Q7 or Q8.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures in bold to the right, indicate full marks.***
4) ***IS 456, IS 800, IS 1343 and steel table are allowed in the examination.***
5) ***Neat diagrams should be drawn wherever necessary.***
6) ***If necessary, assume suitable data and indicate clearly.***
7) ***Use of electronic pocket calculator is allowed.***

SECTION - I

Q1) a) Explain IRC loadings with suitable examples. **[10]**

b) Explain economic span of a bridge. **[10]**

c) What are the functions of bearings? **[5]**

OR

Q2) a) Explain Courbon's theory for determining the load carried by longitudinal girders. **[10]**

b) Explain the different types of bearing used in R.C. bridges. **[10]**

c) Explain impact load. How it is calculated for R.C. bridges. **[5]**

Q3) An R.C. T-Beam deck slab bridge shown in Fig. 3 has the following details. **[25]**

a) Thickness of railings - 100 mm.

b) Thickness of footpath - 175 mm.

P.T.O.

c) Thickness of wearing coat - 80 mm.

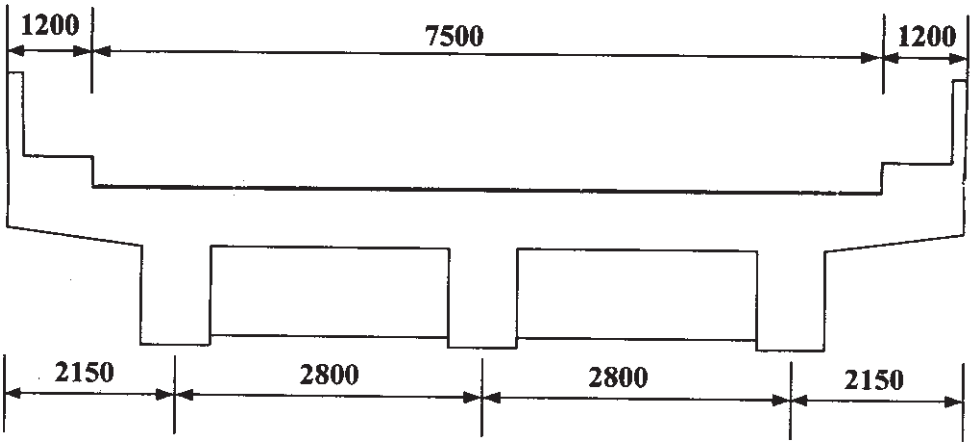
d) Span of main girder - 18.0 m.

e) Spacing of cross-beams - 3.0 m c/c.

f) Live load - IRC Class AA Tracked Vehicle.

g) Materials - M30 grade of concrete and Fe 415 grade of steel Adopt $m_1 = 0.08$ and $m_2 = 0.059$.

Design the deck slab and also sketch the details of reinforcement.



(dimensions are in mm)

Fig. 3

OR

Q4) For the R.C. T-Beam deck slab bridge given in Q.3, design the intermediate post-tensioned prestressed girder. Use M45 grade of concrete and high tension strands of 7 ply 15.2 mm diameter having an ultimate tensile strength of 1200 N/mm^2. Use Fe 415 steel for supplementary reinforcement. Consider loss ratio as 0.80. Sketch the cable profile for the girder. **[25]**

SECTION - II

Q5) a) Explain in brief the advantages of steel bridges. **[12]**

b) Explain in brief with neat sketches the various types of railway steel bridges. **[13]**

OR

Q6) a) Design a rocker and roller bearing for the given data. **[18]**

i) Reaction from the girder = 2000 kN.

ii) Allowable pressure on bearings = 6 N/mm^2.

iii) Allowable pressure on bearing plate = 2500 N/mm^2.

iv) Allowable pressure on concrete bed = 7 N/mm^2 sketch the details.

b) What are the factors considered during the selection of bearing for steel bridges? **[7]**

Q7) Using channel sections, design the members U_2-U_3, U_2L_3 and U_3-L_3 for the railway steel truss bridge shown in Fig. 7. Also draw a neat sketch of the connection of members at U_3 **[25]**

a) Weight of stock rail - 0.68 kN/m.

b) Weight of check rail - 0.48 kN/m.

c) Timber sleepers of size - (0.25 × 0.25 × 2.5) m @ 0.45 m c/c.

d) Unit weight of timber - 7.6 kN/m^3.

e) Spacing of truss - 6.0 m c/c.

f) The bridge supports a eudl of 2950 kN.

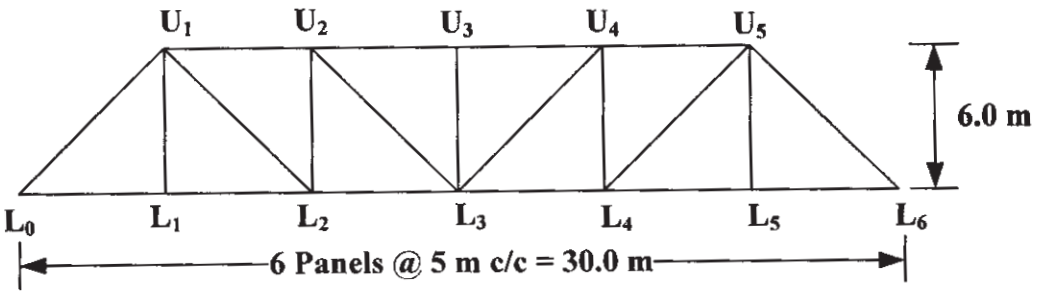


Fig. 7

OR

Q8) For the railway bridge shown in Fig. 7, design the top and bottom lateral bracing with the given data. The rails are 850 mm above the c.g. of bottom chord. The chord members are 400 mm deep and 500 mm wide. The end posts are 475 mm deep and 475 mm wide. The web members are 475 mm deep and 240 mm wide. **[25]**

❖ ❖ ❖ ❖

Total No. of Questions : 12] **[Total No. of Pages :3**

P1025

[3864] - 110
B.E. (Civil)
ADVANCED ENVIRONMENTAL MANAGEMENT
(2003 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) ***Your answers will be valued as a whole.***
6) ***Use of logarithmic tables, slide rule, electronic pocket calculator and steam table is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Define : **[8]**

i) Environment management system.

ii) Environmental policy.

iii) Continual improvement.

iv) Environmental target.

b) What are benefits of EMS? **[4]**

c) What events lead to development of ISO 14000 series? **[6]**

OR

Q2) a) Enlist environmental management system principles and elements. **[6]**

b) Write importance of environmental policy for smooth working of environmental management system. **[6]**

c) Write the advantages of ISO 14000 certification. **[6]**

Q3) a) Explain the provision made to regulate collection, segregation, transport and disposal of solid waste in Municipal Solid Waste (Management & Handling) Rules 2000. **[8]**

b) What is the purpose of Air (Prevention & control) Act 1981; Explain in brief how this act helped the state pollution control board to control air pollution. **[8]**

P.T.O.

OR

Q4) a) Briefly discuss the salient features of Environment Protection Act, 1986. **[5]**

b) Briefly discuss the salient features of Water (Prevention and control of Pollution) Act, 1974. **[5]**

c) Write short notes on : **[6]**

i) Constitution of central board.

ii) Constitution of state boards.

Q5) a) Enlist different control measures for NOx control and Explain any one in detail. **[6]**

b) Write the pollution indices in air monitoring and air quality assessment. **[6]**

c) Explain the limestone injection process used to remove oxides of sulphur from flue gases. **[4]**

OR

Q6) a) Write a procedure for controlling the emission of SOx by treatment of Sulphur from flue gas. **[6]**

b) Explain with examples or chemical formulae the following physical process to control emission of SO2 from thermal power plant.
i) Adsorption ii) Catalytic conversion. **[6]**

c) Write a procedure for controlling the emission of SOx by dilution using tall stacks. **[4]**

SECTION - II

Q7) a) What is bio medical waste? Discuss the effects of biomedical wastes on human health and environment. **[6]**

b) Explain on-site handling, storage and processing of solid wastes. **[6]**

c) Write short notes on : **[6]**

i) Sanitary landfilling.

ii) Composting.

OR

Q8) a) Explain with reference to hazardous waste and give example : **[10]**

i) Reactivity ii) Corrosivity

iii) Toxicity iv) Ignitibility

b) What are the classifications of solid waste? Explain with examples. **[8]**

Q9) a) Write short notes on : **[8]**

i) Carbon adsorption ii) Reverse osmosis

b) Enlist the various methods of denitrification of the effluent and explain the principle of any one biological process of denitrification. **[8]**

OR

Q10) a) What are the advantageous of removing nutrients from effluent? **[4]**

b) Explain the following land treatment system. **[8]**

i) Membrane Technology.

ii) Wetland flow system.

c) Enlist various methods of phosphorous removal from effluent and explain any one method. **[4]**

Q11) a) Write procedure of environmental impact assessment. **[4]**

b) Write positive and negative environmental impacts of following projects. **[8]**

i) Thermal power plant.

ii) Water resources project (Dam).

c) Discuss the role of general public in Environmental Clearance. **[4]**

OR

Q12) a) What are advantages and disadvantages of EIA? **[5]**

b) Explain the role of regulatory agencies and control board in Environmental Clearance of Project. **[5]**

c) Explain constructions 'Leopold Matrix' with reference to EIA. **[6]**

Total No. of Questions : 12] [Total No. of Pages :2

P1026

[3864] - 111
B.E. (Civil)
GEOINFORMATICS
(2003 Course) (Theory) (Elective - I) (401005)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) What are the elements of Interpretation of Aerial Photographs & Satellite Imageries? Explain their significance and factors influencing them. **[12]**

b) What is Atmospheric Windows and Explain its significance. **[6]**

OR

Q2) a) Explain Scattering, Absorption and Refraction with reference to interaction of EMR with the Earth's surface. **[12]**

b) Describe briefly the following types of Resolution with necessary sketches;

i) Spatial Resolution
ii) Spectral Resolution
iii) Radiometric Resolution **[6]**

Q3) a) What is the need of Image Classification? Explain in detail Supervised and Unsupervised method of Image Classification. **[12]**

b) What are the different types of Filters? Explain anyone in detail. **[4]**

OR

Q4) a) What are the different Digital Image Processing Techniques? Explain any two methods in detail. **[12]**

b) Explain Principal Component Analysis. **[4]**

Q5) a) What are the different types of errors in GPS observations and explain how to minimize it? **[12]**

b) What are the Applications of GPS? **[4]**

P.T.O.

OR

Q6) a) Explain with neat sketches the working of GPS, in association with
i) GPS space segments.
ii) GPS control segments & user segments. **[12]**

b) Differentiate Single Point GPS and Differential GPS. **[4]**

SECTION-II

Q7) a) What is GIS? What are the objectives of GIS and explain in detail the components of GIS. **[12]**

b) State the Differences between;
i) Spatial and Non-Spatial Data.
ii) Vector and Raster Model. **[6]**

OR

Q8) a) Describe briefly with necessary sketches the different spatial Analysis that can be performed with help of GIS. **[12]**

b) What are the different types of Map Projections system and describe Geoid and reference ellipsoids. **[6]**

Q9) a) Elaborate the concept of Relational Database, The Hybrid and Integrated GIS Data Model. **[12]**

b) State the difference between Primary Key and Foreign Key. **[4]**

OR

Q10) a) Explain with neat sketches the object oriented GIS model. **[12]**

b) What are the components of DBMS? **[4]**

Q11) Explain application of GeoInformatics with working Flow Charts in following areas;

a) Land use/Land cover classification mapping and analysis.

b) Watershed Management and planning. **[16]**

OR

Q12) Explain application of GeoInformatics with working Flow Charts in following areas;

a) Urban Infrastructure Planning and Development

b) Resources Mapping and Planning for Rural areas. **[16]**

✪✡✪✡

Total No. of Questions : 10] **[Total No. of Pages :2**

P1027

[3864] - 116
B.E. (Civil)
CONSTRUCTION MANAGEMENT
(2003 Course) (Elective - II)

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

Instructions to the candidates:

1) ***Neat diagrams must be drawn wherever necessary.***
2) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
3) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) "Construction is the basic input for Socio-economic Development" Comment on its statement with reference to Gross Domestic Product (GDP). **[8]**

b) Describe the initiative taken by CIDC in Human Resource Development. **[6]**

c) Explain the management function: Staffing and its importance in Construction. **[4]**

Q2) a) What is the definition of Material Management? Describe any three functions of material management. **[8]**

b) Derive the expression for Economic Order Quantity (EOQ). **[8]**

OR

Q3) a) Describe 4Ms in construction. Also show, how they are related with each other. **[8]**

b) Explain advantages and limitations of ABC analysis **[8]**

Q4) a) Describe any six objectives depicting the need of finance to any business. **[8]**

b) What are the methods of 'Medium Term Finance'? Describe 'Venture Capital' in detail. **[8]**

OR

P.T.O.

Q5) a) What are the methods of 'Long Term Finance'? Describe 'Debentures' in detail. **[8]**

b) What are the institutions in India that provide long term finance? Describe any one in detail. **[8]**

SECTION-II

Q6) a) Describe following terms as used in connection with disaster : **[10]**

i) Mitigation of disaster

ii) Disaster Management

iii) Response

iv) Preparedness

v) Recovery

b) What are the on site and off site emergency planning for Floods? **[8]**

Q7) a) What are advantages of training? Describe any one method of training in detail. **[6]**

b) Describe various clauses and requirements of child labour act in detail. Also, state the penalties if an organization violate the act. **[10]**

OR

Q8) a) Describe Works Contract Act in detail. **[8]**

b) What are various methods of training? Explain Vestibule training in detail. **[8]**

Q9) a) What are the constituents of MIS? Explain the procedure for the same. **[8]**

b) What are the advantages of using computer as MIS tool. **[8]**

OR

Q10) a) What is the definition of database? What are the benefits of database approach? **[8]**

b) Write a detailed note on RAMP handbook. **[8]**

Total No. of Questions : 12] **[Total No. of Pages :2**

P1028

[3864] - 117
B.E. (Civil)
INTEGRATED WATER RESOURCES PLANNING AND MANAGEMENT
(2003 Course) (Elective - II)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) State different forms of water in world quoting their availability in volumetric units with percentage of total water. **[8]**

b) Explain perspectives in water infrastructure projects. Also, highlight the problems in such projects. **[8]**

OR

Q2) a) Write with statistics the water resources and irrigation potential of India. **[8]**

b) Explain the present institutional framework for water management. **[8]**

Q3) a) What are different laws in water resources engineering? State the names. Also, state the constitutional provisions of water laws. **[8]**

b) State salient features of national water policy. **[8]**

OR

Q4) a) Explain the scope for privatization of water resources sector. **[8]**

b) State principles of water pricing and water allocation. **[8]**

Q5) a) State any six statistical parameters used in statistical methods and explain in detail the significance of probability with examples. **[9]**

b) State concept of geoinformatics. Write applications of geoinformatics in flood management. **[9]**

OR

P.T.O.

Q6) a) State concept of regression and corelation analysis. Write its applications in water resources engineering. **[9]**

b) What are different types of droughts? State how damage assessment is done during the drought. **[9]**

SECTION - II

Q7) a) Write the parameters used to decide feasibility of inter basin water transfer. Also, state the significance of inter basin water transfer. **[8]**

b) State different water quality parameters required to be maintained for environmental management. **[8]**

OR

Q8) a) Explain : **[8]**

i) Consumptive demands and non consumptive demands.

ii) Irrigation efficiency.

b) How the ecosystem can be protected from environmental management point of view. **[8]**

Q9) a) What are the approaches to be followed for proper implementation of rehabilitation and resettlement. **[8]**

b) Write salient features of any perspective plan for basin development and management. **[8]**

OR

Q10) a) What is water logging? What are its ill effects? How it is controlled? **[8]**

b) State different problems due to siltation of reservoirs and suggest an action plan to reduce the problem of siltation of reservoirs. **[8]**

Q11) Write short notes (Any 3) : **[18]**

a) Use of geoinformatics in integrated water management.

b) Application of ANN in water resources projects.

c) Environmental Management system.

d) Salinity - its ill effects - control measures.

OR

Q12) Write short notes (Any 3) : **[18]**

a) Use of Decision support system in IWRM.

b) Schematization of water network.

c) Basin morphological parameters.

d) Social impact of water resources development.

✪✡✪✡

Total No. of Questions : 6] **[Total No. of Pages : 3**

P1029

[3864]-118

B.E. (Civil)

ADVANCED ENGINEERING GEOLOGY WITH ROCK MECHANICS

(2003 Course) (Elective - II)

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

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***All questions are compulsory.***

SECTION - I

Q1) Write notes on :

a) Engineering significance of older secondary rocks occurring in Maharashtra State. **[9]**

b) Topographical expression of dykes. **[4]**

c) Flow Groups. **[5]**

OR

Write in brief on :

a) Varieties of Basalts. **[4]**

b) Field characters of fractures. **[5]**

c) Engineering significance of older metamorphic rocks occurring in Maharashtra State. **[9]**

Q2) a) Discuss in detail, the geological conditions leading to Tail Channel Erosion in Deccan Trap area. Mention case histories due to

i) Columnar Basalt.

ii) Volcanic Breccia. **[9]**

b) Engineering significance of dykes from dam foundation point of view. Give case histories. **[7]**

P.T.O.

OR

a) Discuss any two case histories of dam sites where economy has been achieved by interpreting correctly the local geological conditions in Deccan Trap area. **[8]**

b) Engineering significance and origin of Tachylytic Basalts. **[8]**

Q3) a) Explain in detail Bieniawski's Geomechanical classification. **[12]**

b) Define Rock mechanics. List only physical properties of rock masses. **[4]**

OR

a) Describe 'Q' system classification of rock masses. **[6]**

b) General RMR value of Compact Basalt. **[6]**

c) Methods of Geophysical survey. **[4]**

SECTION - II

Q4) a) What precautions will have to be taken while tunnelling through volcanic breccias and amygdaloidal basalt? Give case histories. **[12]**

b) What should be minimum depth of drilling for bridge foundation investigations? **[6]**

OR

a) What are fractures? Discuss their engineering significance from tunnelling point of view with case histories. **[12]**

b) Explain importance of subsurface investigations for foundation of bridges. **[6]**

Q5) Give detailed account of water bearing characters of deccan trap rocks. **[16]**

OR

Write notes on the following :

a) Characters and engineering significance of older alluvium. **[8]**

b) Influence of climate on soil formation. **[4]**

c) Granular disintigration. **[4]**

Q6) Write notes on the following :

a) Will dam building activity cause a major earthquake. **[8]**

b) Availability of natural sand as construction material in Deccan Trap area. **[4]**

c) Problems with 'open excavations' in city areas. **[4]**

OR

Write notes on the following :

a) Giant phenocryst basalt as a construction material. **[4]**

b) Foundation of monumental buildings. **[4]**

c) Active faults. **[4]**

d) Fault zone treatment. **[4]**

❖ ❖ ❖ ❖

Total No. of Questions : 12] **[Total No. of Pages : 3**

P1030

[3864]-119
B.E. (Civil)
DAMS AND HYDRAULIC STRUCTURES
(2003 Course)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) Discuss the various investigations required to be carried out to determine the most suitable site for a dam. **[8]**

b) Explain the terms : **[8]**

i) Rockfill dam.

ii) Balloon dams.

OR

Q2) a) Discuss the various factors which govern the selection of type of dam. **[8]**

b) i) Explain the dam instrumentation-uplift cell inclinometer & strainmeter.

ii) What are the limitations of watershed management. **[8]**

Q3) a) Discuss in brief various investigations required for reservoir planning. **[8]**

b) Design an elementary profile of a gravity dam to store water upto a depth of 50 m. Assume uplift factor = 0.75 specific weight of dam material = 24 kN/m^3 coefficient of friction = 0.7. Also calculate principal & shear stresses at heel and toe. **[10]**

P.T.O.

OR

Q4) a) i) Explain how you will find the uplift pressure on a gravity dam provided with drainage gallery. **[8]**

ii) Differentiate between low and high gravity dam.

b) What is area-elevation curve? Also explain elevation-storage curve. What is the use of these curves in reservoir planning? **[10]**

Q5) a) A cross section of a homogenous earth dam is drawn to a scale of 1cm = 25m. Following results were obtained on a trial slip circle. **[8]**

Area of N-diagram = 20sq. cm.

Area of T diagram = 10sq. cm.

Area of U diagram = 5sq. cm.

Length of arc = 15cm.

Soil properties are - cohesion = 22 kN/m^3

- angle of internal friction = 28^o

sp. wt. = 22 kN/m^3

Determine the factor of safety of slope.

b) What are the causes of failure of earth dam. **[8]**

OR

Q6) a) Enlist the various types of spillway gates explain any one. **[8]**

b) Design an ogee spillway by USWES method for the following data : **[8]**

Max. discharge = $3500 m^3/s$

Length of spillway = 175m

Max. water depth above bed = 55m

U/S face vertical

Neglect end contraction and velocity of approach

D/S slope of spillway = 0.75 H : 1V

Coefficient of discharge = 2.2

State crest level of spillway

SECTION - II

Q7) a) Explain in detail, with sketch, the correction for mutual interference of piles as per Khosla's theory of independent variables for weir on permeable foundation. **[8]**

b) i) What is a barrage? How does a barrage differ from a weir?

ii) What is a canal headworks? Describe the functions of a canal headworks. **[8]**

OR

Q8) a) Discuss Bligh's Creep theory for the design of weir on permeable foundation. **[6]**

b) Write short notes on : **[10]**

i) Lake Tapping.

ii) Control Structures - head regulators.

iii) Layout of a typical diversion headworks.

Q9) a) Design an unlined canal in alluvial soil using Lacey's theory to carry a discharge of $18 m^3/s$. Take silt factor = 1.00. **[8]**

b) Write short notes on : **[10]**

i) Benefits of canal lining.

ii) Initial, final regime, regime theory.

OR

Q10) a) Explain different types of cross drainage works provided on a canal alignment and state the conditions under which each one is suitable.**[8]**

b) Explain Kennedy's theory for design of canal. **[10]**

Q11) a) Explain in detail-classification of groynes. **[8]**

b) Explain how water power potential of a stream is assessed. Also state the data required. **[8]**

OR

Q12) a) State and explain the objectives of river training. **[6]**

b) Write short notes on : **[10]**

i) Run off river plant

ii) Types & selection of turbines.

Total No. of Questions :12] **[Total No. of Pages : 4**

P1032

[3864] - 121

B.E. (Civil)

FOUNDATION ENGINEERING

(401010) (2003 Course) (Theory)

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

Instructions to the candidates:

1) ***Answer three questions from section I & three questions from section II.***
2) ***Answer to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answers will be valued as a whole.***
6) ***Use of pocket calculator is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Describe the standard penetration test explaining its application in foundation engineering. **[7]**

b) Distinguish between disturbed & undisturbed samples. **[4]**

c) With a neat sketch explain the procedure of seismic method of exploration. **[6]**

OR

Q2) a) Discuss how would you plan a subsurface exploration programme. What are the factors you must consider for subsurface exploration. **[7]**

b) What is the significance of area ratio as applied to soil samplers. **[4]**

c) What are the factors that influence the depth & number of exploratory holes. **[6]**

Q3) a) Define the terms normal consolidation, over consolidation & preconsolidation pressure. **[6]**

b) Discuss with sketches the following. Compressibility characteristics.

P.T.O.

i) Pressure-void ratio relation.

ii) Coefficient of compressibility.

iii) Degree of consolidation. **[6]**

c) A consolidation test on a sample of clay having thickness of 2.3cm indicates that half the ultimate compression occurs in the first 5 minutes. Under similar conditions, how long will be required for a building on a 6m layer of the same clay to experience half of its final settlement? **[5]**

OR

Q4) a) A settlement analysis carried out for a proposed structure indicates that 9cm of settlement will occur in 5 years & the final settlement will be 45cm based on double drainage condition. A detailed site investigation indicates that only single drainage exists. Estimate the settlement at end of 5 years for the changed condition use $T = \frac{\Pi}{4} U^2$. **[9]**

b) Discuss the validity of assumptions made in the theory of consolidation. **[4]**

c) What is pressure bulb, discuss about it with diagram. **[4]**

Q5) a) Explain the method of conducting a field plate load test on following points:

i) Objective of the test.

ii) Procedure of the test.

iii) Neat sketch.

iv) Interpretation of results. **[8]**

b) Explain how water table influences the bearing capacity. **[4]**

c) A square footing of 2.5m × 2.5m size has been founded at 1.2m below the ground level in a cohesive soil having a bulk density of 18 kN/m^3 and an unconfined compressive strength of 55 kN/m^2. Determine the ultimate & safe bearing capacity of the footing for a factor of safety 2.5, by Terzaghi's theory. **[4]**

OR

Q6) a) State different modes of shear failure & their characteristics with the help of neat sketches. **[6]**

b) Explain the concept of floating foundation with a neat sketch. **[5]**

c) The results of two plate load tests performed on a given location with two circular plates are given below.

i) Dia. = 750 mm, S = 15 mm, Q = 150 kN.

ii) Dia. = 300 mm, S = 15 mm, Q = 50 kN.

Determine the load on a circular footing of 1.2m diameter that will cause a settlement of 15mm. **[5]**

SECTION - II

Q7) a) Indicate the circumtances under which the pile foundations are used for building construction. **[4]**

b) Explain with a sketch the concept of negative skin friction & state how would you determine the same in non-cohesive soil. **[6]**

c) A pile group of 25 piles has to be proportioned in a uniform pattern in soft clay with equal spacing in all directions. Assuming the value of Cu to be constant throughout the depth of the piles, determine the optimum value of spacing of piles in the group. Assume $\alpha = 0.7$. Neglect end bearing effect, & assume the piles to be circular. **[7]**

OR

Q8) a) Draw a neat sketch of pneumatic caisson, lable various parts & explain its working. **[9]**

b) Explain with sketches, various difficulties likely to be faced & the remedial measures to counteract the same during sinking of well foundation. **[8]**

Q9) a) Write a short note explaining method of determining of swelling potentials of a soil. How will you use the results. **[6]**

b) State formula to find bearing capacity of a under reamed piled foundation in cohesive soil. **[3]**

c) Enlist the principles followed during design of foundation on Black cotton soil. Also explain the remedial measure which you will take for a building damaged due to foundation on expansive soil. **[8]**

OR

Q10)a) Discuss earth pressure distribution for cantilever sheet pile in cohesive soil. **[5]**

b) Compare in tabular form cantilever & anchored sheet piles on five different points. **[6]**

c) In cantilever sheet pile how would you calculate the depth of embedment by approximate analysis. Explain with sketch. **[6]**

Q11)a) Write note on liquifaction & its effects. **[4]**

b) Explain Geogrid & Geocomposite with sketches. **[4]**

c) Write a detailed note on types of earthquakes with suitable examples. **[4]**

d) Explain factors influencing ground motion with sketches. **[4]**

OR

Q12)a) Enlist different functions of Geosynthetics with sketches & explain any two of them in details. **[6]**

b) Write detailed note on requirements of reinforced soil mechanism. **[5]**

c) State & explain important factors affecting liquifaction of soil. **[5]**

Total No. of Questions : 12] **[Total No. of Pages : 7**

P1033

[3864]-131
B.E. (Mechanical)
MECHANICAL SYSTEM DESIGN
(2003 Course) (402041)

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

SECTION - I

Unit - I

Q1) a) Fill in the blanks with proper alternative and **rewrite the sentences**. **[5]**

1. For a thick cylindrical tube, open from both the sides, subjected to internal pressure, ———— stress is zero.

   A) Hoop.
   B) Longitudinal.
   C) Radial.

2. In case of a ———— shell, hoop and longitudinal stresses are equal.

   A) Cylindrical.
   B) Ellipsoidal.
   C) Spherical.

3. ———— equation is used for designing cylinders with close ends and made of ductile material.

   A) Birnie's.
   B) Clavarino's.
   C) Lame's.

4. Corrosion allowance will be maximum in case of ———— vessel.

   A) Class I.
   B) Class II.
   C) Class III.

P.T.O.

5. Pressure cooker can be called as ———— Pressure Vessel.
   A) Thick.
   B) Thin.

b) Give two examples each of 'Externally Pressurized Vessel', 'Thin Pressure Vessel' and 'Class I Pressure Vessel'. **[3]**

c) A high pressure cylinder consists of steel tube with inner and outer diameters of 30mm and 50mm respectively. It is jacketed by outer steel tube with an outer diameter 70mm. The tubes are assembled by shrinking process in such a way that maximum principal stress induced in any tube is limited to 110N/mm^2. Calculate the interference pressure and original dimensions of tubes. Assume E = 207000 N/mm^2. **[8]**

OR

Q2) a) What is the necessity of pre-stressing a cylinder? Explain how 'Auto-frettage' provides necessary pre-stressing for cylinder. **[6]**

b) A cylindrical pressure vessel of 1400mm ID is provided with a nozzle of 250mm inner diameter and 15mm thickness. Protruding lengths of nozzle inside and outside the vessel are 15mm and 50mm respectively and it is made up of seamless tube. The thickness of shell is 20mm. Internal pressure in the shell is 4MPa. The corrosion allowance is 2mm. Permissible tensile stress for shell and nozzle material is 200MPa.

Design the dimensions of reinforcing pad **if required**. The reinforcing material is of same quality as that of the shell and is available in thickness of 18mm.

(Assume weld efficiency as 90%) **[10]**

Unit - II

Q3) a) Define 'Optimum design'. What is its objective? How the problems of Optimum Design are classified? Elaborate with suitable examples. **[6]**

b) A tensile bar of length 500mm is subjected to constant tensile force of 3000N. If the factor of safety is 2, design the bar diameter, using Johnson's method, with the objective of minimizing material weight using optimum material from the list given in **Table 1**. **[10]**

Material	Density (ρ) kg/m^3	Cost (c) Rs/kg	Syt N/mm^2
Steel	7800	28	400
Aluminum Alloy	2800	132	150
Titanium Alloy	4500	2200	800

Table 1.

OR

Q4) From the manufacturing considerations, if the cross sectional area of the bar to be designed in problem from Q.3(b) above should not be less than $20mm^2$. Design the bar diameter with the objective of minimizing material cost using other parameters same as given in Q.3(b) above. **[16]**

Unit - III

Q5) a) Derive expression for bending stress in flywheel arm due to torque transmission. **[6]**

b) Torque produced by a four stroke engine is given by $T = 5000 + 750 \sin\theta + 2000 \sin 2\theta$ Nm where 'θ' is angle turned by the crank shaft. Mean engine speed of 130 rpm is to be allowed to fluctuate by $\pm$ 3%. Load torque is constant. Design rim cross section of the flywheel made up of wheel material is FG 150 ($\rho = 7000 kg/m^3$), use factor of safety as 5. Maximum size of flywheel is limited 2m. Assume Rim width to thickness ratio as 2. Assume that rim contributes 90% of the total required inertia. **[12]**

OR

Q6) a) What are the different stresses those can possibly be developed in Flywheel Rim and Arms? With the help of sketch explain how and why each stress gets developed. State assumptions made in each case. Even tough disc type flywheel is easy for manufacturing, why rimmed flywheels are preferred? **[6]**

b) The turning moment diagram of four stroke engine can be assumed to be consisting of four triangles. The areas measured are 750, 100, 80 and $200mm^2$ for power, exhaust, suction and compression strokes respectively. Scale chosen for plotting the diagram is $1mm^2 = 10$ J. The engine is running at 700rpm and speed fluctuation is to be kept within 2% of mean speed. Wheel material is FG 150 ($\rho = 7000 kg/m^3$) with factor of safety as 4. The wheel diameter is limited to 1m and rim is to have rectangular cross section with width to thickness ratio of 2. Design the Flywheel if rim contributes 90% of required MI. Allowable shear stress for flywheel shaft can be taken as $50 N/mm^2$. **[12]**

SECTION - II

Unit - IV

Q7) a) The bolt diameters are normally distributed with a mean of 10.015mm and a standard deviation of 0.02mm. The tolerance specified by designer for bolt diameter is 10 $\pm$ 0.03mm. Calculate the percentage of bolts likely to be rejected.

(Refer **Table 2** for Areas below normal distribution curve) **[10]**

z	0	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.6	0.2257	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2517	0.2549
0.7	0.258	0.2611	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794	0.2823	0.2852
0.8	0.2881	0.291	0.2939	0.2967	0.2995	0.3023	0.3051	0.3078	0.3106	0.3133
0.9	0.3159	0.3186	0.3212	0.3238	0.3264	0.3289	0.3315	0.334	0.3365	0.3389
1	0.3413	0.3438	0.3461	0.3485	0.3508	0.3531	0.3554	0.3577	0.3599	0.3621
1.1	0.3643	0.3665	0.3686	0.3708	0.3729	0.3749	0.377	0.379	0.381	0.383
1.2	0.3849	0.3869	0.3888	0.3907	0.3925	0.3944	0.3962	0.398	0.3997	0.4015
1.3	0.4032	0.4049	0.4066	0.4082	0.4099	0.4115	0.4131	0.4147	0.4162	0.4177
1.4	0.4192	0.4207	0.4222	0.4236	0.4251	0.4265	0.4279	0.4292	0.4306	0.4319
1.5	0.4332	0.4345	0.4357	0.437	0.4382	0.4394	0.4406	0.4418	0.4429	0.4441
1.6	0.4452	0.4463	0.4474	0.4484	0.4495	0.4505	0.4515	0.4525	0.4535	0.4545
1.7	0.4554	0.4564	0.4573	0.4582	0.4591	0.4599	0.4608	0.4616	0.4625	0.4633
1.8	0.4641	0.4649	0.4656	0.4664	0.4671	0.4678	0.4686	0.4693	0.4699	0.4706
1.9	0.4713	0.4719	0.4726	0.4732	0.4738	0.4744	0.475	0.4756	0.4761	0.4767
2	0.4772	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4812	0.4817
2.1	0.4821	0.4826	0.483	0.4834	0.4838	0.4842	0.4846	0.485	0.4854	0.4857
2.2	0.4861	0.4864	0.4868	0.4871	0.4875	0.4878	0.4881	0.4884	0.4887	0.489
2.3	0.4893	0.4896	0.4898	0.4901	0.4904	0.4906	0.4909	0.4911	0.4913	0.4916

Table: 2

b) Write a short note on : Design for Powder Metallurgy. **[6]**

OR

Q8) a) A shaft and hole assembly have following dimensions : **[10]**

Shaft dia = 50 $\pm$ 0.18mm

Hole dia = 50.2 $\pm$ 0.24mm

Assuming the shaft and hole diameters are normally distributed, determine the probability of interference fit.

(Refer Table 2 for Areas below normal distribution curve)

b) Write a short note on : Design for Casting. **[6]**

Unit - V

Q9) a) With the help of appropriate sketch explain why : **[6]**

1) The distance between adjacent fixed gears in a multi-speed sliding mesh gear drive must be greater twice of the face width of gears.
2) The difference in number of teeth on adjacent gears on a compound gear from multi-speed sliding mesh gear drive must be greater than four.

b) Figure 1 shows gearing diagram of a multispeed gearbox with number of teeth on each gear as specified. Motor 'M', running at 1435 rpm, is driving the input shaft through flat belt running over the pulleys with specified diameters. The lowest speed of gearbox should be near about 100 rpm. Answer the following questions based on the figure.

(All Gears are having same module) **[12]**

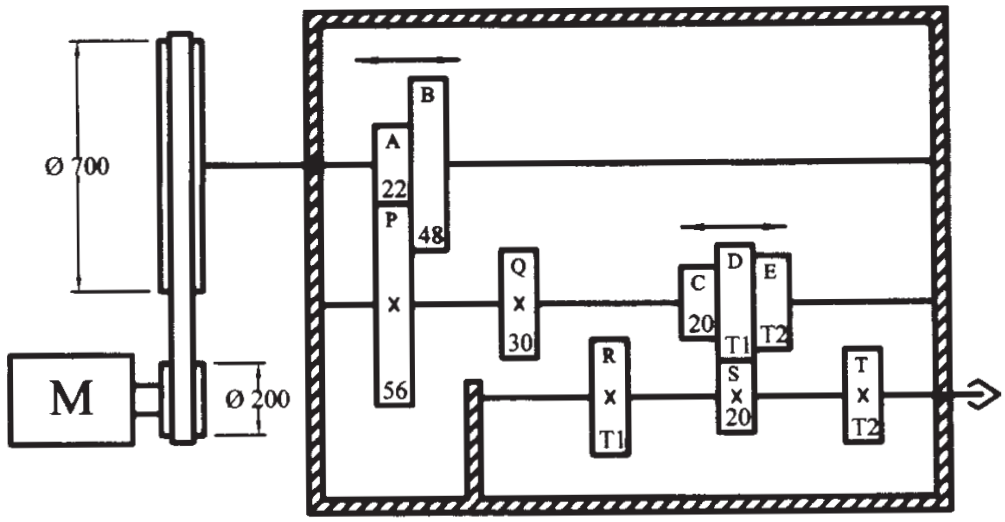


Figure 1

1) Calculate Number of teeth T1 (Round off the calculated number T1 to **nearest** integer) and accordingly calculate T2.
2) Enlist the speeds available on output shaft.
3) Draw speed diagram of the gearbox.
4) What is the geometric progression ratio and range ratio of the gearbox?
5) Write structural formula of the gearbox.
6) What is the current (Meshing A-P D-S) output speed of the gearbox.
7) What will be the output speed if meshing is B-Q C-R.

OR

Q10) A multi-speed gear box is to be designed for a machine tool for speeds varying between 50 rpm and 500 rpm. Recommended GP ratio is as per R5. It is to be driven by an electric motor running at 750 rpm and fitted with 115mm diameter flat belt pulley. Input shaft of gear box is fitted with corresponding flat belt pulley of 545mm diameter. For the proposed system, List out intermediate speeds and round them off to the **nearest** multiple of 5. Write all structure formulae. Draw **symmetric** structure diagrams based on short listed formulae. Select optimum structure diagram. Draw speed diagram. Draw gearing diagram when third speed from bottom is being tapped. Find out number of teeth on each gear assuming min. no of teeth as 20. Draw deviation diagram of the system. **[18]**

Unit - VI

Q11) a) Answer the following in brief with the help of supporting sketches (if required) **[6]**

1. What is the need of containerization?
2. What are different types of conveyors?
3. What is meant by troughed belt conveyor? What is its advantage over flat belt conveyor?

b) What is the use of following components in a flat belt conveyor? **[4]**

1. Snub Pulley.
2. Scraper.
3. Tension take up device.
4. Bend Pulleys.

c) An inclined belt conveyor with 20^{o} inclination is to be used for transporting bulk material with specific weight 10000 N/m^3 Belt width is 1000mm and belt speed is 2m/s. If flow factor is 2.5×10^{-4}, find out capacity of conveyor. **[6]**

OR

Q12) Following data relate to a horizontal belt conveyor used for conveying coal in a thermal power station : **[16]**

Capacity of conveyor : 600 ton/hr
Density of coal : 800 kg/m^3
Belt speed : 2m/s
Surcharge factor : 0.15
Number of plies : 3
Material Factor K1 : 2
Belt tension and contact factor : 80
Material conveying length : 260m
Center distance between snub pulleys : 255m
Ratio of tail pulley to drive pulley dia. : 1.0
Ratio of snub pulley to drive pulley dia. : 0.5
Mass of each carrying run idler : 25kg
Mass of each return run idler : 20kg
Pitch of carrying run idlers : 1m
Pitch of return run idlers : 2.5m
Friction factor for idlers : 0.02
Snub Factor for snub pulleys : 0.03
Snub factor for drive and tail pulleys : 0.06
Material velocity component along belt drive : 1m/s
Angle of lap on drive pulley : 210^o
Coefficient of friction between belt and pulley : 0.4
UTS of belt per meter for ply = 60 N/mm
Drive efficiency : 93%
Mass of belt per mm width per meter length = 0.0155kg/mm/m
Motor speed 1440 rpm
Standard Motor ratings : in multiple of 2.5kW from 5 to 25kW
Determine following parameters of the conveyor :
Standard belt with rounded off to nearest hundred mm.
Reduction ratio of the gear reducer

Power required to drive the conveyor.

Total No. of Questions : 12] **[Total No. of Pages : 5**

P1034

[3864]-132
B.E. (Mech. and Mech./SW)
DYNAMICS OF MACHINERY
(2003 Course) (402042)

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

Instructions to the candidates:

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

SECTION - I

Unit - I

Q1) a) Explain the gyroscopic action in an air plane taking a vertical loop in the sky. Assume suitable directions and determine the effects of gyroscopic action. **[6]**

b) Inertia of a pair of a locomotive driving wheels together with the shaft is 380 kgm^2. The effect of diameter of each wheel is 2m and mean track width is 1.5m. The defect in the rail causes one wheel to fall and rise again 10mm in a total time of 0.1 sec., while the locomotive is traveling along a straight level track at 100 km/hr. If the fall and rise of the wheel is with simple harmonic motion, find the gyroscopic reaction couple on the locomotive. **[10]**

OR

Q2) a) Define following terms related to gyroscope, **[3]**

i) Axis of spin.

ii) Axis of precision.

iii) Axis of couple.

P.T.O.

b) A motor cyclist travels round a curved track of 80m radius at 80km/hr. Determine the angle of heel, if : **[13]**

Mass of the motorcycle with rider = 120kg

Combined center of gravity from ground = 0.425m

Mass of each wheel = 0.8kg

Radius of gyration of each wheel = 0.220m

Effective wheel diameter = 0.6m

The mass of rotating parts is 1.4kg having a radius of gyration of 0.09m and it rotates at 3 times the speed of the wheel and in opposite direction.

Unit - II

Q3) a) Explain a suitable method to determine the unbalance in radial engines. **[4]**

b) The cranks of a four cylinder marine oil engine are arranged at a angular interval of 90^{o}. The engine speed is 700 rpm and the reciprocating mass per cylinder is 800kg. The inner cranks are 1m apart and symmetrically arranged between the outer cranks which are 2.6m apart. Each crank is 400mm long. Determine the firing order of the cylinders for best balance of reciprocating masses amongst the firing order 1-2-4-3 and 1-4-2-3 and also determine the magnitude of the unbalanced primary couple for that arrangement. **[12]**

OR

Q4) a) A five cylinder in line engine has distance between axes of neighboring cylinders equal to 700mm, crank lengths 325mm. Mass of reciprocating parts of 1^{st}, 3^{rd} and 4^{th} cylinders are 155kg each. Angle between first and 3^{rd} crank is 285^{o} and that between 1^{st} and 4^{th} crank is 435^{o}. Assuming crank no.1 at zero degrees, find reciprocating masses and crank angles of second and fifth cylinder so as to achieve complete primary balance. **[12]**

b) Write a note on balancing of rotating masses. **[4]**

Unit - III

Q5) a) A horizontal circular disc of 400mm diameter and 20kg mass is supported by a vertical stepped shaft at the center. The shaft has two steps. First step is 20mm diameter and 200mm long whereas the second step is 15mm diameter and 250mm long, determine the frequency of torsional oscillations of the disc, if the modulus of rigidity of the shaft is 80000 N/mm^2. **[10]**

b) What is the physical significance of the different values of damping factor. **[8]**

OR

Q6) a) Prove that for finding the natural frequency of a cantilever system loaded at its end, the mass of the cantilever is taken into account by adding 33/140 of its mass to the main mass. **[10]**

b) The disc of torsional pendulum has a mass moment of inertia of 0.06 kgm^2. The brass shaft attached to it is of 100mm diameter and 400mm long. When the pendulum is vibrating, the observed amplitudes on the same side of the rest position for successive cycles are 9^o, 6^o and 4^o. Find,

i) Logarithmic decrement.

ii) Damping torque at unit velocity.

iii) Time period of vibration.

iv) What would the frequency be if the disc is removed from viscous fluid?

Assume the modulus of rigidity as 4.4×10^{10} N/m^2. **[8]**

SECTION - II

Q7) a) What are frequency response curves? **[8]**

State 4 observations from these plots drawn for different damping conditions.

b) A 75kg machine is mounted on springs of stiffness $k = 11.76 \times 10^5$ N/m with an assumed damping factor $\xi = 0.20$. A 2kg piston within the machine has a reciprocating motion with a stroke of 0.08m and a speed of 3000 cycles per minutes. Assuming the motion of the piston to be harmonic, determine the amplitude of vibration of the machine and the vibratory force transmitted to the foundation. **[10]**

OR

Q8) a) Draw vector representation diagram for force transmissibility showing all the forces and angles and hence derive the following expression for force transmissibility. **[8]**

$$T_r = \frac{F_{tr}}{F_0} = \frac{\sqrt{1+\left(2\xi\cdot\frac{\omega}{\omega_n}\right)^2}}{\sqrt{\left[1-\left(\frac{\omega}{\omega_n}\right)^2\right]^2+\left[2\xi\cdot\frac{\omega}{\omega_n}\right]^2}}$$

b) A radio set of 20kg mass must be isolated from a machine vibrating with an amplitude of 0.05mm at 500 cpm. The set is mounted on four isolators, each having a spring scale of 31400 N/m and damping factor of 392 N-sec/m.

i) What is the amplitude of vibration of the radio?

ii) What is the dynamic load on each isolator due to vibration? **[10]**

Q9) a) Explain Principal Modes of vibration with respect to 2 DOF translational system. **[6]**

b) Derive a frequency equation for the two natural frequencies for small oscillations of a coupled pendulum shown in fig.1. Assume the rods as mass less and rigid. Also obtain two expressions for the angular amplitude ratios in the two Principal Modes. **[10]**

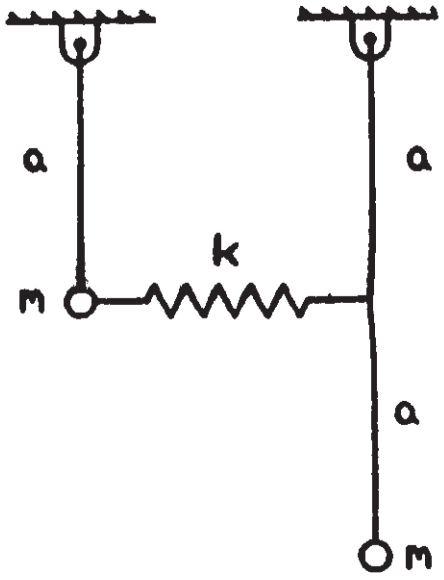


fig. 1.
Q. 9.(b)

OR

Q10) a) Explain torsionally equivalent shaft and show that length of equivalent shaft is given by **[6]**

$$l_e = l_1 \left(\frac{d_e}{d_1}\right)^4 + l_2 \left(\frac{d_e}{d_2}\right)^4 + l_3 \left(\frac{d_e}{d_3}\right)^4$$

b) Two identical rotors are attached to the two ends of a stepped shaft. Each rotor weighs 450kg and has a radius of gyration of 0.38m. The diameter of the shaft is 0.75m for the first 0.25m length, 0.1m diameter for the next 0.1m length and 0.0875m diameter for the remaining length. The total length for the shaft is 0.6m. Assume Modulus of rigidity as 80×10^9 N/m^2. Find :

i) The frequency of torsional vibration.

ii) Position of node.

Draw amplitude and node plot. **[10]**

Q11) a) What do you mean by critical speed of shaft? Derive the expression for a light shaft deflection having a single disc neglecting damping. Explain the significance of 0^o and 180^o phase difference in critical speed. **[8]**

b) A disc of mass 4kg is mounted midway between bearings which may be assumed to be simply supported. The bearing span is 0.48m. The steel shaft which is horizontal, is 9mm in diameter. The CG of the disc is displaced 3mm from the geometric center. If the shaft rotates at 760 rpm, find the maximum stress in the shaft.

Take $E = 1.96 \times 10^{11}$ N/m^2. **[8]**

OR

Q12) a) Explain any two of the following with the help of neat diagrams. **[8]**

i) Vibrometer.

ii) FFT Spectrum Analyzer.

iii) Piezo electric Accelerometer.

iv) Frequency Measuring Instrument.

b) A device used to measure torsional acceleration consist of a ring having a moment of inertia of 0.049kg-m^2 connected to a shaft by a spiral spring having a scale of 0.98 N-m/rad and a viscous damper having a constant of 0.11 N-m-sec/ rad. When the shaft vibrates with a frequency of 15cpm, the relative amplitude between the ring and the shaft is found to be 2^o. What is the maximum acceleration of the shaft? **[8]**

Total No. of Questions : 6] **[Total No. of Pages : 2**

P1035

[3864]-133
B.E. (Mechanical)
MECHATRONICS
(2003 Course) (402043)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Options are given within a question.***
3) ***Answers to the two sections should be written on two separate books.***
4) ***Neat diagram must be drawn wherever necessary.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain a typical measurement system with the help of suitable example. **[6]**

b) Compare various flow meters used in flow measurement systems. **[6]**

c) Explain the various types of control systems. **[6]**

OR

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

i) Hysterisis.

ii) Response of system.

b) Explain with suitable application one type of pressure transducer. **[6]**

c) Explain the working principle of constant current anemometer. **[6]**

Q2) a) Define Gauge factor for a strain gauge. Derive the expression for same. **[6]**

b) List various temperature measuring devices. Explain any one in detail. **[6]**

c) Write various applications of LVDT. **[4]**

OR

a) Why temperature compensation is required in strain gauges? Explain any one method of it. **[6]**

b) Explain capacitive type of level transducer. **[6]**

c) Write a short note on load cell. **[4]**

Q3) a) Explain the concept of hydraulic resistance and hydraulic capacitance. **[6]**

b) Write the advantages and limitations of closed loop control system over open loop control system. **[6]**

c) Explain the concept of transfer function. **[4]**

P.T.O.

OR

a) Compare the translational and rotational mechanical system with the help of impirical formulae. **[6]**

b) Explain basic building blocks of thermal systems. **[6]**

c) Derive for model equation of spring-mass-damper system with usual notations. **[4]**

SECTION - II

Q4) a) Explain P + I + D control action. **[6]**

b) Explain transient and steady state response of system. **[6]**

c) Write a short note on stability of system. **[6]**

OR

a) Explain the dynamic response of second order system to step input. **[6]**

b) Explain the temperature and flow switches. **[6]**

c) Explain the use of relays in control system. **[6]**

Q5) a) Explain the specifications of operational amplifier. **[6]**

b) Explain master-slave JK flip flop. **[6]**

c) Explain decade counter. **[4]**

OR

a) Explain the use of operational amplifier as Integrator. **[6]**

b) Explain any one use of flip-flops. **[6]**

c) Explain sequencial logic in digital signal processing. **[4]**

Q6) a) Explain with block diagram the structure of PLC. **[6]**

b) Explain the use of timers and counters in PLCs. **[6]**

c) Discuss the selection criteria of PLCs. **[4]**

OR

a) Develop a ladder diagram for automatic level control application. **[6]**

b) Explain in short PLC programming. **[6]**

c) Write a short note on Micro-Controller. **[4]**

Total No. of Questions : 12] **[Total No. of Pages : 5**

P1036

[3864]-134
B.E. (Mechanical)
GAS TURBINES AND JET PROPULSION
(2003 Course) (402044)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) What do you understand by sonic velocity? Show that sonic velocity, $a = \sqrt{VRT}$. **[8]**

b) Air at 15 bar 1000 K enters convergent-divergent nozzle with negligible velocity under steady state condition. For a throat area of 30 cm^2 find **[8]**

i) Mass flow rate & throat conditions.

ii) Pressure & temperature in divergent portion where Mach number is 2 & required exit area.

OR

Q2) a) Prove that for a normal shock $\frac{Py}{Px} = \frac{1+\gamma Mx^2}{1+\gamma My^2}$ where γ is ratio of specific heats of air. **[8]**

b) Air enters a pipe of 0.05m diameter at stagnation conditions of 10 bar & 400 K at Mach no. of 2.8. If Mach no. at exit is 1.2 & friction factor is 0.005. Find mass flow rate & length of pipe required. Assume Cp = 1.005 kJ/kg K. **[8]**

P.T.O.

Q3) a) Explain surging & choking in a compressor. **[6]**

b) Explain : **[4]**

i) Slip factor

ii) Power input factor.

c) A centrifugal compressor runs with tip rotor speed of 400 m/sec. & slip factor is 0.96. The compressor takes in air at 1 bar & 300K at ambient conditions. If mass flow rate of air is 20 kg/sec. & compressor works with an isentropic efficiency of 85%, calculate **[6]**

i) Compressor power

ii) Total pressure & temp^{r} at exit of impeller.

Assume Cp = 1.05 kJ/kg K & γ = 1.4.

OR

Q4) a) Discuss various performance characteristic curves on an axial flow compressors. **[6]**

b) Define : **[2]**

i) Coefficient of lift.

ii) Coefficient of drag.

c) An axial flow compressor comprises number of similar stages with equal work done per stage & velocity of flow is uniform throughout compressor. Following is the data **[8]**

Overall stagnation pressure ratio = 3.5

Stagnation inlet temperature = 60°C

Relative air angle at rotar inlet = 130°C

Relative air angle at rotar outlet = 100°C

Blade velocity = 185 m/sec.

Degree of reaction = 0.5

Overall stagnation adiabatic efficiency = 0.87.

Data refer to mean blade height & measurement of angle is done in same sense from blade velocity diagram.

Calculate i) Stagnation outlet temperature

ii) Number of stages

Q5) a) What is the effect of following operating variables on thermal efficiency of gas turbine? Discuss. **[8]**

i) Pressure ratio

ii) Turbine inlet temperature.

iii) Compressor inlet temperature.

iv) Turbine & compressor efficiency.

b) In a gas turbine plant the pressure ratio through which air at 15°C is compressed is 6. The same air is then heated to maximum permissible temperature of 750°C first in a heat exchanger which is 75% efficient & then in combustion chamber. Air is then expanded in two stages such that expansion work is maximum. Air is reheated to 750°C after first stage. Determine cycle thermal efficiency & work ratio & net shaft work per kg of air. Assume compressor efficiency is 80% & turbine efficiency is 85% respectively. **[10]**

OR

Q6) a) Compare open cycle gas turbine & closed cycle gas turbine. **[6]**

b) Explain open gas turbine cycle with intercooling. **[6]**

c) A simple gas turbine operates at pressure ratio of 5:1. Turbine inlet temp^{r} is 580°C. Air temp^{r} at inlet to compressor is 15°C & its pressure is 1 bar. Compressor operates at an isentropic efficiency of 80%. Determine required isentropic efficiency of turbine so that overall efficiency of plant remains at 18%. **[6]**

Take Cpa = 1.005 kJ/kg K.

& Cpg = 1.1 kJ/kg K.

SECTION - II

Q7) a) Draw and explain the energy flow diagram for a stage of an impulse turbine. **[8]**

b) Derive expression for maximum utilization factor of a 50% reaction stage. **[10]**

OR

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

a) Performance graphs of Gas Turbines.

b) Reheat factor and stage efficiency.

c) Multistage impulse turbines.

Q9) a) Explain in detail the combustion theory based on three well known postulates as applied to gas turbines. **[8]**

b) Discuss the factors affecting the combustion chamber design and performance. **[8]**

OR

Q10)Write notes on : **[16]**

a) Fuels for Gas turbines.

b) Annular combustion chamber.

c) Recent developments and applications of gas turbines.

d) Blade cooling of Gas Turbines.

Q11)a) Discuss the working of a Turbojet engine with a neat sketch. Define **[8]**

i) propulsive efficiency

ii) overall efficiency and

iii) thrust specific fuel consumption.

b) A turbojet air craft with two jet engines is travelling with a velocity of 200 m/s. The other data is as given below : **[8]**

i) Flying altitude = 12 km and air density at this altitude = 0.172 kg/m^3.

ii) The propulsive efficiency = 50%

iii) Drag on the plane = 7000 N

Calculate : 1) Absolute velocity of the jet

2) Amount of air compressed per second

3) Net output of gas turbine

4) Diameter of jet

Assume A) overall efficiency = 18%.

B) calorific value of fuel = 48950 $\frac{kJ}{kg}$.

OR

Q12) Write notes on : **[16]**

a) Turbofan engine.

b) Solar Rocket engine.

c) Pulse jet engine

d) Solid and liquid propellants.

❖❖❖❖

Total No. of Questions : 12] **[Total No. of Pages : 7**

P1037

[3864]-139
B.E. (Mechanical)
OPERATION RESEARCH
(2003 Course) (Elective - I)

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

Instructions to the candidates:

1) ***Answer three questions from section-I and three questions from section-II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***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) Solve the following Linear Programming problem graphically. **[6]**

Maximize $Z = 8000\ X_1 + 7000\ X_2$

Subjected to $3X_1 + X_2 \leq 66$

$X_1 + X_2 \leq 45$

$3X_1 \leq 20,\ X_2 \leq 40$

$X_1, X_2 \geq 0$

b) The ABC printing company is facing a tight financial squeeze and is attempting to cut costs wherever possible. At present it has only one printing contract and the book is selling well in both the hardcover and paperback edition. It has just received a request to print more copies if the book in either hardcover or paperback form. Printing cost of hardcover book is Rs.600 per 100 while for that paperback is only Rs.500 per 100. Although the company is attempting to economize, it does not wish to lay off any employee. Therefore it feels obliged to run its two printing press at least 80 and 60 hours per week respectively. Press I can produce 100 hardcover books in 2 hours or 100 paperback books in 1 hour. Press II can produce 100 hardcover books in 1 hour or 100 paperback books in 2 hours. Determine how many books of each type should be printed in order to minimize costs. **[10]**

OR

P.T.O.

Q2) Solve the following Linear Programming problem graphically. **[16]**

Maximize $Z = 2X_1 + 3X_2 + 3X_3$

Subjected to $3X_1 + X_2 + 4X_3 \leq 600$

$2X_1 + 4X_2 + 2X_3 \geq 480$

$2X_1 + 3X_2 + 3X_3 = 540$

$X_1, X_2, X_3 \geq 0$

Q3) A company has four manufacturing plant and five warehouses. Each plat manufactures same product which is sold at different prices in each warehouse area. Cost of manufacturing and cost of raw material is different in each plant due to various factors. The capacities of the plant are also different. The data are given in following table.

Item	Plant			
	1	2	3	4
Manufacturing cost per unit (Rs.)	12	10	8	8
Raw material cost per unit (Rs.)	8	7	7	5
Capacity per unit time	100	200	120	80

The company has five warehouses. The sales price, transportation cost and demands are given in the table.

Warehouse	Transportation Cost per unit (Rs.)				Sales Price per unit (Rs.)	Demand (units)
	Plant 1	Plant 2	Plant 3	Plant 4		
A	4	7	4	3	30	80
B	8	9	7	8	32	120
C	2	7	6	10	28	150
D	10	7	5	8	34	70
E	2	5	8	9	30	90

a) Formulate the problem as Transportation Problem to maximize the profit. **[4]**

b) Find the solution using VAM. **[5]**

c) Test for optimality and find the optimal solution. **[9]**

OR

Q4) a) A company is engaged in manufacturing 5 brands if packed snacks. It is having five manufacturing setups, each capable of producing any of its brands, one at a time. The cost to make a brand on these setups vary according to the following table. **[10]**

	S_1	S_2	S_3	S_4	S_5
B_1	4	6	7	5	11
B_2	7	3	6	9	5
B_3	8	5	4	6	9
B_4	9	12	7	11	10
B_5	7	5	9	8	11

Assume five setups are S_1, S_2, S_3, S_4, S_5 and five brands are B_1, B_2, B_3, B_4, B_5. Find the optimum assignment of products on these setups resulting minimum cost.

b) Show that assignment model is a special case of transportation model. **[4]**

c) Discuss the travelling salesman problem. **[4]**

Q5) a) Derive formula for economic lot size model with constant demand. **[6]**

b) A shopkeeper has a uniform demand of an item of 50 items per month. He buys it from a supplier at a cost of Rs.6.00 per item and the cost of ordering us Rs.10.00 each time. If the stock holding costs are 20% per year of the stock value, how frequently he should replenish his stock? Suppose the supplier offers a 5% discount on orders between 200 and 999 items and 10% discount on orders exceeding 1000. Can the shopkeeper reduce his cost by taking advantage of either of these discounts? **[10]**

OR

Q6) a) Explain necessity of maintaining inventory. **[4]**

b) Explain important characteristics of dynamic programming. **[4]**

c) Solve the following integer linear programming problem using cutting plane method. **[8]**

Maximize $Z = X_1 + X_2$

Subjected to $3X_1 + 2X_2 \leq 5$

$X_2 \leq 2$

$X_1, X_2 \geq 0$ & are integers.

SECTION - II

Q7) a) Solve the following game. **[10]**

Player B

Player A	I	II	III	IV	V
1	10	81	32	43	93
2	59	63	39	69	73
3	71	20	5	27	84
4	34	14	44	44	69

b) Write a short note on group replacement policy for items that fails suddenly. Which of the policies group replacement or individual replacement is better? Why? **[6]**

OR

Q8) a) Find the cost per period of individual replacement policy of an installation of 300 bulbs given the data :

i) Cost of replacing an individual bulb is Rs.2.00.

ii) Conditional probability of failure is given below.

Week No.	0	1	2	3	4
Conditional probability of failure	0	0.1	0.3	0.7	1.0

Also calculate number of bulbs that would fail during each of four weeks. **[10]**

b) Solve the 2 × 5 game graphically. **[6]**

Player B

Player A	I	II	III	IV	V
1	–5	5	0	–1	8
2	8	4	–1	6	–5

Q9) a) Explain Kendall's notations for representing queuing model. **[6]**

b) A bank has two tellers working on saving account. The first teller handles withdrawals only. The second teller handles deposits only. It has been found that the service time distribution for the deposits and withdrawal both are exponential with mean service time of 3 minutes per customer. Depositors are found to arrive in Poisson fashion throughout the day with mean arrival rate of 16 per hour. Withdrawers also arrive in Poisson fashion with mean arrival rate of 14 per hour. What would be the effect on the average waiting time of the depositors and withdrawers if each teller could handle both withdrawal and deposits? What would be the effect if this could only be accomplished by increasing the service time to 3.5 minutes? **[10]**

OR

Q10) a) There are seven jobs each of which has to go through machine A & B in order A-B. The processing time in hours is given below : **[8]**

Job	1	2	3	4	5	6	7
Machine A (Hrs)	3	12	15	6	10	11	9
Machine B (Hrs)	8	10	10	6	12	1	3

Determine the sequence of the jobs that will minimize the total elapsed time. Also find the total completion time and idle time of each machine.

b) A company manufactures around 200 mopeds depending upon the availability of raw material and other conditions. The daily production has been varying from 196 mopeds to 204 mopeds whose probability distribution is as follows. **[8]**

Production/day	196	197	198	199	200	201	202	203	204
Probability	0.05	0.09	0.12	0.14	0.20	0.15	0.11	0.08	0.06

The finished mopeds are transported in a specially designed three storied lorry that can accommodate only 200 mopeds. Using the following 15 random numbers 82, 89, 78, 24, 53, 61, 18, 45, 04, 23, 50, 77, 27, 54 and 10. Simulate the process to find out

i) Average number of mopeds waiting in factory.

ii) Number of empty spaces in lorry.

Q11) a) A small project consists of 13 activities. Their precedence relationship and duration in days is given in table. **[14]**

Activity	Predecessor	Duration (Days)
A	---	6
B	A	4
C	B	7
D	A	2
E	D	4
F	E	10
G	---	2
H	G	10
I	J,H	6
J	---	13
K	A	9
L	C,K	3
M	I,L	5

i) Construct the project network.

ii) Find the Critical Path.

iii) Find total completion time of the project.

b) Differentiate between CPM and PERT. **[4]**

OR

Q12) A project schedule has following characteristics. **[18]**

Activity	To	Tm	Tp
1-2	1	2	3
2-3	1	2	3
2-4	1	3	5
3-5	3	4	5
4-5	2	3	4
4-6	3	5	7
5-7	4	5	6
6-7	6	7	8
7-8	2	4	6
7-9	4	6	8
8-10	1	2	3
9-10	3	5	7

a) Construct the project network.

b) Find the expected duration and variance for each activity.

c) Find the critical path and expected project completion time.

d) What is the probability that the entire project will be completed in 30 days.

Use the following data :

Z	1.41	1.42	1.43	1.44	1.45	1.46	1.47	1.48
Ψ	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306

Total No. of Questions : 12] **[Total No. of Pages : 4**

P1038

[3864]-141
B.E. (Mechanical & Mech. S/W)
CAD/CAM AND AUTOMATION
(2003 Course)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) A triangle PQR with vertices P(0, 0), Q(4, 0), and R(2, 3) is to be subjected to following two transformation in order : **[6]**

1. Translation through 4 and 2 units along X and Y direction; and
2. Rotation through 90^o about the new position of point R.

Determine :

i) The concatenated transformation matrix.

ii) The new position of triangle.

b) Write a short note on Inverse Transformation. **[5]**

c) Determine the concatenated transformation matrix for rotating any entity about any given point. **[5]**

OR

Q2) a) Explain translational and rotational mapping with suitable examples. **[6]**

b) Derive a concatenated transformation matrix to reflect a point about a line $y = mx + c$. **[10]**

Q3) a) Describe the procedure to find the center of a circle that is tangent to two known lines with a given radius. **[8]**

b) How surface modeling different from wireframe and solid modeling? Explain briefly with example. **[4]**

c) Give some practical applications of solid modeling. **[4]**

P.T.O.

OR

Q4) a) What are practical applications of B-spline and Bezier curve? **[6]**

b) What is meant by sweep operation in solid modeling? **[4]**

c) Write a short note on : **[6]**

i) Triangular Bezier patches.

ii) Sculptured surface.

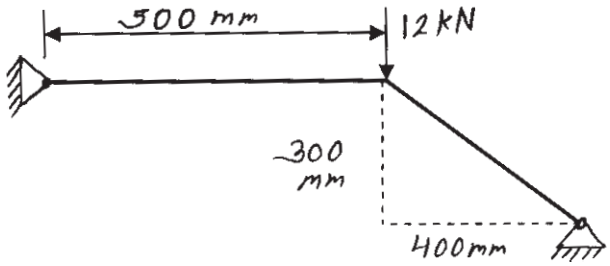
Q5) a) A metallic tapered plate of 600 mm length has the cross-section area of 450 mm^2 and 150 mm^2 at two ends. It is fixed at large end and subjected to tensile load of 35kN at free end. The modulus of elasticity for the bar material is 1×10^5 N/mm^2. Model the bar with three finite elements of equal length and calculate stresses in each element. **[8]**

b) Derive an expression for the element stiffness matrix of the two noded truss element. **[6]**

c) Write a short note on Quadratic Shape Function for 1-D element. **[4]**

OR

Q6) a) For the two-bar truss as shown in the figure, determine nodal displacement and element stress. For both elements E = 70 GPa and A = 200mm^2. **[10]**



b) Give details of various types of element shapes usually employed for modeling components. **[4]**

c) What are the properties of stiffness matrix? **[4]**

SECTION - II

Q7) a) Discuss the Problem Modeling and Boundary Conditions for the following cases : **[8]**

i) A cylinder of infinite length subjected to external pressure.

ii) Belleville spring.

b) Write a short note on Isoparametric Elements? **[4]**

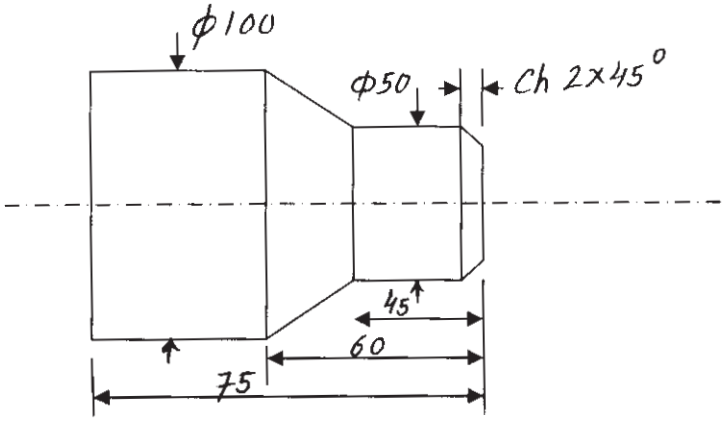
c) Explain reflective symmetry with suitable example. **[4]**

OR

Q8) a) The CST 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 N_1 and N_2 are 0.15 and 0.25, respectively. Determine the x and y-coordinates of point P. **[8]**

b) Derive a relation to determine the Jacobian function for CST element. **[8]**

Q9) a) Write a manual part program for finishing a forged component as shown in the figure. Assume the speed and feed on the turning centre as 450 rpm and 0.4mm/rev. assume 1mm material is to be removed radially from external diameter. **[8]**

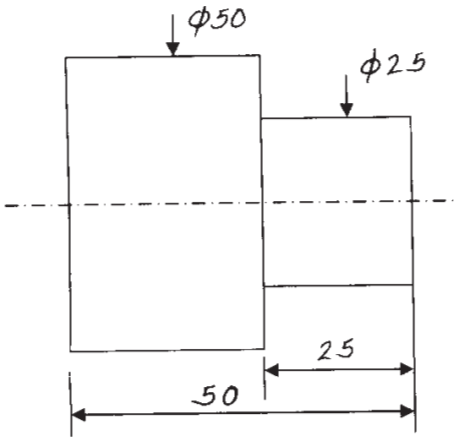


b) What are various activities of a manufacturing plant which can be carried out through computer control? **[4]**

c) What is a canned cycle? Explain with suitable example. **[4]**

OR

Q10) a) Write a manual part program for turning a raw bar of Φ 60mm and 52mm long as per the drawing using canned cycles. **[8]**



b) How is tool offset measured in the machine? **[4]**

c) What is a word address block format? **[4]**

Q11) a) Briefly describe significant application area of robot. **[6]**

b) Discuss the need for flexibility in automation system. **[6]**

c) What is a FMS? How does FMS ensure flexibility in manufacturing? **[6]**

OR

Q12) a) What are different types of drives used in Robot? **[6]**

b) Compare FMS with transfer line and CNC on the basis of volume and variety of part produced. **[6]**

c) What are the different methods of programming of robot? **[6]**

Total No. of Questions : 12] **[Total No. of Pages : 4**

P1039

[3864]-142
B.E. (Mechanical)
POWER PLANT ENGINEERING
(2003 Course)

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

Instructions to the candidates:

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

SECTION - I

Unit - I

Q1) a) Explain the various factors which are to be considered while selecting site of hydroelectric power plant. **[4]**

b) Explain in brief main components of nuclear power plant. **[6]**

c) Discuss the advantages and disadvantages of nuclear power plant. **[6]**

OR

Q2) a) Explain with neat sketch the principle of operation of gas turbine power plant. Also give its applications. **[8]**

b) Write short notes on the following : **[8]**

i) Fast breeder reactors.

ii) Fissile and fertile materials.

Unit - II

Q3) a) Describe in brief the pulverized fuel firing system with a neat sketch. What is the difference between unit system and central system? **[8]**

b) Write short notes on the following : **[8]**

i) Cyclone separator.

ii) Coal-Oil mixture fuel.

P.T.O.

OR

Q4) a) Write a short note on ash handling system used in thermal power plant. **[8]**

b) What are the various requirements of steam piping system in power plant? Explain the steps involved in designing the steam piping? **[8]**

Unit - III

Q5) a) Write a short note on cogeneration. **[6]**

b) A steam power plant equipped with a regenerative and reheat systems is supplied with steam to HP turbine at 8 MPa and 470°C. The part of the steam is extracted at 700 kPa bar for feed water heating and the remaining is reheated to 350°C. It is then expanded in the LP turbine to 3.5 kPa. Determine the following by neglecting feed pump work. **[12]**

i) Power generated by the plant for a steam flow rate of 50kg/s.

ii) Mass of steam bled off per hour for feed heating.

iii) Efficiency of the plant.

Draw the plant schematically and represent the cycle on h-s diagram.

OR

Q6) a) Draw neat sketch of Loeffler boiler and explain its working. What are its merits and demerits? **[8]**

b) In a Rankine cycle, steam is supplied to a turbine at 50 bar, 400°C and is expanded to a pressure of 0.1 bar. Find the thermal efficiency of the plant if the reheat pressure is 6 bar and the reheated steam temperature is 400°C. **[10]**

SECTION - II

Unit - IV

Q7) a) Show by analytical method, that for isentropic flow of steam through a convergent divergent nozzle, the velocity of steam at throat reaches the velocity of sound in steam. **[6]**

b) A convergent-divergent nozzle is required to discharge 2kg of steam per second. The nozzle is supplied with steam at 6.9 bar and 180°C and discharge takes place against a back pressure of 0.98 bar. Expansion up to throat is isentropic and the frictional resistance between the throat and exit is equivalent to 62.76 kJ/kg of steam. Taking approach velocity of 75m/sec and throat pressure of 3.9 bar, determine : **[12]**

i) Suitable areas for throat and exit.

ii) Overall efficiency of the nozzle based on the enthalpy drops between the actual inlet and exit condition.

OR

Q8) a) Compare Jet condenser and surface condenser. **[3]**

b) What are the effects of air leakage in a condenser? **[3]**

c) A surface condenser deals with 13000kg of steam per hour. The leakage of air in the system amounts to 1kg per 2700kg of steam. The vacuum in the air pump suction is 705mm of mercury (barometer pressure 760mm of Hg) and temperature is 34.6°C. Determine the discharging capacity of the wet air pump, which removes air and condensate in m^3/min. Assume volumetric efficiency of the pump as 90%. If the air pump is single acting and runs at 60 rpm and piston stroke is 1.25 times the diameter of the pump, find the dimensions of the air pump. **[12]**

Unit - V

Q9) a) Derive expression for maximum diagram efficiency for a two row velocity compounded impulse turbine assuming frictionless flow. **[6]**

b) A steam turbine of the De laval type receives steam at a pressure of 10 bar and exhausts it at 1 bar. There are four nozzles, each of which is inclined at 20° to the plane of the wheel. The average peripheral speed of the blades is 250m/sec. Obtain the best angle for the blades, assuming that inlet and outlet angles are the same. What is the power developed by the turbine if the area at the throat of each nozzle is 0.24cm^2? **[10]**

OR

Q10) a) What are the different methods of governing of steam turbine? Explain any one with neat sketch. **[6]**

b) The outlet angle of the blade of Parson's turbine is 20° and the axial velocity of flow is 0.5 times the mean blade velocity. Draw the velocity diagram for a stage comprising of one fixed and one moving row of blades, given that the mean diameter is 71cm and speed of rotation is 3000rpm. Also find the inlet angle of the blades if the steam is to enter the blade channel without shock. If the blade height is 6.4cm, mean steam pressure is 5.5 bar, steam dry saturated, find the power developed in the stage. **[10]**

Unit - VI

Q11) a) A power plant of 180MW installed capacity has the following particulars : **[10]**

Capital cost = Rs.2160/kW installed

Interest and depreciation = 12%

Annual load factor = 0.6

Annual capacity factor = 0.5

Annual running charges = Rs.36×10^6

Energy consumed by power plant auxiliaries = 6%

Calculate :

i) Reserve capacity.

ii) The cost of power generation per kWh.

b) Explain how the unit energy cost is determined. **[3]**

c) What is the effect of load factor on cost per kWh? **[3]**

OR

Q12) a) The incremental fuel costs for two generating units 1 and 2 of a power plant are given by the following equations. **[11]**

$$\frac{dF_1}{dP_1} = 0.07P_1 + 24$$

$$\frac{dF_2}{dP_2} = 0.075P_2 + 22$$

where F is the fuel cost in rupees per hr and P is the power output in MW. Determine :

i) The economic loading of the two units when the total load supplied by the power plants is 180 MW.

ii) The loss in fuel cost per hr if the load is equally shared by both units.

b) What is load duration curve? Draw typical load curve for residential and industrial load and construct load duration curves. What is average load? **[5]**

Total No. of Questions : 12] **[Total No. of Pages : 5**

P1041

[3864]-151
B.E. (Mechanical S/W)
DESIGN ENGINEERING
(2003 Course)

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

Instructions to the candidates:

1) ***Answer three questions from section-I and three questions from section-II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***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 straight bevel pinion having 21 teeth to be made of alloy steel (Sult = 800 MPa) is to mesh with bevel gear made of plain carbon steel (Sult = 720 MPa). The axes of pinion and gear intersect at right angles. The gear pair is required to transmit 13kW power from a spindle running at 500rpm to a machine running at 300rpm. The starting torque of the motor is 110% of the rated torque. The factor of safety is 2.0. Tooth system is 20^o full depth involute. The gears are to be machined to meet the specifications of grade 6. The pinion and gear are to be case hardened to 400 BHN and 350 BHN respectively. The deformation factor for gear pair is 10900 × e N/mm. Design the gear pair using Buckingham's equation for dynamic load. For grade 6.

$e = 8 + 0.63 \left[m + 0.25\sqrt{dm} \right]$ where dm : is mean diameter in mm.

Velocity factor = $\frac{6}{6+v}$

Std module (mm) 1, 2, 3, 4, 6, 8, 10, 12, 15 **[18]**

OR

Q2) A single start worm to be made of case hardened steel is to mesh with worm gear having permissible bending stress of 85 MPa. The wear factor is 0.55 MPa. The ratio of pitch circle diameter of worm to the module is 10. Tooth system is 20^o full depth involute. The gear pair is required to transmit 10kW of power from an electric motor running at 1500 rpm to the hoisting drum running at 30 rpm. The application factor and factor of safety are 1.25 and

P.T.O.

1.5 respectively. The coefficient of friction between worm and worm gear teeth is 0.05. If the overall heat transfer coefficient is 28 $W/m^{2o}C$, design the gear pair and find the temperature rise of the lubricating oil above the atmospheric temperature.

Standard module – (mm), 1, 2, 3, 4, 5, 6, 8, 10, 12, 15

Surface area $A = 1.14 \times 10^{-4} \times a^{1.7}$ m^2

a : center distance in mm. **[18]**

Q3) A class 2 cylindrical pressure vessel of 1220 mm inside diameter and 15 mm thickness is provided with a nozzle of 200 mm inner diameter and 12 mm thickness. The extensions of the nozzle outside and inside the vessel are 30 mm and 15 mm respectively. The corrosion allowance is 1.5mm. Double welded butt joints which are spot radiographed are used to fabricate the shell. The nozzle is made up of seamless tube. The pressure inside the vessel is 2 MPa. The allowable tensile stress for shell and nozzle are 120 MPa and 100 MPa respectively. A reinforcing pad of 6 mm thickness and 350 mm outside diameter is welded around the nozzle external to the shell. Find whether reinforcement is adequate or not. Devise the remedy for the same.

Draw the diagram of the areas. **[16]**

OR

Q4) a) A cylindrical pressure vessel shell of inside diameter 1500 mm is subjected to an internal pressure of 2 MPa. The shell as well as heads are made of low alloy steel with ultimate tensile strength of 450 MPa. The double welded butt joints which are spot radiographed are used to fabricate the vessel. Corrosion allowance is 3 mm. Determine the thickness of the cylindrical shell and thickness of head if the heads are **[10]**

i) Flat.

ii) Plain formed.

iii) Torispherical with crown radius of 1125 mm.

iv) Semi-elliptical with ratio of major axis to minor axis as 2.

b) Explain the design of skirt support in case of vertical pressure vessels.**[6]**

Q5) a) Explain design principles in machining. **[6]**

b) A shaft and hole assembly have the following dimensions. **[10]**

Shaft diameter = 40 ± 0.18 mm

Hole diameter = 40.2 ± 0.24 mm

Assuming the shaft and hole diameters are normally distributed, determine the probability of interference fit between the shaft and hole.

Area of the curve from 0 to Z is

Z	1.0	1.5	2.0	2.5
A	0.3413	0.4332	0.4772	0.4938

OR

Q6) a) Explain various junction designs in case of casting. **[6]**

b) A cantilever beam made of steel having the mean yield strength of 280 MPa and standard deviation of 40 MPa. It is subjected to bending stress with a mean of 180 MPa and a standard deviation of 20 MPa. **[10]**

Determine :

i) Reliability of beam.

ii) Minimum factor of safety available.

iii) Average factor of safety available.

The area under the curve is as follows :

Z	2.0	2.2	2.4	2.6
A	0.4772	0.4861	0.4918	0.4953

SECTION - II

Q7) a) A steel bar of 50 mm diameter is subjected to a completely reversed bending stress of 250 MPa. The ultimate tensile strength is 600 MPa. The surface finish factor and size factor are 0.43 and 0.85 respectively. The reliability factor is 0.897. Assuming there is no stress concentration, determine the life of bar. **[8]**

b) Explain the terms fatigue stress concentration factor and notch sensitivity. **[4]**

c) Explain design for infinite life for fluctuating stresses. **[6]**

OR

Q8) A transmission shaft supports a pulley midway between two bearings. The bending moment at the midpoint varies from 200 Nm to 600 Nm. The torque on the shaft varies from 70 Nm to 200 Nm. The frequencies of variation of bending moment and torque are equal to shaft speed. The shaft speed is 1440 rpm. The shaft has ultimate strength of 540 MPa and yield strength of 400 MPa. The corrected endurance limit is 200 MPa. If the factor of safety is 2 find diameter of shaft by modified Goodman method. Use maximum distortion energy theory for calculation of resultant stress. **[18]**

Q9) a) A thin spherical pressure vessel is subjected to an internal pressure of 4 MPa. The mass of empty vessel should not exceed 125 kg. If the factor of safety is 3.0, design the pressure vessel with the objective of maximising the gas storage capacity out of the following materials.

Material	Sult MPa	Density kg/m^3
Low alloy steel	500	7800
Aluminium alloy	250	2800
Copper alloy	420	8400

Select the material and find out the dimensions and capacity. **[12]**

b) Explain Johnson's method for optimisations. **[4]**

OR

Q10) A simple tensile bar of length 200 mm is subjected to a constant tensile force of 5000 N. If the factor of safety is 3, design the bar with the objective of minimising the material cost, out of the following materials.

Material	Density kg/m^3	Cost per unit mass Rs./kg	Yield strength MPa
Steel	7800	14	400
Al. alloy	2800	66	150
Ti alloy	4500	1100	800
Mn alloy	1800	75	100

from the manufacturing considerations, the cross sectional area of the bar should not be less than 50 mm^2. **[16]**

Q11) a) An inclined conveyor handles an ore having density of 0.5t/m^3. The material has to be conveyed over a distance of 1.2km and a height of 500 meters. The belt speed is 1.5 m/s and belt width is 400 mm. Determine the capacity of the conveyor.

Conveyor inclination	16^o - 20^o	21^o - 25^o	26^o - 30^o
Flowability factor	2.5×10^{-4}	2.35×10^{-4}	2.2×10^{-4}

[8]

b) Explain the classification of material handling equipment. **[4]**

c) Draw and explain both end discharge in case of belt conveyor. **[4]**

OR

Q12) a) Draw any four types of idlers used in belt conveyor. **[6]**

b) Draw and explain man machine closed system between a driver and motor cycle. **[6]**

c) Determine the belt capacity of a flat horizontal belt if the effective width of the material on the belt is '*b*' velocity is '*v*' and surcharge angle is 15^{o}. **[4]**

Total No. of Questions : 12] **[Total No. of Pages : 6**

P1042

[3864]-153

B.E. (Mech.) S/W

REFRIGERATION AND AIR CONDITIONING

(2003 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) ***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) Discuss the advantages of air as a refrigerant in air- craft. **[4]**

b) Explain necessity of air-craft refrigeration. **[4]**

c) Explain the analysis of simple air -refrigeration system with the help of p-h diagram. **[8]**

OR

Q2) a) An aircraft is cruising with a speed of 900km/h at an altitude of 11000 m, where the ambient conditions are 0.3 bar and -30°C. Assuming the compression ratio 5, cabin pressure 0.8 bar and air leaving the cabin at 27°C, obtain the power for pressurization and refrigeration and COP. The flow rate through the system is 1 kg/s. **[12]**

b) Explain the term "Ram Efficiency". **[4]**

Q3) a) Differentiate between dry compression and wet compression. Why expansion device is used in VCC instead of expander. Discuss with the help of P-V and T-S diagram. **[8]**

b) An ice production machine produces 20 tons of ice in 24 hours when water is supplied at 0°C. The temperature range of the machine is - 15°C to 25°C. The vapour leaves the compressor in dry and saturated conditions and there is no under-cooling in the condenser. If the actual C.O.P., is 75% of theoretical, find the power required of a compressor.

P.T.O.

The properties of NH_3 used in machine as refrigerant are Given below: **[8]**

Temperature°C	h_f(kJ/kg)	s_f (kJ/kg-K)	h_g (kJ/kg)
25	100.4	0.349	1324
-15	-54.77	-0.214	1310

OR

Q4) a) Discuss briefly the factors affecting the choice of refrigerants commonly used in refrigerating plants. **[8]**

b) Explain the losses occurred in actual vapour compression cycle with the help of p-h and T-s diagram. **[8]**

Q5) a) What is necessity of multi staging? Explain the analysis of two stage compression system with flash gas chamber as a flash intercooler. **[8]**

b) A two-stage refrigeration system works between the pressures limits 40° C and - 15° C. Obtain the COP and capacity for a flow rate of 0.2 kg/s through the evaporator. The intermediate pressure is 4.238 bar. Compare the COP and capacity of the two stage system with a corresponding single stage operating between the above pressure limits. The refrigerant used is R-12. **[10]**

OR

Q6) a) In a vapour absorption refrigeration system,. the refrigeration -15°C. The generator is operated by solar heat where the temperature reached is 110°C, the temperature of heat sink is 55°C. What is the maximum possible COP of the system? **[6]**

b) Explain with neat sketch lithium bromide refrigeration system. **[6]**

c) Explain with neat sketch Cascade refrigeration system. Why CO_2 is a suitable refrigerant for this system. **[6]**

SECTION - II

Q7) a) Sketch 'comfort chart' and show on it the comfort zone'. **[6]**

b) The values obtained from a sling psychrometer are DBT 30ºC and WBT 20ºC. The barometric reading is 740 mm of Hg. Calculate : **[10]**

i) DPT and RH.

ii) degree of saturation.

iii) specific humidity.

iv) specific volume and

v) specific enthalpy.

OR

Q8) a) Use of adsorbent for air conditioning system for hot and humid climate. **[4]**

b) What is the effective temperature? What are the factors that influence the optimum effective temperature? **[4]**

c) A room is to be cooled using a desert cooler having humidification efficiency of 70% in desert area where the environmental condition is 45°C DBT and 15% RH. The room size is 10m × 5m × 4m high. Electrical appliances and occupancy heat load amounts 3 kW, overall HTCs, U_{wall} = 0.95 W/m^2 °C and that of the ceiling as 2.5 W/m^2 °C. The air leaves the room at 3°C above the cooler exit temperature. Determine

i) volume flow rate of air to be humidified,

ii) water evaporated per 8 hour of operation,

iii) area of desert cooler if the velocity of air across the desert cooler is 0.75 m/s. **[8]**

Q9) The following data refer to a 200 capacity theater. Room condition: DBT 26°C, RH 50%, room dimension 15m × 10m × 10m high with 15m side as EW oriented. Outside condition: DBT 42°C, w = 0.02 kg/kg of d.a. U_{wall}=4 kJ/m^2-h-K (S and W), U_{wall}=2.4 kJ/m^2-h-K (E & W), $U_{celling}$ = 3 kJ/m^2-h-K, U_{door} = 3 kJ/m^2 -h-K. Door size 2 m × 1 m on the north side. Solar radiation amounts of 19.5% of the structure heat load. No smoking and ventilation air equal to the make-up air. Air enters the theater at 17°C. Sensible energy release from persons is 60% of the total energy release and rest as latent heat. The make up air is mixed before the coil. Electric appliances inside the room equivalent to 3 kW. Duct and blower heat gains are equivalent to 8000 kJ/h and 4 kW respectively. Determine

a) RSHF.

b) Amount of ventilation air.

c) Inlet conditions of air entering theatre.

d) Amount of air supply to theatre.

e) TR of coil.

f) GSHF and ADP.

[16]

OR

Q10)a) List the various equipments used in an air conditioning system. Explain the function of each. **[6]**

b) Explain the working of thermostatic expansion valve. **[6]**

c) Explain the procedure of charging of refrigerant in the system. **[4]**

Q11)a) Explain "pressure losses" in duct. **[6]**

b) Why the ducts are used in an air-conditioning system. Classify ducts. **[4]**

c) Derive an expression for the equivalent diameter of circular duct corresponding to a rectangular duct of sides 'a' and 'b' for the same pressure loss per unit length when

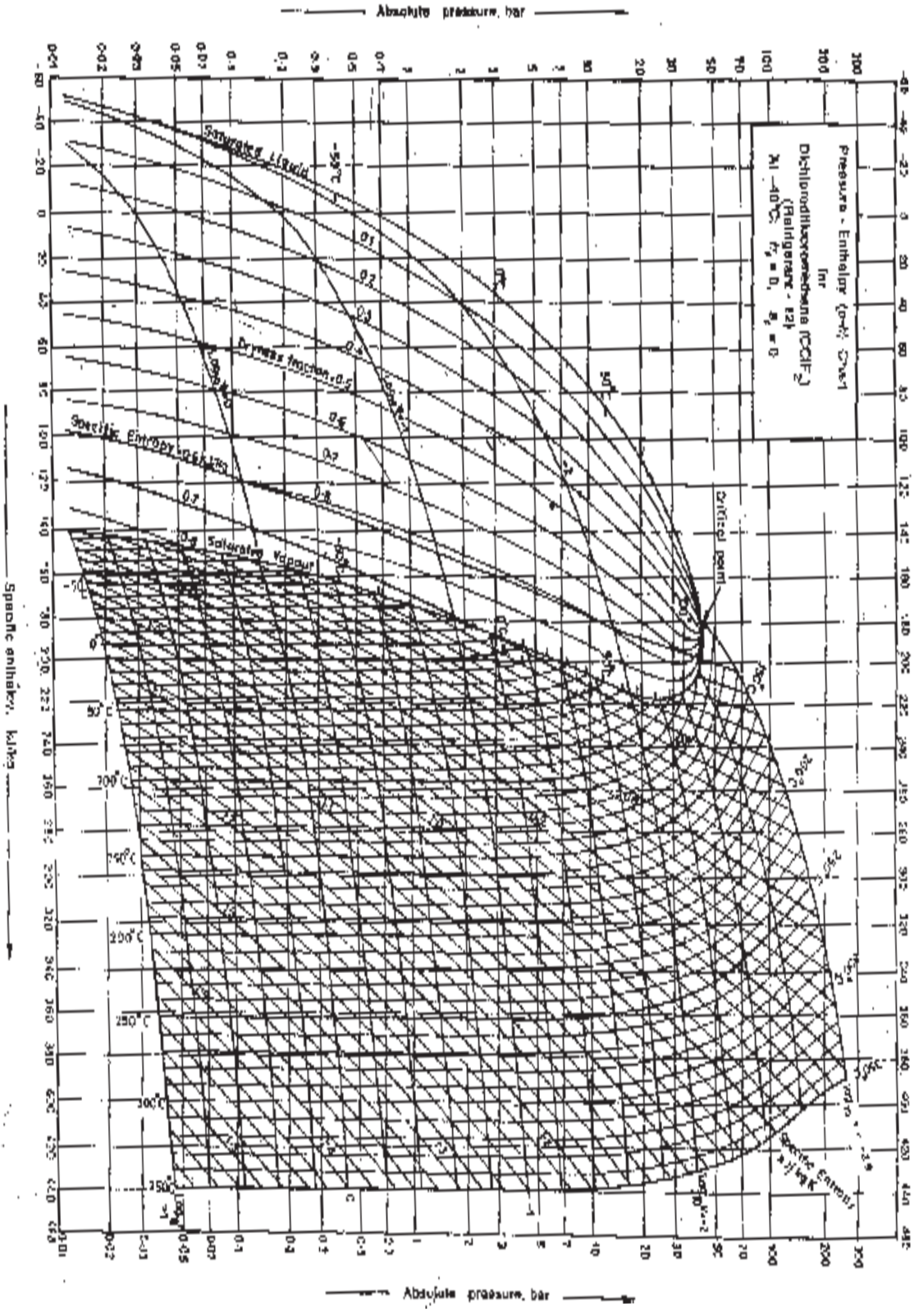
i) the quantity of air passing through both the ducts is same, and

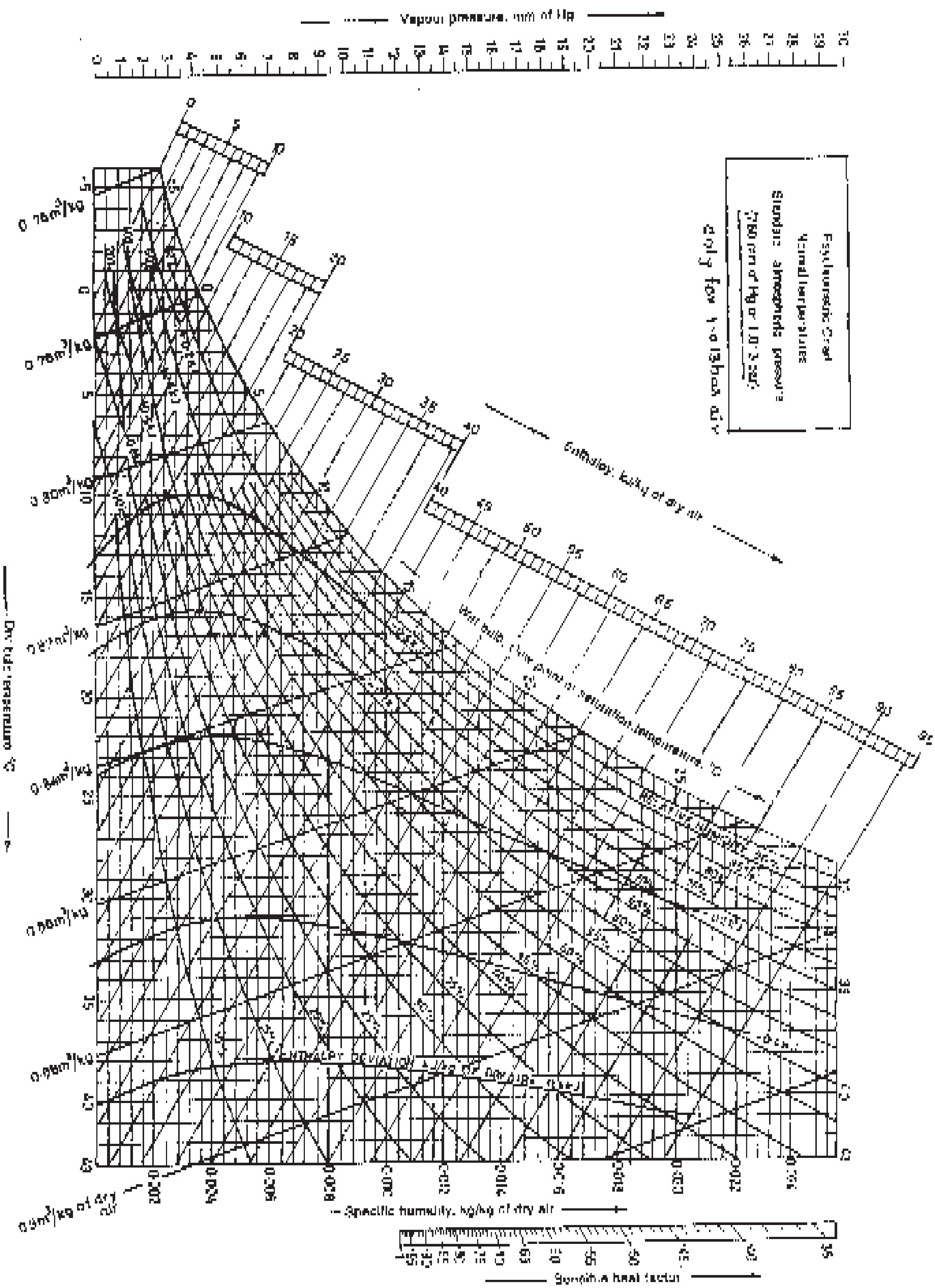
ii) the velocity of air flowing through both the ducts is same. **[8]**

OR

Q12)a) What is Cryogenics? Discuss its applications. **[8]**

b) Explain construction and working of Linde system liquefaction of gas. **[10]**


Absolute pressure, bar
Pressure - Enthalpy (p-h) Chart
for
Dichlorodifluoromethane (CCl2F2)
(Refrigerant - r12)
At −40°C, x = 0, x = 0
Saturated Liquid
Dryness fraction
Saturated vapour
Critical point
Specific Entropy
Specific enthalpy, kJ/kg
Absolute pressure, bar


Vapour pressure, mm of Hg
Enthalpy: kJ/kg of dry air
Specific humidity, kg/kg of dry air
Sensible heat factor
ENTHALPY DEVIATION
RELATIVE HUMIDITY

Total No. of Questions : 12] **[Total No. of Pages : 3**

P1044

[3864]-172

B.E. (Production & Production - S/W)

MACHINE TOOL DESIGN

(2003 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) ***Assume suitable data, if necessary.***

SECTION - I

UNIT - I

Q1) a) Design a nine speed gear box for a machine tool having minimum speed 80 rpm, maximum speed is 1200 rpm, speed of motor is 1440 rpm. Draw the best possible structural diagram, ray diagram, speed flow diagram, gear layout. **[14]**

b) Draw a neat sketch and explain change gear feed drive. **[6]**

OR

Q2) a) Make a neat sketch of an Episcyclic speed gear box and show that it is always gives stepless speed within range. **[10]**

b) Discuss the uses of preferred number series for obtaining a wide range of stepped speed in machine tool gearbox. **[4]**

c) Discuss in brief, design considerations of variator. **[6]**

UNIT - II

Q3) a) Establish the conditions for optimum design criteria in machine tool bed. **[7]**

b) Explain term static and Dynamic rigidity of machine tool. What are the governing factors which influencing static and Dynamic rigidity of machine tool. **[8]**

OR

P.T.O.

Q4) a) What is the procedure for comparative evaluation of various materials used in machine tool structure by weight? **[8]**

b) Why stiffness is important considerations in machine tool structure? Explain the different arrangement of stiffeners in machine tools. **[7]**

UNIT - III

Q5) a) Explain with necessary mathematical relationship a method of estimating a load on each thread in a power screw. **[10]**

b) Explain the method of calculating a dynamic load in recirculating ball screw. **[5]**

OR

Q6) a) Draw profiles for slideways and their combinations used in following machine tools stating the reasons. **[8]**

i) Milling Machine, ii) Drilling Machine, iii) Shaping Machine, iv) Broaching Machine.

b) A Ball lead screw having a semi circular profile has the following dimensions **[7]**

Ball Circle radius = 20 mm

Pitch = 5 mm

Diameter of Ball = 3 mm

Assume Ratio of Ball radius to Groove Radius = 1.04

Young Modulus = 2.1×10^4 N/mm^2

Hertz Contact Stress σ_c = 2300 N/mm^2

Number of circuit before recirculating = 4

(If A/B = 0.040 for that M_σ = 1.6 depends on A/B)

Find Axial load carried by screw, Axial contact deformation.

SECTION - II

UNIT - IV

Q7) a) Sketch typical drill spindle unit using anti friction bearings. Explain how the axial and radial load are resisted. **[8]**

b) Describe different types of bearings employed in machine tools. Give importance of each. **[8]**

OR

Q8) a) State and explain the functions of machine tool spindle. What are desirable features of spindle unit? **[8]**

b) Describe methods for preloading of bearings. **[8]**

UNIT - V

Q9) a) What are the sources of vibrations in machine tool? Enumerate methods of reducing vibrations of machine tool. **[9]**

b) What are the function of control system of machine tool? Compare mechanical control system with electrical control system. **[9]**

OR

Q10) Write a short note on :- **[18]**

a) Various electrical drives and controls used for machine tool.

b) Adaptive control system.

c) Hydraulic control system of machine tool.

UNIT - VI

Q11) Write a short note on :- **[16]**

a) Use of Stepper and Servomotor in CNC machine tools.

b) Resent trends in machine tool design.

c) Use of Matrices in Lay out design.

OR

Q12) a) State systematically the steps to be followed in converting General purpose machine tool in to a Retrofitted CNC machine. **[8]**

b) Enumerate different methods of micromachine / microfabrication. **[8]**

❐❐❐

Total No. of Questions : 12] **[Total No. of Pages : 3**

P1045

[3764]-174

B.E. (Production)

OPERATIONS RESEARCH

(2003 Course)

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

Instructions to the candidates:

1) ***Select Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 from Section–I and Select 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) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Use of calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are the various phases in solving or problem? **[6]**

b) 'Chandan' a steel furniture manufacturing company is specialized in manufacturing of steel cabinets of three types, CAB–I, CAB–II and CAB–III. Company has three types shops, namely press shop. Assembly shop and paintinf shop. The table given below indicates per unit time required by each type of cabinet in these three shops.

SHOP	Cabinetwise per unit time required in each shop in minutes			Total time Available in Hrs.
	CAB–I	CAB–II	CAB–III	
Press	60	80	40	600
Assembly	40	20	40	400
Paint	20	60	40	800

Find out the product unix of these three cabinets to be produced in order to maximize the profit. The unit profits for types CAB–I, CAB–II, CAB–III are Rs.40, Rs.80 and Rs.60 respectively. Also write the dual pf the problem formulated. **[12]**

OR

P.T.O.

Q2) a) Enumerate Linear Programming models in production management. **[6]**

b) ''Balaji'' Travels have three tour plans namely super **[12]**

Q3) a) Estab **[7]**

b) Explain **[8]**

OR

Q4) a) What **[8]**

b) Why **[7]**

Q5) a) Explain **[10]**

b) Explain **[5]**

OR

Q6) a) Draw **[8]**

i) Mill

b) A Ball **[7]**

SECTION - II

Q7) a) Sketch **[8]**

b) Describe **[8]**

OR

Q8) a) State **[9]**

b) Describe **[9]**

Q9) a) What **[9]**

b) What **[9]**

OR

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

a) Vario

b) Adapt

c) Hydra

Q11) Write a short notes on :- **[16]**

a) Use

b) Resent

c) Use

OR

Q12)a) State **[8]**

b) Enum **[8]**

❐❐❐

Total No. of Questions :12] **[Total No. of Pages : 3**

P1047

[3864] - 177
B.E. (Production)
PLANT ENGINEERING AND MAINTENANCE
(2003 Course) (Sem. - I) (Elective - I)

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

Instructions to the candidates:

1) ***Answer Q. No.1 or Q. No.2, Q .No 3or Q. No 4, Q. No. 5 or Q .No 6 from section-I and Q .No.7 or Q .No. 8, Q .No 9 or Q .No 10, Q. No 11 or Q. No 12. from section-II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***
6) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***

SECTION - I

Unit - I

Q1) a) Explain the meaning and significance of plant location. How you will decide the location of a mini steel plant in India? **[8]**

b) Explain in short the various plant engineering functions? **[10]**

OR

Q2) a) Environmental and Ecological aspects are assuming growing importance while making decision on plant location. Comment on this statement.**[10]**

b) How Govt. policies affect the selection of location? **[8]**

Unit - II

Q3) a) Write short notes on: **[8]**

i) CRAFT ii) CORELAP

b) Explain in short various accident prevention practices? **[8]**

OR

P.T.O.

Q4) a) Discuss in brief main steps involved in Systematic Layout Planning? **[8]**

b) Write short notes on:

i) Duties of safety officer ii) Industrial safety Acts **[8]**

Unit - III

Q5) a) Explain in details the operations and maintenance of auxiliary services? **[8]**

b) Write and explain any Eight principle of material handling in short. **[8]**

OR

Q6) a) Write short note on:

i) Estimating capacity requirement for water.

ii) Effluent water treatment. **[8]**

b) Highlight importance of material handling training in a modern manufacturing organization. **[8]**

SECTION - II

Unit - IV

Q7) a) Describe various activities involved in a preventive maintenance. **[8]**

b) Discuss centralized Vs decentralized maintenance. State advantages and disadvantages of both maintenance. **[8]**

OR

Q8) a) Discuss the relationship between maintenance and efficiency, for any organization. What sort of maintenance schedule will you suggest for machine shop? **[8]**

b) Write short notes on:

i) Condition based maintenance.

ii) History cards for equipments. **[8]**

Unit - V

Q9) a) Discuss in detail the importance of lubricants in the context of the maintenance function? **[8]**

b) Describe how store management can help in keeping a better spare parts inventory? **[8]**

OR

Q10)a) How can the chemical effects be useful in assessing the condition of equipment? Explain briefly. **[8]**

b) Differentiate between the spectrometric oil analysis procedure and the magnetic plug inspection system. **[8]**

Unit - VI

Q11)a) Explain the term Failure Mode & Effect Analysis in detail? What are the effects of failure? **[8]**

b) What is Total Productive Maintenance? Explain the various tools and techniques associated with TPM? **[10]**

OR

Q12)a) Explain how computers can be helpful in discharge of maintenance functions? **[10]**

b) What is MTBF? Describe a typical example where MTBF concept can be applied? **[8]**

Total No. of Questions : 12] **[Total No. of Pages : 3**

P1049

[3864]-179

B.E. (Production)

MATERIALS AND FINANCIAL MANAGEMENT

(2003 Course) (411087)

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

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two 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

UNIT - I

Q1) a) Explain Optimal service level. Explain the risk and precautionary measures to be considered in case of uncertainty in demand and lead time. **[8]**

b) Derive an equation for an economic manufacturing quantity (EMQ) when the replenishment is gradual. **[8]**

OR

Q2) a) Explain the following. **[8]**

i) V-E-D analysis

ii) F-S-N analysis.

b) ABC Company collected the following information : **[8]**

i) Minimum annual total cost of inventory = Rs. 16000.

ii) Inventory holding cost per unit per year = Rs. 16.

iii) Number of orders per year = 10

iv) Price per unit = Rs. 100.

Calculate Annual demand of item, procurement cost per order, Economic order quantity.

P.T.O.

UNIT - II

Q3) a) Explain and classify Multi-Echelon system of SCM. **[8]**

b) Explain the factors to be considered while determining ideal location of warehouse. **[8]**

OR

Q4) a) Explain and classify various types of warehouses. **[8]**

b) Explain the parameters affecting Echelon system of SCM. **[8]**

UNIT - III

Q5) a) Explain 'Function phase' in value analysis. **[6]**

b) Enlist and explain the documents related to 'Importing' from foreign supplier. **[12]**

OR

Q6) Write short note on : **[18]**

a) Waste disposal system.

b) Reasons for importing.

c) E-procurement.

SECTION - II

UNIT - IV

Q7) a) Explain the important factors to be considered while determining the working capital. **[8]**

b) Explain 'Executive finance function' and 'Routine finance function'. Enlist various sources of funds. **[8]**

OR

Q8) a) Define Capitalisation. State the causes and disadvantages of Over-capitalisation. **[8]**

b) Differentiate between 'Fixed capital' and 'Working capital' with suitable example. **[8]**

UNIT - V

Q9) a) Explain the factors to be considered for determining the selling price of the product. **[8]**

b) A price of a machine is Rs.6000 and the discount allowed to distributor is 20%. The administrative and selling expenses are 50% of the factory cost and the proportion of material cost, labour cost and factory overheads are 1 : 3 : 2. If the cost of labour on the manufacture of machine is Rs.1200. Determine the profit on each machine. **[10]**

OR

Q10)a) Explain the following methods of depreciation with illustration. **[10]**

i) Diminishing Balance method.

ii) Annuity method.

b) Explain 'Halsey' and 'Rowan' systems of incentive plans. **[8]**

UNIT - VI

Q11)a) Explain the following **[10]**

i) Primary Apportionment

ii) Secondary Apportionment.

b) Explain 'Capital Budgeting'. **[6]**

OR

Q12)Write short note on:

a) Variance analysis. **[5]**

b) Use of marginal costing in decision-making. **[5]**

c) Capital budgeting. **[6]**

❐❐❐

Total No. of Questions : 12] **[Total No. of Pages : 3**

P1050

[3864]-180

B.E. (Production Engineering)

PROCESS PLANNING AND TOOL SELECTION

(2003 Course) (411089)

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 the steps of process planning and list out the information required to do process planning. **[8]**

b) Discuss the principles of DFM which are useful for designing a product. **[8]**

OR

Q2) a) Explain the following terms. **[8]**

i) Part print,

ii) Specification,

iii) Routing,

iv) Process picture.

b) What functions are involved in the design and manufacture of a product and what do they contribute? **[8]**

Q3) a) What are the three types of surface irregularities that can occur, describe each in brief? **[8]**

b) What is meant geometry of form? Define the followings. **[8]**

i) Concentricity,

ii) Roundness,

iii) Angularity,

iv) Symmetry.

P.T.O.

OR

Q4) a) What is the purpose of grouping related surfaces or areas? Explain. **[8]**

b) What key points should be considered in deciding the nature of work to be performed on the work-piece? **[8]**

Q5) a) Define the following terms : **[4]**

i) Nominal size,

ii) Basic size,

iii) Allowance,

iv) Tolerance.

b) Why are locators generally arranged in 3-2-1 pattern? **[6]**

c) What is basic difference between tolerance stack and a limit stack? Explain with a suitable example. **[8]**

OR

Q6) a) What are the rules for locating long cylindrical and short cylindrical work-pieces? Explain with neat diagrams. **[9]**

b) What is tolerance chart? What are the symbols used in tolerance chart? Why it is necessary to balance a tolerance chart. **[9]**

SECTION - II

Q7) a) Explain briefly the relationship between process selection and machine selection. **[8]**

b) Distinguish between General Purpose Machine (GPM) and Special Purpose Machine (SPM). **[8]**

OR

Q8) a) What are various factors affecting the tool selection? Explain. **[8]**

b) What are the various sources of information available to the process engineer in making a machine selection? **[8]**

Q9) a) What is the role of expert system in generative Computer Aided Process Planning (CAPP) system? **[8]**

b) What are the general guidelines for process selection? **[8]**

OR

Q10)a) What is an auxiliary operation? How can supporting operation be distinguished from auxiliary operation? **[8]**

b) Explain Automatic Time Standard System (ATS) in CAPP. **[8]**

Q11) Prepare a operation route sheet with proper operation sequence, time estimation, process parameters and process pictures, use of proper tooling and equipment for adapter ring (as shown in fig.1) using general purpose machine tools. The number of components to be produced is 1500. **[18]**

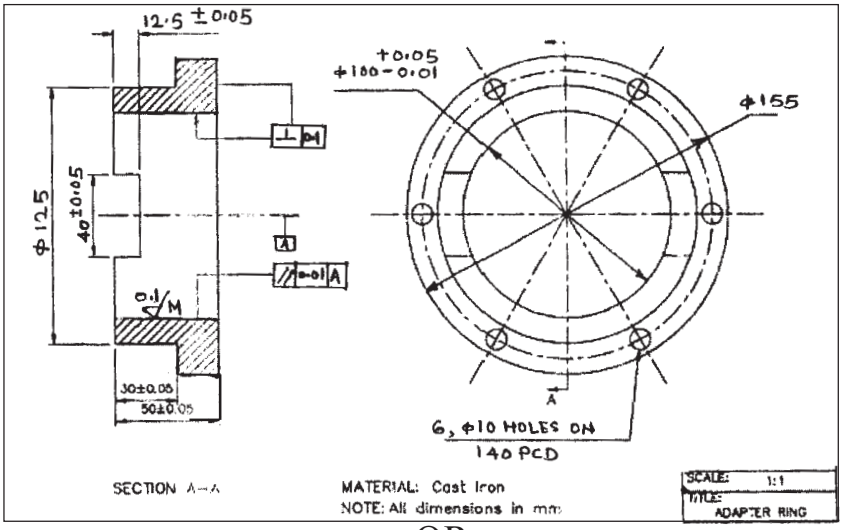


Fig. No.1

OR

Q12) Prepare a process sheet for a component as shown in figure 2. Which is to be manufactured in batches of size 600. Analyse the part print carefully and prepare the process sheet containing manufacturing plan with operation sequence, equipments, tooling, fixtures, process parameters and sample calculation of operation time. **[18]**

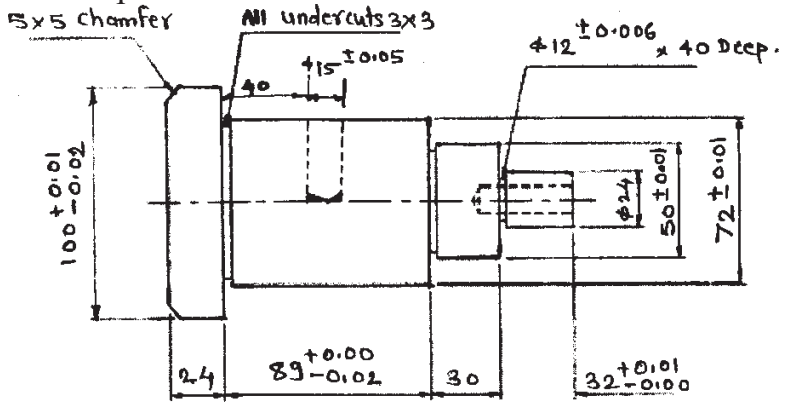


Fig. No.2

Drg. notes :

Material		Titanlum alloy
Tolerance	:	General ±0.1
		Hole ±0.05
		∅100 ±0.05
Surface finish	:	General 3.2 µm
		Hole 0.4 µm
		∅100 0.1 µm.

❐❐❐

Total No. of Questions :12] **[Total No. of Pages : 4**

P1069

[3864] - 243
B.E. (Electronics)
ADVANCED POWER ELECTRONICS
(2003 Course)

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

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6 from section I and Q7 or Q8, Q9 or Q10, Q11 or Q12 from section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Draw the circuit diagram of a three-phase semi-converter feeding a highly inductive (level) active load and the following waveforms for firing angle $\alpha = 60^{o}$:

i) Supply phase voltages.

ii) Supply line voltages.

iii) Output voltage.

iv) Phase A line current. **[8]**

b) A three-phase semi-converter operates from the 415V, 50Hz mains and feeds a highly inductive (level) active load having R = 20Ω. If the firing angle is 60^{o}, calculate: **[10]**

i) Average (DC) load voltage.

ii) Average (DC) load current.

iii) RMS line current.

OR

P.T.O.

Q2) a) With the help of a neat circuit diagram and relevant waveforms, explain the operation of a three-phase circulating-current type dual converter. Derive an expression for the peak circulating current in terms of the firing angle. **[10]**

b) A series-parallel bank of thyristors consists of 5 parallel strings, with each string containing 6 thyristors in series. The rating of all thyristors is identical with a voltage rating of 1600V and current rating of 1000A. During testing it was found that the maximum voltage withstand capability and maximum current carrying capacity of the bank was 8 KV and 4 KA, respectively. Calculate the series-string efficiency and parallel-string efficiency. **[8]**

Q3) a) With the help of a neat circuit diagram, relevant waveforms and mode equivalent circuits, explain the operation of a three-phase, 120^{o} mode, voltage source inverter feeding a balanced, star-connected resistive load. Also derive an expression for the RMS phase output voltage and RMS SCR current. **[10]**

b) The above inverter operates from a 400V DC supply and feeds a balanced, star-connected resistive load of 25Ω per-phase. Calculate

i) RMS phase output voltage.

ii) RMS phase current.

iii) RMS SCR current. **[6]**

OR

Q4) a) What are the different output voltage control and harmonic reduction techniques in inverters? Explain any one technique in detail. **[10]**

b) Cross-conduction ('shoot-through') faults are likely to occur in a 180^{o} mode three-phase VSI but unlikely when the same inverter is operated in 120^{o} mode. Justify.

How would you modify the gate pulse waveforms of a 180^{o} mode three-phase VSI so as to eliminate cross-conduction? **[6]**

Q5) a) With the help of a neat circuit diagram and relevant waveforms, explain the Symmetrical Angle Control (SAC) technique for power factor improvement in AC-DC converters. **[8]**

b) Explain how the following parameters are sensed in power electronic circuits: **[8]**

i) DC current.

ii) AC current.

OR

Q6) a) With the help of a power circuit diagram, control circuit block diagram and waveforms, explain the operation of a single-phase active wave-shaping circuit for power factor improvement. **[10]**

b) Compare ZVS & ZCS converters. **[6]**

SECTION - II

Q7) a) Compare servomotors with conventional DC motors and stepper motors. **[8]**

b) With the help of a neat circuit diagram and relevant waveforms, explain the operation of an unipolar-voltage chopper drive for PM & hybrid stepper motors. **[10]**

OR

Q8) a) With the help of a neat circuit diagram and relevant waveforms, explain the operation of a three-phase LCC based separately excited DC drive having a full converter in the armature circuit and a semi-converter in the field circuit. Also derive an expression for the motor speed in terms of armature converter firing angle, field converter firing angle, motor torque and supply voltage. **[10]**

b) A 400V, 1500rpm, 15A separately excited DC motor with $R_a = 0.2\Omega$, $R_f = 225\Omega$, $K_v = 3.97/\pi$ V/A-rad/sec, is fed from a three-phase full converter operating from the 415V, 50Hz mains. The field circuit is fed from a three-phase semi-converter. Speed variation below base speed is obtained by armature voltage control with the field converter set at $V_f = 450V$, whereas speed variation above base speed is obtained by field voltage control with the armature converter set at $V_a = 450V$. Calculate.

i) The armature converter firing angle for a motor speed of 900rpm if the motor torque is 30N/m.

ii) The field converter firing angle for a motor speed of 1800rpm if the motor current is 10A. **[8]**

Q9) a) With the help of a neat circuit diagram and appropriate torque-speed curves, explain the slip power recovery scheme for speed control of induction motors in both sub-synchronous and super-synchronous speed regions. **[8]**

b) Explain the operation of a three-phase brushless DC motor drive with the help of a neat circuit diagram and relevant waveforms. **[8]**

OR

Q10)a) Explain the operation (any two) of the following motor protections:

i) Field failure in DC motors.

ii) Soft start for DC motors.

iii) Phase failure for three-phase AC motors. **[8]**

b) A 6 pole, 380V, 60Hz, three-phase induction motor has a rated speed of 1160rpm. Calculate its speed, slip and slip frequency during electromagnetic braking under constant V/f control for a stator frequency of 45Hz, the braking torque (-ve) being equal to 75% of rated motor torque. **[8]**

Q11)a) What is meant by supply voltage waveform distortion in a power system? What are the causes and effects of harmonics and inter-harmonics in the power system? **[8]**

b) What are the different types of voltage transients present in a power system? List the mitigation techniques for these voltage transients. **[8]**

OR

Q12)a) Explain the terms 'Voltage sag (dip)' and 'Voltage swell (rise)'. What are the different sources / causes of voltage sags and swells? **[8]**

b) Explain how an Energy Audit helps in controlling energy losses in a typical production plant. **[8]**

Total No. of Questions : 12] **[Total No. of Pages : 2**

P1070

[3864]-244

B.E. (Electronics)

VLSI DESIGN

(2003 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) What is function and procedures? Explain both these terms with suitable VHDL examples. **[16]**

OR

Q2) List synthesizable and Non synthesizable VHDL statements. Write HDL code for Mux 8:1 in two modelings. **[16]**

Q3) Draw state diagram and write HDL code for Traffic Light control. **[16]**

OR

Q4) What is metastability? Explain different methods of state minimization. **[16]**

Q5) With block diagram explain detail architecture of CPLD **[18]**

OR

Q6) With block diagram explain detail architecture of FPGA. **[18]**

P.T.O.

SECTION - II

Q7) Explain with schematic different types of memory. **[16]**

OR

Q8) Explain in short clock distribution, power distribution and global, switch box routing. **[16]**

Q9) a) What is technology scaling explain different scaling techniques? **[9]**

b) Explain different power dissipation in CMOS inverter. **[9]**

OR

Q10) Draw and explain voltage transfer characteristics of CMOS inverter and also derive (W/L) ratio between PMOS and NMOS transistor. **[18]**

Q11) What is the need of design for testability explain fault coverage, controllability and observability? **[16]**

OR

Q12) a) Explain with block diagram BIST. **[6]**

b) Draw state diagram and explain the functioning of TAP controller. **[10]**

❐❐❐

Total No. of Questions :12] **[Total No. of Pages :2**

P1071

[3864]-245
B.E. (Electronics)
EMBEDDED SYSTEM DESIGN
(2003 Course)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) Explain the following design metrics of an embedded system **[10]**

i) Time to market ii) Latency

iii) Speed up iv) NRE - cost

b) Explain the protocol architecture of IrDA. **[8]**

OR

Q2) a) What is an embedded system ? Explain.How they are classified? Explain the Hardware blocks of an Embedded system. **[10]**

b) Explain the bluetooth communication protocol. **[8]**

Q3) a) Describe the processor selection criterion for an Embedded system giving suitable examples. **[10]**

b) What are the characteristics of a shared data bug? **[6]**

OR

Q4) a) Explain the activities of an embedded operating system. **[8]**

b) Explain the software architecture of an embedded system. **[8]**

Q5) a) Explain the productivity tools for developing software systematically. **[8]**

b) What is re-entrant function? State the rules to decide whether the function is re- entrant. **[8]**

P.T.O.

OR

Q6) a) Explain the different types of ROM and RAM devices used in embedded systems. **[8]**

b) What is a task? What are different states of tasks? Draw the task state diagram. **[8]**

SECTION - II

Q7) a) Explain the methods of protection of shared data. **[7]**

b) Explain the following :

i) First-in-First-out.

ii) Round-Robin.

iii) Round-Robin with priority. **[7]**

c) Explain the interrupt routines in an RTOS environment**.** **[4]**

OR

Q8) a) Explain in detail what is a pipe and event in RTOS and where these are used. Give the implementation of any of these in embedded 'C'. **[8]**

b) What are the different time-delay functions ? Explain. **[6]**

c) Explain the deadly embrace. **[4]**

Q9) a) What is RT Linux Module? **[4]**

b) What is the function calls provided for timer management in RT Linux. **[6]**

c) How does a mail box differ from a Queue Message in µc/os -II. **[6]**

OR

Q10)a) Explain the following for its use in µc/os -II along with the implementations in embedded C. **[8]**

i) Task create

ii) Timer

iii) Message queue

b) Compare any four commercial mobile computing operating systems. **[8]**

Q11)Explain the embedded system used in Digital Camera. **[16]**

OR

Q12)a) Explain with a neat diagram of an Adaptive Cruise control system in a car. **[8]**

b) Explain the basic features of smart card hardware. **[8]**

⌘⌘⌘⌘

Total No. of Questions :12] **[Total No. of Pages :3**

P1072

[3864]-246
B.E. (Electronics)
PROCESS INSTRUMENTATION
(Elective-I)(2003 Course)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) With suitable example, distinguish between "Servo Problem" and Regulator Problem" in Process Control. **[6]**

b) Draw the block diagram of a SMART TRANSMITTER for Temperature measurement. Explain the function of each block. **[10]**

OR

Q2) a) Using an RTD with temperature coefficient of resistance 0.0039/°C, design a signal conditioning with bridge and Instrumentation amplifier to provide 0-5V output for a 20°C–100° C Temperature variation. The RTD dessipation constant is 28mw /°C. **[10]**

b) Explain any one optical method for the measurement of displacement. **[6]**

Q3) a) Explain the following terms with reference to a control valve **[6]**

i) Cavitation.

ii) Flashing. **[10]**

b) A liquid level system converts 4 –10m level into 4 –20mA Current. Design a three mode controller that outputs 0 – 5V with 50% PB, 0.03min Reset time and 0.05 min derivative time. Fastest expected time change is 0.8 min.

P.T.O.

OR

Q4) a) Sketch the following control valves :

i) Double seated globe valve.

ii) Diaphragm valve

iii) Butterfly valve.

iv) Digital valve **[12]**

b) In an application of the zeigler Nichols method for controller tuning a process begins oscillations with 30% proportional band with a period of 11.5 minutes. Find out the nominal PID settings. **[4]**

Q5) a) With necessary block diagram, explain the following:

i) Programmed adaptive control.

ii) Self adaptive control. **[10]**

b) With necessary P&I Diagram ,explain the feed forward control of a Heat Exchanger write the specifications of the Instruments used in this scheme. **[8]**

OR

Q6) a) With P&I Diagram explain :

i) Cascade control of Multiple effect evaporator.

ii) Cascade control of Distillation column temperature. **[12]**

b) Explain the term "Statistical Process Control" where it is applied? **[6]**

SECTION - II

Q7) a) Explain the Mathematical model of any one temperature Process. **[10]**

b) With suitable example explain " Internal Model Control ". **[6]**

OR

Q8) a) Explain Gradient Method for Constraint Handling. **[8]**

b) Explain different optimizing tools in Process Control. **[8]**

Q9) a) Distinguish between Relay ladder Diagram and PLC ladder diagram **[4]**

b) Draw the event sequence and ladder diagram for a PLC system for "Elevator operation ". Consider all sensors as direct inputs to the PLC. **[12]**

OR

Q10)a) Draw the event sequence and ladder diagram for a PLC system used as "Alarm Annunciator". Consider all sensors as direct inputs to the PLC. **[12]**

b) Explain the function of Input module and output module in PLCs **[4]**

Q11)a) Draw the block diagram of a SCADA system and explain the function of each block. State two applications of such a system. **[10]**

b) What is the function of a Square Root Extractor? How to implement the same using Electronic circuit ? Where it is used? **[8]**

OR

Q12)a) Draw the block diagram of a Distributed Control System (DCS). Explain the function of each block write the sample specifications of a DCS.**[10]**

b) Write short notes on :

i) Flow totaliser.

ii) Classification of control Panels. **[8]**

⌘⌘⌘⌘

Total No. of Questions : 12] **[Total No. of Pages : 3**

P1074

[3864]-257

B.E. (Electronics)

DIGITAL IMAGE PROCESSING

(2003 Course) (404212)

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

Instructions to the candidates:

1) ***Answer Q1or Q2, Q3or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10, Q11or Q12.***
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.***
6) ***Use of electronic pocket calculator is allowed.***

SECTION - I

Q1) a) Explain MTF of visual system. Sketch the typical response curve. **[8]**

b) Describe any one technique for acquiring image in detail. **[8]**

OR

Q2) a) Discuss with a neat block diagram the process of converting an analog image to a digital image. What is aliasing? **[10]**

b) Write a note on pixel connectivity. **[6]**

Q3) a) Write a note on Discrete Fourier Transform for image transformation. **[8]**

b) What is a color model? Explain any one model in detail. Also state its applications. **[8]**

OR

Q4) a) Explain Hadamard Transform. Derive Hadamard matrix for N = 4. **[8]**

b) Explain HSI model. Write an algorithm for conversion of HSI model to RGB. **[8]**

P.T.O.

Q5) a) Describe any 2 point processing techniques for image enhancement.**[8]**

b) What is histogram? Write the steps for histogram equalization. **[10]**

OR

Q6) a) State the techniques to remove salt–&–pepper noise from an image. Explain any one technique in detail. **[8]**

b) Explain difference between smoothing and sharpening filters. Consider an image and discuss the effects of implementing these filters. **[10]**

SECTION - II

Q7) a) What is redundancy? State and explain the redundancies in an image.**[8]**

b) Draw and explain image compression model. **[8]**

OR

Q8) a) Explain the terms-Lossy compression and Loseless compression. Suggest and explain a compression technique for each in brief. **[8]**

b) Explain JPEG compression standard. **[8]**

Q9) a) Write a note on dialation and erosion. State applications for both. **[8]**

b) Consider an image and derive the chain codes using 4-connectivity and 8-connectivity. **[8]**

OR

Q10)a) A binary image X and a structuring element B are given as below –

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

X

0	1	0
1	1	1
0	1	0

B

Perform image opening. **[8]**

b) Compare the performance of first order and second order derivatives w.r.t. an image. Which one would you prefer for detecting edges? Why? **[8]**

Q11)a) Explain noise models occuring in an image. **[8]**

b) Draw a block diagram for a character recognition system. Suggest various algorithms used at each block. **[10]**

OR

Q12)a) Explain Weiner filtering for image restoration. **[8]**

b) Draw a block schematic for a fingerprint recognition system. Suggest suitable image processing algorithms at each stage. **[10]**

❐❐❐

Total No. of Questions : 12] **[Total No. of Pages : 3**

P1077

[3864] - 281

B.E. (Instrumentation and Control)

PROCESS INSTRUMENTATION - I

(2003 Course)

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

Instructions to candidates:

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

SECTION - I

Q1) a) List input data necessary for design, selection and sizing of Control Valve and output data of the same. **[8]**

b) A control valve is used for regulating the liquid flow from a tank. The water level is to be controlled in this tank at a height of 25 feet by regulating the outflow. The measured inflow varies from 0 to 120 gallons per minute. Calculate the C_v and suggest a suitable valve for this application. Instead of the valve discharging to the atmosphere, if it discharges into a second tank with a head of 15 feet and the maximum flow through is 120 gpm. Calculate the C_v and suggest a suitable valve for this application. **[8]**

OR

Q2) Explain the sources of noise in a control valve. Draw the setup to measure the noise in a control valve. Differentiate between the source treatment and path treatment for reducing the control valve noise. **[16]**

P.T.O.

Q3) a) Derive an expression for finding time constant of a level control system. **[9]**

b) Two fluids are blended in a pipeline 20 ft. Upstream of where the mixture is sampled. The pipe contains 0.4 gal, per foot of length and the flow rate of the blend varies from 10 to 80 gpm. Dead time in the sample to analyzer is 15s. A circulating pump is installed to maintain 100 gpm flow through this 20 ft section of pipe without affecting the throughput. Compare the natural period with and without the pump operation. **[9]**

OR

Q4) Explain the following: **[18]**

a) Dead time

b) Dead zone

c) Dead band

d) Time constant

Q5) a) What are the advantages and disadvantages of a Cascade Control? For what kind of processes the Cascade Control is employed? **[8]**

b) With a suitable application explain the working of a Feedback Control? What are its limitations? **[8]**

OR

Q6) a) Explain the use of Ratio Control with suitable example. **[8]**

b) What is Split Range Control? Explain with reference to its applicability. **[8]**

SECTION - II

Q7) a) What are the various configurable parameters of SLPC? Explain the significance of each parameter indicating appropriate example. **[9]**

b) What is the role of Scaling in Process Control? Explain the various steps involved for scaling in a Flow Ratio Control application. **[9]**

OR

Q8) What is the need of analyzing the Process Control Loops? Explain the procedure to test a Flow Control Loop. Derive mathematical equations to support your answer. Explain significance of the same. **[18]**

Q9) a) Clarify the following terms w.r.t. an Intelligent Controller. **[8]**

i) Forward chaining.

ii) Backward chaining.

iii) Search Engine.

iv) Heuristics.

b) List various methods used for parameter estimation in an Adaptive Control. Also draw the block diagram of Model Reference Adaptive Controller. **[8]**

OR

Q10)a) With the help of a neat block diagram, explain the working of an Optimal Control. **[8]**

b) Differentiate clearly between Adaptive Control and Self tuning Control method. **[8]**

Q11)a) What is SPC? Explain its importance in process industry. In a process control application specify when not to use SPC with justification. **[8]**

b) Explain the use of Fuzzy Logic in Process Control applications. **[8]**

OR

Q12)Write short notes on: **[16]**

a) Model predictive Control.

b) ANN based Control.

Total No. of Questions : 12] **[Total No. of Pages : 5**

P1078

[3864]-283

B.E. (Instrumentation and Control)

DIGITAL CONTROL

(2003 Course)

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

Instructions to the candidates:

1) ***Answer 3 questions from Section - I and 3 questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***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) For the sampled data system shown in Fig. 1 find the Pulse Transfer Function for $G(s) = \frac{1}{s+1}$ and $H(s) = \frac{1}{s}$ (T = 1 sec) **[8]**

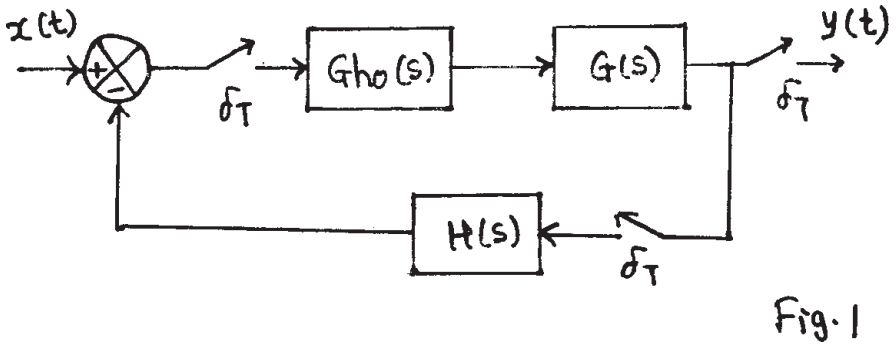


Fig. 1

b) Find the system stability using Jury Stability test whose characteristic equation is given by **[8]**

$p(z) = z^4 - 1.3z^3 + 0.7z^2 + 0.2z - 0.006 = 0.$

OR

P.T.O.

Q2) a) Obtain the pulse transfer function of the system shown in Fig. 2. **[8]**

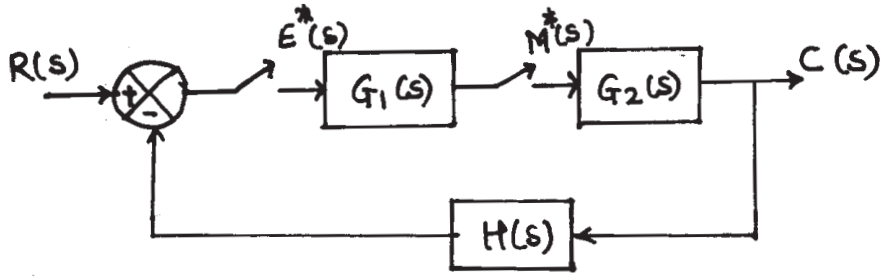


Fig.2

b) A plant shown in Fig.3 is described by the Transfer Function G(s) = $\dfrac{k}{s(s+2)}$. A unity feedback closed loop system with the plant G(s) is stable for all values of $k > 0$. When the sampling time T = 0.4 sec and T = 3 sec find the stability and Comment on the results. **[8]**

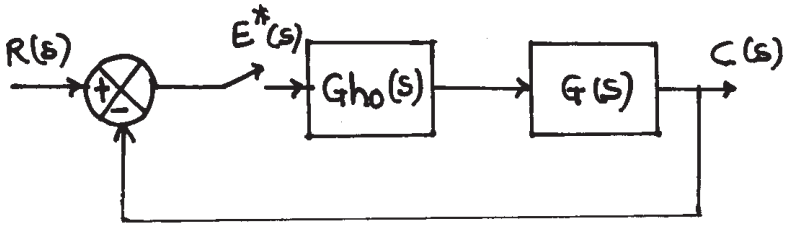


Fig.3

Q3) a) Obtain the state model of the following system using Direct programming H(z) = $\dfrac{z^2+4z+3}{(z-1)(z+0.9)(z-3)}$. **[8]**

b) Diagonalize the following matrix $G=\begin{bmatrix} -4 & 1 & 0 \\ 0 & -3 & 1 \\ 0 & 0 & -2 \end{bmatrix}$. **[8]**

OR

Q4) a) Obtain the state model of the following system using Parallel programming H(z) = $\dfrac{(z+2)}{(z-1)(z+0.9)(z-3)}$. **[8]**

b) Find the Eigen vectors of the following matrix $G=\begin{bmatrix} 4 & 1 & -2 \\ 1 & 0 & 2 \\ 1 & -1 & 3 \end{bmatrix}$. **[8]**

Q5) a) Derive an expression for position form and velocity form of PID controller algorithm. State advantages of velocity form over position form of PID algorithm. **[10]**

b) State and explain the stability of system, asymptotic stability in the large and instability of system in the sense of Liapunov. **[8]**

OR

Q6) a) Determine the stability of the equilibrium state of the following system $\begin{bmatrix} x_1(k+1) \\ x_2(k+1) \end{bmatrix} = \begin{bmatrix} -1 & -2 \\ 1 & -4 \end{bmatrix} \begin{bmatrix} x_1(k) \\ x_2(k) \end{bmatrix}$. Also find the Liapunov function. **[8]**

b) Obtain the state transition matrix of the following discrete time system

$x(k+1) = \begin{bmatrix} 0 & 1 \\ -0.18 & -0.9 \end{bmatrix} x(k) + \begin{bmatrix} 1 \\ 1 \end{bmatrix} u(k)$ and $y(k) = [1 \;\; 0]x(k)$. **[10]**

SECTION - II

Q7) a) Define the terms State Controllability and State Observability. Investigate the system for complete State Controllability and complete State Observability. **[8]**

$x(k+1) = \begin{bmatrix} 0 & 1 \\ -4 & -3 \end{bmatrix} x(k) + \begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix} u(k)$ and $y(k) = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} x(k)$.

b) Consider the system given below. Determine the state feedback gain matrix K such that the system exhibits the deadbeat response. **[8]**

$x(k+1) = \begin{bmatrix} 0 & 1 \\ -0.35 & -1.2 \end{bmatrix} x(k) + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u(k)$.

If $x(0) = \begin{bmatrix} -2 \\ 3 \end{bmatrix}$ find $x(2)$.

OR

Q8) a) What is State Observer. Derive an expression for the condition for State Observer. **[8]**

b) Consider a system **[8]**

$$x(k+1) = \begin{bmatrix} 1 & 1 \\ -4 & -3 \end{bmatrix} x(k) + \begin{bmatrix} 2 \\ 1 \end{bmatrix} u(k) \text{ and } y(k) = [1 \;\; 1]x(k).$$

It is desired that the error vector exhibits deadbeat response. Find observer feedback gain matrix Ke.

Q9) a) Consider the system $x(k+1) = Gx(k) + Hu(k)$ and $y(k) = Cx(k)$ where

$$G = \begin{bmatrix} 0 & 1 \\ -0.16 & -1 \end{bmatrix}, \; H = \begin{bmatrix} 0 \\ 1 \end{bmatrix} \text{ and } C = [0 \;\; 1]$$

Design a full order observer, if the desired eigen values of the observer matrix are $z = 0.2 \pm j0.2$. **[10]**

b) Explain the Smith predictor and its limitations. **[6]**

OR

Q10) Explain the internal model control (IMC) strategies. Design IMC for the system with transfer function $\tilde{G}_p(s) = \dfrac{2e^{-3s}}{1+10s}$. **[16]**

Also convert it into conventional controller with approximate dead time as $e^{-Ds} = \dfrac{1-\frac{Ds}{2}}{1+\frac{Ds}{2}}$.

Q11) Write a short notes on following system identification methods **[18]**

a) Output Error Method.

b) Least Square Method.

c) ARX model.

OR

Q12) Consider the Discrete time control system defined by **[18]**

$x(k + 1) = 0.368x(k) + 0.632u(k)$ and $x(0) = 2$.

Determine the optimal control law to minimize the performance index

$$J = \frac{1}{2}[x(10)]^2 + \frac{1}{2}\sum_{k=0}^{9}[x^2(k) + u^2(k)].$$

Also find J_{min}.

❖ ❖ ❖ ❖

P1079

[3864]-284
B.E. (Instrumentation & Control)
BIOMEDICAL INSTRUMENTATION
(2003 Course) (406264) (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) ***Assume suitable data,if necessary.***

SECTION - I

Q1) a) Define Na Pump, depolarization, action potential and relative refractory period. **[8]**

b) Mention bioelectric signals and their characteristics. **[8]**

OR

Q2) a) Draw the equivalent circuit for two electrodes connected to skin for biopotential measurement. **[6]**

b) What is the role of electrolyte jelly while coupling electrode with body. **[2]**

c) Define bio electrode. Name various types of basic bioelectrodes used for bioelectric potential measurements .Explain the various properties that bioelectrode should possess. **[8]**

Q3) a) Draw and explain Einthoven triangle. **[8]**

b) Design a heart rate meter for rate & rhythm measurement. **[8]**

OR

Q4) a) Design and explain ECG recorder. **[8]**

b) State the specifications of ECG recorder. **[8]**

Q5) a) Explain Phonocardiography. **[10]**

b) List out the sensors used in Phonocardiography. **[2]**

c) State the specifications of Phonocardiography. **[6]**

P.T.O.

OR

Q6) a) What is systolic and diastolic pressure? **[4]**

b) Describe in brief various techniques used for BP measurement. **[8]**

c) Discuss Magnetic blood flow measurement along with neat diagram. **[6]**

SECTION - II

Q7) a) What is EEG? Enlist frequency bands of EEG and give their significance? **[8]**

b) Enlist various illness and diseases for which EEG is effectively used. **[6]**

c) Define efferent and afferent nerves ? **[2]**

OR

Q8) a) Explain 10-20 electrode placements for EEG recording. **[8]**

b) Explain various EEG recording modes. **[8]**

Q9) a) Enlist various Ophthalmic Instruments. **[6]**

b) Design instrument used for measurement of loss in the peripheral vision of the subject. **[6]**

c) Explain various errors in vision and their method of correction. **[4]**

OR

Q10)a) Explain the various types of audiometer with the help of suitable diagram. **[14]**

b) What is the main organ responsible for frequency discrimination in human auditory system ? **[2]**

Q11)a) Explain Bell-jar mechanical Spirometer for respiratory measurement. Explain the following terms with respect to respiratory measurement.

i) IRV
ii) TLC **[16]**
iii) RV
iv) IC

b) State any one application of infrared gas analyzer. **[2]**

OR

Q12)a) Draw and explain the block diagram of servo controlled Ventilator. **[8]**

b) Define let-go current and hold-on current and discuss precautions to minimize shock hazards. **[10]**

⌘⌘⌘⌘

Total No. of Questions : 12] **[Total No. of Pages : 2**

P1080

[3864] - 285

B.E. (Instru. & Control)

INSTRUMENTATION FOR ENVIRONMENTAL ENGINEERING

(2003 Course) (406264 (2))

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

Instructions to the candidates:

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

SECTION - I

Q1) a) What are the natural cycles of environment? Illustrate hydrogen cycle. **[10]**

b) Differentiate between online and offline measurements of pollutants. **[8]**

OR

Q2) a) Explain standard methods of pollution analysis. **[10]**

b) Discuss on recent sensors used for pollution controls. **[8]**

Q3) a) Explain Drop/Topple Environmental testing. **[8]**

b) Describe an ecological risk assessment paradigm. **[8]**

OR

Q4) a) What are the toxic pollutants? Explain the common toxic manifestations. **[8]**

b) Write a note on ISO14001. **[8]**

Q5) a) A conventional cyclone with diameter 1.0 meter handles 3.0 m^3/s of standard air carrying particles with a density of 3000 kg/m^3. For effective number of turns of a gas makes in traversing the cyclone (Ne) is 6. Determine cut size and the efficiency as a function of particle diameter. **[10]**

P.T.O.

b) What is collection efficiency? Explain mechanisms of particulate control equipment. **[6]**

OR

Q6) a) Discuss on HVAC controls. **[8]**

b) Enlist the air pollution monitoring Instruments. Explain monitoring of NO - NO_x & their controls. **[8]**

SECTION - II

Q7) Explain various primary, biological treatments of domestic effluents. Explain controls of activated sludge process. **[18]**

OR

Q8) a) Explain different water quality monitoring instruments. **[10]**

b) Discuss on water quality standards. **[8]**

Q9) a) Explain effects of radiation pollution. How it is controlled. **[8]**

b) What is sonic boom? Explain noise measurement using suitable diagram. **[8]**

OR

Q10)a) Enlist various effects of radiation pollution on living and nonliving organisms. **[8]**

b) Suggest Instrumentation scheme for vehicle noise measurement & control. **[8]**

Q11)a) How pesticides are analysed? Explain spectroscope analysis of pesticides. **[8]**

b) Explain analysis of micronutrients in soil. **[8]**

OR

Q12)Write short notes on: **[16]**

a) Instrumentation setup for soil pollution reduction.

b) Chromatographic characterization pollution analysis.

c) Environmental impact assessment.

Total No. of Questions : 12] **[Total No. of Pages : 3**

P1081

[3864] - 286

B.E. (Instrumentation & Control)

LASER APPLICATIONS IN INSTRUMENTATION

(2003 Course) (Elective - I)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) Explain in detail the process of absorption, spontaneous and stimulated emissions of radiation with the help of energy level diagram. **[8]**

b) Explain the importance of Einstein relations in emissions of radiation. **[8]**

OR

Q2) a) Calculate the ratio of rates of spontaneous and stimulated emissions for a tungsten filament lamp operating at temperature of 2000K with average frequency to be 5×10^{14} Hz. **[5]**

b) Estimate the relative populations of two energy levels such that a transition from the higher to the lower will give visible radiations of 550 nm at room temperature (T = 300K). **[5]**

c) What are the properties of Laser? **[6]**

Q3) a) What is different laser system features which are applicable to most commercial and industrial lasers? Explain each in short. **[12]**

b) Estimate the efficiency of a GaAs laser operating well above threshold. The refractive index of material is 3.6 and laser cavity length is 0.2 mm. The loss coefficient is 800 per meter length and the internal quantum efficiency is 0.8. **[6]**

P.T.O.

OR

Q4) a) Explain the construction and working of He-Ne laser. **[8]**

b) How the laser products are classified for safety standards? **[4]**

c) Calculate the threshold pumping power of a Nd: Glass laser for critical population inversion of 9×10^{21} /m^3 and spontaneous life time of 300 μs. The upper level is at energy of 1.4eV. **[6]**

Q5) a) What are the various basic optical interferometers? **[8]**

b) What is Speckle Pattern? Describe subjective and objective speckles. **[8]**

OR

Q6) a) Describe the electronic speckle pattern interferometer (ESPI) for displacement measurement. **[8]**

b) Describe the properties of speckle pattern in short. **[8]**

SECTION - II

Q7) a) Explain the principle of operation of Laser Velocimeter. **[8]**

b) Compare the two options for the electronic processing of the Doppler signal? **[8]**

OR

Q8) a) Explain the frequency domain processing of Doppler signal in detail. **[8]**

b) Discuss the performance parameters of operation of laser velocimeter. **[8]**

Q9) a) What is the Sagnac effect? Show that the phase shift is proportional to the angular velocity. **[8]**

b) Explain the components required for all fiber FOG configuration. **[8]**

OR

Q10)a) Show that the frequency of the sagnac signal in RLG is proportional to the angular velocity of rotation. **[8]**

b) Explain in detail the Fiber Optic Gyroscope. **[8]**

Q11)a) Write a short note on Holographic Interferometer. **[9]**

b) What are different emulsions used to record the holograms? Mention the characteristics of it. **[9]**

OR

Q12)a) A thin strip of the hologram undergoing stress parallel to the x-axis is illuminated by a He-Ne laser. The fringes are localized in a plane having slope of 1.5 per unit length in x-direction and the fringe spacing is found to be 1 mm. Hence find the strain. **[8]**

b) Explain the any one applications of holographic interferometer that you know. **[10]**

Total No. of Questions :12] **[Total No. of Pages : 2**

P1082

[3864]-288
B.E. (Instrumentation & Control)
BUILDING AUTOMATION - I
(2003 Course)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) Describe conventional fire alarm system. **[8]**

b) Explain Fire Triangle & Fire Signature in detail. **[8]**

OR

Q2) a) What do you mean SLC, Enlist different SLC devices, How SLC devices are Addressed? **[8]**

b) What do you mean zone? Differentiate between Conventional &Addressable System. **[8]**

Q3) a) What is IDC? Explain CLASS A IDC & CLASS B IDC. **[8]**

b) Explain the SLC Communication protocols. **[8]**

OR

Q4) a) Explain single action & double action manual station. **[8]**

b) Explain Heat detectors and their Applications. **[8]**

Q5) a) Explain the purpose of NFPA code. Explain Guidelines for Initiating Devices in details. **[12]**

b) Explain Causes & Effect Matrix. **[6]**

P.T.O.

OR

Q6) a) Explain the purpose of NFPA code. Explain Guidelines for Notification Devices in details. **[12]**

b) Write Input to Output mapping in FAS System. **[6]**

SECTION - II

Q7) a) Explain Authentication in Access Control System. **[8]**

b) What are components of Access Control System. Explain any two in details. **[8]**

OR

Q8) a) How biometrics is used in Access Control System. What do you mean False Acceptance & False Rejection. **[8]**

b) Explain Weignad Protocol with bit format. **[8]**

Q9) a) List type of Lenses & Cameras? Explain any two Types in detail . **[12]**

b) Enlist & Explain the Video broadcast standards. **[6]**

OR

Q10)a) Explain Type of Compression. Differentiate the MJPEG & MPEG. **[12]**

b) What do you mean video streamer. Explain in details. **[6]**

Q11)a) What is Perimeter Intrusion? Explain its importance & Terminologies. **[8]**

b) List various type of Intrusion detection system and explain one. **[8]**

OR

Q12)a) Explain CCTV Control Room. **[8]**

b) Explain the Advanced Applications of Perimeter Security. **[8]**

⌘⌘⌘⌘

P1083

[3864]-289
B.E. (Instrumentation & Control)
PROCESS INSTRUMENTATION - II
(1997 & 2003 Course) (406267)

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

Instructions to the candidates:

1) ***Answer three questions from Section I and three questions from Section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answers will be valued as a whole.***

SECTION - I

Q1) a) List different types of Heat exchangers. **[4]**

b) List different process parameters used in it. **[4]**

c) What do you mean by load on a heat exchanger? **[2]**

d) Which will be control valve type used in heat exchangers (for process fluid and heating medium)? state their fail-safe action. **[8]**

OR

Q2) a) List any four applications of chillers. **[8]**

b) Draw basic diagram of chiller unit. Clearly show / mention flowing mediums **[10]**

Q3) a) Where are reactors practically used ? Which sensor is most preferred in case of temperature measurement in Reactors? List any two applications of CSTR. **[8]**

b) Can a CSTR be controlled with a PLC ? Which programming language will be preferred amongst FBD and IL ? What will be limitation of PLC in such case ? **[8]**

OR

Q4) a) How reactor safety is assured with different instruments, explain. **[8]**

b) How redundancy is important in reactors? In which typical application, redundancy of controller is important for reactor control? Explain. **[8]**

P.T.O.

Q5) a) Enlist different applications where pumps are used; (at least 4). **[8]**

b) How pump safety can be provided ? Explain with example. **[8]**

OR

Q6) a) Which method you will apply for tuning of surge control loop in compressor ? Explain. **[8]**

b) Enlist various types of compressors. What is the used drain valve? **[8]**

SECTION - II

Q7) Enlist any sixteen parameters that are monitored or controlled in a typical Boiler instrumentation system. Do not mention only parameters like: temperature (instead it should be feed water temperature). **[16]**

OR

Q8) a) What is the importance of air -fuel ratio control in Boiler? Explain with example ? **[8]**

b) What do you mean by feed forward control of Boiler drum ? What is shrink effect ? **[8]**

Q9) Explain with neat instrumentation diagrams any four important sub loops of distillation column control. **[16]**

OR

Q10)a) What is the importance of RG Analysis in distillation column ? How it is used in distillation column control ? **[8]**

b) What are different constraints in distillation column control. Explain any two. **[8]**

Q11)a) If evaporator control is not be obtained with mathematical modelling ; which are other options available. Is fuzzy control one of them ? Explain in general. **[8]**

b) Write a short note on Turbodryer or Spraydryer. **[10]**

OR

Q12)a) Where are crystalizers used? How its instrumentation is important ; explain. **[10]**

b) Evaporation is one of the very important process; justify . Draw any one control scheme for the same. **[8]**

⌘⌘⌘⌘

Total No. of Questions :12] **[Total No. of Pages : 2**

P1084

[3864]-290
B.E. (Instrumentation & Control)
COMPUTER TECHNIQUES AND APPLICATIONS
(2003 Course)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) List and explain the five states through which a process may go during its execution. **[10]**

b) Explain the following with respect to process scheduling. **[8]**

i) Long term scheduler.
ii) Short term scheduler.
iii) Context Switching.
iv) Mid term scheduler (with a diagram).

OR

Q2) a) What is the function of the CPU scheduler? Explain the CPU scheduling criteria. **[8]**

b) List the various services offered by Operating Systems. **[10]**

Q3) a) If there are 4 free frames, find the number of page faults for the reference string: 1, 2, 3, 4, 1, 2, 5, 1, 2, 3, 4, 5, for page replacement algorithms mentioned below.

i) FIFO **[3]**
ii) Optimal **[3]**
iii) LRU **[3]**

b) With the help of neat diagram,explain the concept of thrashing. **[7]**

OR

Q4) a) With neat diagrams explain the following page table structures. **[8]**

i) Hierarchical paging.
ii) Inverted page table structure.

b) List the various file allocation methods and explain the working with neat diagrams. **[8]**

P.T.O.

Q5) a) Design a Huffman code for a source that puts out symbols al, a2, a3, a4,and a5 with their respective probabilities of occurrence as 0.1, 0.3, 0.1, 0.1 and 0.4. **[8]**

b) Explain the different scheduling algorithms used in Real time systems. **[8]**

OR

Q6) Write a short note on: **[16]**

a) Vector Computers.

b) Methods of data parallelism.

SECTION - II

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

a) IEEE 802.3

b) IEEE 802.5

OR

Q8) a) Explain the TCP/IP reference model with neat diagram. **[8]**

b) Write a note on Industrial Ethernet. **[8]**

Q9) a) Define Software reliability and discuss any six terms used to quantify the reliability of software products. **[8]**

b) List and explain the basic operating modes of ARM processors. **[8]**

OR

Q10)a) Discuss the architectural overview of ARM 922. **[8]**

b) Write a short note on IEEE 488. **[8]**

Q11)a) Explain white box and black box testing. Discuss the advantages and limitations of each. **[10]**

b) Explain Integration testing and explain the following three Integration test approaches: **[8]**

i) Big-Bang Integration Testing.

ii) Bottom-Up Integration Testing.

iii) Top-Down Integration Testing.

OR

Q12)a) List and explain the five levels of SEI Capability Maturity Model. **[10]**

b) Explain in brief the Software Development Life Cycle. **[8]**

⌘⌘⌘⌘

Total No. of Questions :12] **[Total No. of Pages : 2**

P1085

[3864]-291
B.E. (Instrumentation)
INDUSTRIAL AUTOMATION
(2003 Course) &(1997)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) Explain the general consideration while justifying the automation strategy. **[8]**

b) With an example explain the role of PLC in automation. **[8]**

OR

Q2) a) With an example explain the term control system audit and its advantages. **[8]**

b) With an example explain the role of PLC in automation? **[8]**

Q3) a) With an example explain the use of Action Qualifiers in "SFC". **[10]**

b) Explain the PLC programming methods as Per IEC 1131-3. **[8]**

OR

Q4) a) With an example explain the use of Action Qualifiers in "SFC". **[10]**

b) With an example explain the role of PLC in a SCADA system. **[8]**

Q5) a) What is LAS? Explain the role of LAS in FF network. **[8]**

b) List and explain at least four common-practice commands used in HART. **[8]**

OR

P.T.O.

Q6) a) What is LAS? Explain the role of LAS in FF network. **[8]**

b) Explain any four basic function blocks in FF. **[8]**

SECTION - II

Q7) a) With an example explain at least four major components of the DCS system? **[8]**

b) List and explain the Math function blocks in the DCS system. **[8]**

OR

Q8) a) With an example explain at least four major components of the DCS system? **[8]**

b) List and explain the Advanced function blocks in the DCS system. **[8]**

Q9) a) With the help of an example explain what is "Third party interface"? **[8]**

b) Explain the user access management system in any DCS system. **[8]**

OR

Q10)a) What is alarm? Explain the how the alarms are classified and prioritized. **[8]**

b) List and explain the Advanced function blocks in the DCS system. **[8]**

Q11)With the help of block diagram explain what are the different stages involved In developing the automation for batch process? [**18**]

OR

Q12)What is meant by safety system "architecture"? What are the different safety architectures, which are commonly used, in industrial applications? **[18]**

⌘⌘⌘⌘

Total No. of Questions :12] **[Total No. of Pages :2**

P1086

[3864]-292
B.E. (Instrumentation & Control)
ADVANCED BIOMEDICAL INSTRUMENTATION
(2003 Course) (406270)

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

Instructions to the candidates:

1) ***Answer any three questions 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) With the help of neat diagram, explain the working of R wave inhibited pacemaker. **[8]**

b) Mention the advantages and disadvantages of the same. **[4]**

c) Write down the specifications of a typical pacemaker. **[4]**

OR

Q2) a) Explain different modes of electrosurgical unit.Also, write down specifications of ESU. **[10]**

b) What are different electrode configuration used in cutting and coagulation mode. **[6]**

Q3) a) Expain the need and working of an 'Autoanalyser'. **[8]**

b) List and explain various methods for glucose measurement. **[10]**

OR

Q4) a) Describe system components for a typical Telemedicine System. **[10]**

b) Explain coulter Counter used for blood cell measurement. **[8]**

Q5) a) Explain the construction of X-ray tube with neat diagram. **[6]**

b) What is CT scanning ? What are its advantages? **[5]**

c) What is the role of 'Hounsfield number' in image reconstruction ? **[5]**

OR

Q6) a) What is the role of image intensifier in X-ray imaging. Explain its working with the help of suitable diagram. **[10]**

b) List specifications of X-ray machine and explain their importance. **[6]**

P.T.O.

SECTION - II

Q7) a) With the help of a suitable block diagram, explain the working of rectilinear Scanner. **[8]**

b) Explain ultrasound Diathermy. **[8]**

OR

Q8) a) Draw a diagram, explaining what is meant by spin-spin relaxation time and spin lattice relaxation time. What is the importance of it ? **[8]**

b) Compare different imaging techniques like X-ray imaging Ultrasound,MRI and Thermograph on the basis of their principle of operation,advantages and disadvantages,application area. **[8]**

Q9) a) Explain Instrumentation in Thermography. **[8]**

b) What are different types of Endoscopes available ? Explain the application of same. **[8]**

OR

Q10)a) Which properties of laser make them suitable for biomedical applications Explain any one application of laser in Ophthalmology. **[8]**

b) Explain in brief various types of dialysers used for Hemodialysis. **[8]**

Q11)a) Define Hemodialysis and Peritoneal dialysis. **[2]**

b) List any four points of comparison for these dialysis techniques. **[8]**

c) State any three materials used for wheelchair and specify their properties. **[8]**

OR

Q12)a) What is Lithotripsy ? Explain in detail 'shock wave Lithotripsy'? **[8]**

b) Explain Air Bubble detection and blood leak detection Systems in Hemodialysis **[10]**

⌘⌘⌘⌘

Total No. of Questions : 12] **[Total No. of Pages :2**

P1087

[3864]-296

B.E. (Instrumentation and Control)

BUILDING AUTOMATION-II

(2003 Course)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) Define ASHRAE. Explain role of ASHRAE in HVAC. **[8]**

b) Define and explain followings: **[8]**

i) Specific Heat.

ii) Latent Heat.

OR

Q2) a) Define and explain followings: **[8]**

i) Absolute Humidity.

ii) Relative Humidity.

b) Describe various air properties in relation to HVAC. **[8]**

Q3) a) Explain difference between boiler and Furnace. **[8]**

b) Explain steam heating system. **[8]**

OR

Q4) a) Describe various steam traps of steam system. **[8]**

b) Describe Hydronic heating system. **[8]**

P.T.O.

Q5) a) Explain programming language options of DDC. **[6]**

b) Describe P, PI and PID control actions with HVAC. **[12]**

OR

Q6) a) Describe DDC controller software. **[6]**

b) Explain functions of BMS. **[12]**

SECTION - II

Q7) a) Discuss BACnet. **[8]**

b) Explain elements of LON. **[8]**

OR

Q8) a) Differentiate LON and MODBUS. **[8]**

b) Describe MODBUS. **[8]**

Q9) a) Discuss the efficiency of BAS **[12]**

b) Discuss advantages of BMS **[6]**

OR

*Q10)*a) Draw and explain IBMS structure. **[12]**

b) Discuss IBMS benefits. **[6]**

*Q11)*a) Explain the verticals of BMS for Healthcare. **[8]**

b) Discuss Standards for BAS. **[8]**

OR

*Q12)*a) Explain the verticals of commercial complex. **[8]**

b) List standard for DDC communications. **[8]**

❐❐❐

Total No. of Questions : 12] **[Total No. of Pages : 2**

P1093

[3864]-330

B.E. (Chemical)

ADVANCED SEPARATION PROCESSES

(Elective - I) (2003 Course)

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

Instructions to the candidates:

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

SECTION - I

Q1) Give the types of chromatography and explain in detail 'Liquid Chromatography Separation System'. **[16]**

OR

Q2) a) Explain pressure swing adsorption with neat diagram. **[8]**

b) Give the application of Chromatography. **[8]**

Q3) Explain the following term. **[16]**

a) Fouling.

b) Liquid Emulsion Membrane.

c) Dialysis.

d) Gas Permeation.

OR

Q4) a) Give the advantages of membrane separation processes over other separation technique. **[8]**

b) Explain the mechanism of separation in RO. **[8]**

Q5) a) Explain in detail 'Separation based on reversible chemical complexation'. **[12]**

b) What is reactive crystallization? **[6]**

OR

Q6) Discuss all details of 'Reactive Distillation'. Write all the equations related to Reactive Distillation. **[18]**

P.T.O.

SECTION - II

Q7) a) What is foam formation? Explain collapse and drainage phenomena. **[8]**

b) Give the adsorption properties of foam. **[8]**

OR

Q8) Give the details of design and development of froth flotation equipment. **[16]**

Q9) Explain in details of **[18]**

a) Classification of adductive crystallization.

b) Zone Refining.

OR

Q10) Give the details of **[18]**

a) Zone electrophoresis.

b) Molecular sieves.

Q11) Explain the following terms in detail. **[16]**

a) Recoil method.

b) Exchange Reaction.

OR

Q12) a) What are the factors to be considered for selection of separation processes. **[8]**

b) Explain 'Ring Oven Technology'. **[8]**

Total No. of Questions : 12] [Total No. of Pages :3

P1094

[3864] - 335

B.E. (Chemical)

COMPUTER AIDED PROCESS CONTROL

(2003 Course) (Elective - II) (Sem. - II)

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

Instructions to the candidates:

1) ***Answers to the two Sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***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) State advantages of digital computer control system over electronic control systems. **[6]**

b) What is HMI? State its functions. **[6]**

c) Distinguish between centralized and distributed computer control systems. **[6]**

OR

Q2) a) Explain DDC systems. **[6]**

b) Compare supervisory control and hierarchical control systems. **[6]**

c) Compare centralized and distributed control systems. **[6]**

Q3) a) A process is modeled as $\dot{X} = AX + BU$, $Y = CX$.
Define controllability and observability of the process. Also state mathematical conditions for testing controllability and observability of a process. **[8]**

b) Define RGA for a 2x2 process having steady-state gain matrix

$$k = \begin{bmatrix} k_{11} & k_{12} \\ k_{21} & k_{22} \end{bmatrix}$$

State properties of RGA and use of RGA for determination of the best pairing of input-output variables. **[8]**

P.T.O.

OR

Q4) a) Explain use of decouplers for designing non-interacting control loops. **[8]**

b) Explain the distinguishing characteristics of MIMO systems in comparison with SISO systems. Give suitable examples. **[8]**

Q5) a) Explain functions of sample hold elements in digital control systems. **[8]**

b) Starting from Laplace-domain transfer function model of a classical PID-controller, derive its discrete-time form in position and velocity forms. **[8]**

OR

Q6) a) What are direct synthesis (DS) digital controllers? Draw its block diagram and derive its transfer function D(Z). **[8]**

b) What are dead beat controllers? Derive the dead beat controller for a F.O. process ($K = \tau = 1$) with ZOH for a unit step change in S.P. **[8]**

SECTION - II

Q7) a) Describe digital interfaces used in control systems. **[6]**

b) Explain layered networking of process control systems. **[6]**

c) Explain parts of process control software. **[6]**

OR

Q8) a) Explain polling and interrupt methods of communication between process control computers and peripheral devices. **[9]**

b) Explain network topologies used for networking of process control computers. **[9]**

Q9) Describe the essential components of a DCS system viz - GOS, LOS, LP, I/O boards, P/S and operator's interface. **[16]**

OR

Q10) Describe PLC architecture alongwith essential components viz - P/S, I/O systems, memory, programmer units, peripheral devices. Also state advantages of PLC over computer control of processes. **[16]**

Q11) How will you manage the process control design problem with reference to sequence of design steps, temporal hierarchy of control structure and integration? **[16]**

OR

Q12) a) Explain control system for controlling feed flow rate, top product composition, bottom product composition of a two-product distillation column used to separate a binary mixture (A+B) where A is more volatile than B. **[8]**

b) Explain the feedback and feedforward control strategies for controlling temperature of cold fluid exit stream from a counter-current shell and tube heat exchanger. **[8]**

Total No. of Questions : 10] **[Total No. of Pages : 3**

P1095

[3864]-364

B.E. (Petrochemical)

PROCESS DYNAMICS AND CONTROL

(2003 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 books.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables, slide rule, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Discuss importance and usefulness of Process Control - Explain with help of suitable example. **[8]**

b) Develop the overall Transfer Function of two interacting tanks placed in series. Discuss the dynamics of the system. **[8]**

Q2) a) Solve the differential equation with help of Laplace Transform : **[6]**

$$4.5\ \frac{d^2y}{dt^2} + 13.63\ \frac{dy}{dt} - y = 15 \text{ where } y'(0) = 0 \text{ and } y(0) = 2$$

b) Develop overall transfer function of any 1st order system. In this context highlight importance of Gain. **[6]**

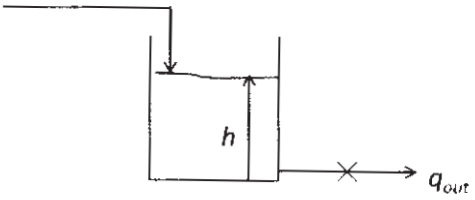
c) Define following with help of neat diagrams : **[4]**

Overshoot, Damping factor.

P.T.O.

Q3) a) Discuss the merits and Demerits of Feed-forward and Feed-back Control loops. **[6]**

b) For a liquid level system as shown below, cross-sectional area of tank = 3.0m^2. The valve characteristics is given by $q_{out} = 13.5 \times h$. **[6]**



Where, q_{out} is flowrate in m^3/h at outlet and h denotes level of liquid above tank in m.

Calculate the time constant for the system if the average operating level is 9m.

c) What is linearlization? Develop an linearlized expression for the following square root relationship **[6]**

$$q = C \times (h)^{1/2}$$

where, q is flow rate, C is a constant and h denotes height.

Q4) a) What are Servo and Regulatory control problems - Discuss the transfer functions with help of neat diagram. **[8]**

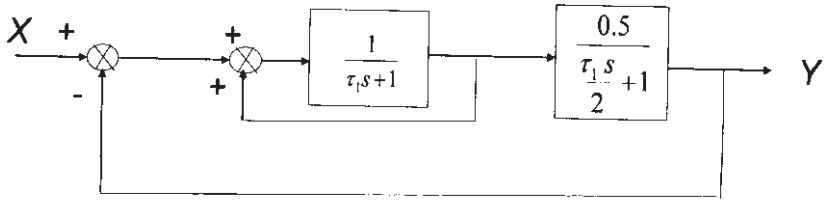
b) With help of neat sketch explain the proportional, derivative and integral modes of a PID controller. **[8]**

Q5) a) For the control system represented by characteristic equation **[8]**

$$s^4 + 4s^3 + 6s^2 + 4s + (1 + K) = 0$$

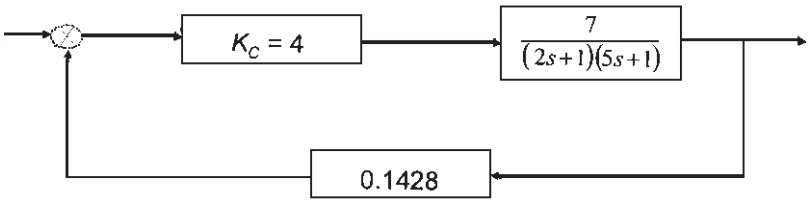
Determine the maximum value of gain K which leads to a stabilized operation.

b) Find the overall transfer function of the following system. **[8]**



SECTION - II

Q6) a) Draw Root locus Diagram for the following closed loop transfer function. Comment on the stability of the system. **[9]**



b) Draw Bode Plot for the following system : **[9]**

$20 \times (10s + 1)^{-1} \times (s + 1)^{-1}$.

Q7) a) Discuss in details the procedure and precautions of Zeigler Nichol controller Tuning method. **[8]**

b) Oil and water are to be separated based on their differences in density. Develop a programmable logic control (PLC) algorithm for this industrially important process. **[8]**

Q8) a) Explain Cascade Control Scheme for a shell and tube heat exchanger. **[8]**

b) With help of sketch explain transformations of Discrete Signals to Continuous and vice-versa. **[8]**

Q9) a) Calculate Amplitude Ratio and Phase Angle for overdamped 2nd order system with transfer function : $G(s) = \frac{12}{(4s+1)(6s+1)}$. **[8]**

b) Explain the poles and Zeros of the Transfer Function. **[8]**

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

a) Ratio Control.
b) Gain Margin and Phase Margin.
c) Negative Feedback and Positive Feedback.
d) Distillation Column Control.
e) PLC based Control.

❖ ❖ ❖ ❖

Total No. of Questions : 12] **[Total No. of Pages :5**

P1096

[3864] - 366
B.E. (Petrochemical)
NOVEL SEPARATION PROCESSES
(2003 Course) (Elective - I)

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

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***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) Write short notes on (Any Three) : **[18]**

a) Selection of separation processes.

b) Micro emulsions and Macro emulsions.

c) Adsorptive Bubble Separation Techniques.

d) Froth Flotation : Principles and Industrial applications.

OR

Q2) Attempt from the following (Any Two) : **[18]**

a) Classify the membrane separation processes with suitable examples.

b) Explain in brief the basic process principles involved in Reverse Osmosis. State the industrial applications.

c) Discuss the process principles involved in Ultrafiltration and Nanofiltration.

Q3) Classify models for membrane separation processes. Derive the model equation for complete mixing model for gas separation by membranes. Discuss the solution strategy for the model equations. **[16]**

OR

Q4) a) Discuss in brief different types of membrane modules with neat sketches by giving industrial applications. **[10]**

P.T.O.

b) Reverse osmosis of salt solution at 25ºC is tested with a 5×10^{-3} m^2 cellulose acetate membrane. On one side of the membrane is 1 mol NaCl/kg H_2O solution at 60 atmospheres (abs.) pressure, on the other is 0.01 mol NaCl/kg H_2O at atmospheric pressure. The permeation rate is 96.12 ml/hour. Find the solvent permeability and the rejection rate. **[6]**

Q5) a) A liquid containing dilute solute A at a concentration 3×10^{-2} kgmol/m^3 is flowing rapidly by a membrane of thickness, 3×10^{-5} m. The solute diffuses through the membrane and its concentration on the other side is 0.55×10^{-2} kgmol/m^3. The mass transfer coefficient k_{c1} is large and can be considered as infinite and $k_{c2} = 2.22 \times 10^{-5}$ m/s.

Data: Distribution coefficient = K′ = 1.55 and Diffusivity, $D_{AB} = 8 \times 10^{-11}$ m^2/sec in the membrane.

i) Derive the equation to calculate the steady state flux, NA and make a sketch.

ii) Calculate the flux and concentration at the membrane interfaces. **[8]**

b) An 8.95-micron tubular membrane is used to recover salt A from a dilute solution. The solutions to either side are at 0.025 and 0.004 kmol/m^3, with mass transfer coefficients of 4.35×10^{-5} and 2.25×10^{-5} m/s respectively. The distribution coefficient is 0.79 and the diffusivity of A in the membrane is 3.05×10^{-11} m^2/s.

i) Calculate the percentage of total resistance to mass transfer contributed by the membrane.

ii) Calculate the membrane area needed to allow recovery at 0.011 kmol/hr. **[8]**

OR

Q6) A membrane is to be used to separate a gaseous mixture of A and B in one of the Petrochemical complex near Mumbai. The following information is available:

Feed flow rate	=	3×10^5 cm^3 (STP)/s
Feed composition of A	=	0.55 mole fraction
Desired composition of reject	=	0.25 mole fraction
Thickness of membrane	=	2.55×10^{-3} cm
Pressure on feed side	=	100 cm Hg
Pressure on permeate Side	=	25 cm Hg
Permeability of A, P_A	=	20×10^{-10} cm^3(STP). cm/(s.cm^2.cm. Hg)
Permeability of B, P_B	=	10×10^{-10} cm^3(STP). cm/(s.cm^2.cm. Hg)

Assuming complete mixing model, calculate the following:

a) the permeate composition

b) the fraction permeated

c) membrane area **[16]**

SECTION - II

Q7) a) Discuss in brief the process principles involved in Pressure Swing Adsorption (PSA) and Temperature Swing Adsorption (TSA) with industrial applications. **[10]**

b) Discuss in brief the adsorption isotherm models with equations. **[8]**

OR

Q8) a) Batch tests were performed in the laboratory using solutions of phenol in water and particles of granular activated carbon. The equilibrium data at room temperature are shown in table below. Determine whether the Freundlich isotherm fits the data and find the constants. **[10]**

Equilibrium data:

$c, \left(\frac{\text{kg phenol}}{\text{m}^3 \text{ solution}}\right)$	$q, \left(\frac{\text{kg phenol}}{\text{kg carbon}}\right)$
0.322	0.150
0.117	0.122
0.039	0.094
0.0061	0.059
0.0011	0.045

b) Copper ions are removed from aqueous solution by an ion exchange resin. Pilot-scale tests where 94.635 ml/min of solution was passed through a cylindrical bed of resin 0.0254 m in diameter and 0.36576 m high gave a breakthrough time of 7.0 minutes, by which time 60% of the bed height had been fully spent. The plant-scale tower is to be 0.9144 meters high, with a flow rate of 283.905 ml/min.

Find

i) New breakthrough time;

ii) Diameter required;

Assume that "zone" of resin in transition is to be the same in both towers. **[8]**

Q9) The adsorption of ethane as Linde molecular sieve 5A°, was studied by Glessner and Myers (1969) at 35°C.

P, [mm Hg)	U take, V [cm^3 (STP/gm]
0.17	0.059
0.95	0.318
5.57	1.638
12.09	3.613
111.32	24.236
220.87	34.278
300.05	38.340
401.25	41. 779
500.18	44.037
602.74	45.693

a) Using the data given above determine if the Langmuir equation can be used to model the data.

b) Calculate the total surface solid, if ρ_{Ethane} = 0.3549 gm/cc. **[16]**

OR

Q10)a) From Darcy's Law, the velocity through a packed bed for a given pressure drop (P) is given by :

$$u = \frac{\varphi P d^2_p}{1\eta}$$

Where,
φ = Darcy's constant
P = Pressure drop
d_p = Particle diameter
1 = Length of column
η = Viscosity of the mobile phase
Also, from the analysis of the Van Deemter equation, for a well packed column and for a highly retained solute, it is found that :

$$H_{min} = 2.48 d_p$$

and the velocity at H_{min} is equal to

$$1.62 D_m / d_p$$

Where D_m is the diffusivity of the solute in the mobile phase.
From the above information's, derive an analytical expression for the maximum efficiency obtainable for a column in terms of these parameters, if the maximum allowable pressure drop is P. **[8]**

b) In gas chromatography, a plot of HETP as a function of the mobile phase velocity is described by the Van Deemter equation :

$$HETP = A + B/u + Cu$$

Physically, what do the terms A, B and C represent? Derive an expression for optimum value of the mobile phase velocity and the plate height in terms of these parameters. **[8]**

Q11) a) Define the following terms in connection with chromatographic separations and give appropriate equations (Any Four) **[8]**

i) Partition coefficient (K)

ii) Retention Volume (V_R)

iii) Retention Ratio (R)

iv) Capacity factor (k')

v) HETP

vi) Resolution (R_s)

b) Two amino acids, glycine and alanine, were separated by liquid chromatography with the following results :

Amino Acid	T_R, (minutes)	W (minutes)
Glycine	4.35	0.52
Alanine	5.10	0.64

i) Calculate the resolution of amino acids.

ii) Calculate the plate number for alanine.

iii) What is the minimum plate numbers needed to provide a resolution of 1.5?

iv) How do you get this high plate number? **[8]**

OR

Q12) Write short notes on (Any Three) : **[16]**

a) Bioseparation.

b) Super Critical Fluid Extraction.

c) Reactive Separations.

d) Ion Exchange Operations.

e) Classification of Chromatographic separations.

✪✡✪✡

Total No. of Questions : 12] **[Total No. of Pages : 5**

P1097

[3864]-370

B.E. (Petrochemical Engineering)

PROCESS ECONOMICS AND PROJECT ENGINEERING

(2003 Course)

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

Instructions to the candidates:

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

SECTION - I

Q1) Answer the following: **[18]**

a) What is meant by capitalized cost? Where is it used?

b) A storage tank was priced at Rs. 1,75,000 in 1998 when the cost index was 460. What is its value today when the cost index is 850?

c) List the factors to be considered in the evaluation of capital requirements for a process plant.

d) Discuss incremental costs for economic analysis.

OR

Q2) a) Draw a break-even chart and write the advantages of Break-even chart on managerial decision. **[8]**

b) A pump installation costing Rs.80,000 has a salvage value of Rs.4000. It requires Rs. 2000 for its annual maintenance. If the value of the money is 10% and the pump has a life of 3 years, what is the present worth of service rendered by the pump? What is the capitalized assuming perpetual operation? **[10]**

Q3) a) Discuss in detail the various components of a balance sheet and the economic ratios and their significance. **[8]**

b) Discuss the tree diagram showing cash flow for industrial operations.**[8]**

OR

Q4) a) Two projects A and B have initial capital investment of Rs. 10,00,000 each the cash-inflows of the two projects are as under:

P.T.O.

	Cash in flows	
Year	**Project A**	**Project B**
1	Rs.4,00,000	Rs.2,50,000
2	Rs.5,00,000	Rs.3,50,000
3	Rs.1,00,000	Rs.2,50,000
4	Rs.25,000	Rs.1,50,000
5	Rs.25,000	Rs.2,00,000
6	Rs.20,000	Rs.1,75,000

Choose one out of the two projects or the basis of Pay-Back period method of evaluation. Comment on the limitation of Pay-Back period method? **[10]**

b) Discuss with suitable example(s) the factors affecting investment and production cost of typical refinery project. **[6]**

Q5) a) Estimate the manufacturing cost per 100 kg of product under the following conditions: **[8]**

Fixed Capital Investment = Rs 10 million
Raw material cost = Rs. 1/kg of product
Annual production output = 10 million kg product
Utilities:
800-kPa steam = 50 kg/kg of steam
Purchased electric power = 0.9 kWh/kg of product
Filtered and softened water = 0.055 m^3/kg of product
Operating labor = 12 persons per shift at Rs.25 per employee per hour
Plant operates three hundred 24 hour days per year
Corrosive liquids are involved
Shipments are in bulk carload lots
A large amount of direct supervision is required
There is no patent, royalty, interest, or rent charges
Plant overhead costs amount to 50 percent of the cost for operating labor, supervision, and maintenance

b) Company X is considering the Projects that have the following costs: (All costs are in Rupees)

Item	Project A	Project B
First cost	3,50,000	2,80,000
Annual Operating Costs	55,000	42,000
Salvage Value	15,000	12,000
Life, years	3	6

Using money worth 15% per year, determine which alternative should be selected on the basis of a present worth analysis. **[8]**

OR

Q6) The following proposals are under consideration:

Proposal	**A**	**B**	**C**	**D**	**E**
Initial outlay, Rs.	5,50,000	4,30,000	5,20,000	5,00,000	5,50,000
Annual cash flow, Rs.	70,000	60,000	50,000	45,000	95,000
Life, years	10	6	7	9	12

Rank these proposals

a) In the order of profitability after payback period, and

b) Net present value method assuming an interest rate of 10%. **[16]**

SECTION - II

Q7) You are employed by a Petrochemical company looking to set up an Ethylene oxide and Glycol manufacturing plant. This will involve the impact of ethylene and oxygen from neighboring plants located close by. The ethylene oxide will be produced and fed to an adjacent plant to manufacture ethylene glycol. The glycol will be exported to a tank farm nearby pipeline for in another adjacent plant.

The engineering technology used is basically that commonly found in the petrochemical industry where large quantities of flammable liquids and gases are continuously processed. The plant operations will be in the principal plant sections:

1. Reaction of ethylene and oxygen to produce ethylene oxide.
2. Reaction of ethylene oxide with water to produce ethylene glycol.
3. Distillation section to separate the various grades of ethylene glycol.
4. Ethylene oxide storage (as liquefied gas under pressure)
5. Laboratory.
6. Workshop and offices.

The site that the company has in mind is in one of MIDC area, near Mumbai that is ringed by an area designated for housing at a distance of 1.5km.

Based on above information, answer the following questions:

a) What are the main types of environmental impact that the site has potential to generate, and what would be the most likely sources of that impact?

b) Outline in brief how you would identify the health hazards to plant operating personnel. **[18]**

OR

Q8) a) Explain in brief the plant-design project stages with suitable example? **[8]**

b) Make a proforma for the specifications for Distillation column. **[10]**

Q9) a) Discuss important utilities required in a typical petrochemical complex/ refinery unit. **[8]**

b) Discuss in brief the following safety terms: **[8]**

i) Flash and Smoke Point
ii) Fault tree analysis
iii) Trip and interlock system
iv) HAZOP and HAZAN

OR

Q10)a) Give any Six standard symbols for equipment and brief description of the equipment. **[6]**

b) Discuss in various types of valves with neat sketch used in Petrochemical Industries. Draw the symbols used in P & ID's **[10]**

Q11)Consider the construction project of ABC Petrochemical company Ltd., for a boiler house described in the table below:

	Task	Precedence	Duration (Working days)
A	Construct floor slabs	-	8
B	Erect boiler house frame	A	21
C	Construct chimney base	A	3
D	Erect precast chimney	C	6
E	Construct boiler bases	A	6
F	Position boilers	E	2
G	Construct pump bases	A	4
H	Construct oil tank piers	A	3
I	Position oil tanks	H	1
J	Construct oil line trenches	A	5
K	Position pumps	G	1
L	Install roof decking	B,D,F	8
M	Erect structures for Chimney flue and vent	D	3
N	Erect flue headers	D,F	3
O	Brick out and fit burners	D,F	6
P	Fit boiler mountings and control	F	2
Q	Install oil lines	F,I,J	10
R	Install pipe system	F,K,L	25
S	Test pipe system	R	2
T	Install plant wiring	M,O,P,Q,S	20
U	Commission boiler house	N,T	1

a) Find and list the tasks on the critical path (show all working).

b) What is its length? **[16]**

OR

Q12) Write short notes on: **[16]**

a) Plot plan and equipment layout.

b) Engineering flow diagram and Piping and Instrumentation Diagram.

c) Selection of MOC in Petrochemical and Refinery plants.

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1098

[3864] - 371

B.E. (Electronics Engg.)

PROCESS INSTRUMENTATION

(1997 Course) (Elective - I) (404205)

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

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two 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) With suitable examples explain open loop and closed loop control system. **[8]**

b) Define the term transducer. With suitable examples give classification of transducers. **[8]**

Q2) a) Define the term vacuum. Explain any one technique to measure vacuum pressure. **[8]**

b) What is meant by LVDT? Explain in detail the application of LVDT for displacement measurement. **[8]**

Q3) a) List the different continuous controllers. Explain proportional controller in detail. **[8]**

b) Explain in detail op-amp based proportional + derivative controller. **[8]**

Q4) a) Explain in detail the principle and working of flapper NOZZLE system in detail. Obtain its transfer function. **[8]**

b) Compare electronic, pneumatic & hydraulic systems. **[8]**

P.T.O.

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

a) V/I converter.

b) pH Measurement.

c) Hydraulic PI controller.

d) Tuning of PID controller.

SECTION - II

Q6) a) Explain the following terms related to PLC: **[8]**

i) Scan time.

ii) PLC ladder diagram.

iii) On delay and off delay timer.

b) With suitable assumptions draw the ladder diagram for elevator system. **[8]**

Q7) a) What do you understand by the term interlocks. Explain any two interlocks for boilers with its operation. **[8]**

b) List the different types of boilers. Explain three element drum level control in boiler. **[8]**

Q8) a) Explain adaptive control system in detail. **[8]**

b) Explain the following terms related to control valve.

i) Valve coefficient.

ii) Rangeability.

iii) Cavitation.

iv) Turn down. **[8]**

Q9) a) Explain in detail supervisory control system. **[8]**

b) Explain in detail instrument control panel. **[8]**

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

a) Dryer controls.

b) Actuators.

c) Distillation column controls.

d) Two wire transmitters.

Total No. of Questions : 12] **[Total No. of Pages : 3**

P1099

[3864] - 383

B.E. (Polymer Engineering)

POLYMER COMPOSITES AND BLENDS

(2003 Course) (409363)

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

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
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 calculators is allowed.***

SECTION - I

Q1) a) Discuss Toughening of polymers via polymer blend technology with two examples. **[10]**

b) Discuss any two methods of polymer blend preparation. **[8]**

OR

Q2) a) Discuss in detail the Property relationships of a blend with its components with suitable property response curve. **[8]**

b) Draw and explain in detail the schematic representation of the steps to be taken when developing polymer alloys and blends with a specified set of desired performance characteristics. **[10]**

Q3) a) Write a note on Polymer Blend Morphology. **[8]**

b) Distinguish between Coupling agent Vs Compatibilizer. **[8]**

OR

Q4) a) Write a note on Thermodynamics in polymer blend technology. **[10]**

b) Discuss with one example the role of Maleic Anhydride grafted polymers in blend Technology. **[6]**

P.T.O.

Q5) a) Write a note on Rheology of Polymer blends. **[8]**

b) Explain the followings: **[8]**

i) Semi-IPN ii) Sequential-IPN.

OR

Q6) Write a note on the followings: **[16]**

a) Toughened PA6.

b) Engineering Polymer Blends.

c) Interpenetrating Polymer Network.

d) Commercial Blends of PP.

SECTION - II

Q7) a) What are Initiators and Accelerators and list different Initiators and Accelerators used for Unsaturated polyester along with different parameters used for the same? **[10]**

b) Explain the neat sketch of Carbon Fiber manufacturing process. Give the comparison between Carbon Fibers and Glass Fibers. **[6]**

OR

Q8) a) Discuss the classification of Glass Reinforcement on the basis of applications. **[4]**

b) Explain the following Unsaturated Polyester resins: Heat Resistance, Low Shrinkage and Flame Retardant Unsaturated Polyester Resins. **[12]**

Q9) a) Explain Resin Transfer molding process with neat sketch along with the two products manufactured by the same. **[8]**

b) What is pressure bag forming process and differentiate between Vacuum bag Forming and Pressure bag Forming. List any four parameters of Vacuum bag Forming Process. **[8]**

c) Give the name of FRP processes by which products like profile, cladding sheet are manufactured. **[2]**

OR

*Q10)*a) Discuss different types of windings used in filament winding along with neat diagrams and significances. **[8]**

b) Give the name of FRP processes by which products like Bath Tub, Wind Mill, Sliding used in water park, Automotive car body are manufactured. **[4]**

c) List any four parameters for the pultrusion process and explain the effect of same parameters on properties of pultrusion technique products. **[6]**

Q11)a) Trouble shooting in Hand Lay Up Technique. **[8]**

b) State the repair techniques used in composite? Explain with neat diagram the repairs technique used for opening accessing from both side in composites. **[8]**

OR

Q12)a) Write a note on Nanocomposites with one example. Why silicates are used in Nanocomposites as filler. **[10]**

b) Explain the repair of composite for small Impact fracture. **[6]**

Total No. of Questions :12] [Total No. of Pages : 2

P1104

[3864] - 412
B.E. (Computer Engineering)
DISTRIBUTED SYSTEMS
(2003 Course) (410451)

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

Instructions to candidates:

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

SECTION - I

Q1) a) What is the difference between distributed operating system and network operating system? **[6]**

b) What is difference between vertical distribution and a horizontal distribution? **[6]**

c) Explain degree of transparency with suitable example. **[6]**

OR

Q2) a) Explain different types of system models in a Distributed System. **[6]**

b) Enlist and explain different middleware models. **[6]**

c) Explain different transparencies in distributed system with suitable examples. **[6]**

Q3) a) Explain different forms of communication in message oriented communication. **[8]**

b) What are the issues concerned with parameter passing in RPC system? **[8]**

OR

Q4) a) Explain token bucket algorithm with respect to quality of service requirements. **[8]**

b) Explain general architecture for message queuing system for persistent communication. **[8]**

P.T.O.

Q5) a) Compare Coda and xFS distributed file system. **[8]**

b) What is X.500? Describe the organization of X.500 name space. **[8]**

OR

Q6) a) Explain principle of log based striping in xFS with neat diagram. **[6]**

b) Explain how DNS can be used to implement a home based approach to locating mobile users. **[6]**

c) Explain difference between iterative and recursive name resolution. **[4]**

SECTION - II

Q7) a) To achieve totally-ordered multicasting with Lamport timestamps, is it necessary that each message is acknowledged? Explain. **[6]**

b) Explain Berkeley algorithm for clock synchronization with suitable example. **[6]**

c) Explain how NTP (network time protocol) is useful to distribute time over the Internet, also state the features of NTP. **[6]**

OR

Q8) a) Explain the difference between nested transactions and distributed transactions. **[8]**

b) Explain Bully and Ring election algorithms. Discuss time complexity for both algorithms in best case and worst case. **[10]**

Q9) a) Enlist and discuss different failure models. **[8]**

b) Explain different techniques to achieve reliable group communication. **[8]**

OR

Q10)a) Explain n-army problem with possible solution. **[8]**

b) What are different classes of failures that can occur in RPC system? Explain with suitable example. **[8]**

Q11)a) Explain the elements of GRID computing systems. **[8]**

b) How does Portable Object Adapter use a servant to build image of CORBA object? **[8]**

OR

Q12)a) What is virtual organization concept in GRID? **[8]**

b) Explain the importance of CORBA IDL, CORBA RMI service and CORBA Naming Service. **[8]**

Total No. of Questions : 10] **[Total No. of Pages : 2**

P1105

[3864] - 422

B.E. (I.T)

ORGANISATIONAL BEHAVIOUR & MANAGEMENT CONCEPT

(Elective - I) (414445) (Theory)

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

Instructions to the candidates:

1) ***Q.5 and Q.10 are compulsory.***
2) ***Solve any two from remaining each section.***

SECTION - I

Q1) What is organisation Behaviour? How different academic disciplines have contributed to OB? **[16]**

Q2) a) Critically evaluate Herzberg's two factor theory of motivation. What contribution has it made to the better understanding of motivation in the work place?

b) Explain the authoritarian and humanistic style of leadership in Mc Gregor's Theory X and Theory Y. **[16]**

Q3) What are the different levels of conflict? Discuss the various conflict handling modes and tactics. **[16]**

Q4) What are the situational variables identified by Fiedler? What is the most effective style to use? **[16]**

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

a) Morale.

b) Organisational climate.

c) Autocratic model.

d) Perception.

e) Types of groups.

P.T.O.

SECTION - II

Q6) What skills are needed for an effective leader? What are the characteristics of such skills? **[16]**

Q7) Elaborate the concept of resistance to change. How do people overcome resistance to change? **[16]**

Q8) Discuss Re-engineering as one of the essential tasks of modern managers. **[16]**

Q9) Define stress management. What are the ill-effects of stress? How do people cope up with stress? **[16]**

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

a) Organisation effectiveness.

b) Constructive conflict.

c) Defence mechanism.

d) Strategies for conflict resolution.

e) Perception.

Total No. of Questions : 12] **[Total No. of Pages : 3**

P1106

[3864] - 423

B.E. (Information Technology)

SYSTEM OPERATIONS AND MAINTENANCE

(2003 Course) (414448)

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

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate sheet.***
2) ***Use of logarithmic tables, slide rules and electronic pocket calculator is allowed.***
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) Service providers have been collecting experience with 3SSs for a long period of time, but message have never reached the right vendor. Why? What are the industry issues of OSS, BSS and MSS. **[8]**

b) Explain new business opportunities for support system vendors when services are offered in combinations. **[8]**

OR

Q2) a) With suitable diagram explain organizational structure of an average telecommunication provider. **[8]**

b) What are the strategic benefits offered after deployment of advanced support system? Explain with suitable example. **[8]**

Q3) a) Explain functions and protocols that support TMN services? **[8]**

b) Explain the significant differences between TINA and TMN. Give suitable example to justify your difference. **[8]**

OR

Q4) a) What is LDAP? Explain various attributes of LDAP. **[8]**

P.T.O.

b) What are the goals of telecommunication service providers with middleware? When should middleware solutions be used in a telecommunication environment? **[8]**

Q5) a) With suitable diagram show the principle function of sales process. Show all input and output connections to the other processes and functions. Also identify the information sources for these processes. **[10]**

b) Explain functional areas of call-rating and discounting process. **[8]**

OR

Q6) a) Explain various functions of the Customer Interface Management process? **[10]**

b) What is IP Billing? Explain 4 categories of rating schemes. **[8]**

SECTION - II

Q7) a) Draw and explain structure of SNMP based management service. **[8]**

b) How manual service processing and centralized service processing are different? Explain. **[8]**

OR

Q8) a) What is workflow? Explain the benefits of workflow applications? **[8]**

b) Explain following principle functions of Service Configuration Process:-

i) Align capacity (preorder)

ii) CPE

iii) Activate service **[8]**

Q9) a) Draw suitable diagram to explain overview of Management Operation Support System. **[8]**

b) What is management framework? Explain its architecture with neat diagram. **[8]**

OR

Q10)a) What is TBS? How other sub-systems support a critical aspects of customer service provisioning process. **[8]**

b) What is SiteScope? Explain the various monitors available with SiteScope. **[8]**

Q11)a) "The allocation of business process and support tools to people complicates the hiring process." Do you agree with the statement? What

are the various criteria for hiring network management staff? **[8]**

b) What is the need of maintaining job profiles? What items job profiles should include? Explain the profile of network operations manager. **[10]**

OR

Q12)a) What is the need of maintaining job profiles? What items job profiles should include? Explain the profile of call center operator. **[10]**

b) How knowledge management tools allow individual to query the enterprise Information base. Explain areas where service providers can be benefited from such tools. **[8]**

Total No. of Questions :12] **[Total No. of Pages : 2**

P1107

[3864] - 424

B.E. (Information Technology)

DISTRIBUTED SYSTEMS

(2003 Course)

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

Instructions to the candidates:

1) ***Answer question 1 or 2, 3 or 4, and 5 or 6 from section - 1 and question 7 or 8, 9 or 10, and 11 or 12 from section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) List and explain advantages and disadvantages of distributed systems over centralized system. **[8]**

b) Explain with neat diagram architectural Models of distributed systems. **[8]**

OR

Q2) a) What are the various challenges for designing distributed systems? **[8]**

b) What are the services offered by middleware in a distributed system? **[8]**

Q3) a) Describe working of Remote Procedure Call in client server communication with suitable diagram. **[8]**

b) What is group communication? Explain different types of group communication. **[8]**

OR

Q4) a) What is RMI? Explain types of RMI invocation semantics. **[8]**

b) What is Call Back RPC? How does a server handle Call Back to the client? **[8]**

Q5) a) Highlights desirable features of a good distributed file system. List the functions of distributed file system. **[10]**

b) Explain different types of file sharing semantics. **[8]**

OR

P.T.O.

Q6) a) Draw and explain NFS architecture and give detail functions of layers. **[10]**

b) Write a short note on CODA file system. **[8]**

SECTION - II

Q7) a) Explain the following: **[8]**

i) Physical Clock.

ii) Network Time Protocol.

iii) Drift Rate.

iv) Happened before relation.

b) What is a distributed Deadlock? What are the necessary conditions for deadlock to occur in distributed environment? **[8]**

OR

Q8) a) Explain the reasons for drift in computer clocks. **[4]**

b) Enumerate the various issues in clock synchronization. **[6]**

c) What is Election Algorithm? Explain in brief about Bully algorithm? **[6]**

Q9) a) What is Fault tolerance? Explain different types of failures. **[8]**

b) What is check pointing? Explain independent check pointing and coordinated check pointing. **[8]**

OR

Q10)a) What is message ordering? Explain FIFO order and causally ordered multicast. **[8]**

b) What is recovery? What is backward and forward recovery? **[8]**

Q11)a) Draw and explain CORBA architecture. **[10]**

b) Explain : OBV, CCM, GIOP, DDS. **[8]**

OR

Q12)a) Explain cluster computing system with working, types of clusters and how it can be used as an alternative to traditional super computers. **[10]**

b) Write short note on Grid Computing. **[8]**

Total No. of Questions :12] **[Total No. of Pages : 2**

P1108

[3864] - 425

B.E. (IT)

INFORMATION RETRIEVAL

(2003 Course) (414450)

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

Instructions to the candidates:

1) ***Answer Question 1 or 2, 3 or 4, and 5 or 6 from section - 1 and Question 7 or 8, 9 or 10, and 11 or 12 from section - II.***
2) ***Answers to the two sections should be written in separate 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 Luhn's ideas Index term weighting. **[8]**

b) Explain Single-Pass algorithm. **[8]**

OR

Q2) a) Explain Rochhio's algorithm. **[8]**

b) Explain Cluster Hypothesis represent graphically the R-R and R-N-R distribution. **[8]**

Q3) a) Describe Boolean and Vector model. **[8]**

b) Explain with example sequential and inverted files. State their advantages and disadvantages. **[10]**

OR

Q4) a) Explain XML data model and evaluation of queries. **[8]**

b) Explain with an example organization of records in multi-lists, state its advantage over inverted files. **[10]**

P.T.O.

Q5) a) Explain different evaluation measures for information retrieval systems. **[8]**

b) Write notes on:

Dendogram and SQL3 **[8]**

OR

Q6) a) What are the different starting points for search interfaces? **[8]**

b) Write notes on:

TREC Collection and User Oriented Measures. **[8]**

SECTION - II

Q7) a) What are OPACs? **[8]**

b) Discuss cataloguing using MARC record. **[8]**

OR

Q8) a) What are Digital Libraries? **[8]**

b) What is MARC Record? **[8]**

Q9) a) What is multimedia IR? How is data retrieval done? **[9]**

b) Explain query specification and processing. **[9]**

OR

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

a) MULTOS.

b) GEMINI

c) Generic multimedia indexing.

Q11) a) Compare parallel and distributed IR. **[8]**

b) Explain distributed architecture of a search engine. **[8]**

OR

Q12) Write notes on : (any two) **[16]**

a) Suffix Arrays.

b) Query processing.

c) Challenges in web search.

P1110

[3864]-431
Final Year B. E. (Biotech.)
CHEMICAL REACTION ENGINEERING - II
(2003 Course) (409343)

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

Instructions to the candidates:

1) ***Figures to the right indicate full marks.***
2) ***Use of Programmable calculator is not allowed.***
3) ***Draw a neat sketch wherever necessary.***
4) ***Make necessary assumptions wherever required.***
5) ***Answer any THREE questions from Section I and any THREE questions from Section II.***

SECTION - I

Q1) a) Calculate time needed to burn to completion particles of graphite (R_0= 4.5mm,ρ = 2.2gm/cc, k = 20 gm/s) in 8% oxygen stream. Assume that gas film diffusion doesn't offer resistance to diffusion and reaction. **[6]**

b) Solids of unchanging size (R=0.3mm) are reacted with gas in steady flow bench scale fluidized reactor with following result : **[12]**
F_o= 10gm/s, W = 100 gms, X_B = 0.75

OR

Q2) a) Spherical solid particles containing B are roasted isothermally in an oven with gas of constant composition. Solids are converted to nonflaking product according to SCM with initial concentration of A as 0.01 kmol/ m^3. Determine rate controlling mechanism for this transformation in these cases. **[12]**

Case - I

D_p, mm	X_B	t,sec
2	0.87	1
1	1	1

Case - II

D_p	X_B	t,sec
1	0.3	2
1	0.75	5

b) Write short note on : **[6]**

i) Shrinking Core Model.

ii) Progressive Conversion Model.

P.T.O.

Q3) Gaseous A absorbs and reacts with B in liquid in packed bed under following conditions. **[16]**

k_{Ag}. a = 0.1 mol/(hr.m^2 .pa)

F_l = 0.01 m^3 / m^3

k_{Al}.a = 100 m^3 / m^3

$D_{Al} = D_{Bl} = 10^{-6}$ m^2/hr.

k = 10 m^3 liq/ (mol. hr.)

$H_A = 10^5$ pa.m^3 /mol.

a = 100 m^2/m^3 ; p_A= 100 pa, C_B=100 mol/m^3

Calculate a) Rate of reaction in mol /(hr.m^3)

b) Decide location of major resistance.

c) Determine behaviour of liquid film.

OR

Q4) Rate of CO_2 absorption into alkaline buffer solution of K_2CO_3. The reaction is given by second order reaction.$-r_A = k.C_A.C_B$ Pure CO_2 at l atm was bubbled into packed column irrigated by solution kept at room temperature and close to constant C_B. Find fraction of CO_2 absorbed. **[16]**

Data : $V_r = 0.604m^3$; $f_l = 0.08$; a = 120 m^2/m^3 ; π = 101.325 pa.

H_A= 3500 pa.m^3/mol ; v_o= 0.0363 m^3/s; C_B = 300 mol/m^3.

$D_{Al} = D_{Bl} = 1.4 * 10^{-9}$ m^2/s; k = 0.43 m^3/(mol.s).

k_{Ag}.a = 0.1 mol/(hr.m^2. pa); k_{Al}.a = 0.025 s^{-1}.

Q5) a) Explain determination of surface area by BET method. **[6]**

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

i) Mercury Penetration Method.

ii) Nitrogen desorption Method.

OR

Q6) a) Describe experimental methods for catalyst preparation. **[6]**

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

i) Catalyst deactivation.

ii) Promoters and Inhibitors.

SECTION - II

Q7) a) Determine the catalyst required for 30% conversion of 1500 mol/hr. of pure gaseous A at 3 atm and 110°C. The reaction is carried out in packed bed $A \rightarrow 4R$, $-r_A = 95$ 1/(hr.kg catalyst) C_A. Assume mixed flow with very large recycle of gaseous reactant A. **[12]**

b) Determine amount of catalyst needed for 80% conversion of 1000 m^3/ hr.of pure gaseous A (C_{A0}=100 mol/m^3) if stoichometry and rate is given by A = R ; $-r_A = 50\ C_A/(1 + 0.02\ C_A)$; mol/kg.hr. **[6]**

OR

Q8) a) The following kinetic data are obtained for first order reaction in packed bed reactor using various amount of catalyst and fixed feed rate of 10 kmol/hr. **[16]**

W, kg	1	2	3	4	5	6	7
X_A	0.12	0.20	0.27	0.33	0.37	0.41	0.44

i) Calculate reaction rate at 40% conversion.

ii) How much catalyst is needed for 40% conversion if feed rate is 400 kg/hr.

b) Briefly explain effectiveness factor and Thiele Modulus. **[2]**

Q9) a) A particular first order reaction in absence of pore diffusion resistance proceeds as $r_A = 10^{-6}$ mol/ (s.cm^3 cat.) at $C_A = 10^{-5}$mol/cm^3 at 1 atm and 400°C. Determine size of catalyst pellet that should be used to ensure that pore resistance don't affect rate of reaction. **[8]**

b) The first order decomposition A = R is run in an experimental MFR. Determine the controlling resistance for following runs. **[8]**

D_p, mm	W, kg	C_{A0}, mol/ml	v, ml/hr	X_A
3	1	100	9	0.40
12	4	300	8	0.80

OR

Q10) A bubble column slurry reactor is to used for oxidation of dilute aqueous ethyl alcohol to acetic acid by action of pure oxygen at 10 atm. The reactor is maintained at 30°C and used pd - $A1_2O_3$ - $r_A = k.\ C_A$, $k = 1.77*10^{-5}m^3$/ (kg cat.sec). Calculate fractional conversion of ethy1 alcohol to acetic acid. **[16]**

Data: Gas: $v_g = 1*10^{-2}$ m^3 /sec., $H_A = 86000$ pa.m^3/mol.

Liquid: $v_l = 2*10^{-4}$ m^3/sec; $C_{B0} = 400$ mol/m^3

Reactor: 0.1 m^2 * 5 m high, $f_l = 0.75$; $f_g = 0.05$; $f_s = 0.20$

Catalyst: $d_p = 1*10^{-4}$ m; $D_e = 4.16*10^{-10}$ m^3/cm.cat.sec.; ρ_s=1800kg/m^3

Kinetics :$(k_A i.a_i)_{g+1} = 0.052$ m^3/m^3; $k_{AC} = 4*10^{-4}$ $m^3/(m^2$ cat.sec)

Q11) Sustrate A decomposes in presence of enzyme E.Kinetic runs were carried out in presence of inhibitor B and without B. **[16]**

Run 1: $C_{Ao} = 600$ mol/m^3, $C_{E0} = 8$ gm/m^3 ; $C_{B0} = 0$

C_A ,mol/m^3	350	160	40	10
t, hr	1	2	3	4

Run2 : $C_{A0} = 800$ mol/m^3, $C_{E0} = 8$ gm/m^3; $C_{B0} = 100$ mol/m^3

C_A ,mol/m^3	560	340	180	30	80
t, hr	1	2	3	5	4

a) Find rate equation for the decomposition of A.

b) Explain the role of B in fermentation.

c) Suggest mechanism for this reaction.

OR

Q12) a) A sucrose is hydrolyzed at ambient temperature by enzyme sucrase. With initial concentration of 1.5 mol/m^3 and sucrase concentration 0.0158 mol/m^3 , following data were obtained.

t,hr.	2.5	4.0	5.5	7.0
C_A,mol/m^3	0.80	0.68	0.46	0.28

Find the rate equation to represent the kinetics of this hydrolysis reaction. **[8]**

b) Write short notes on : **[8]**

i) Competitive Inhibition.

ii) Noncompetitive Inhibition.

⌘⌘⌘⌘

Total No. of Questions :11] [Total No. of Pages : 3

P1111

[3864] - 432

B.E. (Biotechnology)

ENZYME AND FERMENTATION ENGINEERING

(2003 Course) (Sem.- I) (416282)

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 should be drawn whenever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Explain the mechanism of different types of reversible enzyme inhibition and how it affects the kinetics of reaction in terms of the Michaelis Menten constants? **[10]**

b) What is dilution rate? Discuss the effect of dilution rate on biomass concentration in a chemostat. **[6]**

OR

Q2) a) Prove that the dilution rate equals the specific growth rate for balanced growth conditions in a chemostat. **[5]**

b) Explain the significance of constants in the Michaelis Menten equation for characterizing enzyme kinetics. **[5]**

c) An inhibitor (I) is added to the enzymatic reaction at a level of 1 gram/lit. The following data was obtained for K_m = 9.2 gram S/lit. Is the inhibitor competitive or non-competitive? **[6]**

V g/l-min	0.909	0.658	0.493	0.4	0.33	0.289	0.227
S g/l	20	10	6.67	5	4	3.33	2.5

Q3) a) What is submerged liquid fermentation? Explain with characteristics and applications. **[6]**

b) Describe in detail the continuous mode of fermenter operation. **[6]**

c) Explain the construction, working and applications of hollow fibre bioreactor. **[6]**

P.T.O.

OR

Q4) a) With the help of neat diagrams, describe the different types of bioreactors employed for submerged fermentation. **[8]**

b) Differentiate between batch and fed batch mode of operation of fermenters. **[5]**

c) Enlist the advantages and disadvantages of solid state fermentation over submerged fermentation. **[5]**

Q5) a) Explain how bubble characteristics affects oxygen mass transfer rate in fermenters. **[5]**

b) Describe in detail any one method for determination of $k_L a$ in a fermenter. **[6]**

c) Describe the effect of increasing gas flow rate on performance of a fermenter. **[5]**

OR

Q6) Write notes on the following: **[16]**

a) Factors causing change in broth rheology.

b) Measurement and control of foam in fermenters.

c) Factors affecting power consumption in bioreactors.

SECTION - II

Q7) Write notes on the following (any three):

a) Inoculum development for a large scale fermenter. **[18]**

b) HTST sterilization.

c) Procedure for batch sterilization along with temperature time profile.

d) Dependence of k_d on temperature and significance of del factor.

Q8) a) What are the different physical methods used for immobilization of enzymes. What are the advantages offered by them? **[8]**

b) Explain in brief any one industrial application of immobilized enzymes. **[4]**

c) What are the factors which affect intra-particle diffusivity in case of immobilized enzyme and how? **[4]**

OR

Q9) a) Enlist the different advantages of chemical immobilization of enzymes over physical methods. **[4]**

b) How do you determine the rate limiting regime in case of enzyme immobilized on the external surface of the support? **[4]**

c) The data for production of dextrose from corn starch using both soluble and immobilized (azo glass beads) glucoamylase in a fully agitated CSTR is given below: **[8]**

V_0 (mmol/lit-min)		S_0
Free enzyme	**Imm.enzyme**	**(mol/lit)**
0.083	0.056	0.01
0.143	0.098	0.02
0.188	0.127	0.03
0.222	0.149	0.04
0.250	0.168	0.05
0.330	0.227	0.1
0.408	0.290	0.29

Determine K_m and V_{max} for this reaction using both free and immobilized enzyme. Do the data indicate any diffusional limitation in the immobilized enzyme preparation?

Q10) a) Enlist the advantages and applications of the following advanced fermentation techniques: **[9]**

i) Microfermentation.

ii) Disposable fermenters.

iii) Semi-synthetic fermentation.

b) What are the differences in design considerations for bioreactors handling animal and plant cells? Elaborate. **[7]**

OR

Q11) Write notes on the following: **[16]**

a) Design criteria for bioreactors for plant cell cultures.

b) Advantages and disadvantages of disposable fermenters.

c) Microfermentation.

d) Production of antibiotics using semi-synthetic fermentation.

Total No. of Questions :12] **[Total No. of Pages : 5**

P1112

[3864] - 433

B.E. (Biotechnology) (Sem-I)

Bio - process Equipment Design

(2003 Course) (416283)

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

Instructions to the candidates:

1) ***Figures to the right indicate full marks.***
2) ***Use of programmable calculator is not allowed.***
3) ***Draw a neat sketch wherever necessary.***
4) ***Make necessary assumptions wherever required.***
5) ***Answer any three Questions from Section I and Three Questions from Section II.***

SECTION - I

Q1) a) Explain the working of rotary vacuum filter in detail. **[8]**

b) Explain in detail pressure filters and state their advantages and disadvantages. **[8]**

OR

Q2) a) State the principle of partition chromatography with suitable example. **[6]**

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

i) TFF system

ii) Leaf filter

Q3) a) Describe the general design procedure for process equipment. **[6]**

b) Describe downstream processing operations used in fermentation process. **[10]**

OR

Q4) a) What is the criteria for the selection of a valve. **[6]**

b) Differentiate between wiped joint and socket joint. **[4]**

P.T.O.

c) Estimate the optimum pipe diameter for a flow of dry chlorine gas of 10,000 kg/hr at 6 atm and at 20°C through carbon steel pipe. **[6]**

Q5) a) Write a short note on purging of vessels. **[6]**

b) Calculate the thickness of torispherical head (100-6), (80-10) and elliptical head (2:1) for a vessel having a design pressure of 3.5 kg/cm^2. Welded joint efficiency can be taken as 100%. Also calculate the percentage reduction in thickness with reference to the thickness of a torispherical head (100-6). Permissible stress for a material of construction is 1250 kg/cm^2. **[12]**

OR

Q6) a) Explain various types of construction used for high pressure vessels. **[6]**

b) A high pressure vessel fabricated by shrink fit construction has three concentric shells. The ratio of outer radius to inner radius for all the shell is 1.4. The vessel is subjected to an internal pressure of 150 kg/cm^2. Pressure outside the vessel is atmospheric. Estimate:

i) The maximum combined stress at the interfaces of concentric shells.

ii) Interface pressure resulting internal pressure and shrinkage stresses.

Data: Modulus of elasticity, E=2x10^6 kg/cm^2 **[12]**

Internal diameter of vessel is 400 mm.

SECTION - II

Q7) a) A looped flow arrangement plate heat exchanger is to be used for cooling viscous liquid from 95°C to 60°C. The mass flow rate of viscous hot liquid is 2.6 kg/sec, water available at 18°C is to be used as a cooling medium. **[12]**

Maximum water outlet temperature is 44°C.

Plates are made up of stainless steel.

Plate thickness t = 1 mm.

Projected heat transfer area of plate = 0.2 m^2.

Effective width between the plate = 0.4 m.

Distance between the centers of inlet and outlet ports = 0.8 m.

Properties	Hot fluid	water
Viscosity N-S/m^2	0.1230	$0.78x10^{-3}$
Heat capacity J/kgK	2512	4180
Thermal conductivity W/mK	0.1731	0.62

Gasket thickness = 3mm

b) Discuss the fouling of plate heat exchanger. **[6]**

OR

Q8) 1.2 kg/sec of an organic liquid is to be cooled from 45°C to 20°C using a chilled water at 5°C in a shell and tube heat exchanger having 12 mm ID/14mm OD steel tubes of 1.6 m length. Outlet temperature of water is 10°C. Design a suitable heat exchanger with following data. **[18]**

	Organic liquid	water	steel
Specific heat, J/kg°K	2150	4180	-
Viscosity, mNs/m^2	0.25	0.80	-
Density,kg/m^3	716	1000	-
Thermal conductivity, W/mK	0.133	0.61	45
Fouling resistance, m^2K/W	0.0002	0.0004	-

As a first estimate take an overall heat transfer coefficient as 610 $W/m^2\,^0K$ and valid your design.

Q9) a) Give classification and selection criteria of agitators. **[8]**

b) Calculate the diameter of a shaft used in agitation system. Torque acting over the shaft is 115000 kg-cm, while bending moment acting over the shaft = 34600 kg-cm^2. Ultimate tensile strength of shaft material = 6900 kg/cm^2. Ultimate shear stress is 75% of ultimate tensile stress. Factor of safety used is 6.0. **[8]**

OR

Q10)a) A toluene is continuously nitrated to mononitrotoulene in a cast iron vessel, 1m in diameter, fitted with propeller agitator 0.3m diameter, rotating at 2.5Hz. The temperature is maintained at 310K by circulating 0.5 kg/sec. Cooling water through a stainless steel coil 25mm O.D. and 22mm

I.D. in the form of helix 0.8 m in diameters.The conditions are such that the reacting material may be considered to have some physical proprieties as 75% H_2SO_4 acid. If the mean water temperature is 290 K, what is the overall heat transfer co-efficient for desired at transfer co-efficient.

Proprieties of water	**Properties of 75%H_2SO_4**
K = 0.59 W/mK	K = 0.40 W/mK
Cp = 4180 J/kg-K	Cp = 1880 J/kg-K
$\mu = 1.08 \times 10^{-3}$ N-S/m^2	$\mu = 6.5 \times 10^{-3}$ N-S/m^2 (at 310 K)
ρ=998 kg/m^3	$\mu_s = 8.6 \times 10^{-3}$ N-S/m^2 (at 300 K)
	ρ=1666 kg/m^3

Thermal conductivity of stainless steel 15.9 W/mK. Dirt resistance at inside and outside surfaces are 0.0002 and 0.0004 m^2K/W respectively. **[12]**

b) Write note on jackets and coils. **[4]**

Q11)a) A sieve plate distillation column is used for certain operation. Calculate the plate efficiency, using Van Winkle's correlation. **[8]**

Given data:

Density of liquid = 925 kg/m^3

Viscosity of liquid = 0.34×10^{-3} N-S/m^2

Density of vapour = 1.35 kg/m^3

Viscosity of vapour = 10×10^{-6} N-S/m^2

Liquid diffusivity (Light key component) = $4.64 \times 10^{-9}$$m^2$/sec

Height of weir = 50 mm

Hole area = 0.038 m^2

Total column cross-sectional area = 0.50 m^2

Superficial vapour velocity = 1.62 m/s

Liquid surface tension = 60×10^{-3}N/m

b) Discuss various feed arrangements to be considered for distillation column along with neat sketches. **[8]**

OR

Q12)a) Explain the optimum sieve plate performance diagram. **[6]**

b) Explain the design of plate type column with dowmcomer. **[6]**

c) Write short note on the smoker equations. **[4]**

Total No. of Questions :11] [Total No. of Pages : 3

P1113

[3864] - 435
B.E. (Biotechnology)
ENVIRONMENTAL BIOTECHNOLOGY
(2003 Course) (Sem.- I) (416281)

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

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Draw diagrams wherever necessary.***
3) ***Maximum marks for each question is given in parentheses.***

SECTION - I

Q1) Describe the variations of the conventional activated sludge process for wastewater treatment. Mention the advantages and disadvantages of each type. **[18]**

OR

Q2) a) An 1800 ml of activated sludge is allowed to settle for 30 minutes. At the end of the settling time the sludge volume is 1300 ml. What is the thirty minute settled sludge volume (SSV 30). If the mixed liquor concentration of a waste water sample is 3200 mg/L, what is the sludge volume index (SVI)? **[9]**

b) Explain the different methods employed for dewatering sludge. **[9]**

Q3) What is the significance of sampling in wastewater? Describe the different types of sampling techniques. Why is equalization done? **[16]**

OR

Q4) a) What are the different types of aeration mechanisms employed in suspended biological treatment method? **[8]**

b) The $B.O.D_5$ of a surface water sample is 250 mg/litre at 25^oC. Assuming the value of the reaction constant $K = 0.23\ day^{-1}$ to the base 'e', estimate the ultimate B.O.D of the sample. **[8]**

Q5) Differentiate any four**:** **[16]**

a) Chemical coagulation and Chemical precipitation.
b) Stabilization Ponds and Aerated lagoons.
c) Fixed film biological process and suspended growth process.
d) Adsorption and Absorption.
e) Sedimentation and flocculation.
f) Chlorination and Irradiation.

P.T.O.

SECTION - II

Q6) Explain the principle of Upflow Anaerobic Sludge Blanket digestor with the help of a neat diagram. Also describe the advantages and disadvantages of the process. **[18]**

OR

Q7) Discuss the current strategies for the treatment of distillery effluent? **[18]**

Q8) What is meant by hazardous waste? Explain the methods of site remediation and waste minimization in hazardous waste treatment. **[16]**

OR

Q9) Explain the various methods involved in the disposal of radioactive wastes. **[16]**

Q10) Read the following data and answer the questions below: **[16]**

An abandoned petrochemical refinery site has soil contaminated with petroleum by-products [organic chemicals including total petroleum hydrocarbons (TPH)], lead (Pb), and arsenic (As). The chemical analysis of the contaminated soil for TPH, Pb, and As was: Soil pH - 7.2; TPH - 45,600 mg/kg; Pb - 1,300 mg/kg; As - 100 mg/kg of contaminated soil. A small-scale pilot study was conducted at the contaminated site to evaluate the ability of bioremediation (natural attenuation), phytoremediation, and chemical immobilization to reduce risk to soil contaminants. Results of the pilot study are shown in the following table.

Remediation Treatment	Before treatment		After treatment	
	Soil lead (mg/kg)	Soil TPH (mg/kg)	Soil lead (mg/kg)	SoilTPH (mg/kg)
Bioremediation	1,300	45,600	1,300	22,100
Phytoremediation	1,300	45,600	812	23,150
Immobilization	1,300	45,600	1,300	45,600

a) One method to optimize bioremediation and contaminant removal is to increase contaminant solubility. List one chemical method to increase TPH solubility and bioavailability and optimize bioremediation to further reduce soil TPH levels.

b) One approach to optimize phytoremediation and contaminant removal is to increase contaminant solubility. Describe all chemical methods/ techniques to optimize phytoremediation by increasing contaminant solubility of Pb.

c) List one hyperaccumulator plant that can be used for phytoremediation of the following contaminants: Lead hyperaccumulator, Arsenic hyperaccumulator. Explain the mode of phytoremediation by the plant.

d) Some chemical immobilization treatments have been shown to reduce risk from soil ingestion of lead. List two and explain the mode of action.

OR

Q11) Write short notes on any two **[16]**

a) Treatment of textile effluent.

b) Composting and waste management.

c) Phytomining.

d) Bioremediation of hydrocarbons.

Total No. of Questions : 12] **[Total No. of Pages : 2**

P1114

[3864] - 442

B.E. (Biotechnology) (Sem. - II)

FOOD BIOTECHNOLOGY

(2003 Course) (416286)

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

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Draw neat diagrams wherever necessary.***
3) ***Maximum marks for each question is given in parentheses.***

SECTION - I

Q1) a) What are the potential applications of food irradiation? What type of food can be irradiated? **[8]**

b) Elaborate the preservation methods used for fruits and vegetables. **[8]**

OR

Q2) a) Describe the factors to be considered during chilling storage of food. **[8]**

b) Describe the process of canning. **[8]**

Q3) What are the different sources of food spoilage? Mention the major microorganisms involved in food spoilage and food poisoning. Describe the rapid methods of microbial analysis? **[16]**

OR

Q4) Explain the different biochemical changes caused by microorganisms in food. **[16]**

Q5) a) Discuss the different heat treatment methods for food preservation? **[9]**

b) Explain the application of membrane technology for concentration of fruit juices. **[9]**

OR

Q6) a) Discuss the current status of butanol production from agricultural biomass. **[9]**

P.T.O.

b) How do microorganisms help in the production of flavor compounds? Explain with suitable example. **[9]**

SECTION - II

Q7) a) Discuss the role of enzymes in fruit and vegetable juices. **[8]**

b) 'Fermentation products are good for health'. Justify with specific advantages. **[8]**

OR

Q8) a) Explain the process of cheese making by enzymatic process. **[8]**

b) Discuss the advantages and disadvantages for the use of single cell protein as food supplement. **[8]**

Q9) Explain the process of solid state fermentation and compare it with liquid cultures. With suitable example explain its application in food industry. **[16]**

OR

Q10) Give an overview of the physical and chemical methods used in waste water treatment from food industry. **[16]**

Q11) Describe the biological treatment methods in waste water treatment from food industry. **[18]**

OR

Q12) What is meant by anaerobic treatment of waste water? Explain the principle of Upward Anaerobic Sludge Blanket. What are the variations of this techniques currently used in waste water treatment? **[18]**

Total No. of Questions :10] **[Total No. of Pages : 2**

P1115

[3864] - 147

B.E.(Mechanical Engineering)

RAPID PROTOTYPING

(2003 Course) (402050) (Elective)

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) ***Neat diagram should be drawn wherever necessary.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is product definition? What type of activities should be included in product definition? **[6]**

b) How RP technology has been revolutionizing the manufacturing industry. **[4]**

c) What are the reasons for the failure of a new product? **[6]**

Q2) a) How can bringing a product to market rapidly have an impact on the rate of return and how it affects the outcome of other competitive products? Elaborate with a example. **[8]**

b) Why design is an iterative process and how does Rapid Prototyping aid this? **[4]**

c) Why time-to-market is so critical? **[4]**

Q3) a) Use an example to explain the limitation of the stereolithography process. **[6]**

b) Why solid model is needed in RP and What are data inputs in RP. **[5]**

c) Why Rapid Prototyping is also called as Generative Manufacturing. **[5]**

P.T.O.

Q4) a) What is an STL file? How it is sliced? Explain with sketch. **[4]**

b) Compare the advantages and disadvantages of the stereo lithography process and mask-based process. **[6]**

c) Compare FDM with SLA. **[6]**

Q5) Write Short notes: **[18]**

a) LLM Technology and its applications.

b) SGC.

c) SLC file Format.

SECTION - II

Q6) a) What are the merits and demerits of the solid, liquid and powder based RP processes. **[6]**

b) Among solid-based (not powder) RP processes, which process can produce metal parts such as aluminum? How does it work? **[6]**

c) What are the material choices in solid-based RP processes? **[4]**

Q7) a) What are the differences between rapid tooling and conventional tooling? **[6]**

b) What are the material choices in liquid-based RP processes? **[4]**

c) Explain with sketch Multi Component Metal Powder Laser Sintering process. **[6]**

Q8) a) When making a prototype is necessary? **[4]**

b) Which method to select among solid, liquid and powder based RP processes for a particular application? Explain with suitable example? **[8]**

c) Which are the operative aspects in RP? **[4]**

Q9) a) Explain in detail Direct Rapid Tooling and Indirect Rapid Tooling. **[8]**

b) What are the important factors influencing the cost of RP process? Elaborate with suitable example. **[8]**

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

a) Single Component Metal Powder LASER Sintering.

b) Orthopedic applications of RP.

c) 3D Printing.

Total No. of Questions :12] **[Total No. of Pages : 3**

P1116

[3864] - 162

B.E. (Mech. S/W)

NON CONVENTIONAL ENERGY SOURCES

(402065)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) What is meant by renewable energy sources? Explain in brief these energy sources with special reference to Indian context. **[9]**

b) Discuss the merits and demerits of alternative energy sources over the currently used energy sources. **[8]**

OR

Q2) a) Define Zenith angle, Solar Azimuth angle, Declination angle, Hour angle. Determine the local solar time and declination at a location latitude $23^{0}15'$N, Longitude $77^{o}30'$ E at 12.30 IST on June 19. Equation of time correction is given from standard table or chart = - (1'01"), take standard time longitude = $82^{o}30'$. **[9]**

b) What is the difference between a Pyrheliometer and a Pyranometer? Explain the working of instrument used for measurement of global radiation of sun. **[8]**

P.T.O.

Q3) Explain the effects of various parameters affecting the performance of flat plate collectors and what are the measure taken to maximize the performance. **[17]**

OR

Q4) a) Discuss in brief the applications of solar air heating. **[6]**

b) Differentiate between active and passive solar heating system. **[4]**

c) Explain tilt factor for beam radiation, diffuse radiation and reflected radiation and write their expression for the case of tilted surface facing due south (i.e.$\gamma = 0$). **[7]**

Q5) a) Write the limitations of flat plate collectors and advantages of concentrating solar collectors. **[6]**

b) Explain optical efficiency, aperture width, concentration ratio and acceptance angle in connection with concentrating collectors. **[4]**

c) Explain cylindrical parabolic concentrator with neat sketch. **[6]**

OR

Q6) Write short notes on **[16]**

a) Solar pond as energy storage.

b) Solar stills.

c) Heliostats.

d) Materials for concentrators and reflecting surfaces.

SECTION - II

Q7) What is solar cell? Explain the photovoltaic principle. Describe a basic photovoltaic system for power generation. **[17]**

OR

Q8) What is the basic principle of wind energy conversion? Describe the main consideration in selecting a site for wind generators. Explain with neat sketch wind electric generation system. **[17]**

Q9) a) What is hydrothermal resource and explain vapour dominated hydrothermal power plant with neat sketch. **[9]**

b) Explain the principle of operation of tidal power plant. Derive the expression for tidal energy per tidal cycle for a single pool, single effect tidal system. **[8]**

OR

Q10) a) What are the main types of OTEC power plats? Describe their working in brief with sketch. **[9]**

b) What is fuel cell? Explain the principle of operation of fuel cell. **[8]**

Q11) a) Describe floating dome type of biogas plant. State advantages and limitations of floating drum type and fixed dome type biogas plant. **[8]**

b) Explain the methods of obtaining Energy from biomass. **[8]**

OR

Q12) Write short notes on following: **[16]**

a) Biogas for diesel engine.

b) Biomass gasification.

c) Micro Hydel power plant.

d) Environmental protection norms ISO 14000.

Total No. of Questions :6] **[Total No. of Pages : 2**

P1117

[3864] - 193

B.E. (Production S/W)

ERGONOMICS AND HUMAN FACTORS IN ENGINEERING

(2003 Course) (Elective-I)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) What are Human-Machine Systems? Explain its characteristics. **[8]**

b) What is the meaning of term 'Accident'? Explain various factors contributing to accidents. **[8]**

OR

a) Explain significance of 'Warning' in brief. **[6]**

b) Write a note on work & rest cycles? **[8]**

c) Define 'Anthropometry'. **[2]**

Q2) a) Explain static dimensions and dynamic dimensions. **[8]**

b) Explain various limits for MMH task design. **[8]**

OR

a) Explain the principles for arranging components. **[8]**

b) Explain the consideration for designing a seated work surface. **[8]**

Q3) a) Write short note on special purpose lighting for illumination. **[6]**

b) Explain the various effects of cold stress on performance. **[6]**

c) Explain the system of measurement of light. **[6]**

OR

P.T.O.

a) Write a note on luminance ratio. **[6]**

b) Write a note on means of reducing heat stress. **[6]**

c) Explain VDT. **[6]**

SECTION - II

Q4) Describe design consideration for following controls. (Any Three) **[18]**

a) Foot pedal.

b) Hand wheels and Cranks.

c) Knobs for producing torque.

d) Multi-function hand control.

OR

Compare the following types of work station: **[18]**

a) Seating.

b) Standing.

c) Seat-stand.

With respect to their advantages, disadvantages and applications.

Q5) a) Compare respiratory response and cardio vascular response in work physiology. **[8]**

b) Describe muscle metabolism. **[8]**

OR

a) Compare between aerobic and anaerobic glycolysis. **[8]**

b) Write a short note on Learning curves and explain its significance in human factors engineering. **[8]**

Q6) Write short notes on: (Any Four) **[16]**

a) Applications of PTS.

b) Ready WFS (work factor system).

c) Brief WFS (work factor system).

d) Types of MOST.

e) MTM-1 System.

f) Mento Factor System.

Total No. of Questions : 12] **[Total No. of Pages : 5**

P1118

[3864]-287

B.E. (Instrumentation and Control)

ADVANCED CONTROL SYSTEM

(2003 Course) (406264) (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) ***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) Find describing function for combine deadzone & saturation characteristics as shown in figure 1. **[12]**

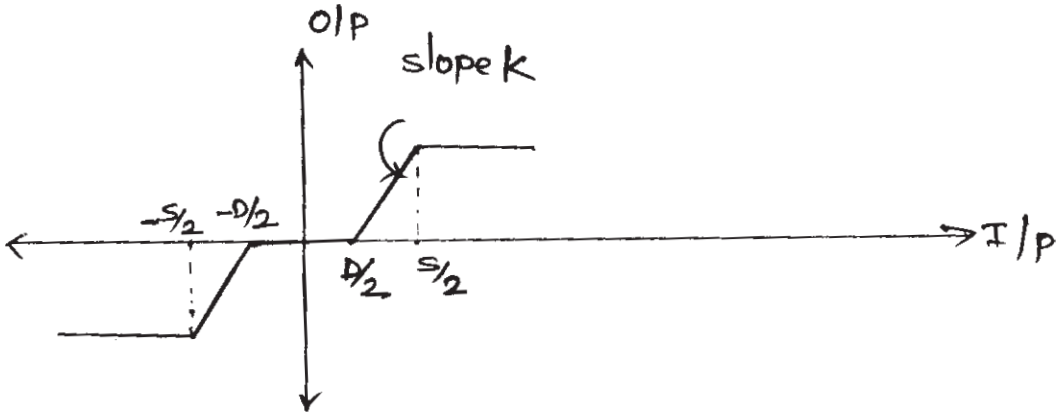


Fig. 1

b) What are the characteristics of phase plane method. **[6]**

OR

P.T.O.

Q2) a) What mean by "Jump Resonance"? Explain it with the help of soft & hard spring technique. **[6]**

b) Find frequency & Gain (K) of limit cycle for the system shown in the figure. 2. **[12]**

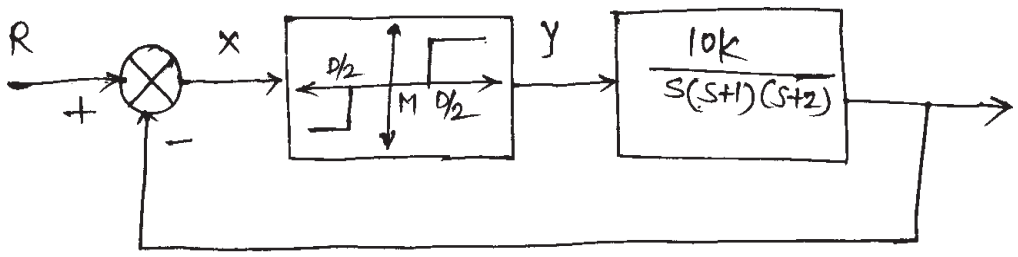


Fig. 2

Q3) Consider the system shown in fig. 3. Find the amplitude and frequency of limit cycle. Also comment on nature of limit cycle (s) and stability of system. **[16]**

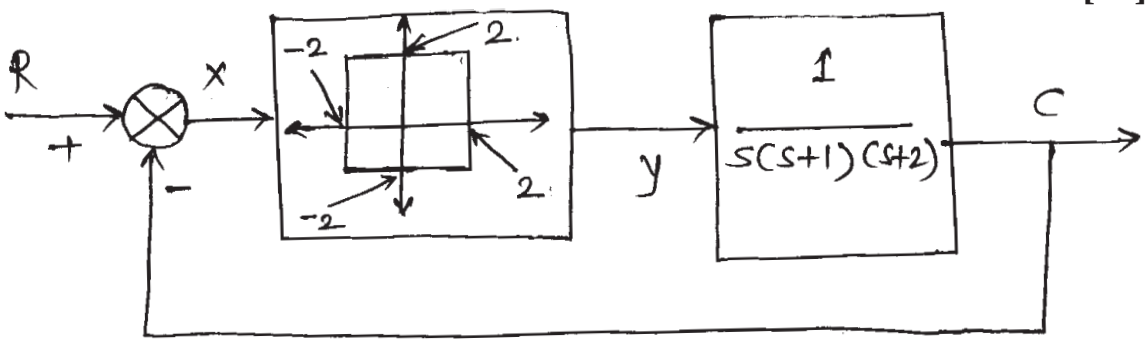


Fig. 3.

OR

Q4) The nonlinear system described the nonlinear element as $u = g(e) = e^3$ and the system is described by differential equation **[16]**

$$\ddot{e} + \dot{e} = Ke^3;\ K > 0$$

Find stability region of nonlinear system as shown in fig. 4.

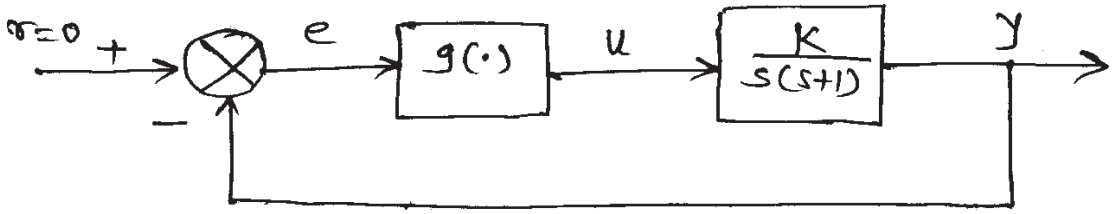


Fig. 4. Nonlinear System.

(Note : - The equilibrium point lies at the origin)

Q5) a) Explain different elements of Model Reference Adaptive Control (MRAC) system with the help of neat block diagram. **[8]**

b) Consider Dynamics of Mass-Spring-Damper system given by **[8]**

$$M\frac{d^2y}{dt^2} + B\frac{dy}{dt} + ky = u; \quad y = \text{output}$$

u = Input

where M = 1kg B = 1N/ms

K = 1 N/m design MRAC system

response follows the reference model given by

$$\frac{d^2y_m}{dt^2} + \frac{15.14\,dy_m}{dt} + y_m = r \quad \text{select } r(t) = 2$$

OR

Q6) a) Explain MIT Rule for continuous time Model Reference Adaptive Control (MRAC) scheme with reference to 1st order system. **[8]**

b) Explain Model Reference Adaptive Control using Lyapunov approach for stability analysis of continuous time system. **[8]**

SECTION - II

Q7) a) In Self-Tuning Regulator (STR) following input output data has been obtained from real plant. **[12]**

Time (t)	Input data [u(t)]	Output data [y(t)]
1	2.0	0.0
2	1.0	4.0
3	2.0	–2.0
4	1.5	4.0
5	1.0	2.0

Use any regression method to fit a model with the structure $y(t) + ay(t-1) = b\,u(t-1) + e(t)$ where $e(t)$ is error signal.

b) Write short note on Indirect Self Tuning Regulator. **[4]**

OR

Q8) a) Write short note on : **[12]**

i) Continuous time self tuners.

ii) Linear quadratic Self Tuning Regulator.

b) With the help of neat diagram explain different element of Self Tuning Regulator. **[4]**

Q9) Explain following industrial adaptive controllers with reference to parameter estimation, control design, prior information & industrial experiences.**[18]**

a) EXACT : The Foxboro adaptive controller.

b) Asea Brown Boveri (ABB) adaptive controller.

OR

Q10)a) Explain temperature control of a distillation column using adaptive control technique. **[10]**

b) Enlist the considerations in design of Robust Control System. **[8]**

Q11)a) Obtain the control law that minimizes the performance index **[8]**

$J = \int_0^\infty (x_1^2 + u^2)dt$ for the system.

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix} \begin{bmatrix} X_1 \\ X_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u$$

using reduced matrix Riccati eq^n

b) State eq^{n}s are **[8]**

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} -2 & -4 \\ 1 & -4 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 2 \end{bmatrix} [u]$$

$$y = \begin{bmatrix} 1 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

determined feedback gain matrix for a system & desired pole locations at –50, –50.

OR

Q12)Consider the plant **[16]**

$$\begin{bmatrix} \frac{dx_1}{dt} \\ \frac{dx_2}{dt} \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ -1 & 2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 1 \\ 0 \end{bmatrix} u$$

a) Prove that the system is unstable.

b) Prove that the system is controllable

c) Select the values of matrices Q and R with the constraint that they are positive definite and design a controller for the plant so as to minimize.

$$J = \frac{1}{2} \int_0^\infty \left(x^T Q x + u^T R u \right) dt$$

check that the resulting overall system is stable.

❖ ❖ ❖ ❖

Total No. of Questions :12] **[Total No. of Pages : 2**

P1119

[3864] - 338

B.E. CHEMICAL

INDUSTRIAL HAZARDS & SAFETY

(2003 Course)

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

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Discuss the importance of ingredients of successful safety program and Draw a neat sketch of the same. **[8]**

b) Explain about role of computers & softwares in Industrial safety. **[8]**

OR

Q2) Describe in detail about **[16]**

a) FAR.

b) OSHA incidence rate.

Q3) a) Discuss the importance of Industrial Hygiene in Chemical Industries. **[9]**

b) Discuss the evaluation of worker's exposure to dust. **[9]**

OR

Q4) a) Focus on Govt. Regulations related to Industrial safety. **[8]**

b) Determine the TLV for uniform mixture of dust containing. **[10]**

Dust	Concentration,wt%	TLV in ppcf
A	65	25
B	30	2.7

P.T.O.

Q5) a) Distinguish between fires & Explosion. **[8]**

b) What are the different types of fire extinguishers? Give their compositions & specific application. **[8]**

OR

Q6) Write short notes on **[16]**

a) BLEVE.

b) Fire Triangle.

SECTION - II

Q7) Explain about the design to prevent fires & explosions and discuss about the explosion proof equipments & instruments **[16]**

OR

Q8) a) Explain the storage & handling of flammable and toxic chemicals. **[8]**

b) Draw a neat sketch of VSP for acquiring runway reactions data and discuss in detail. **[8]**

Q9) Give the importance of **[16]**

a) HAZOP study.

b) Probability theory for Risk assessment.

OR

Q10) Discuss in detail about. **[16]**

a) Risk assessment.

b) Revealed & Unrevealed failure.

Q11) Write short notes on **[18]**

a) Emergency shutdown system.

b) Hazard model & Risk data.

OR

Q12) Write short notes on **[18]**

a) Tackling of disasters.

b) Safety Audit in chemical Laboratories.

Total No. of Questions :12] **[Total No. of Pages : 3**

P1120

[3864] - 340

B.E.(Chemical)

FUEL CELL TECHNOLOGY

(2003 Course) (409348) (Elective - II)

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

Instructions to the candidates:

1) ***Use two separate answer sheets for writing the answers to the two sections.***
2) ***Draw schematics wherever necessary.***
3) ***Assume suitable data,wherever necessary.***
4) ***Write the chemical reactions wherever necessary.***
5) ***All questions are compulsory.***

SECTION - I

Q1) Differentiate among PEM, phosphoric acid, molten carbonate and solid oxide fuel cells, based on their operating conditions and materials of construction of different components. **[16]**

OR

Q2) a) Delineate the salient features of hydrogen storage for fuel cell. **[8]**

b) Explain schematically the working principle of Molten Carbonate Fuel Cell (MCFC). **[8]**

Q3) a) In a typical SOFC, current density of $10 A/m^2$ is obtained when pure hydrogen is fed at the pressure of 2 atm. Inside the fuel cell, total pressure of gases on anodic side is observed to be 2.5 atm. The air is supplied at 1.5 atm. The cell is operated at 900^oC. The diffusivities of hydrogen, oxygen and water vapor are 95, 70 and 55 $C/s.m^2.atm$. Calculate concentration overpotentials across anode and cathode. **[9]**

b) Calculate fuel utilization factor, air ratio, power output and fuel efficiency of SOFC using the given data. **[9]**

Average current density = $10 A/m^2$

P.T.O.

Active anode surface area = 0.2 m^2

Fuel flow rate = 20 mole/hr

Fuel composition = hydrogen - 85%, carbon monoxide - 15%

Air flow rate = 15 mole/hr

Output potential = 220 V

Lower heating value of fuel = 30000 kcal/kg.

OR

Q4) Gibbs free energy for the formation of water vapor is - 54.635 kcal/mole at STP condition. In the typical SOFC, the partial pressures of hydrogen, oxygen and water vapor are 0.9, 0.25 and 0.29 atm respectively. The cell is operated at 850° C. Assuming the activities of the components.

Proportional to their partial pressures, calculate:

a) Standard open circuit potential.

b) Open circuit potential at the operating conditions. Faraday's constant is 96487 J/V.mol. **[18]**

Q5) a) Derive Nernst equation for calculating open circuit potential of SOFC using H_2 as a fuel and O_2 as an oxidizer. **[12]**

b) What is the effect of fuel utilization on Nernst potential. **[4]**

OR

Q6) Write short notes on the following.

a) Activation overpotential.

b) Limitations of external steam reforming.

c) Effect of temperature on SOFC performance.

d) Triphase boundary. **[16]**

SECTION - II

Q7) a) Explain kroger-vink defect structure in solids. **[8]**

b) Derive the Butler-Volmer form of the charge transfer rates. **[8]**

OR

Q8) a) Explain reaction mechanism and salient features of oxidative reforming of methane. **[8]**

b) Explain with neat sketch the SOFC design configurations. **[8]**

Q9) a) Explain the role of limiting reforming factor (steam-to-fuel ratio) in the utilization of hydrocarbons in SOFC. **[10]**

b) Analyze the criteria for the selection of hydrocarbon as a fuel for SOFC. **[6]**

OR

Q10)a) Explain the role of different components of SOFC. **[6]**

b) Illustrate and compare between planar and tubular design of SOFC. **[10]**

Q11)Explain the design of typical direct ethanol SOFC considering the following aspects:

a) Catalyst

b) Structure

c) Reactions and

d) Exit gas characteristics. **[18]**

OR

Q12)a) Explain charge transfer chemical reaction mechanism in SOFC. **[8]**

b) What are the recent advancements in the materials of anode, cathode, electrolyte and interconnect? **[10]**

Total No. of Questions :8] **[Total No. of Pages : 2**

P1121

[3864] - 350

B.E.(Petroleum)

OIL WELL DRILLING ENGINEERING

(2003 Course)

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

Instructions to the candidates:

1) ***Question Nos.1 and 5 are compulsory. Out of the remaining attempt 2 questions from section - I and 2 questions from section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***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 different stages in well planning and design. Explain in brief G.T.O. **[9]**

b) For the existing conditions the drilling rate is 13 ft/hr and bit life is 33 hr. A mud company claims that spending $ 3000 more dollars on the mud will cause bits to drill 10% faster and 20% longer. The values for the bit and drilling conditions are given below.

Bit=$1491 Tool = Stabilizer $ 120 Mud = $ 2000 (one cost component) Trip = 8 hr lost time = 0.3hr (one cost component), Rig rental = 550$/hr, support rental $ 250/hr Tool rental = 9 $ /hr (one cost component). Calculate drilling cost per foot with and without the consideration of new drilling mud. **[9]**

Q2) a) Discuss design considerations in drill string for buildup angle. **[8]**

b) How many drill collars should be run if maximum weight on bit is anticipated tobe 20 tonne, the average drill collar length is 9.2m the drill collar weight is 0.218 tonne/mtr and buoyancy factor of mud is 0.857.**[4]**

c) Discuss different pressure losses in the drill string while circulation. **[4]**

P.T.O.

Q3) a) Discuss geometrical planning of type II (s-shape) directional well. **[12]**

b) Find vertical and horizontal stress at a depth of 10,000 ft Assume poisson's ration = 0.26 overburden gradient 1 psi/ft. **[4]**

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

a) Torque & drag in directional wells.

b) MWD Tool.

c) Multilateral wells.

d) Ragland vector diagramme.

SECTION - II

Q5) a) Discuss in detail casing seat selection procedure. Discuss kick tolerence and differencial sticking point aspect. **[9]**

b) Discuss API classification of cement. Using following data, calculate pumping rate required to put cement slurry into turbulent flow in the annulus.

Hole size 8.5" casing size 5.5" cement depth = 5000 ft(feet) I.D. of 5.5" casing is 4.60" n' 0.30 k' = 0.196 ρ = 15.5 ppg. **[9]**

Q6) a) Explain driller's method of well control in detail. **[8]**

b) Mud weight =13 ppg SIDPP = 400 psi SICP = 450 psi Depth = 9000ft. Calculate kill mud weight. **[2]**

c) Discuss different reasons and symptom's of kick in brief. **[6]**

Q7) a) Explain hydraulic system (accumulator system) of BOP in detail. **[8]**

b) Discuss BOP function test in detail. **[8]**

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

a) Casing design.

b) Floating rigs.

c) Subsea BOP stack.

Total No. of Questions :12] **[Total No. of Pages : 3**

P1122

[3864] - 411

B.E. (Computer Engineering)

SOFTWARE TESTING & QUALITY ASSURANCE

(2003 Course) (410450)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) Define measurement and compare the indirect and direct measurement with example. **[9]**

b) Explain the use of measurement in assessment and prediction of the any system. Take any hypothetical example as software project. **[9]**

OR

Q2) a) Describe the emperical relation system and numerical relation system with example and mathematical modelling. **[9]**

b) Give the classification of software measurement and with it's significance in the measurement. **[9]**

Q3) What are the problems with FPs (functional point calculation)? What are the categories of the complexities? Explain the complexity verses use of resources. **[16]**

OR

Q4) Explain the algorithmic complexities. Explain how "different solutions to the same problem may have different complexities" with any example. Give the difference between the complexity and performance with example. **[16]**

P.T.O.

Q5) A software program reads three integer values. The three values are interpreted as representing the lengths of the sides of a triangle. The program prints a message that states whether the triangle is scalene, isosceles or equilateral. There are strategies for picking test data. Different strategies may be appropriate for different stages in program development, for different types of problems, and for different types of errors. Judicious use of testing strategies helps a programmer think about possible bugs and to avoid the bugs. Find the equivalent classes, Define the table for valid and invalid test cases for scalene, isosceles and equilateral. Do the boundry value analysis and error guessing for the same problem. **[16]**

OR

Q6) Explain white box testing with following point. **[16]**

a) Test adequacy b) Static testing

c) Code complexity d) Mutation testing

SECTION - II

Q7) What is test plan? Give the management of test plan of any project you studied. How you report & execute the test plan for your project? **[18]**

OR

Q8) a) What is ad-hoc testing? What is Usability and accessibility testing? **[9]**

b) Explain the software test automation. **[9]**

Q9) What are ISO 9000 standards? Who created the standards? How did ISO get standard? Give the Structure of ISO. **[16]**

OR

Q10) Give the answers of the following questions considering Malcolm Baldridge Assessment. **[16]**

a) What is self-assessment?

b) Benefits of self-assessment.

c) Self-assessment resources.

d) Self-assessment Ten step approaches.

Q11) Give the short on: **[16]**

a) Choosing method of fix distribution.

b) Testing shipment unit.

c) The problem categories & their suggested action in problem.

OR

Q12) Give short notes on: **[16]**

a) Preparing shipment unit.

b) Customer side problem reporting activities.

c) Challenges and best practices in problem resolution.

Total No. of Questions :12] **[Total No. of Pages : 3**

P1123

[3864] - 415

B.E. (Computer)

HIGH PERFORMANCE NETWORKS

(2003 Course)

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

Instructions to the candidates:

1) ***Solve Q1or Q2, Q3 or Q4, Q5 or Q6 from section I and Solve Q7 or Q8, Q9 or Q10, Q11 or Q12 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) Describe the significance of Carrier Extension in Gigabit Ethernet MAC Operation. **[8]**

b) Explain How Flow control is provided in Gigabit Ethernet. **[8]**

OR

Q2) a) Explain in detail what is Frame bursting and need of it. **[8]**

b) Discuss in short about 1000 BASE - X Family with suitable applications. **[8]**

Q3) a) Define the terms CIR, Bc, Be. What are their significance in congestion control? **[6]**

b) Comment on the Transmission structure of ISDN? What are the data rates supported? **[6]**

c) Draw and explain The ATM cell structure at the User-Network interface. **[6]**

OR

Q4) a) Draw and explain B-ISDN protocol architecture. Which layers of this architecture Relates to ATM function. **[6]**

P.T.O.

b) Describe the terms FECN and BECN. **[6]**

c) Differentiate between Frame relay and ATM. **[6]**

Q5) a) Explain the need of ATM Adaptation layer. Describe in short the AAL Type 1 along with its suitable application. **[8]**

b) Explain in short about SONET/SDH hierarchies and also draw the basic SONET frame format? What is the data rate supported? **[8]**

OR

Q6) a) What are the functions of Transmission Convergence(TC) sub layer? Draw the diagram of Header Error Control Operation. **[8]**

b) Describe any 4 ATM QOS parameters. **[8]**

SECTION - II

Q7) a) List and explain various xDSL types (At least 4 points). **[8]**

b) Explain in detail about DMT processes? How it is related to xDSL. **[8]**

OR

Q8) a) Draw and Explain A typical ADSL equipment configuration. **[8]**

b) What are echo suppressors and echo cancellers? What effect they have on XDSL. **[8]**

Q9) a) Explain the significance and working of RSVP. **[8]**

b) Why Class based QOS is better than Flow Based QOS? Explain the concept Behind Differentiated services. **[8]**

OR

Q10)a) What is MPLS? Draw and Explain the structure of label. **[8]**

b) Can LSR transmit/receive a native IP Packet (non MPLS) on MPLS Interface? How Does LSR know which is the Top label, Bottom label, Middle label of the label stack? **[8]**

Q11)a) Describe in detail 802.11b standard specifying frequency band, data rate supported, No of APs supported, spread spectrum etc. **[10]**

b) Differentiate between 802.11 a and 802.11 g standards. **[8]**

OR

Q12)a) Differentiate between 802.16 and 802.16a standards. **[6]**

b) Explain the following terms.

1>Time Division Duplexing (TDD).

2>Frequency division Duplexing (FDD). **[6]**

c) Comment on WiMax Security scheme/protocol. **[6]**

Total No. of Questions :12] **[Total No. of Pages : 2**

P1124

[3864] - 420

B.E. - (IT)

MOBILE COMPUTING

(414445) (Elective - I) (2003 Course)

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

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain various standards used in mobile computing environment. **[8]**

b) Explain various steps used during the design of voice application development. **[8]**

OR

Q2) a) Explain the significance of Core, Edge and Access Network. What are their functions? **[8]**

b) Explain various types of mobilities used in mobile computing environment. **[8]**

Q3) a) Describe the Bluetooth protocol stack in detail. **[6]**

b) Explain how mobile IP works with appropriate diagram. **[6]**

c) Explain the value added services of SMS. **[6]**

OR

Q4) a) Draw an architectural diagram of GSM and explain various elements used in it. **[6]**

b) Explain the security mechanism used in GSM. **[6]**

c) Explain Java Card in detail with appropriate diagram. **[6]**

P.T.O.

Q5) a) Explain the WAP protocol stack in detail. **[8]**

b) What is the difference between GSM and GPRS? What are the network elements in GPRS that are different from GSM. **[8]**

OR

Q6) a) Explain the transmission plane and GPRS protocol stack. **[8]**

b) Explain how Direct Sequence Spread Spectrum technology used in CDMA. **[8]**

SECTION - II

Q7) a) What are the advantages and disadvantages of WLAN? Under what situation is WLAN desirable over LAN? **[8]**

b) What are the design constraints for the application of hand held devices? **[8]**

OR

Q8) a) What is number portability? Explain the three phases used in number portability. **[8]**

b) Explain SS#7 protocol stack in detail. **[8]**

Q9) a) Describe the Palm OS architecture. **[8]**

b) Explain the functions of different layers in Symbian OS architecture. **[8]**

OR

Q10)a) What is CDC and CDLC in J2ME? **[8]**

b) Explain the three prong approach used in Java. **[8]**

Q11)a) Explain the different flavors of Windows CE. **[6]**

b) Compare SIP an H.323. **[6]**

c) Explain various attacks on static assets. **[6]**

OR

Q12)a) What are the different components of Information Security. **[6]**

b) Explain any two real time protocols. **[6]**

c) Explain various attacks on dynamic assets. **[6]**

Total No. of Questions :8] **[Total No. of Pages : 2**

P1125

[3864] - 7

B.E.(Civil)

ADVANCED ENGINEERING GEOLOGY WITH ROCK MECHANICS

(1997 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) ***Neat diagrams must be drawn wherever necessary.***

SECTION - I

Q1) Write notes on:

a) Stand up time of a rock mass during tunnelling. **[4]**

b) Explain 'strength' as a mechanical property of rock mass. **[8]**

c) Location and depth of drill holes taken for bridge foundation. **[5]**

Q2) a) Engineering significance of fractures from dam foundation point of view. **[6]**

b) Tunnelling through folded rocks. **[5]**

c) Origin of Tachylytic basalts. **[5]**

Q3) a) Write a note on Bieniawski's classification of rock mass. **[9]**

b) Will dam building activity causes a major earthquake? Explain with suitable examples. **[8]**

Q4) a) Write brief on Rock Quality designation (R.Q.D.). **[5]**

b) Tachylytic basalts occurring in a dam project area. **[6]**

c) Treatment to be given a dyke occurring below the pier of a bridge. **[5]**

P.T.O.

SECTION - II

Q5) Write notes on:

a) Any three case histories of tail channel erosion in deccan trap area. **[9]**

b) Problems with 'made grounds' in cities. **[4]**

c) Region 1. **[4]**

Q6) Write notes on:

a) Characters and engineering significance of older alluvium. **[8]**

b) Engineering significance of dykes in tunnelling. **[5]**

c) Engineering significance of active faults. **[4]**

Q7) a) Engineering significance of Pre Cambrian metamorphic rocks. **[8]**

b) Amygdaloidal basalts as construction material. **[4]**

c) Basalt flow groups. **[4]**

Q8) Write notes on:

a) Engineering significance of dykes from dam foundation point of view. Give case histories. **[8]**

b) Waterbearing characters of compact basalts. **[4]**

c) Multiaquifer system. **[4]**

Total No. of Questions :10] **[Total No. of Pages : 2**

P1126

[3864] - 11A

B.E.(Civil)

CONSTRUCTION MANAGEMENT

(1997 Course) (Elective - II)

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

Instructions to the candidates:

1) ***Answer three questions from section-1 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) ***Assume suitable data, if necessary.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***

SECTION - I

Q1) a) Give any six peculiar characteristics of construction industry. State how it differs from other types of industries. **[12]**

b) State the responsibilities to be shouldered by a construction manager. **[6]**

Q2) a) Explain MUSIC 3D rule in detail by giving suitable example. **[8]**

b) Carry out ABC analysis for following annual data. **[8]**

Item	Annual cost In Rs.	Item	Annual cost In Rs.
Cement	6000	Reinforcement steel	870
Bricks	1000	Steel fixtures	150
Aggregates	500	Timber	550
Paints	630	Rubble	150
Tools and plant	300	Plumbing	1500
Plastering material	250	Fuel items	95
Structural steel	2400	Precast piles	1200

Draw graph showing A, B & C items.

P.T.O.

Q3) a) What is meant by 'working capital'? State the factors on which working capital depends. **[8]**

b) What is meant by feasibility study? What is the importance of carrying out feasibility study of a construction site? What are the factors considered for technical feasibility study? **[8]**

Q4) a) What is the meaning of occupational health hazard? State the same for a labour working in pneumatic caisson. **[8]**

b) Describe the concept of cash flow with suitable example. **[8]**

Q5) Write short notes on any two of following. **[16]**

a) Financial Feasibility study.

b) HML analysis.

c) Qualities of Construction Manager.

SECTION - II

Q6) a) Draw a typical layout of a multistoreyed construction at concreting stage. Name different areas, state the assumptions you have made. **[10]**

b) What are the functions of a financial risk manager? **[8]**

Q7) a) What are the factors to be considered before designing site layout? **[8]**

b) What are various methods of training? Explain Vestibule training in detail. **[8]**

Q8) a) What is the documentation necessary to be kept under 'Maternity Leave Act? What are the penalties to an organization violating the act. **[8]**

b) What are the Personal Protective Equipments used on site? Explain the use of each. **[8]**

Q9) a) What are the benefits of computer used as a tool of MIS? **[8]**

b) What are the constituents of MIS? Explain the procedure for the same. **[8]**

Q10) Write short notes on any 2 of following: **[16]**

a) Risk Management.

b) Provident Fund Act.

c) Factors affecting site layout.

Total No. of Questions : 9] **[Total No. of Pages : 2**

P1127

[3864] - 18

B.E. (Production & Industrial Engg.)

MATERIALS MANAGEMENT

(1997 Course) (Elective - I) (411085)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) Explain the interdepartmental Relationship of purchase department with the other department of manufacturing organisation. **[8]**

b) Explain purchase cycle with proper flow chart. Enlist the documents used in purchase cycle. **[8]**

Q2) a) Explain the importance of materials managements function in manufacturing organisation. State its objectives and various techniques and tools used to acheive these objective. **[8]**

b) Explain the term Right Quality and Right Quantity of purchase. **[8]**

Q3) a) Describe the procedure for ABC analysis. List out the merits and demerits of ABC analysis. **[8]**

b) Explain the principles of negotiation. **[8]**

Q4) a) Explain various types of values in value analysis. **[6]**

b) Explain the letter of credit. What are the different types of letter of credit? **[6]**

c) What are the advantages and disadvantages of JIT purchasing? **[4]**

P.T.O.

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

i) Importing.

ii) Ethics in purchasing.

iii) Types of Tenders.

SECTION - II

Q6) a) Explain various types of inventories in detail. Give reason for keeping inventory. **[8]**

b) Derive the EOQ formula for the purchase model without shortages. **[8]**

Q7) a) An automobile industry estimate that it will sell 12000 units of its product for the forth coming year. The ordering cost is Rs 100 per order and the carrying cost per unit per year is 20% of the purchase prize per unit. The purchase prize per unit is Rs 50. find

i) Economic order (EOQ). **[3]**

ii) No. of orders per year. **[2]**

iii) Time between successive order. **[1]**

b) Explain Q system (Fixed Order Qty) and P system. (Periodic Review System). **[6]**

c) What is the effect of storage costs on EOQ model? **[4]**

Q8) a) Explain various phases of Value Analysis in detail. **[8]**

b) Explain 'GOLF' (G-NG-L-F) analysis and VED analysis. **[8]**

Q9) Write short note on: **[18]**

a) Logistic Management.

b) Material codification.

c) Waste disposal system.

Total No. of Questions :8] **[Total No. of Pages : 2**

P1128

[3864] - 24

B.E.(Prod. SW)

INDUSTRIAL RELATIONS & MANUFACTURING MANAGEMENT

(411125) (1997 Course)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) What is the meaning of labour relations? What are the causes & effects of strained industrial relations? **[8]**

b) What are the characteristics of Indian Industrial labour working in service sector? How these are different from those working in manufacturing sector? **[8]**

Q2) a) Discuss the Indian Trade Union act. **[8]**

b) Discuss the provisions for the settlement of dispute under the industrial dispute act, 1947. **[8]**

Q3) a) What is Motivation? Explain how can motivation helps in improving industrial relations? **[4]**

b) Incentives are necessary for smooth & efficient running of a factory comment. **[6]**

P.T.O.

c) Two operators, A&B while working on two identical lathe machines produced respectively 1500&1700 number of some component whose standard production is 200 numbers per hour. Labour hour rate is Rs.6. Rate differentials to be applied as-80% of standard piece rate for below standard performance, 120% of the standard rate for standard & above standard performance. Assuming 8 hrs. working day, calculate earning of each operator. **[6]**

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

a) Collective bargaining. b) Non-financial incentives.

c) Objectives & functioning of trade unions. d) Objectives of ILO.

SECTION - II

Q5) a) Explain the role played by the following departments in the manufacturing management. **[9]**

i) Finance ii) Materials iii) Design.

b) What is material handling? State principles involved in it. **[7]**

Q6) a) Discuss the types of 'maintenance'. **[8]**

b) Define & differentiate between project & jobbing production. **[8]**

Q7) a) Discuss the main functions of 'production planning & control'. **[8]**

b) Discuss Break-even analysis in detail. **[8]**

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

a) Types of Layouts. b) JIT c) Process planning

d) Fore casting e) Productivity improvement.

Total No. of Questions :8] **[Total No. of Pages : 2**

P1129

[3864] - 25

B.E.(Prod. S/W)

POWDER METALLURGY

(1997 Course) (411085)

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

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two 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 powder metallurgy? Discuss in brief some of the modern developments in powder metallurgy. **[8]**

b) Briefly discuss the advantages & limitations of structural parts produced by P/M techniques. Compare the P/M method with other fabricating methods. **[8]**

Q2) a) What is meant by metal powder characteristics? Discuss the chemical, physical & technological characteristics of metal powders. **[8]**

b) Describe the various methods used for the determination of particle size & particle size distribution of powder. **[8]**

Q3) a) Critically explain the technology of production of iron powders by reduction, electrodeposition, thermal / carbonyl decomposition & atomisation methods. **[8]**

b) What is blending or mixing? It is extremely desirable in the production of P/M parts, explain in brief. **[8]**

P.T.O.

Q4) Write short notes on following (any three): **[18]**

a) Powder conditioning.

b) Powder compaction.

c) Production of ultrafine powders.

d) Flow sheet of electrolytic process.

SECTION - II

Q5) a) Explain the role of different factors on the degree of compaction of a metal powder. To what extent can the theoretical density be approached by compacting. **[8]**

b) What are the factors that are required to be considered for a die design? Does the die design impose any limitation on the compacting load? Explain. **[8]**

Q6) a) Compare & contrast hot compacting with cold die compacting. Do you expect any variation in compact strength & other properties in compacts obtained by both these two methods. **[10]**

b) What is sintering? Explain the stages of it. **[6]**

Q7) a) Why should the sintering furnace atmosphere be controlled? What atmospheres are generally used & how are these maintained / created? **[8]**

b) Discuss the steps involved in the production of self lubricating bearings. What are their fields of application? **[8]**

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

a) Sintered metal friction materials.

b) Flowsheet of production of tungusten carbide powder.

c) Ferrites.

d) Heat treatment of P/M parts.

e) Finishing P/M parts.

Total No. of Questions :10] **[Total No. of Pages : 2**

P1130

[3864] - 26

B.E. (E & TC)

COMPUTER ARCHITECTURE

(1997 Course)

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

Instructions to the candidates:

1) ***Answers 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 with proper diagram the trends towards parallel processing. **[6]**

b) With proper block schematic explain basic uniprocessor Architecture.**[6]**

c) Explain the following concepts in brief related to uniprocessor system.**[6]**

i) Multiprogramming ii) Time sharing

Q2) a) In a pipelined computer, successive instructions are executed in an over lapped fashion. Justify. **[8]**

b) With the help of block schematic explain the functional structure of an SIMD array processor. **[8]**

Q3) a) Draw only the block diagrams for Flynn's classification of various computer organizations. **[8]**

b) Compare serial processing with parallel processing. **[8]**

Q4) a) Describe at least four characteristics of MIMD multiprocessors that distinguish them from multiple computer systems or computer networks. **[8]**

P.T.O.

b) Explain the following terminologies associated with SIMD computers.

i) Barrel-shifting functions

ii) Cube-routing functions. **[8]**

Q5) a) Explain in brief characteristics of vector processing. **[8]**

b) With the help of diagram explain the logical structure of the communication between tasks using multiprocessor. **[8]**

SECTION - II

Q6) a) Explain with proper diagram the classical memory hierarchy. **[6]**

b) Explain in brief the concept of virtual memory. **[6]**

c) In parallel processing which addressing schemes are used for main memory. **[6]**

Q7) a) How virtual to real address translation is done using page map. **[8]**

b) Explain segmented memory system in brief **[8]**

Q8) a) Compare parallelism versus pipelining. **[8]**

b) With the help of simple block diagram explain basic data flow mechanism. **[8]**

Q9) a) List various applications of parallel processing and explain one application in brief. **[8]**

b) Explain parallel processing at job level and task level. **[8]**

Q10)a) What are various memory policies? Explain one of the policy with proper example. **[8]**

b) For multiprocessor system explain the significance of the following terms.

i) Message passing

ii) Multithread. **[8]**

Total No. of Questions :10] **[Total No. of Pages : 2**

P1131

[3864] - 45

B.E. (Electronics Engg.)

PROCESS INSTRUMENTATION

(1997 Course) (Elective - I) (404205)

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) ***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 suitable examples explain open loop and closed loop control system. **[8]**

b) Define the term transducer. With suitable examples give classification of transducers. **[8]**

Q2) a) Define the term vacuum. Explain any one technique to measure vacuum pressure. **[8]**

b) What is meant by LVDT? Explain in detail the application of LVDT for displacement measurement. **[8]**

Q3) a) List the different continuous controllers. Explain proportional controller in detail. **[8]**

b) Explain in detail op-amp based proportional + derivative controller. **[8]**

Q4) a) Explain in detail the principle and working of flapper NOZZLE system in detail. Obtain its transfer function. **[8]**

b) Compare electronic, pneumatic & hydraulic systems. **[8]**

P.T.O.

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

a) V/I converter.

b) pH Measurement.

c) Hydraulic PI controller.

d) Tuning of PID controller.

SECTION - II

Q6) a) Explain the following terms related to PLC: **[8]**

i) Scan time.

ii) PLC ladder diagram.

iii) On delay and off delay timer.

b) With suitable assumptions draw the ladder diagram for elevator system. **[8]**

Q7) a) What do you understand by the term interlocks. Explain any two interlocks for boilers with its operation. **[8]**

b) List the different types of boilers. Explain three element drum level control in boiler. **[8]**

Q8) a) Explain adaptive control system in detail. **[8]**

b) Explain the following terms related to control valve.

i) Valve coefficient.

ii) Rangeability.

iii) Cavitation.

iv) Turn down. **[8]**

Q9) a) Explain in detail supervisory control system. **[8]**

b) Explain in detail instrument control panel. **[8]**

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

a) Dryer controls.

b) Actuators.

c) Distillation column controls.

d) Two wire transmitters.

b) Define the following for contineous and discrete system. **[8]**

i) Probability density function.

ii) Probability distribution fun.

iii) Mean.

iv) Median.

Q5) Write notes on : **[16]**

a) Modeling of servo system.

b) Modeling of auto-pilot system.

SECTION - II

Q6) a) What is usefulness of random numbers? Can we generate random numbers by programming. **[6]**

b) Explain any one method for generation of random numbers and perform test of randomness. **[10]**

Q7) a) What is the significance of Chi^2 method? Explain the pre-requisite for this method. **[8]**

b) Explain the single server and 2-server system and define CAT (Commulative Arrival Time), CDT (Commulative Departure Time), service time, and wait time. **[10]**

Q8) a) What do you mean by system dynamics? Explain. **[6]**

b) Explain the limitations by queing system on simulation. **[10]**

Q9) a) Draw the flow chart for 4-bit up-counter to be implemented using VHDL. **[8]**

b) Draw the flow-chart for telephone system. **[8]**

Q10) Write notes on : **[16]**

a) CAD tools for simulations.

b) Validitation.

Total No. of Questions : 10] **[Total No. of Pages : 2**

P1132

[3864]-51
B.E. (ETX)
COMPUTER BASED SIMULATION AND MODELING
(1997 Course)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) What do you mean by the systems? Explain the various types of systems giving examples. **[10]**

b) Explain the limitations of system simulation. **[6]**

Q2) a) What do you mean by system modeling? Explain the modeling types in detail. **[12]**

b) What is the advantage (s) of system modeling? **[4]**

Q3) a) What do you mean by system simulation? Explain with an example. **[10]**

b) What is the significance of simulation. **[6]**

Q4) a) Prove for a queing system probability of Arrival **[10]**

$$q_k(t) = \left(\frac{t}{\alpha}\right)^k \frac{1}{k!} e^{-t/\alpha}$$

where α : Inter-Arrival Time.

k : instant at which arrival.

q : probability of arrival.

P.T.O.

Total No. of Questions :10] **[Total No. of Pages : 2**

P1133

[3864] - 68

B.E. (Ind. Electronics)

COMPUTER TECHNIQUES

(1997)

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) What are the advantages of parallel processing over sequential processing? How can parallelism be implemented in uniprocessors? State applications of parallel processing. **[18]**

Q2) Draw block diagram of array processors & explain it. Give examples & applications of array processors. **[16]**

Q3) Describe the types of topologies used in computer networks & compare them based on speed, complexity, cost etc. **[16]**

Q4) What is CSMA/CD? Describe it in detail. **[16]**

Q5) Write notes on (any two): **[16]**

a) Error control techniques in computer networks.

b) Wireless LAN 802.11.

c) Computer viruses.

P.T.O.

SECTION - II

Q6) Elaborate in detail, any one mobile telephone system. **[18]**

Q7) Draw & explain cryptography model. Explain any one cryptography standard. **[16]**

Q8) a) Draw & explain system architecture & file system of unix.

b) List & explain any eight commands in unix. **[16]**

Q9) a) Explain program development cycle of software engineering.

b) Explain the memory management techniques used in unix/linux. **[16]**

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

a) Data compression techniques.

b) ISO-OSI model.

c) Typical mother board.

Total No. of Questions :8] **[Total No. of Pages : 3**

P1134

[3864] - 87

B.E.(Chemical)

PROCESS DYNAMICS & CONTROL

(1997 Course)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) Explain the functions of feedback control system. **[6]**

b) A mercury thermometer at 25°C is suddenly dipped in boiling water. If time constant of the thermometer is 20 sec, find the temperature reading after 5, 10, 15 & 20 seconds. **[6]**

c) Define: **[6]**

i) Proportional gain of P-controller.

ii) PB of P-controller.

iii) Reset time of PI- controller.

iv) Rate time of PD-controller.

v) Dead time.

vi) Time constant of thermometer.

P.T.O.

Q2) a) Starting from differential equation model, derive the transfer function of a first-order system. Also derive the expression for unit-step response of the system. Sketch the response curve. **[8]**

b) What are the interacting and non-interacting liquid tank systems? State their transfer functions $\frac{\overline{H}_2(s)}{\overline{Q}i(s)}$ and sketch the response of height H_2 in tank ② for unit step change in input flow rate Qi to the tank ① **[8]**

Q3) a) Draw block diagram of feedback control system. Derive the expression for servo and regulator response of the system. **[8]**

b) A first-order process having transfer function $G_p = \frac{1}{s+1}$ is controlled using a P-controller with $K_C = 5$. Assuming $G_m = G_f = 1$, derive the expression for servo response of the closed-loop system. Also calculate the offset in the value of output. **[8]**

Q4) a) Explain ON-OFF control system. Sketch open-loop and closed-loop response characteristics of the system. What is differential gap in ON-OFF control action? State industrial applications of these controllers. **[8]**

b) A first-order process having transfer function $G_p(s) = \frac{K}{\tau s+1}$ is controlled using a PI-controller having $G_C(s) = K_C\left(1 + \frac{1}{\tau_I s}\right)$ derive the expression for output servo-response of the closed-loop system. Find the closed- loop servo transfer function and its parameters. Also calculate the offset. **[8]**

SECTION - II

Q5) a) A feedback control system has the characteristic equation-

$$s^4 + 20s^3 + 224s^2 + 1240s + 2400 + K = 0$$ **[8]**

i) Using the Routh array method find the range of values of K for which system will be stable.

ii) Also find the value of K which will cause sustained oscillations, along with the corresponding frequency of oscillations.

b) Sketch the root locus plot for a system having forward path transfer function as $G(s) = \frac{K}{s(s+2)(s+3)}$. Clearly indicate the break-away point and points of intersection of the root locus with imaginary axis. Explain the behaviour of output at these points. **[8]**

Q6) a) What is frequency response of the given process having transfer function $G(s) = \frac{\overline{Y}(s)}{\overline{U}(s)}$? How will you represent the frequency response graphically? Indicate the gain margin and phase margin on the frequency response curves. **[6]**

b) Sketch asymptotic Bode plot for a feedback control system having open-loop transfer function $GH = \frac{3}{s(1+0.05s)(1+0.2s)}$. **[10]**

Determine:-

i) Gain crossover frequency and corresponding phase margin.

ii) Phase crossover frequency and corresponding gain margin.

iii) Comment on stability of the system.

Q7) a) State transfer function of a PID-controller. What is tuning of PID-controller? Explain Cohen-coon method of tuning a PID-controller. **[8]**

b) Explain cascade control scheme for controlling temperature of liquid inside CSTR with jacket fluid temperature as the secondary control variable. State advantages of cascade control over single-loop temperature control. **[8]**

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

a) Ratio control.

b) Feedforward control.

c) Pure capacitive (integral) process.

Total No. of Questions : 10] **[Total No. of Pages :3**

P1135

[3864] - 12
B.E. (Mech. S/W)
APPLIED THERMODYNAMICS - III
(1997 Course)

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

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Answer any three questions from section I and any three questions from section II***
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 static and stagnation properties? Explain. **[4]**

b) Explain with sketches the following

i) Mach line, ii) Mach angle, iii) Mach cone, iv) Mach wave, **[4]**

c) With usual notation derive the following relation for adiabatic flow **[8]**

$$Po = P + \frac{\rho V^2}{2}\left[\frac{2}{KM^2} + \frac{M^2}{4} + \frac{2-K}{12}.M^4 + ...\right]$$

Q2) a) Explain function and applications of Nozzles. **[5]**

b) Steam enters a convergent - divergent nozzle at pressure of 22 bar and temperature of 300^0c the exit pressure is 4 bar steam flow rate is 11 kg/sec find - **[12]**

i) Velocity of steam at throat and exit.

ii) Area of nozzle at throat and exit in mm^2.

Q3) Write short notes on (any four) : **[16]**

a) Compounding of turbines.

b) Comparison of steam turbine and steam engine.

c) Zone of silence and zone of action.

d) Surface condensers.

e) Air pumps.

P.T.O.

Q4) A steam turbine has a steam flow rate of 10,000 kg/hr. Steam enters the surface condenser at 40ºC and 0.85 dry. Air leakage is 30 kg/ hr.condensate is at 300ºC find - **[16]**

a) Capacity of the wet air pump in m^3/min.

b) Quantity of coolingwater circulated, if the rise in temperature is 10ºC in kg/min.

Q5) a) Write - Governing of steam turbine. **[5]**

b) Steam is supplied to a three stage turbine at 35 bar and 400ºC and exhaust at 0.05 bar and o.9 dry. if the work developed per stage is equal, find.**[12]**

i) Condition at entry to each stage.

ii) Stage efficiencies.

iii) Reheat factor.

iv) Overall efficiency.

SECTION - II

Q6) a) Discuss the working of BENSON Boiler with a neat sketch and list the advantages of this boiler. **[8]**

b) Explain the important features of high pressure boilers. **[6]**

c) Write a note on pulverised fuel firing. **[4]**

Q7) a) Explain the working of a closed cycle gas turbine with a neat layout and list advantages and disadvantages of closed cycle plant. **[8]**

b) The following data referes to a gas turbine plant.

i) Air at 1 bar and 300 k is compressed adiabatically to 6.2 bar.

ii) Cp for air = 1.005 kJ/kg - k and r = 1.4.

iii) The compressor efficiency is 88%.

iv) The fuel heating value 44186 KJ/kg and fuel air ratio is 0.017.

v) The turbine internal efficiency is 90% calculate the work out put of turbine and work input to compressor per kg of air compressed and thermal efficiency of plant. Assume Cp = 1.147 kJ/kg - K and r =1.333 for products of combustion. **[8]**

Q8) Write notes on (any four) : **[16]**

a) Co-generation.

b) PWR.

c) Nuclear Fuels.

d) Feed water treatment.

e) Nuclear waste disposal.

Q9) a) Explain the load curves for four different consumers. How load duration curve is constructed and what is its use? **[8]**

b) Define and explain the following:Diversity factor, Load factor, Demand factor and capacity factor. **[8]**

Q10)a) Explain the working of RAM jet with a neat layout. Discuss its thermodynamic cycle. List its advantages, disadvantages and applications. **[10]**

b) Explain with a neat sketch the working of liquid propellant rocket. **[6]**

Total No. of Questions :10] **[Total No. of Pages : 2**

P1136

[3864] - 13

B.E. (Mechanical Engineering)

MICROPROCESSOR APPLICATIONS

(1997 Course) (402045) (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 different types of semiconductor memories with suitable examples. **[10]**

b) What are distinguishing features of microcontroller over microprocessor? Explain application areas of microcontrollers and microprocessors. **[8]**

Q2) a) Describe bit oriented instructions of 8051. What are the advantages of bit oriented instructions? **[8]**

b) Explain structure of port 1 of 8051. **[6]**

c) Explain PSW register in 8051. **[2]**

Q3) a) Describe use of RS232C standard for data transmission and reception. Also explain RS232C standards in detail. **[10]**

b) Explain four modes of timers of 8051. **[6]**

P.T.O.

Q4) a) Explain various interrupts used in 8051. **[8]**

b) Describe idle and power down modes of 8051. **[8]**

Q5) a) With suitable diagram, explain the working of successive approximation ADC. **[8]**

b) Explain basic operation of DAC. Also explain different DAC characteristics. **[8]**

SECTION - II

Q6) a) Explain with suitable diagram, the working of PC based data acquisition system. **[8]**

b) What are various application development environments used in data acquisition systems? Explain in detail. **[10]**

Q7) a) State features of PLC. Explain architecture of PLC with block diagram. **[8]**

b) What are steps involved in problem solving using ladder diagram? Explain with suitable example. **[8]**

Q8) a) Design a boiler control system using PLC. Draw necessary PLC ladder diagram. **[12]**

b) Sketch common notations for fuse and motor in PLC ladder diagram. **[4]**

Q9) a) How to multiplex analog inputs to ADCs? Explain. **[8]**

b) Discuss the applications of different types of ADCs. **[8]**

Q10 a) Design a microprocessor based weighing machine. Draw necessary block diagram and flow chart. **[12]**

b) What are different specifications of differential pressure transmitter? Explain in brief. **[4]**

Total No. of Questions :10] **[Total No. of Pages : 2**

P1137

[3864] - 91

B.E. (Computer Engineering)

MULTIMEDIA TECHNIQUES

(1997 Course) (410252)

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

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two 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) Fill in the blanks- **[10]**

i) The sampling rate for CDDA quality sound is_____.

ii) In HDTV the aspect ratio is _____.

iii) "For loss less digitization, the sampling rate should be at least twice the max. Frequency response" is a _____.

iv) Picture elements are commonly called as _____.

v) In India _____ Television broadcasting standard is used.

b) What is authoring? Explain DirectX authoring tool. **[8]**

Q2) a) Enlist the minimum specifications of Multimedia PC level 1 and level 2. **[8]**

b) Which are the Multimedia supported databases? Differentiate between the Conventional databases and Multimedia databases. **[8]**

Q3) a) Explain GIF file format in detail. **[8]**

b) Discuss the factors that determine size of file and quality of sound for audio capture and playback. What are various chunks present in a sound file stored as WAV format? **[8]**

P.T.O.

Q4) a) What is HDTV? Why the quality of HDTV is better? Justify. **[8]**

b) Explain the process of image acquisition and the devices involved in it. **[8]**

Q5) a) What is variable length coding? Explain MP3 encoder in details. **[8]**

b) What is streaming? How it is useful in multimedia application development? List the protocols used in streaming. **[8]**

SECTION - II

Q6) a) Which are the various modes of JPEG Compression? Explain Hierarchical JPEG compression. **[8]**

b) What is MIDI? Explain MIDI system and its control commands. **[8]**

Q7) a) What do you mean by lossy and lossless compression? Explain Huffmans compression with an example. **[8]**

b) Explain the internal storage structure of Digital Versatile Disc with labels and layers of storage. **[8]**

Q8) a) Calculate the capacity of a CD-DA, which has a 74 min play time. The sound stored on CD-DA is a stereo,16-bit linear quantified at 44.1 KHz sampling rate. **[8]**

b) Which are the types of nodes in VRML? Write a script for implementing dining table using VRML? **[8]**

Q9) a) Explain the designing of Hand gloves for their use in Multimedia Applications. **[8]**

b) What is the main goal of Document Architecture ODA? Explain in brief the SGML document architecture. **[8]**

Q10 Write short notes on (Any Three):

a) Microsoft Windows Multimedia Extensions. **[18]**

b) 2D and 3D Animation.

c) Head mounted displays.

d) Define Hue & Saturation.

Total No. of Questions : 12] **[Total No. of Pages :4**

P1138

[3864] - 103
B.E. (Civil)
QUANTITY SURVEY, CONTRACTS & TENDERS
(2003 Course)

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

Instructions to the candidates:

1) ***Answer Q1 or Q2,Q3 or Q4,Q5 or Q6 from Section - I and Q7 or Q8,Q9 or Q10,Q11, or Q12 from Section - II.***
2) ***Answers to the two Sections should be written in separate 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 square room of internal dimensions 3m × 3m × 3m has the following openings in it.

a) Door $D_1 \rightarrow$ 1.8 m × 2.1 m, thickness of door frame 300 mm.

b) Door $D_2 \rightarrow$ 1.2m × 2.1 m, thickness of door frame 100 mm.

c) Exhaust fan opening → 150 mm × 150 mm.

d) Window $W_1 \rightarrow$ 2.3 m × 1.5 m, thickness of window frame 50 mm.

e) Window $W_2 \rightarrow$ 1.5 m × 1.5 m, thickness of window frame 50 mm.

Wall thickness is 300 mm.

Door D_2 is centrally located in the thickness of wall. Window sill from inside is 150 mm. External plaster is 25 mm thick sand faced in C.M (1:3) whereas internal plaster is 19 mm thick in C.M (1:5) sunla finish. Slab thickness is 200 mm. Brickwork is in C.M (1:8) using I.S bricks. Assuming suitable additional data and applying rules of I.S 1200, work out

i) Item quantity for brickwork. **[4]**

ii) Item quantity for external plaster. **[4]**

iii) Item quantity for internal plaster. **[4]**

iv) Cost of bricks, cement and sand required to execute the above items of work. **[6]**

P.T.O.

OR

Q2) An isolated trapezoidal column footing has the following dimensions:-

D = 500 mm, d = 200 mm, $A_1 = 2_m \times 2_m$

A_2 = 800 mm × 800 mm. Mix used is (1:1$\frac{1}{2}$: 3).

Reinforcement steel is 10mm ϕ, TOR at 160mm C-C bothways. Column size is (600mm × 600mm). Determine.

a) Item quantity for concrete using Prismoidal formula **[3]**

b) % of steel reinforcement used. **[3]**

c) Item quantity for formwork required for footing. **[3]**

d) Bar bending schedule for steel reinforcement. **[3]**

e) Cost of cement, sand, coarse aggregates and steel required to execute the above works. **[6]**

Q3) a) Explain advantages of preparing an approximate estimate. **[4]**

b) With examples, explain any 3 methods of preparing an approximate estimate. **[12]**

OR

Q4) a) Explain advantages of preparing a detailed estimate. **[4]**

b) Differentiate between revised estimate and supplementary estimate with examples each. **[4]**

c) Explain why and how contingencies and W.C. establishment costs are added at the end, while preparing a detailed estimate. **[4]**

d) Explain correctly any 4 painting factors as per IS 1200, used for painting of doors and windows. **[4]**

Q5) 10m^3 of CCTW door frames are to be prepared and fixed in position, in brick masonary. Prepare

a) Brief specification for BOQ. **[2]**

b) Detailed specification for execution and measurement. **[8]**

c) Item Rate per unit for door frames Assume correct, suitable data as required. **[6]**

OR

Q6) 10m^3 of M (1:1:2) R.C.C without steel reinforcement is to be provided and laid for construction of slab. Prepare

a) Brief specification for BOQ. [**2]**

b) Detailed specification for execution and measurement. **[8]**

c) Item rate per unit of R.C.C work. **[6]**

SECTION - II

Q7) a) Differentiate between cost, price and value with an example. **[3]**

b) Explain any 4 types of values with examples. **[4]**

c) Explain any one method of valuation in detail. **[4]**

d) Work out the present value of property based on following data:- **[7]**

i) Monthly rent is Rs. 50,000/-

ii) Outgoings are at 40%

iii) Interest on sinking fund investment is 4%

iv) Interest on land investment is 8%

v) Interest on capital investment is 10%

vi) Total useful life - 75 years.

vii) Future life from valuation data - 15 years.

viii) Total present land worth = Rs. 30 lakhs.

OR

Q8) a) Explain any 2 methods of depreciation in brief. **[6]**

b) Explain belting method of valuation with an example. **[4]**

c) Work out value of property based on following data. **[8]**

i) Original construction cost = Rs. 10 lakhs.

ii) Depreciation of 90% is to be done using sinking fund method.

iii) Total useful life :- 75 years.

iv) Life consumed :- 40 years.

v) Present land rate :- Rs 10,000/- per m^2

vi) Land area :- 50m × 40m.

vii) Interest rate on sinking fund :- 5.5%.

Q9) a) Explain 4 pre -qualifications in any tender with any example. **[6]**

b) Explain scrutiny of tender documents with examples. **[6]**

c) Explain 3 bid system with an example. **[4]**

OR

Q10)a) Differentiate between selective tendering and open tendering with proper examples. **[6]**

b) Explain in brief any 4 important constituents of a tender document. **[6]**

c) Explain front end loading with a proper example. **[4]**

Q11)a) Explain any 6 important tender condition provisions made by the MOS & PI. **[12]**

b) Explain in brief the FIDIC conditions of contract. **[4]**

OR

Q12)a) As an engineer incharge of works, suggest your action w.r.t. **[9]**

i) Steel reinforcement in beam is exposed and corroded.

ii) Internal plaster is not in perfect line and level.

iii) Flooring is not in proper slope and water is getting stagnated.

b) Explain void contract with an example. **[3]**

c) Explain the various ways in which contractual disputes can be resolved. **[4]**

Total No. of Questions : 12] **[Total No. of Pages : 4**

P1142

[3864]-173

B.E. (Production)

MANUFACTURING AUTOMATION AND CONTROL

(2003 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) For a 50 kN press tool weigh 5 kN. Calculate the pressure required for pressing operation if bore diameter of cylinder is 30 mm, rod area is 25 mm and counter balance valve is used in circuit. **[6]**

b) What are the functions of fluid reservoir in hydraulic system? **[4]**

c) Explain with neat sketch the working of deceleration valve. **[8]**

OR

Q2) a) What size of accumulator is necessary to supply 5000 cm^3 of fluid in a hydraulic system having maximum operating pressure of 200 bar, which drops to minimum 105 bar. Assume adiabatic expansion and compression of gas with pre-charge of accumulator at 70 bar. **[6]**

b) Explain with neat sketch the pressure reducing valve to maintain fixed pressure difference between inlet and outlet. **[6]**

c) Explain with neat sketch working of swash plate type axial piston pump. **[6]**

P.T.O.

Q3) a) A hydraulic cylinder having bore diameter of 180 mm and a rod diameter of 125 mm is connected regeneratively. The flow rate from full bore end on retract is 250 *l*/min. Calculate the extend speed and extend thrust if maximum pressure is 100 bar. **[8]**

b) Explain with neat sketch the meter out circuit to maintain constant feed rate with variation in load. **[8]**

OR

Q4) The pressure flow requirement of a hydraulic system is shown in Fig. 1.

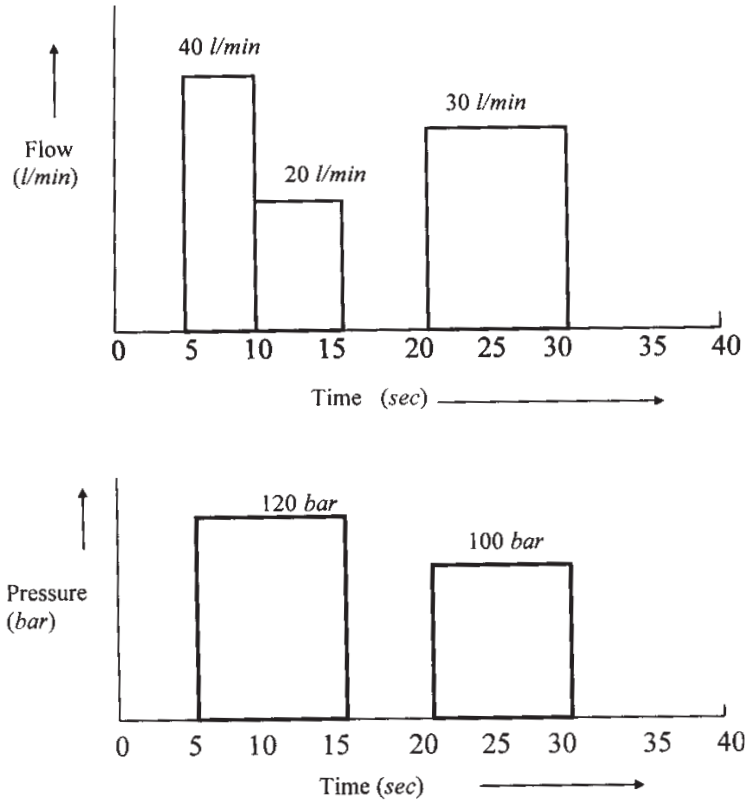


Fig. 1

Draw the hydraulic circuits and calculate the efficiency of each circuit when using : **[16]**

a) Single fixed displacement pump.

b) Single fixed displacement pump with accumulator.

c) Two fixed displacement pump.

d) Single fixed displacement pump with intensifier.

Q5) a) Draw the suitable pneumatic circuit using cascade system to actuate cylinder 'A', cylinder 'B' and cylinder 'C' as per position step diagram shown in Fig. 2. **[10]**

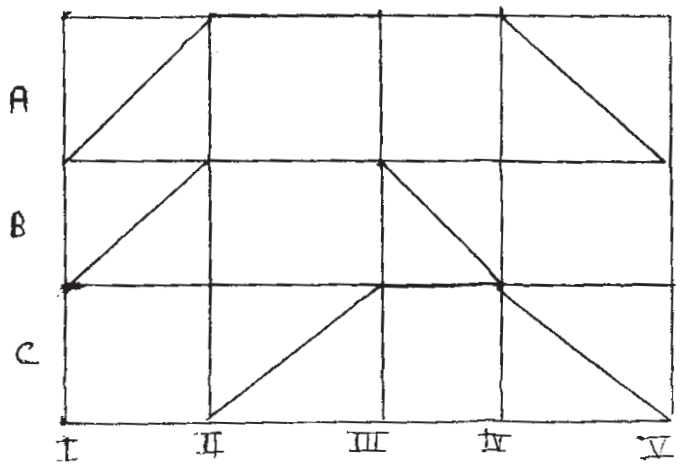


Fig . 2

b) Explain with suitable example the working of twin pressure valve used in pneumatic system. **[6]**

OR

Q6) a) How do pneumatic actuators differ from hydraulic actuators? **[4]**

b) Explain with neat sketches working of fluidic AND gate and OR gate. **[6]**

c) Explain with neat sketch the construction and working principle of two stage air compressor. **[6]**

SECTION - II

Q7) a) Explain for a microprocessor, the roles of : **[8]**

i) accumulator ii) status

iii) memory address iv) program counter registers

b) Draw a ladder diagram to turn a red light ON for 2500 ms when a normally open start push button is pushed. The PLC timer tick is 10 ms. A normally stop button resets the system. **[8]**

OR

Q8) a) Explain with suitable example the use of counters in PLC. **[8]**

b) Write a program to do following : **[8]**

i) Load number 30 H in register B and 39 H in register C.

ii) Subtract 39H from 30H.

iii) Display the answer at port1.

Q9) a) A PID controller has K_p = 2.0, K_I = 2.2 s^{-1}, K_D = 2 s. Controller output for zero error is 40%. Plot the controller output for the error shown in figure 3. **[12]**

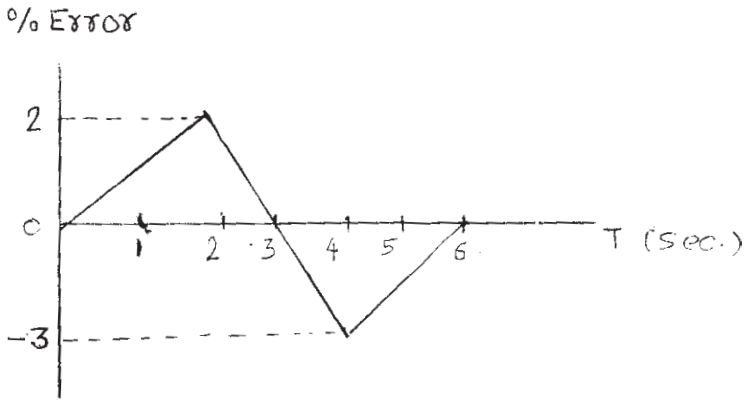


fig.3

b) How micro controller does differ from a microprocessor? **[4]**

OR

Q10)a) Explain with suitable example latch circuit. **[8]**

b) Specify the four control signals commonly used by 8085 microprocessor. **[8]**

Q11)a) Explain with suitable example the gravity fed magazine, weight operated magazine, and friction fed magazine. **[10]**

b) Explain various types of work transfer systems. **[8]**

OR

Q12)Write short notes on : **[18]**

a) FMS layouts.

b) Types of robot end effectors.

c) Design for automated assembly.

❖❖❖❖

Total No. of Questions :12] **[Total No. of Pages : 3**

P1146

[3864]-262
B.E.(E&TC)
VOICE NETWORKS
(2003 Course)(404215)

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

Instructions to the candidates:

1) ***Answer three questions from Section I and three questions from Section II.***
2) ***Attempt not more than six questions of which at least three questions must be from each Section.***
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 in detail various subscriber loop signaling systems used in Telephone Switching. **[8]**

b) Describe role of redundancy in Stored Program Control Electronics Switching systems. How it is achieved in its different configuration? **[6]**

c) Enlist four distinct points between Single stage and Multistage network. **[4]**

OR

Q2) a) Describe with necessary diagram the working of Time multiplexed space switch. Calculate the number of trunks that can be supported on a time multiplexed space Switch, given that

i) 64 channels are multiplexed in each stream.

ii) Control memory access time is 50 ns.

iii) Bus switching and transfer time is 50 ns per transfer. **[8]**

b) List at least six differences between the postal and telephone systems and bring out the analogy between S&F and circuit switched connections. **[6]**

c) What are the differences between common control and direct control? **[4]**

P.T.O.

Q3) a) Explain typical traffic distribution for central processors and peripheral processors. **[8]**

b) A call processor in an exchange requires 100 ms to service a complete call. What is the BHCA rating for the processor ? If the exchange is capable of carrying 800 E of traffic, what is the call completion rate? Assume an average call holding time of three minutes. **[8]**

OR

Q4) a) Explain the Service Level for telecommunication traffic. How Traffic usage is defined ? **[8]**

b) State and explain Erlang B and Poisson's formula. A trunk accumulated 0.75 Erlangs of usage while 9 calls were carried in a hour with no overflow. What is the average holding time per call in seconds, CCS and Erlangs? **[8]**

Q5) a) Describe in detail transmission structure of ISDN. **[8]**

b) Draw ISDN reference points and Functional groupings model and explain user network interface. **[8]**

OR

Q6) a) Explain in detail the architecture of ISDN and its objectives. **[8]**

b) With the help of neat sketches explain different services supported by ISDN. **[8]**

SECTION-II

Q7) a) With the help of neat block diagram explain GSM architecture and its evolution. **[6]**

b) Explain different interference reducing mechanism in GSM. **[6]**

c) Enlist Speech Codec attributes and describe Half Rate and Full Rate codec used in GSM. **[6]**

OR

Q8) a) Explain with the flow diagram and various channel association to originate a call in GSM network. **[6]**

b) Describe in detail various techniques in GSM to enhance spectral efficiency. **[6]**

c) Explain various data services in GSM system. **[6]**

Q9) a) With the help of neat diagram describe DSSS system transmitter. Calculate the processing gain for a DSSS system that has a 15 Mega chips per second (Mcps) code clock rate and 9.6-kbps information rate. How much improvement in the processing gain will be achieved if the code generation rate is changed to 60Mcps? **[8]**

b) Describe various Logical Channels in CDMA. **[8]**

OR

Q10)a) Compare GSM &IS-95 CDMA architecture w.r.t following parameters:

i)	Frequency Band	ii)	Channel Bandwidth
iii)	Voice Quality	iv)	Interference
v)	Handoff	vi)	System capacity
vii)	Radio interface	viii)	Economics

[8]

b) Explain Walsh Code and how it is incorporated in CDMA. **[8]**

Q11)a) Describe Real time protocols used in VoIP. **[8]**

b) Describe in detail MEGACO/H.248 Protocol. **[8]**

OR

Q12)a) Define VoIP? Draw and explain the various elements of Voice over IP network. **[8]**

b) Explain the architecture of Session Initiation Protocol and SIP session setup. **[8]**

⌘⌘⌘⌘

Q5) a) Differentiate FPGA w. r. t. CPLD in context of architectural details. **[9]**

b) What makes CPLD non volatile? Explore I/O block of CPLD in detail. **[9]**

OR

Q6) a) List typical technical features & specifications of any FPGA family in detail. **[9]**

b) Explore the LUT-based logic & interconnect mattrix of FPGA in detail. **[9]**

SECTION - II

Q7) a) Why is power distribution so important? Explain the different techniques. **[8]**

b) Draw the ckt diagram of SRAM/DRAM memory cell & its read, write timing diagram in detail. **[8]**

OR

Q8) a) What is power optimization? What are ways to achieve it? Explain in brief. **[8]**

b) Give the generalized ASIC design flow & explain each step in brief. **[8]**

Q9) a) Starting with voltage Transfer curve of CMOS Inverter prove that $W_p/W_n \approx \mu_n/\mu_p$ is needed to achieve symetry. **[8]**

b) Design CMOS logic for Y = AB + C. Compute area on chip. If this logic operates at V_{DD} = 1 Volt, load of 10pF and output Y is changing at the rate of 10 MHz, calculate power dissipation. **[8]**

OR

Q10)a) What is PDP? What does designer understand from it? What is its maximum value for a logic? **[8]**

b) Which different device & wiring parasitics are important in digital design? Which are dominant? **[8]**

Q11)a) What is JTAG? How does boundary scan work when number of devices/ FPGAS is more than one on a board? **[9]**

b) Why is testability necessary? Explain with suitable example. **[9]**

OR

Q12)a) What are the different faults involved in chip design? What are techniques to minimize them? **[9]**

b) Explore partial scan & full scan with suitable examples in detail. **[9]**

☒☒☒☒

Total No. of Questions :12] **[Total No. of Pages : 2**

P1148

[3864]-264
B.E. (E & T/C)
VLSI DESIGN
(2003 Course)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) Certain logic checks event, transaction on a data line. Write VHDL code for this logic. What is quiet attribute? **[8]**

b) What is passive process? Explain with VHDL code for suitable logic. **[8]**

OR

Q2) a) How do you take a decision to choose modeling style of an architecture? On what factors does it depend? Suggest appropriate example. **[8]**

b) Write VHDL code for 8 bit shift register for PISO operation. Write separate function to check clock edge. **[8]**

Q3) a) What are the limitations of FSM? Is there any method to auto convert FSM diagram into HDL code? **[8]**

b) Draw FSM diagram & write VHDL code for bank ATM machine. It senses a credit card insertion, four digit PIN number, five digit amount & then acknowledges to the user. **[8]**

OR

Q4) a) Draw state diagram for 4 digit synchronous ring counter. Write VHDL code & test bench for it. **[8]**

b) How is handshaking done in UART communication? Which attributes in VHDL are useful in it? Explore with example. **[8]**

P.T.O.

Total No. of Questions :12] **[Total No. of Pages : 3**

P1148

[3864] - 264
B.E. (E & T/C)
VLSI DESIGN
(2003 Course)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) Certain logic checks event, transaction on a data line. Write VHDL code for this logic. What is quiet attribute? **[8]**

b) What is passive process? Explain with VHDL code for suitable logic. **[8]**

OR

Q2) a) How do you take a decision to choose modeling style of an architecture? On what factors does it depend? Suggest appropriate example. **[8]**

b) Write VHDL code for 8 bit shift register for PISO operation. Write seperate function to check clock edge. **[8]**

Q3) a) What are the limitations of FSM? Is there any method to auto convert FSM diagram into HDL code? **[8]**

b) Draw FSM diagram & write VHDL code for bank ATM machine. It senses a credit card insertion, four digit PIN number, five digit amount & then acknowledges to the user. **[8]**

OR

Q4) a) Draw state diagram for 4 digit synohronous ring counter. Write VHDL code & test bench for it. **[8]**

P.T.O.

b) How is handshaking done in UART communication? Which attributes in VHDL are useful in it? Explore with example. **[8]**

Q5) a) Differentiate FPGA w. r. t. CPLD in context of architectural details. **[9]**

b) What makes CPLD non volatile? Explore I/O block of CPLD in detail. **[9]**

OR

Q6) a) List typical technical features & specifications of any FPGA family in detail. **[9]**

b) Explore the LIJT based logic & interconnect mattrix of FPGA in detail. **[9]**

SECTION - II

Q7) a) Why is power distribution so important? Explain the different techniques. **[8]**

b) Draw the ckt diagram of SRAM/DRAM memory cell & its read, write timing diagram in detail. **[8]**

OR

Q8) a) What is power optimization? What are ways to achieve it? Explain in brief. **[8]**

b) Give the generalized ASIC design flow & explain each step in brief. **[8]**

Q9) a) Starting with voltage Tranfer curve of CMOS Inverter prove that Wp/Wn $\approx \mu_n/\mu_p$ is needed to achieve symetry. **[8]**

b) Design cmos logic for $Y = AB + C$. Compute area on chip. If this logic operates at $V_{DD} = 1$ Volt, load of 10pF and output Y is changing at the rate of 10 MHz, calculate power dissipation. **[8]**

OR

Q10)a) What is PDP? What does designer understand from it? What is its maximum value for a logic? **[8]**

b) Which different device & wiring parasitics are important in digital design? Which are dominant? **[8]**

Q11)a) What is JTAG? How does boundary scan work when number of devices/FPGAS is more than one on a board? **[9]**

b) Why is testability necessary? Explain with suitable example. **[9]**

OR

Q12)a) What are the different faults involved in chip design? What are techniques to minimize them? **[9]**

b) Explore partial scan & full scan with suitable examples in detail. **[9]**

Total No. of Questions :12] **[Total No. of Pages : 3**

P1149

[3864] - 266
B.E. (E & TC)
ADVANCED POWER ELECTRONICS
(2003 Course)

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

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 from section - I and 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) ***Draw a neat sketch 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 phase controlled converters? Explain with circuit diagram & W/F'S, working of 3ϕ half controlled converter feeding resistive load at $\alpha=60^{o}$ for following. **[10]**

i) Supply phase voltage ii) Supply line voltage

iii) O/P voltage iv) Supply current

v) Current through SCR

b) What is inherent freewheeling? Explain. **[4]**

c) Why 3 ϕ converters are preferred over 1ϕ AC-to DC converters for higher power applications? Justify. **[4]**

OR

Q2) a) Explain the effect of source inductance on performance of 1ϕ HCC with waveforms. Derive expression for its O/P voltage, firing angle α & overlap angle μ. **[10]**

b) What is "string efficiency"? State its significance. **[4]**

c) Why an RLE (-) load is necessary for inversion mode? **[4]**

P.T.O.

Q3) a) What are dual converters? Explain with neat circuit diagram & waveforms working of 1ϕ dual converter with highly inductive load. Deduce equation for circulating current. **[8]**

b) Does the input p.f. of converter depends on the load p.f.? Justify. **[4]**

c) What is coasting in converters? Explain in brief. **[4]**

OR

Q4) a) What are inverters? Explain with neat circuit diagram & waveforms working of 3ϕ transistorized voltage source inverter in 180^{o} conduction mode feeding a balanced star load. **[10]**

b) Justify why PWM inverters are preferred over square wave inverters? **[6]**

Q5) a) Explain the operation of 3ϕ transistorized VSI with 120^{o} mode of conduction feeding balanced star load. **[8]**

b) Explain harmonic ellimination techniques. **[4]**

c) Compare linear, switched mode, Resonant converters. **[4]**

OR

Q6) Write short notes (any three):

a) Static & Dynamic equalizing circuits.

b) Braking techniques.

c) Resonant converter (ZVS).

d) Dual mode dual converter.

e) p.f. improvement techniques. **[16]**

SECTION - II

Q7) a) What are dc drives? Explain with circuit diagram & W/F'S, working of 1ϕ separately excited DC Motor with highly inductive load. **[10]**

b) What are DC Motor performance parameters? Explain. **[6]**

OR

Q8) a) What are stepper motors drives? Explain with circuit diagram & W/F'S, working of stepper motor with characteristics. State its specifications & salient features. **[10]**

b) What are DC servo motors? Explain. **[6]**

Q9) a) What are ac drives? Explain with circuit dia working of 1ϕ speed control technique of induction motor with $\frac{V}{f}$ technique. Comment on Tq, speed ch s. **[10]**

b) What are braking techniques? **[6]**

OR

Q10)a) What is slip power recovery? Explain static Krammer system for speed control of 3ϕ-IM. **[10]**

b) Effects of harmonics on motor drives. **[6]**

Q11)a) What is the necessity of power quality? Explain with different types of powerline disturbance. **[10]**

b) What is energy audit? Explain the required procedure for energy audit? **[8]**

OR

Q12)Write short notes (any three): **[18]**

a) Scherbius system.

b) ON-line UPS.

c) Flux vector control technique of IM.

d) Brushless DC motors.

e) Universal motors.

Total No. of Questions : 12] **[Total No. of Pages : 2**

P1150

[3864] - 267

B.E. (E & T/C)

ADVANCED DIGITAL SIGNAL PROCESSING

(2003 Course)

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

Instructions to the candidates:

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

SECTION - I

Q1) Explain the LMS Algorithm. **[17]**

OR

Q2) Explain the concept of Adaptive filters with the help of NOISE can celler. Derive the necessary equation. **[17]**

Q3) a) Explain forward and backward linear prediction. **[8]**

b) Explain AR, MA and ARMA. **[8]**

OR

Q4) Explain the Levinson Durbin Algorithm and derive the necessary equations. **[16]**

Q5) a) What is power spectrum Estimation? What are limitations of traditional methods. **[8]**

b) Explain the periodogram method. **[9]**

OR

P.T.O.

Q6) a) Explain the welch method and Blackman-Tukey method. **[8]**

b) Explain the modern parametric estimation methods. **[9]**

SECTION - II

Q7) a) Explain multirate DSP? Where is it used? State and explain the application areas where multirate DSP is used. **[10]**

b) Differentiate between Decimation and Interpolation. **[7]**

OR

Q8) a) Explain Decimation with the help of a block diagram. **[9]**

b) Explain sampling rate conversion by Non Integers. **[8]**

Q9) Explain the following terms w.r.t DSP architecture.

a) Harward Architecture b) Pipelining

c) Fixed point d) Floating point. **[16]**

OR

Q10) Explain with Algorithm and diagram how will you implement FFT algorithm using a DSP processor. **[16]**

Q11) Explain the following terms w.r.t speech processing:

a) Vowels b) Diphthongs c) Semi vowels

d) Nasals e) Unvoiced fricatives f) Voiced fricatives **[17]**

OR

Q12) What do you understand by the terms: **[17]**

a) Cepstrum b) Pitch detection

c) Formant d) Vocoders.

Total No. of Questions :12] **[Total No. of Pages : 3**

P1151

[3864] - 270
B.E. (Electronics & Telecommunication)
ELECTRONICS MEASUREMENT SYSTEMS
(2003 Course)

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

Instructions to the candidates:

1) ***Answer three questions from section I and three questions from section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answers will be valued as a whole.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Give circuit diagram for measuring small inductor using LCR-Q meter and derive expression for small inductor 'Ls'. **[8]**

b) Calculate the value of the self capacitance of a coil when the following measurements are made:

i) AL frequency F_1 = 2 MHz tuning capacitor is set at 400pF.

ii) When the frequency is increased to 6 MHz, the tuning capacitor is tuned at 20 pF. **[6]**

c) Explain accuracy and precision of measuring instruments. **[4]**

OR

Q2) a) Explain with block diagram 'Vector Voltmeter'. **[10]**

b) Explain with block diagram true RMS Voltmeter. **[8]**

Q3) a) List different types of standards and explain what is a difference between a primary standards and secondary standards. **[8]**

b) Explain working principle of frequency counter. **[8]**

OR

P.T.O.

Q4) a) A set of voltage measurement by five observers is recorded as - 640m Volts, 650m Volts, 700m Volts,675m Volts and 680m Volts. Calculate.

i) Arithmetic mean ii) Average deviation

iii) Standard deviation and iv) Variance **[8]**

b) How to extend the frequency range of frequency counter? Explain any one technique. **[8]**

Q5) a) Why delay line is required in vertical section of CRO? Explain different types of delay lines. **[8]**

b) Explain with neat block diagram digital storage oscilloscope. **[8]**

OR

Q6) a) With the help of neat diagrams explain difference in dualtrace and dual beam CRO. **[8]**

b) What is oscilloscope probe compensation? How is this adjusted? What effects are noted when the compensation is not correctly adjusted? **[8]**

SECTION - II

Q7) a) Explain with neat diagram TRF wave analyzer. **[8]**

b) Explain with neat diagram any one scanning type spectrum analyzer. **[8]**

OR

Q8) a) Explain with neat diagram THD analyzer. **[8]**

b) Explain logic analyzer with block diagram and give its important specifications . **[8]**

Q9) a) How to measure intermodulation distortion? Explain any one method. **[9]**

b) What is SINAD test? How this test is performed for radio receiver? **[9]**

OR

Q10)a) How to measure complex impedance using network analyzer? Give setup and measurement procedure. **[9]**

b) Explain following terms with reference to communication measurement.**[9]**

i) Dynamic Range ii) Receiver Sensitivity

iii) Receiver Selectivity

Q11)a) Give setup for computer controlled testing of radio receiver. **[8]**

b) Give advantages and disadvantages of virtual instruments and measurements. **[8]**

OR

Q12)a) What are the requirements of the ATE. **[8]**

b) What limits the datarate in the IEEE 488 system? What is the recommended maximum cable length for the IEEE 488 system. **[8]**

Total No. of Questions :12] **[Total No. of Pages : 3**

P1152

[3864] - 271
B.E. (E & T/C)
TELECOMMUNICATION NETWORK MANAGEMENT
(2003 Pattern)

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

Instructions to the candidates:

1) ***Use two separate answer books for Section I and Section II.***
2) ***Read the questions carefully and concentrate on intensions of questions asked.***
3) ***Answering to the point will be given the weightage.***
4) ***Whenever necessary, use neat diagrams to express your views.***
5) ***If necessary, use of Logarithmic Tables or Slide Rule orPocket calculator.***
6) ***Figures to the right side of question indicates full marks.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) How telephone exchanges can be classified? To which class of exchange customer is connected? Which types of lines are used for connecting exchanges? **[6]**

b) With the help of neat diagram, explain how these exchanges are arranged hierarchically to manages the calls originated by customers connected to different local exchanges those are governed by different hierarchical domains. **[6]**

c) What is the unit of traffic in telecommunication networks? What is the formula for calculating traffic on telecommunication networks? Explain constituent terms used in the formula. **[6]**

OR

Q2) a) Explain detail the simplex and duplex concepts used in telecommunication networks, How simplex system differ from duplex system? Explain duplex telecommunication transmission using 2 wires and 4 wires. How do you distinguish full duplex and half duplex systems. **[8]**

P.T.O.

b) With the help of neat diagram, explain in detail, the concepts of pulse and DTMF dialing used in telephone signaling to connect calls from one end to other end. **[10]**

Q3) a) i) Integrated service data network is a representation of integration of various services such as _____,_____and_____. **[1.5]**

ii) BRI services are characterized by _____ Channels and the data rates of _____. **[1]**

iii) T1-PRI services are characterized by _____ Channels and the data rates of _____. **[1]**

iv) E1-PRI services are characterized by _____ Channels the data rates of _____. **[1]**

v) Coding on S/T and U interfaces are respectively represented by _____ and _____ . **[1]**

vi) The ISDN reference points are represented by_____, _____, _____, _____ and _____. **[2.5]**

b) Compare ATM, Frame Relay and X.25 services. **[8]**

OR

Q4) Using neat diagrams, explain in detail, the normal and extended ISDN configurations, also explain these configurations with respect to various ISDN reference points as mentioned in ISDN Models. Also explain the type of data coding and interfaces that takes place at these reference points. **[16]**

Q5) Explain in detail, the concepts related to narrowband, baseband and broadband systems. **[16]**

OR

Q6) What is meant by DSL? Explain the concept behind DSL technologies. What are the bands used by POTS, ISDN and DSL Technologies? Explain these bands and logic behind such allocation in detail using a neat figure. **[16]**

SECTION - II

Q7) What is meant by autonomous systems? What is meant by routing? What are the ways for routing the information? How the routing for autonomous systems is managed? What are the routing protocols used for routing within and in between autonomous systems explain in detail. **[18]**

OR

Q8) Write the short notes on:

a) Comparison between Static and Dynamic Routing. **[6]**

b) Comparison between Centralized and Distributed Routing. **[6]**

c) Principles of shortest path routing Algorithms. **[6]**

Q9) Which are the parameters those are responsible for judging the quality of service (QoS) in telecommunication networks? Discuss in detail all the parameters and their relevance in various types of traffic on telecommunication network. **[16]**

OR

Q10)a) How telecommunication traffic is characterized? What is burstiness in telecommunication traffic? How burstiness is measured? **[12]**

b) If for a particular telecommunication network has peak traffic of 2 Mbps and average traffic of 64 Kbps calculate the burstiness of such traffic conditions. **[4]**

Q11)Describe in detail the layered model of telecommunication management, what are layers those layers? Describe each layer in detail. **[16]**

OR

Q12)a) Discuss security aspects of networks and how security is ensured? **[8]**

b) Describe the features of Configuration Management Systems? **[8]**

Total No. of Questions : 12] **[Total No. of Pages : 3**

P1157

[3864] - 276

B.E. (E & TC)

AUDIO - VIDEO ENGINEERING

(2003 Course)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) Explain with suitable expressions, why (G-Y) signal is not transmitted in colour T.V. transmission? **[4]**

b) Compare the technologies suitable for flat panel display used for colour T.V. **[8]**

c) Define the terms: **[6]**

i) Hue ii) Kell factor

iii) Saturation iv) Colour Temperature

OR

Q2) a) Draw the complete colourplexed composite video signal received in colour T.V., indicating level & timings of different component of signal. Explain the purpose of different components. **[8]**

b) What are the compatibility requirements for colour T.V. transmission? Explain the concept of frequency interleaving. **[8]**

c) State why VSB modulation is used in T.V.? **[2]**

P.T.O.

Q3) a) Explain the working of PAL Encoder with necessary block schematic & also explain the cancellation of phase errors with colour circle & phasor diagrams. **[8]**

b) Explain the working of T.V. pattern generator with necessary block schematic. State the use of different patterns. **[8]**

OR

Q4) a) Describe giving block diagram, the working of IF Modulation T.V. Transmitter. State its advantages over High level Modulation T.V. Transmitter. **[8]**

b) State the procedure followed in fault finding of T.V. receiver. What is the likely fault or faulty stage in a T.V. indicated by following symptoms?

i) Height compressed ii) Width compressed

iii) Picture snowy iv) Tilted raster **[8]**

Q5) a) State the difference between component coding & composite coding-specify the important parameters for digitized video signal. **[8]**

b) Discuss the different uncompressed & compressed Digital Video Tape Recording formats. **[8]**

OR

Q6) a) Explain the General format for MAC signal for transmitting colour T.V signals. State different types of MAC signals. **[8]**

b) What are the technical advantages of using digital technology in television systems? **[3]**

c) Compare in brief Interlace & progressive scanning used in Digital T.V. **[2]**

d) State the data transmission rate & compression ratio for different video compression MPEG formats. **[3]**

SECTION - II

Q7) a) Discuss the HDTV standards & typical parameters for HDTV. transmission. State compatibility problems in HDTV. Why progressive scanning is preffered in HDTV? **[10]**

b) Draw the block diagram of CATV system & explain its operation. **[8]**

OR

Q8) a) Write short notes (Any two): **[10]**

i) CCTV.

ii) Set top box used in DTH. TV.

iii) T.V. coverage plan for Marathon.

b) Explain in brief the term 'Video on Demand'. **[4]**

c) State ATSC picture display formats in tabular form for HDTV, SDTV & EDTV, indicating different parameters. **[4]**

Q9) a) State the typical specifications/parameters of Compact Disc (CD) & state its advantages on traditional recording systems. What is the difference between CD & DVD? **[8]**

b) Draw a block diagram for magnetic recording & reproduction system. Describe function of each block. **[8]**

OR

Q10)a) Discuss in brief MP3 audio compression format used, indicating different specifications/parameters used. State principles & techniques used for compression. **[8]**

b) Explain with necessary block schematic, how sound is reproduced from compact disc? **[8]**

Q11)a) Write short notes on (Any two): **[10]**

i) Speakers for cell phones.

ii) PA system for Auditorium.

iii) Acoustic chamber.

b) State the following for chordless microphone PA system. **[6]**

i) Typical microphone used & its specifications.

ii) Type of RF modulation used, range of frequencies, distance of communication.

iii) Areas of application.

OR

Q12)a) State the necessity of reverberation, typical reverberation periods & factors on which reverberation time depends. **[8]**

b) State the advantages for satellite Radio. Draw the block diagram for satellite Radio uplink system & explain how audio is fed into satellite for world wide Radio reception. **[8]**

Total No. of Questions :6] **[Total No. of Pages 2**

P1158

[3864]-302
B.E.(Printing)
SURFACE PREPARATION - II
(2003Course)

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

Instructions to the candidates:

1) ***Question Nos.1 and 5 are compulsory. Out of the remaining attempt 2 questions from section I and 2 questions from Section.II***
2) ***Answer to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Explain the properties of Rubber Flexo plate. **[10]**

b) Explain the advantages of Photopolymer plates. **[8]**

OR

a) Explain in detail requirements for printing a job for Flexography. **[12]**

b) State the features and applications of Flexography. **[6]**

Q2) a) State the requirements of negative for Flexo Plate. **[6]**

b) Calculate % shortening and new negative length for 2.84 mm plate thickness having printed length of 30 cm . **[10]**

OR

a) Explain the importance of Back and Main exposure in Flexo plate-making **[8]**

b) Mention the safety precautions for processing a Flexo Plate. **[8]**

Q3) a) Explain the term 'Plate Staggering". **[8]**

b) Write notes on : **[8]**

i) Factors affecting extensive swelling of relief.

ii) Inspection of negatives for flexo plate-making.

OR

Describe the preparation of 3.18 mm plate thickness. **[16]**

P.T.O.

SECTION - II

Q4) a) Explain the process involved in preparation of Digital Flexo Plate. **[8]**

b) Write notes on : **[8]**

i) Storage and Handling of Flexo Plates.

ii) Wash-out Solvents.

OR

Explain in detail optimization of a Flexo Plate. **[16]**

Q5) Explain in detail Etching and Electronic Engraving process for Gravure. **[18]**

OR

a) Explain in detail Gravure cylinder-making by laser engraving process. **[10]**

b) Explain the benefits of image carrier for electronic and laser process. **[8]**

Q6) a) Explain the importance of Nickel and Chrome in making of a Gravure cylinder. **[6]**

b) Write notes on : **[10]**

i) Cell structures in Gravure cylinder making.

ii) Checking of a Gravure cylinder.

OR

Write notes on <u>any four</u> : **[16]**

a) Chemistry of an Electrolyte.

b) Temperature.

c) Polarization Effect.

d) Efficiency of an Electrolyte.

e) Contaminants.

⌘⌘⌘⌘

Total No. of Questions : 6] **[Total No. of Pages : 2**

P1159

[3864] - 306

B.E. (Printing)

FLEXIBLE PACKAGING

(Elective - I)

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

Instructions to the candidates:

1) ***Question Nos. 1 and 4 are compulsory. Out of the remainingattempt 2 questions from section - I and 2 questions from section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Explain the Basic requirements of Packaging. **[10]**

b) Define the role of polyester in packaging. **[8]**

OR

Explain the characteristics and applications of Poly Vinyl Chloride. **[18]**

Q2) Explain with neat diagram Hot and Dry Lamination Techniques. **[16]**

OR

Write notes on: **[16]**

a) Blown-Film process.

b) Calendering process.

Q3) Explain in detail Bag-in-Box technique for a product. **[16]**

OR

Write notes on (Any Two): **[16]**

a) Aseptic b) Blister-pack c) Retort

P.T.O.

SECTION - II

Q4) Explain in detail wrapping techniques. **[18]**

OR

Answer the following: **[18]**

a) Caps and Closures.

b) FFS Techniques.

c) Stand-up Pouches.

Q5) Explain in detail packaging technology for Beverage products. **[16]**

OR

Mention the deterioration factors for the following products. **[16]**

a) Milk c) Chocolate

b) Cheese d) Meat

Q6) Explain in detail Gravure process for Flexible Packaging. **[16]**

OR

Explain in detail Rotary Letter press for Flexible Packaging. **[16]**

Total No. of Questions :8] **[Total No. of Pages : 2**

P1160

[3864]-361
B.E. (Petrochemical)
REFINING OPERATIONS
(2003 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 two separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data,wherever necessary.***
5) ***Use of electronic calculator is allowed.***

SECTION - I

Q1) Write a note on overall refinery configuration. Provide an appropriate flow diagram along with the answer. **[16]**

Q2) Explain the important specifications and their practical relevance for the following refinery products. **[16]**

a) Gasoline.

b) High speed Diesel.

c) LPG.

d) Aviation Turbine Fuel

Q3) a) Discuss in detail the challenges posed by Leavier crudes that have to be processed by refineries in recent years. **[8]**

b) Explain in brief significance of and process principle behind crude desalting. **[8]**

Q4) With reference to atmospheric and vacuum distillation units in a refinery, explain the following .

a) Pressure and Temperature conditions in the column .

b) Boiling ranges of the products.

c) Means of maintaining the vacuum.

d) Provision of reflux.

e) Role of side stripper. **[18]**

P.T.O.

SECTION - II

Q5) Write a note on catalytic reforming of naphtha that covers the following.

a) Feed and products.

b) Catalyst and Reactor.

c) Temperature and pressure conditions.

d) Importance of the process.

e) Mode of Operation. **[16]**

Q6) a) Explain why importance of hydrogen is increasing for refiners in the context of recent environment regulations. **[4]**

b) Give an approximate estimate of kg of carbon dioxide produced per kg of hydrogen used by refinery (Hint : Base your calculation on methane as the fossil fuel source). **[5]**

c) Explain hydrotreating process in brief. **[7]**

Q7) Write a note on hydrocracking process that covers the following.

a) Feed and products

b) catalyst and Reactor.

c) Temperature and pressure conditions.

d) Importance of the process.

e) Hydrogen requirement. **[16]**

Q8) Write Notes :

a) Role of carbocation in FCC process.

b) Reactions in catalytic reforming.

c) Increasing importance of delayed coking.

d) Important properties of Lube oils

e) Stages in LOBS production. **[18]**

⌘⌘⌘⌘

Total No. of Questions :10] **[Total No. of Pages : 3**

P1162

[3864] - 365

B.E. (Petrochemical Engineering)

ENVIRONMENTAL ENGINEERING

(2003 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 electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Discuss removal of particulate matter from the gaseous emissions from a complex fertilizer unit in details. **[8]**

b) Discuss the impact of 'Gas Flaring' on environment in details. **[6]**

c) Enlist five characteristics of hazardous waste. **[2]**

Q2) a) Explain impact of Petroleum & Petrochemical industry on environment starting from crude oil production to refining. **[6]**

b) Describe Aquatic Ecosystem with neat diagram. **[6]**

c) Discuss Hydrologic cycle with neat diagram. **[6]**

Q3) a) With the help of neat sketch describe catalytic oxidation method for air pollution control. **[8]**

b) With the help of flow diagram, explain 'Ethyl Amine Process' for removal of acidic pollutants from gaseous emissions from petroleum industries. **[8]**

P.T.O.

Q4) a) Explain any four important parameters used internationally to assess quality of produced wastewater. **[4]**

b) Give at least four advantages of electrostatic preceptor. **[4]**

c) A conventional cyclone with diameter 2 m handles 6 m^3/s of standard air carrying particles with a density of 2000 kg/m^3. For effective number of turns (Ne) = 6. Determine the cut size. What will be the cut size for a high efficiency cyclone? Take viscosity of gas (μg) as 1.81×10^{-5} kg/(m.s.). Neglect the density of the gas. **[8]**

Q5) a) With respect to solid waste discuss the following with neat diagram. **[8]**

i) Sanitary land filling operations.

ii) Composting.

iii) Open dumping.

b) Give detailed classification of medical waste. **[4]**

c) What are the methods to treat the Biomedical wastes? **[4]**

SECTION - II

Q6) a) Write the detailed classification of solids found in waste water. **[4]**

b) Discuss in details about recovery of materials from process effluents. **[8]**

c) Discuss in details about 'Organic matter in a wastewater'. **[6]**

Q7) a) What is Chemical Oxygen demand? Can we determine tentative BOD of wastewater if its COD is known? How? **[6]**

b) What are the different types of secondary treatment available? Write in details about any two secondary treatments. **[10]**

Q8) a) What are Chemical treatment methods are available for waste water treatment. Explain any one in details. **[8]**

b) Discuss in detail about how liquid effluent from petrochemical complex is treated. **[8]**

Q9) a) Determine the 12-day demand of a wastewater at 20°C if its 5-day BOD at the same temperature is 250 mg/L. Also, calculate the 5-day BOD at 27°C as well as 30°C temperature. **[8]**

Data

i) $\theta = 1.053$

ii) Reaction Rate constant (k) (base e, 20°C) = 0.23 per day.

b) Discuss the new potential methods of disposal for solid wastes. **[8]**

Q10 Write short note on following: (Any Four): **[16]**

a) Anaerobic sludge digester.

b) Sludge treatment & disposal.

c) Trickling filter Vs Activated sludge process. (Four points)

d) Facultative pond system.

e) Sludge volume index (with formula).

P1164

[3864]-403
B.E. (Computer)
(Common to Information Tech.)
OBJECT ORIENTED MODELING AND DESIGN
(410443) (2003 Course)

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

Instructions to the candidates:

1) ***Figures to the right indicate full marks.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***From Section I,Answer (Q1 or Q2) and (Q3 or Q4) and (Q5 or Q6). From Section II,Answer (Q7 or Q8) and (Q9 or Q10) and (Q11 or Q12).***
4) ***In design questions you are encouraged to make further suitable assumptions on scope of the systems given wherever felt necessary and do state your important assumptions if any.***
5) ***All diagrams/ concepts are expected inUML2.0 except stated otherwise explicitly.***

SECTION - I

Q1) Write short Notes on the following : **[18]**

a) How OMG standards XMI,MOF help in interoperability, exchange between UML tools, UML models.

b) Limitations of UML 1.3 which were overcome in UML 2.0.

c) Need for modeling, planning software systems before constructing them.

OR

Q2) Write short Notes on any three : **[18]**

a) OMG standard XMI.

b) Concepts : OO concept abstraction, iterative approach to development.

c) RUP : Rational Unified Process.

d) Architecture driven approach.

P.T.O.

Q3) a) Why do we break large systems into subsystems. Taking an example of any large system show how packages can be used to either MODEL grouping of use cases into PACKAGES or grouping of classes/ components into packages. **[8]**

b) What changes have deployment diagrams undergone from UML1.3 to UML2.0. **[4]**

c) What are characteristics and examples of commercial database applications (Hint banking, HR etc.) Which UML diagrams are especially more suitable for commercial applications? **[4]**

OR

Q4) Consider a Scenario for an IPL cricket league system. A partial description of possible features of website follows. It is expected that many concurrent users will be performing multiple transactions like viewing players data, searching match specific details, downloading offline videos, following live scores, and buying tickets online .First Draw a PACKAGE diagram for above system. Make suitable assumptions and IDENTIFY one reusable general purpose COMPONENT for the system and give its interface/services too. Finally Draw a DEPLOYMENT diagram assuming that clients can be internet based as well as mobile based. **[16]**

Q5) a) How do UML profiles help customization of UML. **[6]**

b) With own examples explain extensibility mechanisms of UML. **[6]**

c) What is <<extends>> stereotype in UML. **[4]**

OR

Q6) a) Consider a railway reservation and enquiry system. Passengers can book tickets of different categories, look at personal ticket history, check status of reservation, check schedules, check availability, compute fares for plans. Railway authorities can add trains, decide quotas, and change stations for a route, even change train timings. Add further assumptions about the scope of application if necessary. Draw a USE CASE diagram for this description using full UML notation for use case diagrams. **[10]**

b) Write short notes on various BEHAVIOURAL diagrams. **[6]**

SECTION - II

Q7) a) Draw a CLASS diagram for a typical MOVIE rental shop. System could help in Renting returning, product catalogue, search, membership, fees collection, special offers amongst other possibilities. DVDs, VCDs can be rented. Special services like home delivery and pick up are supported too. Add your own assumptions about working of shop if necessary your class diagram must show relevant attributes, methods, relationships. **[8]**

b) How do you show ASSOCIATION relationship in class diagram, give an appropriate example, and give Notation in UML. **[4]**

c) How do you reverse engineer Java INTERFACES to UML, illustrate with examples. **[4]**

OR

Q8) In context of CLASS/OBJECT diagrams write on different ways to identify classes given below. **[16]**

a) Identifying :Entity, Controller, UI classes.

b) English statement of problem and identifying nouns.

c) Identify domain concepts as classes.

d) Identify classes using CRC method.

Q9) a) Draw a STATE diagram for the system partially described below A Train may be on a platform ready to leave, in between stations, could be arriving or leaving a station. The train could be Held in between for some reason, shunted aside for servicing etc. Consider a system that needs to report on TRAIN STATUS (for example : status as held in between stations) in real time. Make additional assumptions about scope; use advanced state diagram 2.0 features if relevant to draw the state diagram. Explain how state diagrams are related to classes and also give complete notation for STATE (entry action, etc). **[12]**

b) What are protocol state machines in UML **[4]**

OR

Q10)a) Draw an INTERACTION OVERVIEW Diagram for a typical college Library system. (Hint: Typical library has membership, issuing of books, returning of books, fine calculations as some example use cases with their own sequence diagrams.) Make suitable assumptions about scope. **[6]**

b) How does one model 'data/objects' in an Activity diagram, Illustrate with meaningful examples. **[4]**

c) What is the difference between 'Fork/Join and Decision Nodes'. Draw two activity diagram fragments to clearly differentiate between when to use FORK/JOIN and when to use DECISION nodes. **[6]**

Q11)a) Consider a use case of a "Rent a Car" .A partial description of usecase follows. Customers rent online from choice of cars. A transaction of renting car further involves aspects like source, destination, number of days car is hired, rate of hiring, etc. Payments can be done in various ways. Loyal customers with repeat business may be given discounts. Some of the likely classes are Cars, Types of cars, Rates Card, Customers, Transaction for renting the car, RentingCar a controller object, Payment, Rental GUI object to interact etc. Make additional suitable assumptions about the scope and DRAW the SEQUENCE DIAGRAMS showing actors, lifelines, objects, messages/parameters, return values, iterations. **[14]**

b) Why use sequence diagrams. **[4]**

OR

Q12)a) For use case "Rent A Car" described in (question number 11 a) draw a COMMUNICATION diagram. Please make additional assumptions if relevant and appropriate. First Identify classes, actors for above system and THEN DRAW a COMMUNICATION diagram for above usecase with best use of UML2 Notation. **[8]**

b) Show two different ways to model/ depict 'Iteration' in sequence diagrams, with suitable examples. **[6]**

c) In the context of interaction diagrams, with examples, explain the concept of 'Synchronous Messages'. **[4]**

⌘⌘⌘⌘

Total No. of Questions :12] **[Total No. of Pages : 4**

P1165

[3864] - 413

B.E. (Computer / I.T) (Common)

SOFTWARE ARCHITECTURE

(410451) (2003 Course) (Elective - II)

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

Instructions to the candidates:

1) ***Figures to right indicate full marks.***
2) ***Answers to two sections should be written in separate answer books.***
3) ***From section I, Answer (Q1 or Q2) and (Q3 or Q4) and (Q5 or Q6).***
4) ***From section II, Answer (Q7 or Q8) and (Q9 or Q10) and (Q11 or Q12).***
5) ***Make suitable assumptions wherever appropriate and relevant.***

SECTION - I

Q1) a) When and why will a software Architect choose following technology choices for any system, Justify with examples.

i) Building applications from scratch versus composing/assembling applications from reusable components/APIs.

ii) C++ over C **[6]**

b) Write short Notes on Architecture Business Cycle. **[6]**

c) What do you understand by following concepts

i) Components and Connectors.

ii) Stakeholders for architecture and their needs/expectations. **[6]**

OR

Q2) a) Software Architect typically has to take decisions related to following aspects.With example show how would he decide and what kind of decisions will he take in following cases. **[6]**

i) Making a technology choice for developing a web application.

ii) Modular decomposition of system and drawing package diagrams.

Illustrate your answers with appropriate examples.

P.T.O.

b) Write short notes on Model View Controller architecture (MVC) and its applications. **[6]**

c) Considering civil engineering/Architects profession of designing and constructing residential/office buildings, bridges, townships etc, clearly write with examples the role, need for an Architect and kind of design decisions an architect takes that lead to quality of building like aesthetics, style, foundation, light/air etc. Similarly a software architect also helps build software with quality like security, performance etc. Explain with examples how software architect and architecture contributes to any software System's quality. **[6]**

Q3) a) List out some common user friendly features common to all WINDOWS based applications like WORD, IE browser etc and explain why these features are good usability examples (Hint : example usability features are menus, undo...) **[6]**

b) What do you understand by quality aspect 'Availability' and discuss availability tactics like Redundancy and ping/echo. **[6]**

c) What do you understand by security of a web application. **[4]**

OR

Q4) Explain and illustrate the following concepts (in context of quality attribute/ tactics) with examples, in brief. **[16]**

a) Various quality factors important for a software system.

b) Components/Interfaces and reusability.

c) Response time, performance of website.

d) Intrusion detection.

Q5) a) What is a proxy pattern. What is remote proxy pattern? Show how remote proxy helps in two aspects: transparency and marshalling/unmarshalling. Draw a diagram to show how remote proxy pattern works. **[8]**

b) What are design patterns. How are they documented using a template (Hint intent, motivation (forces), applicability, structure; consequences etc)? Explain the way they are documented with examples to illustrate from ITERATOR pattern. **[8]**

OR

Q6) a) Give intent, applications, advantages of following patterns: Factory, Event Listener Adaptor patterns. **[10]**

b) Write short notes on Design pattern 'Facade pattern' **[6]**

SECTION - II

Q7) a) What is XML, peer to peer architecture. What is the role of following J2EE technologies JXTA. **[4]**

b) What are enterprise java beans and entity beans. **[4]**

c) Compare and contrast J2SE and J2EE. **[4]**

d) What are some of the standard packages that accompany Java standard platform, what are they useful for. **[4]**

OR

Q8) a) What are EJBs. Compare and Contrast stateless and stateful Session beans. **[4]**

b) Discuss how various Java based client and server side TECHNOLOGIES, that are part of J2EE/advanced java can be combined to develop an Application. **[6]**

c) Explain what you understand by database applications, transactions and role of JDBC in database queries. **[6]**

Q9) Explain following Web Client side concepts through simple examples **[16]**

a) Cookies and personalization/session management.

b) Plugins for browsers.

c) HTML forms and JavaScript validations.

d) Java applets, with an example code/application.

OR

Q10)a) Consider an online BOOK STORE application, show what concerns/ functionality of the online web based book store, will you distribute to presentation, business, data layers in 3 tier architecture. Make suitable assumptions about the features/scope of online bookstore. **[4]**

b) What is XML, give an example of user defined tags for student's personal information and a sample XML, file to depict use of those tags. **[4]**

c) What are JSPs and how do they separate presentation, business logic. **[4]**

d) How does one manage http requests/responses in Servlets. **[4]**

Q11) Write short notes on ANY THREE: **[18]**

a) Interfaces in general and IUnknown Interface specifically.

b) Web service and protocols XML, SOAP, UDDI, and WSDL.

c) .NET and Advantages of .NET.

d) ASP.NET.

OR

Q12) Explain in context of COM/.NET the following briefly: **[18]**

a) Dynamic WebPages and Active X control.

b) Heterogeneity/Interoperability and need for standards like COM, .NET.

c) Abstract classes.

d) .NET Remoting.

e) Components versus Classes.

f) DLLs versus static library.

Total No. of Questions : 12] **[Total No. of Pages : 3**

P1167

[3864] - 434

Final Year B.E. (Biotechnology)

NOVEL SEPARATION TECHNIQUES

(416284)

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

Instructions to the candidates:

1) ***Figures to the right indicate full marks.***
2) ***Use of Programmable calculator is not allowed.***
3) ***Draw a neat sketch wherever necessary.***
4) ***Make necessary assumptions wherever required.***
5) ***Answer any THREE questions from section I and any THREE questions from section II.***

SECTION - I

Q1) a) Explain the range and characteristics of Bioproducts? **[6]**

b) Explain in detail the need of downstream processing? **[10]**

OR

Q2) a) Give a brief overview of Bioseparations? **[6]**

b) Differentiate between bioprocesses and other conventional separation processes? **[10]**

Q3) a) Explain in detail Gas chromatography with a neat sketch? **[8]**

b) Define Ion exchange chromatography? What is the principle behind it? List out the applications of Ion exchange chromatography. **[8]**

OR

Q4) a) What are the materials used in HPLC columns for stationary phase and mobile phase? **[4]**

b) How many types of column chromatography techniques are there? Explain the principle for separation behind column chromatography? **[6]**

c) Explain Liquid chromatography with a neat sketch? **[6]**

P.T.O.

Q5) a) What are the advantages of membrane separation processes over conventional separation processes? **[6]**

b) Classify different separation techniques along with examples? **[8]**

c) Explain Pervaporation in detail with a neat sketch? **[4]**

OR

Q6) a) Give a short notes on: **[6]**

i) Micro filtration.

ii) Ultra filtration.

iii) Reverse osmosis.

b) What are the different types of membranes used in membrane separation processes? **[6]**

c) Explain Electro dialysis in detail with a neat sketch? **[6]**

SECTION - II

Q7) Explain in detail with a neat sketch Atomic absorption spectroscopy? Give its applications? **[16]**

OR

Q8) Define NMR spectroscopy? Explain in detail NMR spectroscopy with a neat sketch? Give its applications? **[16]**

Q9) a) Define Adsorption? Give a short notes on Freundlich isotherm? **[8]**

b) Explain the nature of adsorbents used in various adsorption operations? **[8]**

OR

Q10)a) List out various industrial adsorbent materials along with their applications? **[6]**

b) Give a brief notes on zeolites? **[4]**

c) Explain the following terms: **[6]**

i) Adsorption potential.

ii) Isosters.

iii) Adsorption hysterisis.

Q11)a) What are the advantages of Reactive Distillation over conventional distillation operation? **[9]**

b) Define thermal diffusion? Explain thermal diffusion with a neat sketch? **[9]**

OR

Q12)a) Give a short notes on Molecular sieves? Give their application? **[9]**

b) Explain the following: **[9]**

i) Isothermal chromatography.

ii) Reactive extraction.

iii) Zone refining.

Total No. of Questions :12] **[Total No. of Pages : 3**

P1168

[3864] - 441
B.E. (Biotechnology) Final Year
PLANT ENGINEERING
(2003 Course) (Sem. - II) (419289)

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

Instructions to the candidates:

1) ***Figures to the right indicate full marks.***
2) ***Use of Programmable calculator is not allowed.***
3) ***Draw a neat sketch wherever necessary.***
4) ***Make necessary assumptions wherever required.***
5) ***Answer any Three Questions from section I and any Three Questions from Section II.***

SECTION - I

Q1) a) Explain the procedure for drawing process flow diagram. **[8]**

b) Discuss scale up factors for following equipments. **[10]**

i) Nozzle discharge centrifuges.

ii) Packed columns.

OR

Q2) Draw neat labeled process flow diagram for the following process.

Separation of n-butanol-water is carried out in two steps. The process starts by charging the original mixture to a decanter which operates at temperature below the boiling point. The butanol-rich phase from decanter is fed to a stripping column which produces high purity alcohol as bottom product and an overhead vapour which approaches the azeotropic composition. The aqueous phase is fed to the second stripper which produces butanol free water as bottom product. Since water is the product open stream can be used to provide reboil vapour. The aqueous column also produces a top vapour which approaches the azeotropic composition. Both overhead vapour streams are condensed in common condenser and then fed to the decanter alongwith fresh feed. **[18]**

P.T.O.

Q3) Write short note on following: **[16]**

a) Thermodynamic feasibility.

b) Process feasibility.

c) Kinetic feasibility.

OR

Q4) a) Explain various factors affecting site location. **[8]**

b) Describe the factors considered for feasibility survey. **[8]**

Q5) a) State the service fluid code for piping as per IS 9446-1980 for following utilities. **[8]**

i) Effluent ii) Condensate iii) Electricity

iv) Drain v) Brine supply

b) Draw symbols for following used in engineering line diagram. **[8]**

i) Flow indicator ii) Level indicator

iii) Flow recorder iv) Pneumatic lines

OR

Q6) a) Draw utility block diagram for the batch reactor excluding process lines. **[8]**

b) Draw utility line diagram for tray dryer without process lines. **[8]**

SECTION - II

Q7) a) Write short note on: **[8]**

i) Single rod hanger

ii) Roller support

b) Discuss color codes used for transportation of flammable gases and process fluids. **[8]**

OR

Q8) a) Write short note on: **[8]**

i) Pipe routing

ii) Pipe expansion and contraction

b) Explain water hammer design of gas pipelines. **[8]**

Q9) a) Explain the construction and working double acting reciprocating pump. **[8]**

b) Describe performance curve of centrifugal pumps. **[10]**

OR

Q10)a) Explain rotine and preventive maintaince of chemical plant during shutdown. **[10]**

b) Describe the working of vacuum pump and blower. **[8]**

Q11)a) Write short on: **[8]**

i) CPM technique.

ii) PERT technique.

b) Explain the safety regulations and safety index to be followed for design of chemical plant. **[8]**

OR

Q12)a) Explain the steps for PERT planning technique. **[8]**

b) A small engineering project consists of 6 activities namely A,B,C,D,E,F with duration of 4,6,5,4,3 and 3 days respectively. Draw network diagram and mark the critical path. **[8]**

Total No. of Questions : 12] **[Total No. of Pages : 3**

P1256

[3864]-149
B.E. (Mechanical)
AUTOMOBILE ENGINEERING
(2003 Course)

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

Instructions to the candidates:

1) ***Answer three questions from Section I and three questions from Section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of 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 chassis? What are the various components of chassis? Indicate their functions. **[8]**

b) What is the purpose of clutch plate? Explain with sketch kinds of clutch plate used in automobile. Explain function of various components of it. **[8]**

OR

Q2) a) Give the specifications of the following automobiles : **[8]**

i) Hero Honda Splendor.

ii) Kawasaki caliber.

iii) MARUTI 800.

iv) TATA INDICA.

b) What are various components of two wheeler automobile Indicate with neat sketch, function of each component, used in it. **[8]**

P.T.O.

Q3) a) Explain the purpose of synchronizer and its operation in a gear box. **[8]**

b) Explain the automotive overdrive system in transmission. **[8]**

OR

Q4) a) Explain with sketch various shift positions made in gear box for gears in first, second, third, top, and reverse in 4 wheeler automobile. **[8]**

b) Describe with neat sketch operation of a epicyclic gear box. **[8]**

Q5) a) Explain with neat sketch independent type front suspension. What are advantages of it? **[9]**

b) Describe following in brief : **[9]**

i) Spring rate and frequency.

ii) Variable rate spring.

iii) Sprung and un sprung masses.

iv) antiroll bar.

OR

Q6) Write short note on the following (any three) : **[18]**

a) Self levelling suspension.

b) Conventional suspension system.

c) Hotkiss drive.

d) Various types of suspension springs.

e) Hydrogas suspension.

SECTION - II

Q7) a) Explain construction of stub axle and wheel mounting. **[6]**

b) Explain the term “turning circle radius” as applied to wheel. **[6]**

c) Sketch the sectional view of tyre and indicate its various parts. **[4]**

OR

Q8) a) Describe the following : **[8]**

i) Tread pattern of tyres.

ii) Wheel balance.

b) What are the functions of the suspension system? **[4]**

c) Define camber angle, what is a function of camber angle in a vehicle. **[4]**

Q9) a) Explain in brief principle and working of a differential used in automobile. **[8]**

b) What is constant velocity universal joint? What is the purpose of a slip joint in a propellor shaft? Explain. **[8]**

OR

Q10)a) Explain briefly construction and working of automobile propellor shaft. **[8]**

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

i) Rear axle arrangement.

ii) Two speed rear axle.

Q11)a) Explain with neat sketch, construction and operation of hydraulic brake system used in automobile. **[6]**

b) Describe in brief construction of a battery used in automobiles. **[6]**

c) Discuss construction and working of head lamp. **[6]**

OR

Q12)Write short note on the following (any three) : **[18]**

a) Trouble shooting of automobile.

b) Starting system.

c) Servo-braking system.

d) Cut-out relay.

e) Electric Horn.

❖ ❖ ❖ ❖

Total No. of Questions : 12] **[Total No. of Pages : 3**

P1257

[3864]-156
B.E. (Mechanical S/W)
AUTOMOBILE ENGINEERING
(2003 Course)

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

Instructions to the candidates:

1) ***Answer three questions from Section - I and three questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of 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 vehicle specifications? List specification of any two 4-wheeler automobile of your choice. **[8]**

b) Show by line diagram the following types of clutches. **[8]**

i) Multiplate clutch.

ii) Vacuum operated clutch.

OR

Q2) a) Show by line diagram the following arrangements. **[8]**

i) Front engine rear wheel drive.

ii) Front engine front wheel drive.

b) What is meant by ‘clutch plate’? Explain it with help of sketch. State what are various clutch lining materials. **[8]**

Q3) a) What is total resistance when vehicle is in motion? Explain concept of traction and tractive effort. **[8]**

P.T.O.

b) A car weighing 20,000 N has a static weight distribution on the axles of 50 : 50. The wheel base is 3.5m and the height of centre of gravity above ground is 0.5m. If the coefficient of friction on the road is 0.6 find the maximum gradability. **[8]**

i) For front wheel drive if engine power is not limitation.

ii) For rear wheel drive.

OR

Q4) a) Explain step by step how gear ratio are selected for a standard gear box of automobile? **[8]**

b) Describe working of synchromesh gear box and give its advantages over other gear boxes. **[8]**

Q5) a) Explain with neat sketch front wheel independant suspension system. **[6]**

b) What are different types of rubber springs? Briefly explain two important types of rubber springs. **[6]**

c) State advantages and objectives of suspension system. **[6]**

OR

Q6) Write short note on the following (any three) : **[18]**

a) Sprung weight and unsprung weight.

b) Hydro gas suspension.

c) Shock absorbers.

d) Self levelling suspension.

SECTION - II

Q7) a) Sketch and explain various parts of automobile wheel. Explain various types of wheel rim and rim details with neat sketch. **[8]**

b) What are the functions of the steering system? What are the components of the steering system? **[8]**

OR

Q8) a) Explain briefly the following : **[8]**

i) Tilting steering wheel.

ii) Collapsible steering column.

b) What are the function of tyres? Differentiate between tubed and tubeless tyres. **[8]**

Q9) a) What are the two purposes that the final drive serve? Explain. **[8]**

b) Draw a layout of propellor shaft assembly, and explain function of various component of it. **[8]**

OR

Q10)a) Explain construction and working of constant velocity universal joint. **[8]**

b) Describe briefly construction and working of a differential used is automobile. **[8]**

Q11)Write short note on following : **[18]**

a) Servo braking system.

b) Battery ignition system.

c) Preventive maintenance of automobile.

OR

Q12)Write short note on following : **[18]**

a) Antiskid braking system.

b) Starting system.

c) Dash board instruments.

❖❖❖❖

Total No. of Questions : 12] **[Total No. of Pages : 3**

P1258

[3864]-229

B.E. (Electrical)

RESTRUCTURING & DEREGULATION

(2003 Course)

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

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Explain main features of Electricity Act. 2003 **[8]**

b) Explain the functions of Central Electricity Authority (CEA). **[8]**

OR

Q2) a) Discuss in detail National Electricity Policy and National Tariff Policy. **[8]**

b) State and explain the functions of regulatory commission at central and state level. **[8]**

Q3) a) Explain the tariff setting philosophy with reference to following basic principles. **[8]**

i) Average cost of supply.

ii) Embedded (Historical) cost of supply.

iii) Long range marginal cost.

b) Explain following terms : **[8]**

i) Capital cost.

ii) Dept. & equity.

iii) Variable cost.

iv) Working capital.

v) Depreciation.

P.T.O.

OR

Q4) a) Explain performance indices at Generation, transmission, and distribution level. **[8]**

b) Explain following economic methods to compare investment options with examples. **[8]**

i) Payback period.

ii) Internal rate of return.

iii) Net present value.

Q5) Explain following types of regulations : **[18]**

a) Rate of return regulation.

b) Performance based regulation.

c) Incentive regulation.

d) Benchmarking or yardstick regulation.

OR

Q6) a) Explain different non-price issue. **[9]**

b) Explain the roles of central Electricity Regulatory Commission (CERC) and State Regulatory Commission in the power sector. **[9]**

SECTION - II

Q7) a) Explain the following models in details **[8]**

i) Pool model.

ii) Bilateral trades.

b) Explain the California Energy Crisis after the electricity reforms. **[8]**

OR

Q8) a) Explain competition in the market various competition for the market. **[4]**

b) Explain electricity reforms in Nordic Pool. **[4]**

c) Explain various ISO (Independent System Operator) models. **[8]**

Q9) a) State and explain various methods of transmission pricing. **[8]**

b) Specify pecularities of electricity as a commodity. Explain rules that govern the electricity markets. **[8]**

OR

Q10)a) Compare integrated trading model and decentralized trading model. **[8]**

b) Explain Power Exchanges in India. Also explain the concept of market clearing price. **[8]**

Q11)a) Explain in detail congestion issue and management. **[9]**

b) Explain and compare TRANSCO & ISO. **[9]**

OR

Q12)a) What is the importance of transmission pricing under open access condition? State and explain major components of transmission costs. **[9]**

b) Write brief notes on : **[9]**

i) Ancillary Services.

ii) Role of Load Dispatch Centers in Electricity returns.

❖❖❖❖

Total No. of Questions : 12] **[Total No. of Pages : 3**

P1259

[3864]-255

B.E. (Electronics)

ROBOTICS & INDUSTRIAL AUTOMATION

(2003 Course) (404212)

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

Instructions to the candidates:

1) ***Attempt Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10, and Q11 or Q12.***
2) ***Answers to the two 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 the following terms related to robotic manipulators and give brief comments. **[10]**

i) Repeatability
ii) Precision.
iii) Accuracy.
iv) Kinematic Parameters.
v) Tool path & trajectory.

b) Explain : **[8]**

i) Soft & Hard automation.
ii) Fixed & Flexible automation.

OR

Q2) a) How does the SCARA arm geometry differ from the vertical articulated arm? Why is the SCARA arm more ideal for assembly applications? **[10]**

b) What is work envelope? Discuss the work envelopes of 5 basic robot configurations. **[8]**

P.T.O.

Q3) a) Discuss the steps for obtaining forward solution of a robotic manipulator and explain. **[8]**

b) What is Inverse kinematic solution? Why the Inverse kinematic solutions are not unique? **[8]**

OR

Q4) a) Explain Screw Transformations. **[8]**

b) For the point 2i + 4j + 6k, perform following operations. **[8]**

i) Rotate 45 deg about x-axis.

ii) Translate 6 units along y-axis.

iii) Rotate 60 deg about x-axis & translate 2 units along y-axis.

iv) Translate 4 units along y-axis then rotate 30 deg about x-axis.

Q5) a) List different types of end effectors. Explain the selection criterion for each type for various applications. **[8]**

b) Discuss the Lift & Tray Technique for slip detection with neat diagram. **[8]**

OR

Q6) a) Explain the working principle of proximity rod tactile sensor with neat sketch. **[8]**

b) Draw a neat sketch of pneumatically controlled prismatic joint & explain. **[8]**

SECTION - II

Q7) a) What is Jacobian Control? Discuss the Jacobian in terms of D-H matrices. **[10]**

b) What is motion planning in robotics? Discuss the types of motion used in motion planning. **[8]**

OR

Q8) a) Discuss how straight line motion is obtained using an articulated robot. **[10]**

b) Define trajectory of a robot. Give advantages & disadvantages of defining trajectory using work space coordinates & joint space coordinates. **[8]**

Q9) a) Describe different Segmentation Algorithms used in Robot Vision System. **[8]**

b) What is image smoothening? Explain how it is done on a binary image. **[8]**

OR

Q10)a) Explain Image Analysis Algorithm with suitable example. **[8]**

b) Draw neat sketch showing robot system with computer vision & explain. **[8]**

Q11)a) Describe MEMS as microsensor & microactuator with the help of neat block diagram. **[8]**

b) Explain in detail, how object recognition is done in robotics. **[8]**

OR

Q12)Write notes on : **[16]**

a) Specifications of Robot.

b) Task planning.

c) Link & Joint parameters.

d) Nano robot.

❖❖❖❖

Total No. of Questions : 12] **[Total No. of Pages : 3**

P1260

[3864]-269
B.E. (E&TC)
ROBOTICS AND INDUSTRIAL AUTOMATION
(2003 Course) (404218)

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

Instructions to the candidates:

1) ***Attempt Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10 and Q11 or Q12.***
2) ***Answers to the two 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 5 basic robot configurations according to the work envelope, typical applications & power sources. **[10]**

b) What is SCARA robot? Explain the application in which it is most suitable. **[8]**

OR

Q2) a) Define & explain in brief the following terms : **[10]**

i) DOF.

ii) Precision.

iii) Accuracy.

iv) Tool orientation

v) Reach & Stroke.

b) Explain : **[8]**

i) Soft & Hard automation.

ii) Fixed & Flexible automation.

P.T.O.

Q3) a) Explain the conditions for existence of the Inverse Kinematic Solutions. Why the Inverse Kinematic Solutions are not unique? **[8]**

b) For the point 3i + 7j + 5k, perform following operations. **[8]**

i) Rotate 30 deg about X-axis.

ii) Translate 8 units along Y-axis.

iii) Rotate 30 deg about X-axis and translate 6 units along Y-axis.

iv) Translate 6 units along Y-axis then rotate 30 deg about X-axis.

OR

Q4) a) Construct the link co-ordinate diagram using D-H algorithm for SCARA robot & compute the arm matrix T_{Base}^{Tool} (q). **[8]**

b) Draw Joint & Link diagram and define : **[8]**

i) Joint angle.

ii) Joint distance.

iii) Link length.

iv) Link twist angle.

Which is the variable parameter for revolute & prismatic joint?

Q5) a) Name 4 different types of end effectors. Compare & contrast the end effectors from the view of their functions. **[8]**

b) Discuss basic operational characteristics of following proximity sensors : **[8]**

i) Inductive sensor.

ii) Hall effect sensor.

iii) Capacitive sensor.

iv) Ultrasonic sensor.

OR

Q6) a) Which sensor can be used along with the gripper to sense whether the object is falling? Explain the working principle. **[8]**

b) Draw a neat sketch of pneumatically controlled prismatic joint & explain. **[8]**

SECTION - II

Q7) a) Explain how straight line motion can be achieved using an articulated robot. **[10]**

b) Explain the term motion planning in robotics. Describe the types of motion used in motion planning. **[8]**

OR

Q8) a) What is Jacobian Control? Discuss the Jacobian in terms of D-H matrices. **[10]**

b) What is the difference between path & Trajectory? Explain the term Trajectory planning along with proper sketch. **[8]**

Q9) a) What are the template matching techniques of gray level image? Discuss their application to Robot Vision. **[8]**

b) Draw neat sketch of robot system employing computer vision & discuss. **[8]**

OR

Q10)a) Explain the term Perspective Transformation in Robot Vision System. **[8]**

b) Explain different structured illumination techniques used in Robot Vision System. **[8]**

Q11)a) Explain the terms - MEMS & Microsystems. Discuss their applications. **[8]**

b) What is Task Planning in robotics? Explain in detail. **[8]**

OR

Q12)Write notes on : **[16]**

a) Robot Intelligence.

b) Nano robot.

c) Forward solution.

d) Actuators used in robotics.

❖ ❖ ❖ ❖

Total No. of Questions : 6] **[Total No. of Pages : 3**

P1261

[3864]-310

B.E. (Printing)

SUBSTRATE & INK TECHNOLOGY

(2003 Course)

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

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) State the names of three sheet former machines used in paper industry and explain one in detail with speciality of paper. **[10]**

b) Name the flexible packaging materials used in printing industry and describe in detail any one with its major forms. **[8]**

OR

a) Write the importance of stock preparation and refining in paper making industry and discuss in detail use of conical refiner in paper industry. **[10]**

b) Mention with qualities of paper required for the following printing jobs (any two) : **[8]**

i) Annual Reports.
ii) Books.
iii) Greeting cards.
iv) News paper.

Q2) a) Explain any two in detail : **[8]**

i) Opacity of paper in printing.
ii) Brightness of paper.
iii) Color and shade of paper.
iv) Metric sizes in paper.

P.T.O.

b) Explain the following points in detail while selecting the paper for printing job (any two) : **[8]**

i) Finish of the paper.

ii) Coated paper.

iii) Size and weight of the paper.

OR

a) Which precautions will be taken, explain in detail, while placing an order in paper reels for printing job? **[8]**

b) Discuss the importance of following properties of paper in your printing job. (any two) : **[8]**

i) Moisture Content.

ii) Cobb Factor.

iii) Grain Direction.

iv) Dimentional Stability.

Q3) a) Discuss in detail the points to be considered under the indirect costing of printing job. **[8]**

b) To find the total quality of paper required in the size 61 × 88 cms for printing 20,000 booklets in the size 210 mm × 297 mm assuming each booklet contains 24 pages. **[8]**

OR

a) Calculate the total quantity of paper required in the size 45.5 × 58.5 cms for printing monthly magazine 500 copies in the size 210 mm × 297 mm assuming the magazine contains 32 pages. **[8]**

b) To find the length of 60 gsm paper in a reel width 62 cms. The weight of the reel is 300 kgs. **[8]**

SECTION - II

Q4) a) Describe in brief the "Raw Materials" required for the manufacture of offset printing inks. **[6]**

b) With the help of neat sketch explain the process of flexographic printing. **[6]**

c) What are dryers? Explain the purpose of their addition in ink formulations. In which type of formulation these are not required? **[6]**

OR

a) Explain the principles of ink formulation. **[6]**

b) Discuss the significance of color matching in the process of ink formulation. **[6]**

c) Comment of UV curing printing inks. **[6]**

Q5) a) What are the quality controls used in checking print qualities explain them in detail. **[8]**

b) Discuss the concept of 'Green Printing'. **[8]**

OR

a) Comment on any two of the following : **[8]**

i) Ink Trapping.

ii) Ink Contrast.

iii) Environment management system.

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

i) Significance of viscosity in offset print quality.

ii) Ink water balance.

Q6) Comment on any two of the following : **[16]**

a) Heatset and Coldset inks.

b) Screen printing inks.

c) Electrographic inks.

d) White pigments used in printing inks.

OR

Write short notes on any four : **[16]**

a) Plasticizers in inks.

b) Security inks.

c) Solid waste control.

d) Dot variation and Print quality.

e) Roto gravure printing.

f) Printing inks and environmental considerations.

❖❖❖❖

Total No. of Questions : 12] **[Total No. of Pages :5**

P1262

[3864] - 324
B.E. (Chemical)
PROCESS EQUIPMENT DESIGN - II
(Revised 2003 Course)

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

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Your answers will be valued as a whole.***
5) ***Assume suitable data, if necessary.***

SECTION - I

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

i) Types of agitators and baffles with neat sketch.

ii) Power requirements for agitation.

b) Calculate the diameter of a shaft for an agitation system. H.P. required for agitation is 3 HP and speed of rotation is 36 rpm. Impeller diameter is 65 cm. Torque (max) exerted is 18900 kg. m. While bending moment is 27700 kg-m. Calculate the minimum shaft diameter for shear stress and tensile stress.

Permissible shear stress = 400 kg/cm^2

Permissible tensile stress = 600 kg/m^2 **[8]**

OR

Q2) a) A jacketed, agitator reactor consists of a vertical cylinder 1.5m diameter, with a hemispherical base and flat flanged top. The jacket is fitted to be cylindrical section only and extends to a height of 1m. The spacing between the jacket and vessel walls is 75mm. The jacket is fitted with a spiral baffle. The pitch between spirals is 200 mm.

The jacket is used to cool the reactor contents. The coolant used is chilled water at 10ºC; flow rate 32,500 kg/hr, exit temperature 20ºC.

Estimate heat transfer coefficient at the outside wall of the reactor and pressure drop through the jacket.

P.T.O.

Data : physical properties of coolant at mean temp. 15ºC

ρ = 999 kg/m^3 density

μ = 1.136 (MN/m^2)s viscosity

P_r = 7.99

k_f = Thermal conductivity = 595×10^{-3} W/mºC

Use if = 3.2×10^{-3} for pressure drop **[12]**

b) Write note on Limpet coil jacket in reaction vessel with neat sketch. **[6]**

Q3) 6250 kg/hr dry potassium chloride is to be produced in a fluidized bed dryer. Initial moisture content is 10%. While final moisture content is 0.5%.

The feed enters the dryer at 20ºC. Density of potassium chloride = 2000 kg/m^3.

Specific heat of potassium chloride = 712 J/kg. k

Minimum size of particle = 0.1 mm

Maximum size of particle = 0.5 mm

Mean size of particle = 0.25 mm

Flue gases available at 800ºC for drying.

The temperature of exhaust flue gases from FBD = 125ºC

Heat loss can be assumed as 15%

Temp. of dry salt at discharge = 125ºC

Specific heat of flue gases = 1050 J/kg. k

Latent heat of vaporization = 2470 J/kg. k

Sp. heat of water vapor = 1970 J/kg. k

Density of flue gas at std condition = 1.29 kg/m^3

Viscosity of flue gas at exit temperature is 0.22×10^{-3} N.s/m^2.

Porosity of fluidized bed = 0.70

Porosity of fixed bed = 0.4

Fluidized bed height = 360 mm (approx) **[16]**

OR

Q4) a) A wet solid is dried from 25 to 10% moisture under constant drying condition in 15 ks (4.17 Hrs). If the critical and equilibrium moisture contents are 15 and 5 percent respectively; how long will it take to dry the solid from 30 to 8 percent moisture under the same conditions? **[8]**

b) Write short notes on : **[8]**

i) Solvent Drying.

ii) Atomisers in spray dryer.

Q5) a) Acetone is to be recoverd from agueous waste stream by continuous distillation in sieve plate distillation column. Find the diameter of the column for following conditions.

The feed rate = 13000 kg/hr

Molar feed rate = 672.9 kmol/hr

Vapor rate at top = 55.5 kmol/hr

Vapor rate at bottom = 162.3 kmol/hr

Slope of bottom operating line = 5.0

Slope of top operating line = 0.57

Top composition 94% mol (98% W/W), Bottom-essentially water
Reflux ratio = 1.35

At bottom $\rho_v = 0.72$ kg/m^3, $\rho_L = 954$ kg/m^3

Liquid surface tension = 57×10^{-3} N/m

At top $\rho_v = 2.05$ kg/m^3, $\rho_L = 753$ kg/m^3

Liq. surface tension = 23×10^{-3} N/m

Take tray spacing as 0.5m

At bottom $k_1 = 7.5 \times 10^{-2}$

At top, $k_1 = 9.0 \times 10^{-2}$ **[12]**

b) Explain various plate areas in plate distillation column. **[4]**

OR

Q6) a) Write note on **[10]**

i) Van. Winkle's Correlation.

ii) Plate - pressure drop.

b) Give the comparison of plate contactors used in plate distillation column. **[6]**

SECTION - II

Q7) a) Explain Cornell's method for prediction of height of transfer unit in detail. **[9]**

b) Explain packing support, liquid distributor, liquid redistributors as the column internals with neat sketch. **[9]**

OR

Q8) a) Using Onda's method, find height of transfer unit in packed adsorption column operating at 20°C.

With following data,
Pressure = 1.01325 bar,
Total concentration C_T = 55.6 kmol/m^3
Surface tension of liquid $\rho_L = 70 \times 10^{-3}$ N/m at 20ºC
Molar gas flow rate per unit c/s area G_m = 0.027 kmol/s.m^2
Molar liquid flow rate L_m = 0.93 kmol/s.m^2

V_w^* = 0.79 kg/m^2.sec , L_w^* = 17.6 kg/m^2.sec.

Packing used are 38 mm Intalox saddle ceramics.
a = 194 m^2/m^3, σ_c for ceramics = 61×10^{-3} N/m
$\mu_L = 10^{-3}$ N. s/m^2, $\mu_v = 0.018 \times 10^{-3}$ N. s/m^2, ρ_L = 1000 kg/m^3
ρ_v = 1.21 kg/m^3, Diffusivity $D_L = 1.7 \times 10^{-9}$ m^2/s $D_v = 1.45 \times 10^{-5}$ m^2/s **[10]**

b) Discuss on choices of plats or packings in distillation column for separation. **[8]**

Q9) a) Explain detailed design of decanter with essential equations and neat sketch. **[10]**

b) Explain reflux drum with neat sketch. **[6]**

OR

Q10)a) Estimate the dimensions of rectangular oil-water separator for following condition.

Max. waste water flow rate = 0.047 m^3/sec
temp. of operation = 38ºC
Sp. gravity of waste water = 0.995
Absolute viscosity of wastewater = 0.0007 N.s/m^2
Sp. gravity of oil = 0.90 **[10]**

b) Explain principle, constructional features of knock-out drum with neat sketch. **[6]**

Q11)a) Describe the design of pipeline for natural gas. **[8]**

b) Water is flowing through a pipeline at a rate of 1 kg/sec. The internal diameter of the pipeline is 25mm and the length of pipeline is 2200m. Estimate the pressure drop in the pipeline.

Data : Density of water = 1000 kg/m^3
Viscosity of water = 0.001 N.s/m^2 **[8]**

OR

Q12)a) Write notes on : **[10]**

i) Pipe thickness and diameter.

ii) Pipe supports.

b) Discuss on fluid dynamics parameters in pipeline design. **[6]**

Total No. of Questions : 12] **[Total No. of Pages : 4**

P1268

[3864]-384
B.E. (Polymer)
MOLD AND DIE DESIGN
(2003 Course)

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

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Draw neat diagrams wherever necessary.***
3) ***Assume suitable data, if necessary.***
4) ***Numbers to right indicate full marks.***
5) ***Use of log tables, electronic pocket calculators is allowed.***

SECTION - I

Q1) Design and draw plan view and sectional side view to bring out the details of feed system, ejection system and cooling system for a two cavity two plate mold for the component shown in fig.1.

Material : ABS; Shrinkage : 0.5%; Cavity pressure : 200kg/cm^2. **[35]**

OR

Q2) Design and draw plan view and sectional side view to bring out the details of feed system, ejection system and cooling system for a two cavity underfed mold for the component shown in fig.2.

Material : HIPS; Shrinkage : 0.5%; Cavity pressure : 180kg/cm^2. **[35]**

Q3) Calculate the size of runners and gate. Also calculate the size of guide pillar for mold designed in Q.1 or Q.2. **[5]**

OR

Q4) Calculate size of cavity and core inserts for mold designed in Q.1 or Q.2.**[5]**

Q5) Explain with neat sketches, the opening sequence for a split cavity mold with stripper plate ejection. **[10]**

OR

Q6) Write a note on split safety and split guiding mechanism used in split cavity molds. **[10]**

P.T.O.

SECTION - II

Q7) a) Draw a neat sketch of rectangular hot runner manifold block, label the parts and explain its construction in details. **[6]**

b) Explain the construction of any 2 secondary nozzles used in hot runner molds with a neat sketch. **[6]**

c) A manifold block is to be heated from 30°C to 230°C. Calculate expansion between centres of secondary nozzles which are situated 635mm in *x* direction and 350 mm in *y* direction. Coefficient of thermal expansion for steel $\alpha = 13 \times 10^{-6}$ mm/mm°C. **[4]**

OR

Q8) a) Explain various heating techniques used to raise the temperature of a hot runner manifold block. Draw neat sketches to explain. **[6]**

b) Write down advantages and disadvantages of hot runner molds. List few applications of hot runner molds. **[6]**

c) A manifold block of 350 mm × 350 mm × 60 mm is to be heated by using 4 cartridge heaters. If the loading value is 2W/cm^3, calculate wattage of a single cartridge heater. **[4]**

Q9) a) Explain with neat sketches any three milling operations. **[6]**

b) A carbide milling cutter 250 mm in diameter is used to cut a block of mild steel with a plain cutter. The block is 500 mm long. If the feed is 0.5 mm per revolution and depth of cut is 1.5 mm, determine the time required to take one cut. The over travel is 20 mm, cutting speed is 80 m/min. **[6]**

c) Write a note on steels used in making of injection molds. **[4]**

OR

Q10) a) Write down the process sheet for guide pillar for mold designed in Q.1 or Q.2. **[4]**

b) Explain with neat sketches different elements of plain milling cutter. **[6]**

c) With a neat sketch, explain the process of EDM. Write down the requirements of the dielectric fluid. **[6]**

Q11) a) Draw a neat sketch of an inline or cross head pipe die. Explain in short functions of the major parts. **[12]**

b) Write down the mathematical formulae to estimate the pressure drop due to shear and elongation in a coni-cylindrical die. **[6]**

OR

Q12) a) Draw a neat sketch of a centre fed blown film die. **[8]**

b) Find pressure drop through the exit region of the die shown in fig.3. Calculate the bubble dimensions assuming no inflation or draw down Q = extruder output = 95×10^{-6} m^3/s $\tau = 2.4 \times 10^5$ N/m^2 ; $\lambda = 2.24 \times 10^5$ pa - s $r_R = 5.5$. Material : LDPE n = 0.33 **[10]**

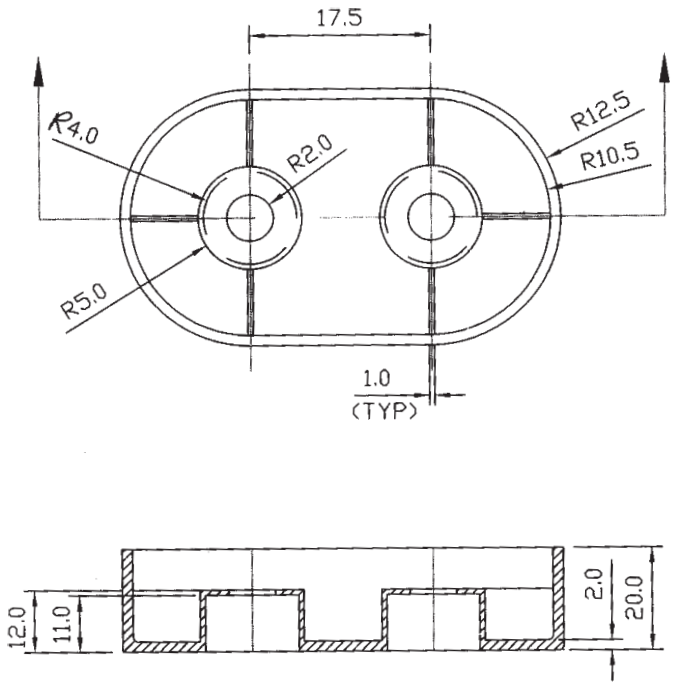


FIGURE (1)
All dimensions are in mm.

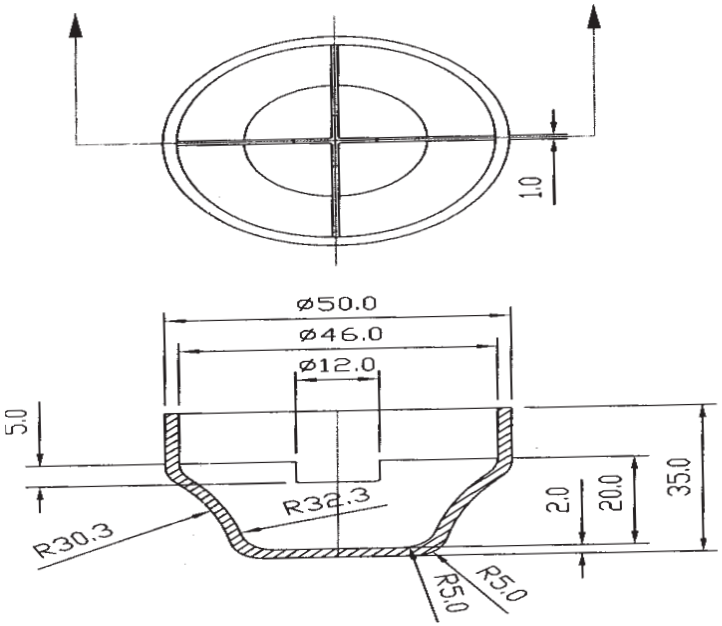


FIGURE (2)
All dimensions are in mm.

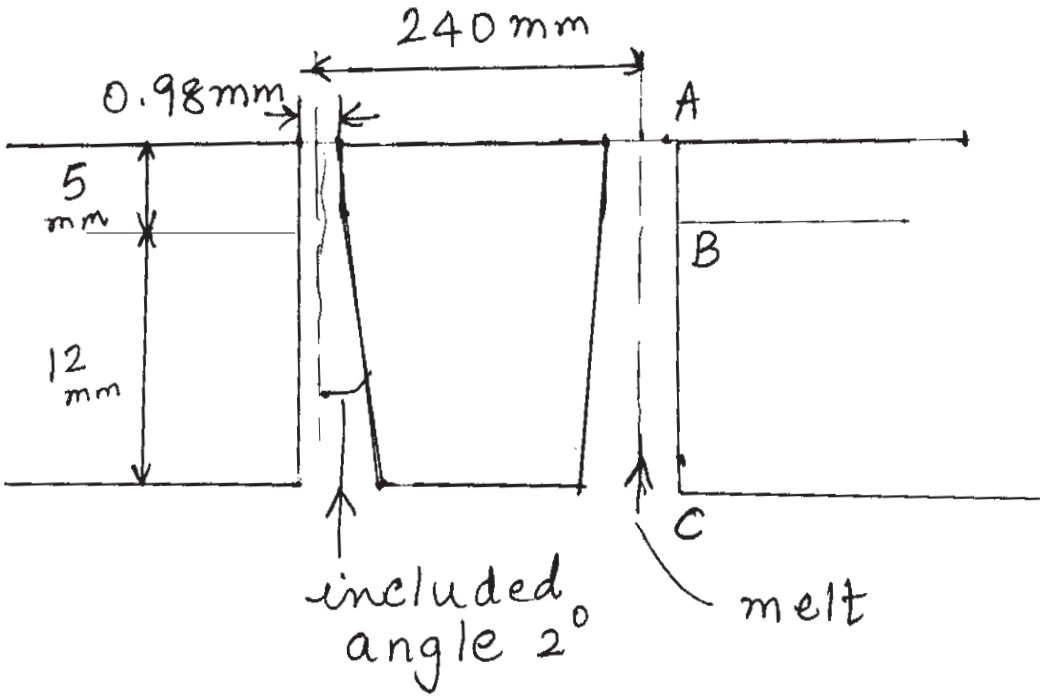


FIG. 3

☒☒☒☒

Total No. of Questions : 12] **[Total No. of Pages : 3**

P1270

[3864]-408
B.E. (Computer Engineering)
MULTIMEDIA SYSTEMS
(2003 Course) (410445) (Elective - I)

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

Instructions to the candidates:

1) ***Answer Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6 from Section-I and 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 answer sheets.***
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) What is multimedia document architecture? Explain what do you mean by MHEG & SGML? **[9]**

b) What is GTK + and QT? Give the features of GTK+. **[9]**

OR

Q2) a) Explain with suitable examples multimedia building blocks and its role in development of web based multimedia applications. **[9]**

b) What are the various devices used in multimedia systems? What are the different multimedia components present in Windows OS? **[9]**

Q3) a) What is histogram of an image? Write algorithm for computing histogram of 8 bit gray scale image? **[8]**

b) What is vector quantization? How is it applied to image compression? **[8]**

OR

Q4) a) Explain different image enhancement techniques by point processing? **[8]**

b) Explain lossy compression technique. Give example. **[8]**

P.T.O.

Q5) a) What are different audio devices used in multimedia systems? Explain any four. **[8]**

b) What are different features of MP3 audio format? Explain its file format. **[8]**

OR

Q6) a) How audio data is captured? What are the fundamental characteristics of audio data? How do you define quality of audio data? **[8]**

b) Explain WAV file format in detail. **[8]**

SECTION - II

Q7) a) Name different techniques used for text compression. Explain with suitable example arithmetic coding applied to text data. **[9]**

b) What are the features of MPEG in video compression? Define and explain I, P and B frames with reference to MPEG. **[9]**

OR

Q8) a) Explain with suitable example how Huffman coding is applied to text compression and decompression? What is compression ratio? **[9]**

b) Which are the different video broadcasting techniques? Explain various features of H.261 and H.263. **[9]**

Q9) a) What is Virtual Reality? Explain any two virtual reality devices. **[8]**

b) What is the purpose of interpolators in VRML? Explain any two with proper VRML code. **[8]**

OR

Q10) a) Explain with suitable examples the four class specifiers available in VRML 2.0. Show the way of connecting event out of a VRML node to event in of another node. **[8]**

b) What are various features of VRML? Explain the use of EVENTS and ROUTS with proper examples. **[8]**

Q11) a) Explain basic principles of 2D animation. **[8]**

b) Explain major steps involved in 3D animation. **[8]**

OR

Q12) Write short notes on : **[16]**

a) 2D Animation Techniques.

b) Methods for creating lighting effects in animation.

c) 3D Sound System.

Total No. of Questions : 10] **[Total No. of Pages : 4**

P1271

[3864]-37
B.E. (E & TC)
FIBER OPTIC COMMUNICATION
(1997 Course) (404191) (Elective - II)

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

Instructions to the candidates:

1) ***Solve section-I and section-II separately.***
2) ***Solve any three questions from section-I and any three questions from section-II.***
3) ***Assume suitable data if necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) State whether the following statements are true or false and give reasons for the same (any three) : **[18]**

a) Si cannot be used for optic transmission system components in the third window of transmission.

b) Single mode fibers are most widely used fiber types.

c) Optical Communication is feasible only in the IR range.

d) Fiber Optic Communication is restricted to only a few transmission windows.

Q2) a) Draw the spectral attenuation curve of optical fiber and mention the different types of loss mechanisms. Explain how these losses can be minimized. **[8]**

b) Determine the cutoff wavelength for the single mode operation of an optical waveguide having radius 8 μm, core refractive index 1.47 and fractional index difference of 0.002. **[8]**

Q3) a) Describe in detail the various modes of propagation in optical fibers. **[8]**

b) Explain the difference between : LASER and LED. **[8]**

Q4) a) A silicon p-i-n photodiode has a quantum efficiency of 85% at the operating wavelength of 0.85 μm. Calculate : **[8]**

i) Its responsivity at 0.85 μm,

ii) The received optical power if the mean photocurrent is 5 μA and the received photons at this wavelength.

P.T.O.

b) Explain the factors that determine the response time of a photodiode. Draw the equivalent circuit of a simple photo diode receiver and find out its bandwidth in terms of circuit parameters. **[8]**

Q5) Write short notes on : **[16]**

a) E/O modulation Techniques.

b) DH structure of LED.

SECTION - II

Q6) Answer the following questions (any three) : **[18]**

a) State and explain the major elements of optical fiber transmission link. Comment on the selection of each of these elements.

b) State and explain the various methods for measurement of attenuation in fiber. Comment on the merits and demerits of each of these methods.

c) Explain the homodyne and heterodyne detection schemes used in optical communication.

d) A 32 × 32 port multimode fiber transmission star coupler has 1mW of optical power launched into a single input port. The average measured optical power at each output port is 14 μ W. Calculate total loss incurred by the star coupler and average insertion loss through the device.

Q7) a) An analog optical fiber link employing D-IM has a p-i-n photodiode receiver in which thermal noise is dominant. **[10]**

The system components have the following characteristics and operating conditions :

p-i-n photodiode with quantum efficiency = 60%

Effective load impedance for photodiode = 50 KΩ

Preamplifier noise figure = 6dB

Operating wavelength = 1 μ m

Operating temperature = 300^{o}K

Receiver post detection Bandwidth = 10 MHz

Modulation index = 0.5

Estimate the required average incident power at the receiver in order to maintain an SNR, defined in terms of the mean square signal current to mean square noise current of 45 dB.

b) What are the necessary requirements to be fulfilled by the material being used for manufacturing optical fibers? How can the refractive index of glass be varied to achieve different properties of fiber? Describe any one method of fiber fabrication technique. **[6]**

Q8) a) Explain the following terms used in fiber optic domain : **[8]**

i) C/N ratio.
ii) RIN.

b) State the principles of good connector design. State the different types of optical fiber connectors. **[8]**

Q9) a) Find the optical gain at threshold of a LD having following parametric values : **[8]**

Reflectivities at both ends = 32%

Absorption coefficient of material = $10cm^{-1}$

Length = $500\mu m$.

What is the effect observed if the length is reduced down to $100\mu m$?

b) Choose the correct alternative from the multiple options for each of the following : **[8]**

i) Which of the following cables will have the highest launch power capability?

1) 50/125/0.2
2) 85/125/0.275
3) 62.5/125/0.275
4) 100/140/0.3

ii) Equilibrium Mode Distribution is best described by which statement?

1) 70% of the core diameter and 70% of the fiber NA should be filled with light.
2) 70% of the fiber diameter and 70% of the cone of acceptance should be filled with light.
3) 70% of the input light should be measured at the output.
4) 70% of the unwanted wavelengths should be attenuated by the fiber.

iii) The higher the index number :

1) The higher the speed of light.
2) The lower the speed of light.
3) Has no effect on the speed of light.
4) The shorter the wavelength of propagation.

iv) The term dispersion describes the process of :

1) Separating light into its component frequencies.
2) Reflecting light from a smooth surface.
3) Absorption of light by an uneven rough surface.
4) Light scattering.

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

a) Optical Amplifiers.
b) Wavelength Division Multiplexing.
c) Non Linear optical effects.

☒☒☒☒

Total No. of Questions :12] **[Total No. of Pages :3**

P1272 **[3864]-136**

B.E.(Mech.)

MATERIALS ENGINEERING AND THEIR PROCESSING

(2003 Course)

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

Instructions to the candidates:

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

SECTION - I

Q1) Answer the following :

a) Draw Fe-Fe_3C phase equilibrium diagram and label completely. Explain the slow cooling of 0.4 % C and 1.2 % C steels. **[8]**

b) Which stainless steel is suitable for Heat-Exchanger tubes ? Why ? Explain weld decay in stainless steels. **[6]**

c) State composition, properties and applications of TRIP steel. **[4]**

OR

Q2) Answer the following :

a) Give classification of tool steels. Explain the heat-treatment for 18:4:1 steel. **[8]**

b) Explain the following terms with respect to pure iron.

i) Allotropy

ii) Cooling Curve

iii) Volume changes. **[6]**

c) State composition, properties and applications of dual phase steel. **[4]**

Q3) Answer the following :

a) Explain the procedure of plotting the TTT curves for 0.4 % carbon steel. State the difference between TTT and CCT curves. **[6]**

b) State the characteristics of Martensite and Retained Austenite. Why amount of R.A. is more in tool steel ? How it is minimized ? **[8]**

c) Explain the principle of induction hardening. **[2]**

P.T.O.

OR

Q4) Answer the following :

a) Explain the following heat- treatments with one application (any two): **[8]**

i) Austempering ii) Martempering

iii) Patenting

b) Explain the principle of carburising. Distinguish between carburising and nitriding. **[6]**

c) Why annealing improves the machinability. **[2]**

Q5) Answer the following :

a) Give the classification of cast irons. Explain the production process, micro-structure & applications of the following (any two) **[8]**

i) S.G.iron ii) C.G.iron

iii) Malleable iron

b) Draw Cu-Zn phase equilibrium diagram and explain single phase & two phase brasses. **[8]**

OR

Q6) Answer the following :

a) Draw Al-Si phase equilibrium diagram & explain the effect of sodium on the diagram. **[6]**

b) Give the composition and properties of Duralumin. Explain the precipitation hardening treatment. **[6]**

c) State the characteristics of bearing materials. Give one example. **[4]**

SECTION - II

Q7) Answer the following :

a) Classify the composites with respect to matrix and explain their properties and applications. **[6]**

b) What is hybrid composite ? State advantages and disadvantages of hybrid composites. **[6]**

c) State manufacturing processes used for composites. Explain filament winding technique with neat sketch. **[6]**

OR

Q8) Answer the following :

a) State suitable composite for the following and give justification. (any three) : **[9]**

i) Offset structure ii) Automobile carbody

iii) Television body iv) Body of drilling m/c

b) Explain the effect of following factors on the strength of polymers. **[6]**

i) Degree of cross linking.

ii) Branching.

c) What is liquid crystal polymer? **[3]**

Q9) Answer the following :

a) Explain with neat sketch the principle of CVD coating. State advantages, disadvantages and applications of CVD coating. **[8]**

b) Explain the co-relation between metallurgical factors and wear. **[4]**

c) Explain the principle of hardfacing and state limitations. **[4]**

OR

Q10) Answer the following :

a) Explain the properties and applications of the following matrix materials. (any three) **[9]**

i) Phenolics ii) Epoxies

iii) Polymides iv) Silicones.

b) State the properties and applications of ceramics. Bond between ceramics and fibers should be weaker than matrix why ? **[7]**

Q11) Answer the following :

a) State advantages and disadvantages of nanotechnology. Properties of carbon anotubes changes w.r.t. dimensions. Explain in details. **[8]**

b) State composition and properties of shape memory alloy. **[4]**

c) State the composite used for tennis racket and give the reason. **[4]**

OR

Q12) Answer the following :

a) With neat sketch explain arc discharge method used for the production of carbon nanotubes. How boron nanotubes differ from carbon nanotubes. Give one application of each. **[10]**

b) Explain the principle of super conductivity. **[3]**

c) What is shape memory alloy ? Discuss with one example. **[3]**

⌘⌘⌘⌘

Total No. of Questions : 12] **[Total No. of Pages : 6**

P1273

[3864]-152
B.E. (Mech. S/W)
INDUSTRIAL HYDRAULICS AND PNEUMATICS
(2003 Course)

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

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Answer Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6 from section-I and Q. 7 or Q. 8, Q. 9 or Q. 10, Q. 11 or Q. 12 from section-II.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are the different locations where filters are provided in hydraulic systems. **[6]**

b) Compare hydrostatic and hydrodynamic power transmission. **[5]**

c) Write in short on Fluid Power applications in material handling. **[5]**

OR

Q2) a) Draw a neat sketch and explain working of a Gear Pump. Draw typical characteristics of a Gear pump. **[10]**

b) What are the different types of seals used in various hydraulic components? **[6]**

Q3) a) What are the properties of fluids which need to be considered while used in hydraulic systems? **[6]**

b) Explain in brief the areas of application of fluid power. **[6]**

c) Why hydraulic power especially useful with heavy work? **[4]**

OR

Q4) a) Explain : **[10]**

i) Accumulator as an auxiliary power source.
ii) Accumulator as a hydraulic shock absorber.

b) What are the advantages of fluid power system. **[6]**

P.T.O.

Q5) a) Explain the different centre positions in direction control valves. **[6]**

b) What is meter in and meter out circuit. Draw and explain the advantages of these circuits. **[8]**

c) What is the purpose of providing pressure switch in a hydraulic circuit? **[4]**

OR

Q6) a) Explain working with the help of a neat sketch of **[15]**

i) Pressure compensated flow control valve.
ii) Pressure reducing valve.

b) What is positive displacement and non-positive displacement pumps? **[3]**

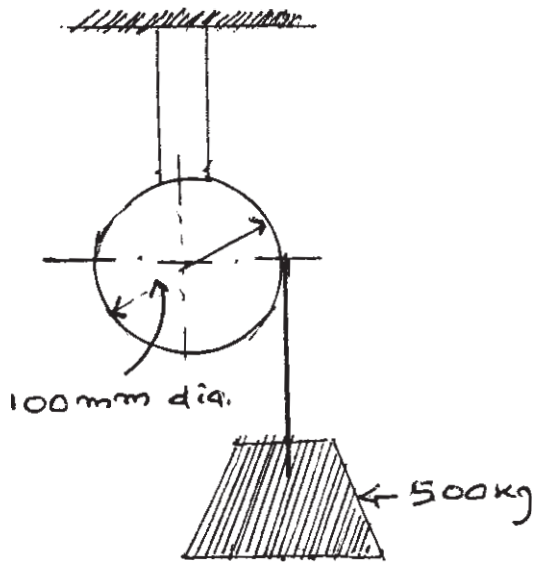
SECTION - II

Q7) a) Explain with proper diagrams, the various types of styles used for mounting of hydraulic cylinders. **[4]**

b) Draw circuits to show the applications of : [No description required] **[6]**

i) Unloading valve.
ii) Extension of double acting cylinder with regenerative circuit.
iii) Meter out flow control during the both strokes of cylinder.

c) A motor is to be selected for operating the winch shown in fig. The motor should be capable of lifting the mass of 500kg at a linear speed of 600 mm/s. **[6]**

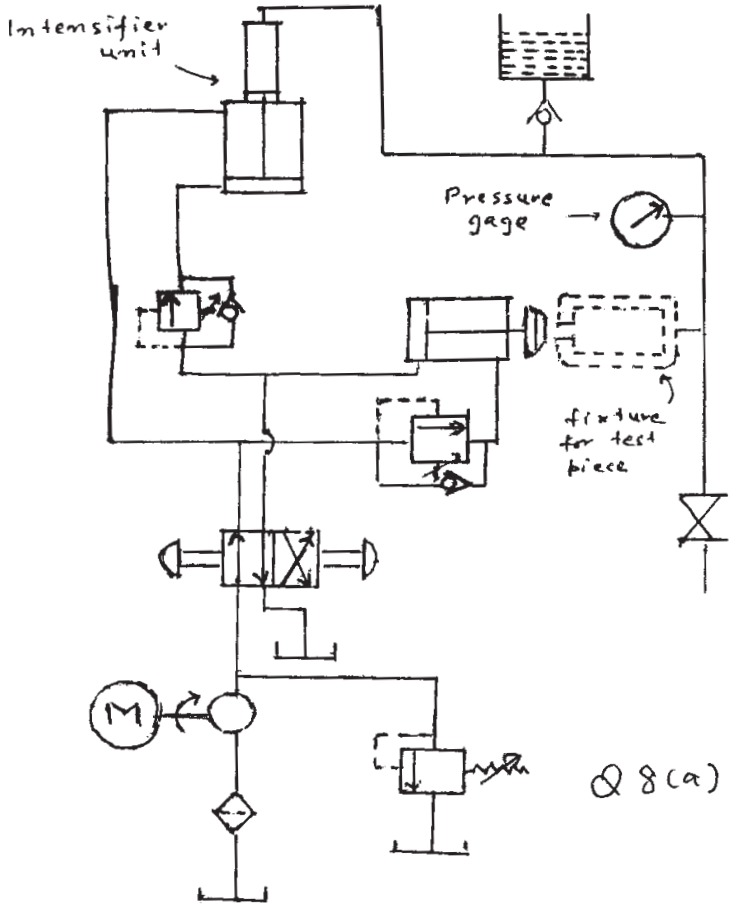


calculate :

i) The displacement of motor for the available pressure of 160 bar. Assume hyd. efficiency 95% mech. efficiency 93%.
ii) The flow rate in 1Pm.

OR

Q8) a) The circuit shown is used for hydraulic pressure testing of work piece. Two cylinders-one for locking and other to provide oil at high pressure are operated in sequence study the circuit and explain the operations of extending and retraction during one cycle. **[10]**

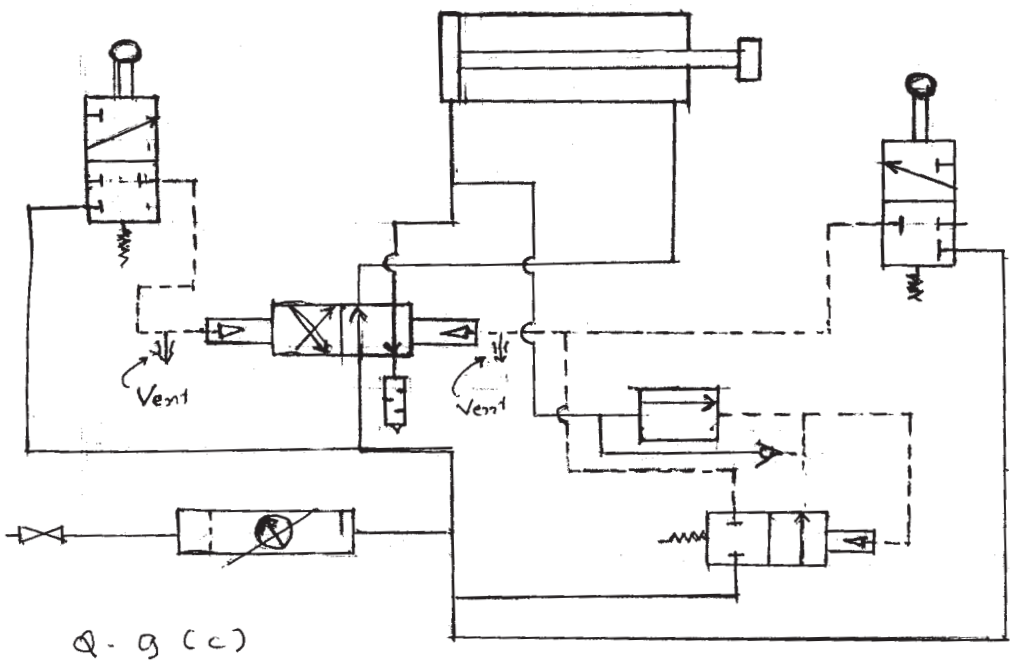


b) Why cushioning of cylinder is essential? Explain with proper sketches various methods used in cushioning of cylinders. **[6]**

Q9) a) Compare the salient features of hydraulic and pneumatic modes of power transmission. Discuss the fields of application and factors that govern the selection of the either of two. **[3]**

b) Draw a typical basic pneumatic circuit incorporating directional/flow control (meter out) valves in addition to all other essential components of the circuit. **[3]**

c) A pneumatic circuit for the operation of a double acting cylinder, with protection against overload is shown in fig. Analyse the circuit and describe the operation when the lever of the starting valve is momentarily depressed. **[10]**



OR

Q10) a) Write a short note on pneumatic motor indicate the specific applications of such motors. **[3]**

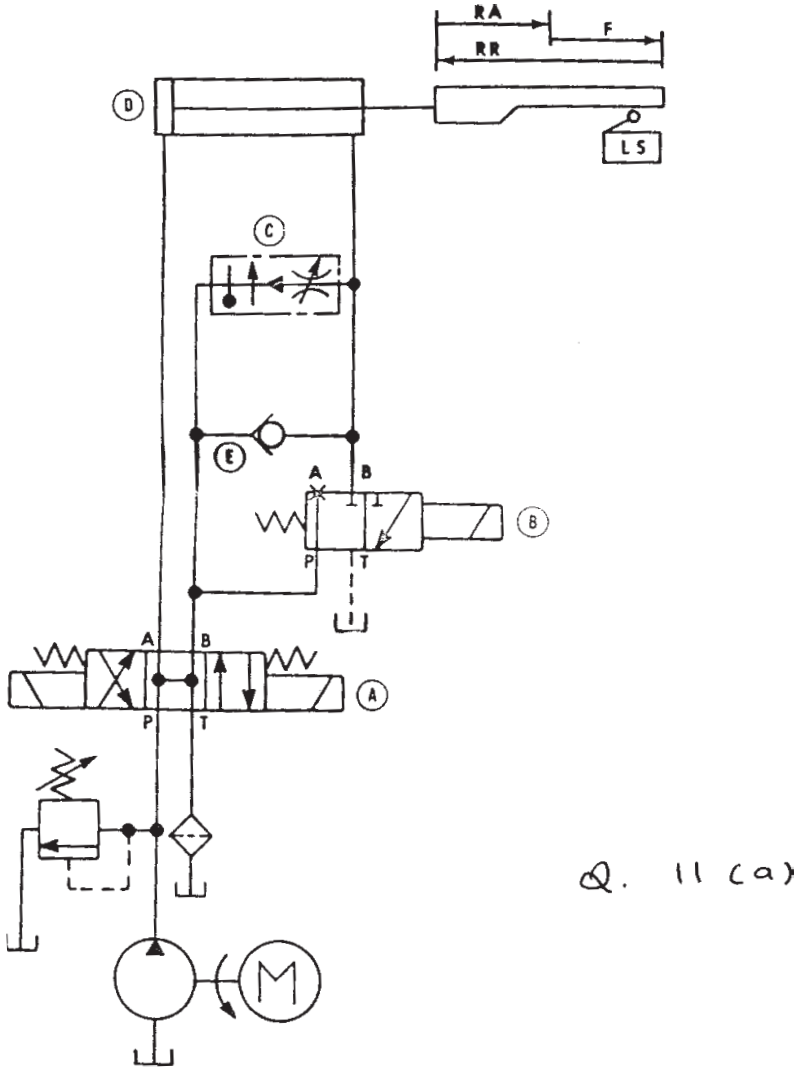
b) Draw standard graphic symbols for : **[4]**

i) Exhaust port silencer.
ii) Quick exhaust valve.
iii) Pneumatic pressure relief valve.
iv) And valve.

c) Explain the purpose of pressure regulator in FRL unit. How the performance of pneumatic actuator is affected in the absence of pressure regulator in the system? **[3]**

d) Describe with sketch the working of pressure regulator. **[6]**

Q11) a) The circuit shown is used for rapid advance of Piston followed by slow motion during the actual operation of the machine. Analyse the circuit and explain how the complete operation of double acting cylinder takes place during the whole cycle. **[8]**



Q. 11 (a)

b) The following details pertain to the above circuit : **[10]**

i) Initial extension of 600mm of Piston at a speed of 120 mm/s against a load of 10kN, which is followed by 200 mm advance at 50 mm/s against a load of 50kN. Assume uniform retraction against a load of 10kN. All the essential components are shown in the diag.

ii) Design the probable ratings of :

1) Cylinder and piston rod diameter (cylinders with 60 mm to 80 mm bore and piston rods with 20 mm to 40 mm are readily available).

2) Flow control valve.

3) Pump details.

4) Spring settings for relief valve and check valve.

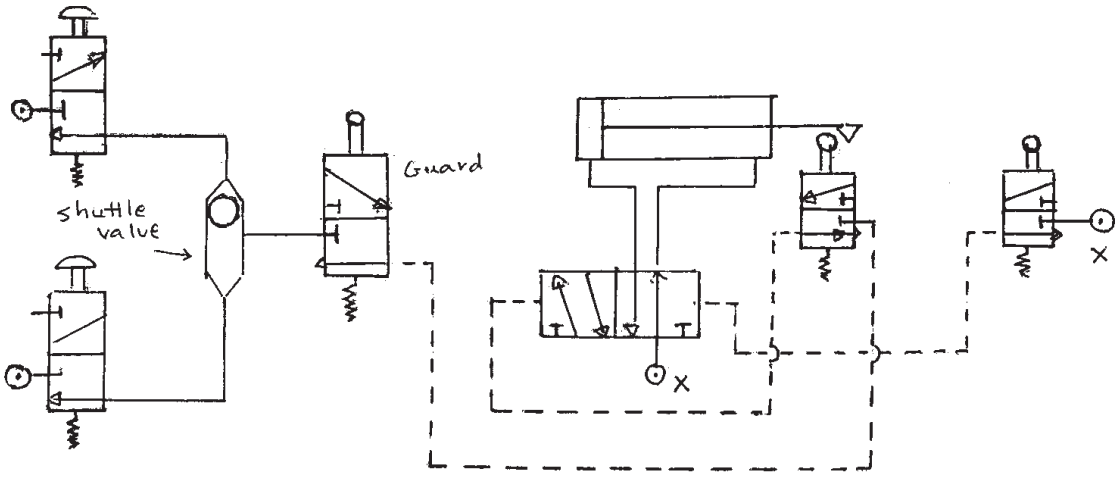
5) Any additional details if you feel to specify (e.g. time required for extraction)

[Make suitable assumptions if required].

OR

Q12) a) Design a suitable safety pneumatic circuit for the continuous reciprocating action of the piston of a double acting cylinder. The circuit should necessarily be provided with two control valves. (in addition to the other valves) to keep both the hands of operator engaged during the extension stroke. Release of one or both the hands of operator off the valves should retract the cylinder to starting position. All the valves provided should preferably have pilot operated spring return systems. **[10]**

b) Study and analyse the circuit shown in fig. All the points marked 'X' are connected to pneumatic power supply. **[8]**



Q. 12 (b)

Total No. of Questions : 12] **[Total No. of Pages :5**

P1274

[3864] - 224
B.E. (Electrical)
CONTROL SYSTEM - II
(2003 Course)

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

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***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) Compare the state space technique with the transfer function method for the analysis of feedback control systems. **[8]**

b) Obtain state space representation in phase variable form for a system described by (Draw block diagram also) **[10]**

$$\frac{Y(s)}{U(s)} = \frac{s+2}{s^3+3s^2+4s+5}$$

OR

Q2) A D.C. motor position control system is described by the following differential equations

$$V - E_b = I_a R_a + L \frac{dI_a}{dt}$$

$$T = K_m I_a;\ T = J\frac{dw}{dt} + B\,w;\ E_b = K_b\,w$$

Where $w = \frac{d\theta}{dt}$ = angular velocity

I_a = Armature current

V = Armature voltage; E_b = Back emf

K_m = Motor torque constant; K_b = Back emf constant

J = Rotor inertia; B = frictional constant.

P.T.O.

Obtain two different state models for the system using **[18]**

a) $[x_1, x_2, x_3]^T = [\theta, \dot{\theta}, I_a]^T$

b) $[x_1, x_2, x_3]^T = [\theta, \dot{\theta}, \ddot{\theta}]^T$

Q3) a) Derive the solution of a nonhomogeneous state equation $\dot{X} = AX + BU$. **[8]**

b) Using the concept of similarity transformation obtain diagonal form for a system

$$\dot{X} = \begin{bmatrix} 3 & -1 & 1 \\ -1 & 5 & 1 \\ 1 & -1 & 3 \end{bmatrix} X + \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix} U$$

[8]

OR

Q4) a) State Caley-Hamilton theorem and explain how it can be used for computation of state transition matrix. **[8]**

b) Obtain state transition matrix using Laplace transform method for

$$A = \begin{bmatrix} 0 & 1 \\ -3 & -4 \end{bmatrix}.$$

Hence obtain solution for a homogeneous equation $\dot{X} = AX$ for the initial condition $X(0) = [1 \quad 1]^T$. **[8]**

Q5) a) Define controllability and observability of a system. Explain Kalman's test and Gilbert's test for controllability and observability. **[10]**

b) Investigate controllability and observability of a system described by

$$\dot{X} = \begin{bmatrix} 1 & 2 & -1 \\ 0 & 1 & 0 \\ 1 & -4 & 3 \end{bmatrix} X + \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix} U$$

$$Y = \begin{bmatrix} 1 & 1 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$$

[6]

OR

Q6) a) Explain Ackerman's method for pole placement using state feedback. **[8]**

b) Consider a system defined by

$$\dot{X} = AX + BU$$

where

$$A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -1 & -5 & -6 \end{bmatrix} \quad B = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}$$

Using state feedback control, it is desired to have the closed loop poles at $s = -2 \pm j4$; $s = -10$. Determine the state feedback gain matrix K. **[8]**

SECTION - II

Q7) a) Explain the method of describing function for analysis of nonlinear systems stating clearly the assumptions. What are the advantages and disadvantages of the method over phase plane method? **[8]**

b) Obtain the describing function for the ON-OFF nonlinearity with dead zone shown in Figure 7b. **[8]**

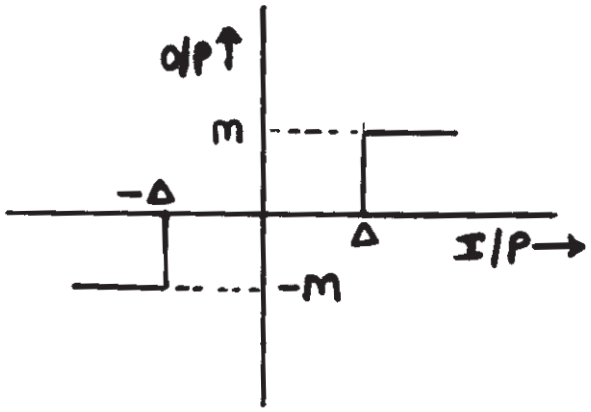


fig 7b

OR

Q8) a) Write a short note on the following phenomena of nonlinear systems. **[8]**

i) Jump resonance.

ii) Subharmonic Oscillations.

b) For the system shown in figure 8b, determine the amplitude and frequency of the limit cycle. **[8]**

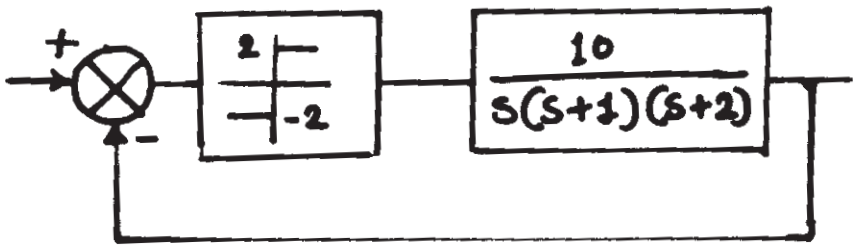


fig 8b

Q9) a) Find equilibrium points for the nonlinear systems described by the following state equations **[6]**

i) $\dot{x}_1 = x_2$

$\dot{x}_2 = -\sin x_1$

ii) $\dot{x}_1 = ax_1 - bx_1x_2$

$\dot{x}_2 = cx_1x_2 - dx_2$

b) A linear second order system is described by the equation

$$\ddot{e} + 2\xi\, w_n\dot{e} + w_n^2\, e = 0$$

where $w_n = 2 \quad \xi = 0.2$.

Using the method of isocline, construct phase trajectory of the system for the initial conditions

$e(0) = -2 \qquad \dot{e}(0) = 1$ **[10]**

OR

Q10)a) Explain the direct method of Lyapunov to determine the stability of a nonlinear control systems. **[8]**

b) Consider a system described by the state equations

$\dot{x}_1 = x_2$

$\dot{x}_2 = -x_1 - x_2$

Choosing Lyapunov function

$V(x) = x_1^2 + x_2^2$, comment on stability of the system **[8]**

Q11)a) Explain the concept of performance index and different indices ISE, ITAE, IAE and ITSE. **[9]**

b) Explain in brief different factors considered in designing optimal controller. **[9]**

OR

Q12) Write a note on : **[18]**

a) Power transmitting techniques.

b) Switches and relays.

c) Hydraulic and pneumatic actuators.

✪✡✪✡

Total No. of Questions : 12] **[Total No. of Pages : 4**

P1275

[3864]-225

B.E. (Electrical)

ROBOTICS & AUTOMATION

(2003 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) ***Figures to the right indicate full marks.***
4) ***Your answers will be valued as a whole.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Differentiate between fixed, flexible and programmable automation stating clearly their application area. **[8]**

b) Write a short note on the basic components of robot. **[8]**

OR

Q2) a) With the help of block diagram, explain basic concept of CNC machine and its industrial applications. **[8]**

b) Explain following robot like devices with the help of neat diagram **[8]**

i) Prostheses.

ii) Telecherics.

Q3) a) Explain the concept of end effector, tool frame, tool point, roll, pitch, yaw with the help of neat diagram. **[6]**

P.T.O.

b) Explain the concept of work volume and work envelope for the following types of robots. **[10]**

i) Cartesian Robot.

ii) Cylindrical Robot.

iii) Spherical Robot.

Is there any relation between their work envelope and their industrial applications. Explain.

OR

Q4) a) Compare point to point, continuous path and pick-place robots. **[8]**

b) Write a note on selection of drive for robot applications. **[8]**

Q5) Write a note on (any 3) : **[18]**

a) Two methods of rotary to rotary motion conversion.

b) Two methods of rotary to linear motion conversion.

c) Lagrangian analysis.

d) Mechanical grippers.

OR

Q6) a) Explain the concept of robot arm kinematics and dynamics with the help of block diagram. **[9]**

b) Derive a set of dynamic equations for a single prismatic joint working against gravity using Lagrangian method. **[9]**

SECTION - II

Q7) a) Draw a neat diagram of 'Puma Robot' explaining the degrees of freedom. Also show all the co-ordinate frames attached to the robot. **[10]**

b) For the robotic tool shown in Figure 7b, suppose we yaw the tool by π radians about x axis, then pitch the tool by $-\pi/2$ radians about new y axis and finally roll the tool by $\pi/2$ radians about new z axis. **[8]**

i) Sketch the sequence of tool positions after each of the yaw, pitch and roll movements.

ii) Find the transformation matrix T which maps tool coordinates into wrist coordinates.

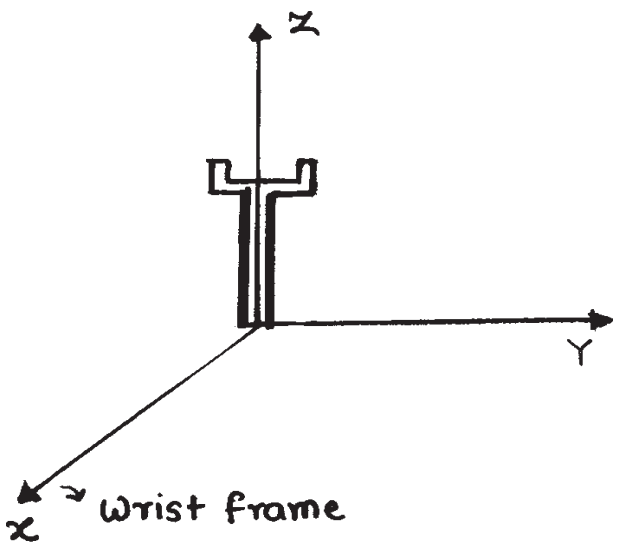


FIG 7b

OR

Q8) a) Define D-H parameters with the help of neat diagram. **[8]**

b) Frames A,B,C and D are attached to the corners of a cuboid as shown in Figure 8b. Using the concept of homogeneous transformation matrix, find T_{AB}, T_{AC}, T_{BC}, T_{AD}. **[10]**

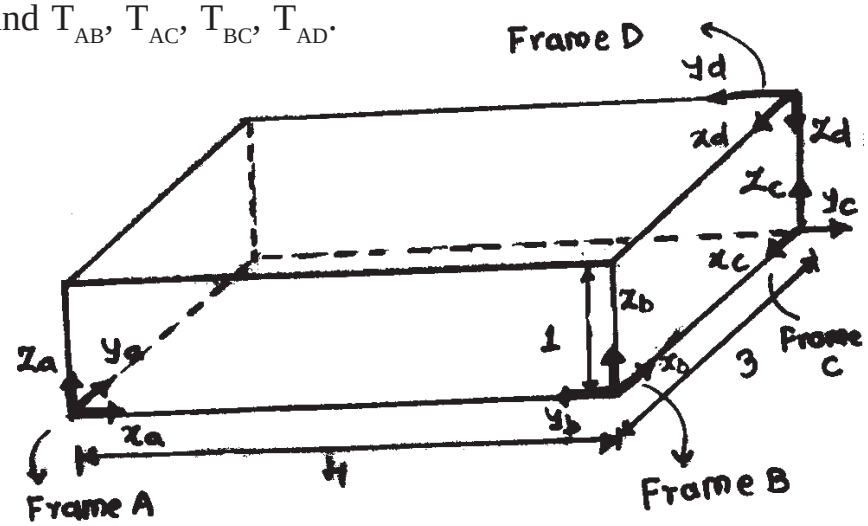


FIG 8b

Q9) Write a note on the following industrial applications of robots (Details of selection criteria, sensors, drives, method of control and peripheral devices).

a) Part sorting and inspection. **[16]**

b) Welding.

c) Spray painting.

d) Grinding.

OR

Q10) a) Explain the concept of inverse kinematics, its importance and problems associated with it. **[8]**

b) Explain direct method and geometric method to solve inverse kinematics problem stating clearly their advantages and disadvantages. **[8]**

Q11) Explain with the help of block diagram :

a) JPC (Joint Position Control). **[5]**

b) RMPC (Resolved Motion Position Control). **[5]**

c) RMRC (Resolved Motion Rate Control). **[6]**

OR

Q12) Write a note on :

a) Online and Offline programming. **[4]**

b) Teach pendant. **[4]**

c) Classification of robot languages. **[8]**

❖ ❖ ❖ ❖

Total No. of Questions :6] **[Total No. of Pages :2**

P1281

[3864]-373
B.E. (Petro Chemical Engineering)
PETROLEUM EXPLORATION AND PRODUCTION OPERATIONS
(Elective) (2003 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) ***Draw neat diagrams wherever necessary***

SECTION - I

Q1) a) What are the important stages of development of petroleum industry during last two centuries? Discuss the factors that make balance of demand and supply of petroleum even today. **[10]**

b) What happens to each barrel of oil produced in terms of approximate percentage usage in each important application. **[6]**

OR

a) What is the general structure of an E & P oil company? Explain the terms with respect to oil industry: National Oil Company, Major, Independents, Service Company. **[8]**

b) Give the 'Standard Geological Timescale' in a tabular form and the major events in each division. **[8]**

Q2) What are sedimentary rocks? How are they formed? Give a classification of sedimentary rocks. Why are they important to petroleum industry? **[16]**

OR

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

a) Calorific value of hydrocarbon fuels,

b) Geochemical Exploration,

c) Kerogen,

d) Types of reservoir drive mechanisms,

e) Rock cycle.

P.T.O.

Q3) Explain different types of geophysical methods of exploration for oil in brief with the help of neat sketches. **[18]**

OR

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

a) Physical properties of crude oil,

b) Scenario of development of petroleum industry in India in the next decade,

c) Migration of hydrocarbons,

d) Comparison of NYMEX, Brendt, Middle East and Mumbai High crudes.

SECTION - II

Q4) With the help of neat figures show various systems of a typical oil well drilling rig and explain. **[16]**

OR

a) What are well logs? How are they recorded? How are they useful in locating hydrocarbons? **[6]**

b) Explain important (i) surface or (ii) subsurface production equipment. **[10]**

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

a) Impact of petroleum industry on environment,

b) Nonconventional petroleum resources,

c) Hydrocarbon potential of India,

d) Carbon credits,

Q6) Write notes on any three of the following: **[18]**

a) Processing of crude oil,

b) Recent advancements in drilling technology,

c) Functions of drilling fluids,

d) Importance and types of casings,

e) Oil Refining industry in India,

f) Enhanced Oil Recovery.

⌘⌘⌘⌘

Total No. of Questions : 12] **[Total No. of Pages : 3**

P1287

[3864]-250

B.E. (Electronics)

ELECTRONIC MEASUREMENT

(2003 Course) (404209)

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

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***

SECTION - I

Q1) a) Write the principle of Digital LCR - Q meter. Draw the diagram and explain. Also state its applications and specifications. **[10]**

b) Why the Vector Impedance Meter is used? Explain its operation with neat block diagram. **[8]**

OR

Q2) a) What is the distributive capacitance C_d? Explain distributive capacitance measurement in Q-meter circuit. How C_d and insertion resistance affect the 'Q' of a coil? **[10]**

b) Explain with the neat diagram Autoranging in DMM. What do you mean by Autozeroing in DMM. **[8]**

Q3) a) State how the stability is achieved in Digital Frequency Meter using TCXO and OCXO. **[8]**

b) Explain the High Frequency Measurement techniques in Digital Frequency counter. **[8]**

OR

Q4) a) Write brief notes on

i) Regression Analysis.

ii) Calibration Methodologies. **[8]**

b) Calculate

i) Arithmetic Mean

ii) Deviation of each value from the mean.

iii) Standard Deviation.

iv) Variance

P.T.O.

for the given data:

$x_1 = 49.7$

$x_2 = 50.1$

$x_3 = 50.2$

$x_4 = 49.6$

$x_5 = 49.7$ **[8]**

Q5) a) Compare Digital Storage Oscilloscope with Analog CRO. Write their specifications also. **[8]**

b) What are different sampling Techniques used in DSO? Explain. Also draw and explain the Block diagram of DSO. **[8]**

OR

Q6) a) Explain the various measurements performed on DSO. Also comment on the memory in DSO. **[8]**

b) What is the difference between dual beam CRO and dual Trace CRO? Draw and explain the block diagram of dual Trace CRO. **[8]**

SECTION - II

Q7) a) Explain in brief the need of Logic Analyzer, FFT Analyzer, Protocol Analyzer and Spectrum Analyzer in electronic measurement systems. State at least one specification of each. **[10]**

b) Draw the diagram and explain Fundamental Suppression Distortion Analyzer. **[8]**

OR

Q8) a) What are different types of Spectrum Analyzers? State their application area. Explain any one with neat block diagram. **[8]**

b) Write the different modes of observing the signals on Logic Analyzer. Also write any two applications and two specifications of Logic Analyzer. **[6]**

c) Why protocol analyzer is used in the measurement system? **[4]**

Q9) a) Write a brief note on S-parameters and their measurements **[8]**

b) Comment on the Accuracy of Network Analyzer. **[8]**

OR

Q10)a) Compare Scalar Network Analyzer and vector Network analyzer. Explain any one with neat diagram. **[8]**

b) Comment on Sensitivity, Selectivity and phase fitter measurement in communication system. **[8]**

Q11)a) What do you mean by Virtual Instrumentation? Describe in brief the components of virtual instrumentation system. **[8]**

b) Explain IEEE-488 bus structure in detail. **[8]**

OR

Q12)a) Write a brief note on Computer Controlled test measurements. **[8]**

b) Compare FDM and TDM. How will you use Virtual Instrumentation for the measurement of FDM and TDM? **[8]**

Total No. of Questions : 12] **[Total No. of Pages :4**

P1288

[3864] - 251
B.E. (Electronics)
MANAGEMENT INFORMATION SYSTEM
(2003 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 table is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What do you understand by the term "convergence technology"? What are its implications for the technology industry? **[8]**

b) Describe various information purposes. Elaborate how decision-making can be viewed to be the dominant purpose of using information. **[8]**

OR

Q2) a) Explain key concept of MIS. **[8]**

b) Why does open system view of business organization hold for its systems, sub-systems and their components also? **[8]**

Q3) a) Why does a technological shift from energy based to data driven technologies create a new market need to use information decision 'smarter'? **[10]**

b) Define- information integrity, information integrity risk. **[6]**

OR

Q4) a) Why is a business process in a complex and changing environment an open system? **[8]**

b) Explain why there is a shift from collective design decision to individual design decision with example. **[8]**

P.T.O.

Q5) a) i) "The focus of a System Dynamics study is not a system, whatever it is, but a problem".

What is the significance of "System Dynamics" methodology in studying the complex system failures'? Explain with the help of an example.

ii) Consider the following "job backlog-anxiety system".

"In a situation of high backlog of work, a larger number of tasks are to be completed, which causes anxiety to rise. Rise in anxiety makes it more difficult to concentrate and complete any given task. This increases the average time to complete a task. This results in slowing down of task completion rate, which in turn has the job backlog depleted less rapidly".

Present above system by its causal-loop representation? Is it a feedback loop? If yes, which type, negative or positive?

[9]

b) List and briefly describe stages in approaching a problem in a system using the System Dynamics methodology. **[9]**

OR

Q6) a) " In engineering design and control, there is a subject area of "systems engineering", which is concerned with planning and design of (large) systems to achieve proper balance, performance, and economy. For example, design and development and launching into the space of a communication satellite is a systems engineering project".

What is the difference in studying a system from the "system engineering" angle and from "System Dynamics" angle? Explain with the help of an example of your choice. **[8]**

b) Describe the following System Dynamics variables **[10]**

i) Level variable
ii) Rate variable
iii) Parameters and input variable
iv) Supplementary variable
v) Auxiliary variable.

SECTION - II

Q7) a) What do you understand by following terms? Explain with the help of example. **[8]**

i) Closed system and open system.
ii) Closed loop and open loop.

b) Develop a systems view of Integrity Information Technology Development System. In the process explain the significance of System Dynamics modeling for Integrity Information System Development. **[10]**

OR

Q8) a) A common problem of large development projects is threefold:

i) the cost overruns

ii) the need to hire and train additional personnel midway through the project, and

iii) overrunning the scheduled time allotted.

For a product/system/service development firm, fig(1) gives a "hiring (or firing) system" adopted by the development project firm for adjusting workforce, and fig. (2) a system for assessing "the time required and the time remaining".

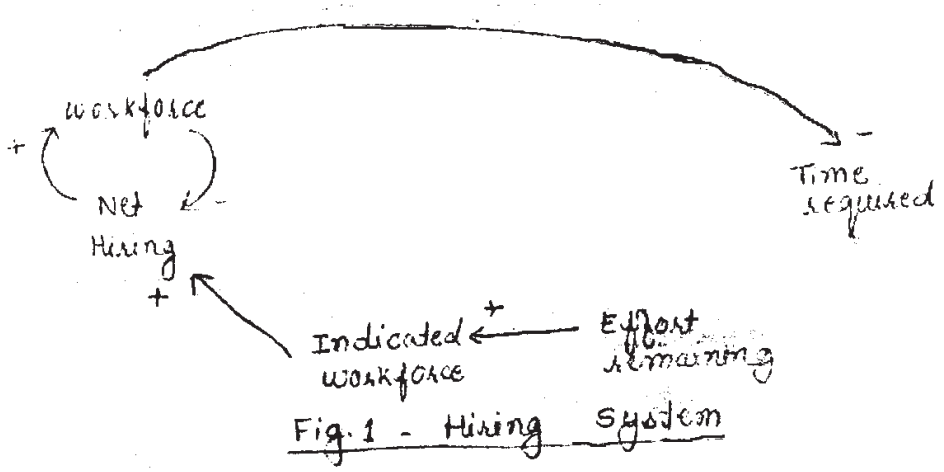


Fig. 1 - Hiring System

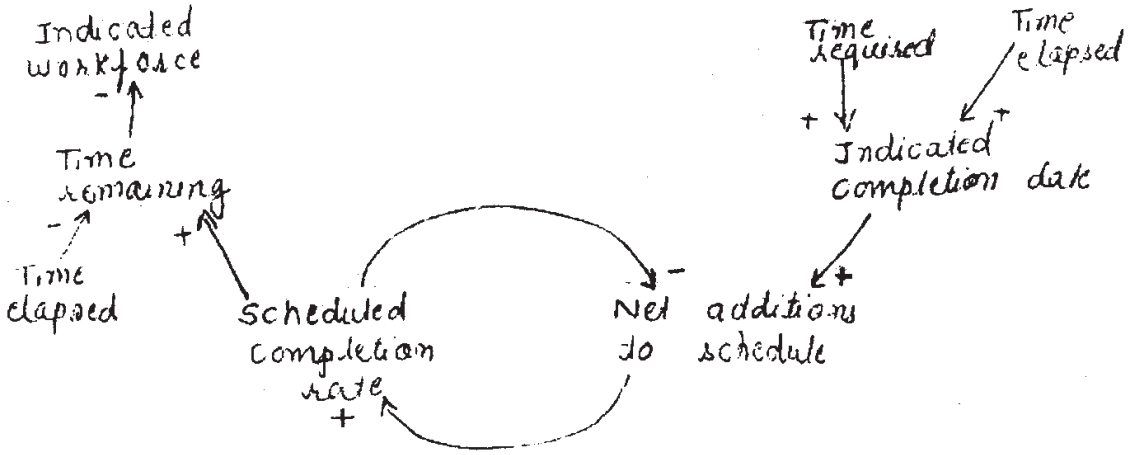


Fig. 2 - A system for assessing "The time required and time remaining"

i) Develop an integrated causal-loop model showing an overview of a development project structure. What more can you say about causal loop model and the structure? **[9]**

ii) Identify feedback loops in the project structure and explain their nature. Do these feedback loops control the system problems? Explain. **[9]**

Q9) a) Why are existing perceptions of certainty, risk, uncertainty, and risk the concern of information economics? **[8]**

b) "I*I in computerized information system, which has a context specific application, is an interdisciplinary area". Explain briefly. **[8]**

OR

Q10)a) What is the theory of uncertainty avoidance, i.e., risk aversion? What does it state? What is its implication for decision making? **[8]**

b) Explain why "Usability Risk" by itself is irrelevant with respect to determining which decision action to choose. **[8]**

Q11)a) Define components of I*I risk. **[8]**

b) "In SEU Theory equation of information value does not account for information analysis and evaluation costs, which are the reality when information is seen as a workable mechanism for decision-making under complex and changing environment". Discuss. **[8]**

OR

Q12)a) Write short notes on -Acquisition cycle, Utilization cycle, information integrity cycle under the I*I technology development. **[8]**

b) Give Cost benefit Analysis equation of Information Integrity and each term of the equation. **[8]**

Total No. of Questions : 12] **[Total No. of Pages : 3**

P1289

[3864]-409

B.E.

NETWORK AND INFORMATION SECURITY

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 to the right indicate full marks.***
3) ***Draw neat diagrams wherever necessary.***
4) ***Make suitable assumptions wherever necessary.***

SECTION - I

Q1) a) Explain the basic security concepts. How the individual components of the system are identified for analysis. **[8]**

b) Explain the ISO Security Architecture. **[8]**

OR

Q2) a) What are typical phases of operation of viruses or worms? How do the worms propagate? **[8]**

b) Explain Man-in-Middle attacks and Reply attacks with suitable example. What are different security measures to control these attacks? **[8]**

Q3) a) Enlist and explain the principles of Public Key Cryptosystem. **[8]**

b) Enlist and explain three threats associated with user authentication over a network or internet. **[8]**

P.T.O.

OR

Q4) a) Explain basic arithmetic and logical functions used in MD5 and SHA-1 operation. **[8]**

b) Enlist HMAC design objectives and explain HMAC algorithm with structure. **[8]**

Q5) a) What is triple encryption? Explain meet-in-middle attack in DES with suitable example. **[9]**

b) Explain different type of attacks addressed by message authentication. **[9]**

OR

Q6) Write short notes on : **[18]**

a) Digital Signatures.

b) Kerberos.

c) Trusted systems.

d) Elliptical curve cryptography.

SECTION - II

Q7) a) What is the purpose of the X.509 standard? How is an X.509 certificate revoked? **[8]**

b) What are key components of VPN? Discuss various security issues concern to VPN. **[8]**

OR

Q8) a) What services are provided by IPSec? Explain various application of IPSec with examples. **[8]**

b) What are key components of VPN? Discuss various security issues concern to VPN. **[8]**

Q9) a) What protocols comprise SSL? What is the difference between SSL connection and SSL sessions? **[8]**

b) What are different types of Intruders in the system? Explain with examples. **[8]**

OR

Q10) a) List and define the principle categories of SET participants. **[8]**

b) List and explain the techniques used to avoid guessable password. **[8]**

Q11) a) What is OS hardening? Explain the concepts of Honey pot with suitable illustration. **[10]**

b) Explain the difference between Packet filtering router and Stateful inspection firewall. **[8]**

OR

Q12) Write short notes on any three : **[18]**

a) Email Security.

b) Smart Card Security.

c) WiFi and WiMax Security.

d) Advanced Encryption Standard.

❖ ❖ ❖ ❖

Total No. of Questions : 12] **[Total No. of Pages : 3**

P1290

[3864]-333
B.E. (Chemical)
CHEMICAL PLANT ENGINEERING
(2003 Course)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) Explain the role of laboratory data and pilot plant data. **[9]**

b) Discuss the importance of process flow diagrams in plant design. **[9]**

OR

Q2) a) What are the main factors should be consider in making feasibility study? **[9]**

b) Discuss the various function of pilot plant. **[9]**

Q3) a) Explain the factors to be considered for preparing plant layout with a suitable example. **[8]**

b) Explain in detail the factors affecting process selection. **[8]**

OR

Q4) a) Explain plant safety operation and maintenance. **[6]**

b) A plant layout is to be prepared for batch process which involves process equipment such as reactor, condenser, steam heating jacket for reactor; a filter and two pumps. Discuss the factors to be considered for preparing this layout. **[10]**

Q5) What are various waste treatments in chemical industry. Explain any two waste water treatment with neat diagrams. **[16]**

OR

P.T.O.

Q6) Explain the primary and secondary process utilities required for process plant. **[16]**

SECTION - II

Q7) a) Explain normal pipe size. **[6]**

b) Give the details of colour code for piping. **[6]**

c) Explain different methods of pipe sizing. **[6]**

OR

Q8) Write short notes on :

a) Transportation of solids in pipeline. **[6]**

b) Pipe supports. **[6]**

c) Piping for high temp.. **[6]**

Q9) a) Explain single acting and double acting reciprocating pump with neat diagram. **[10]**

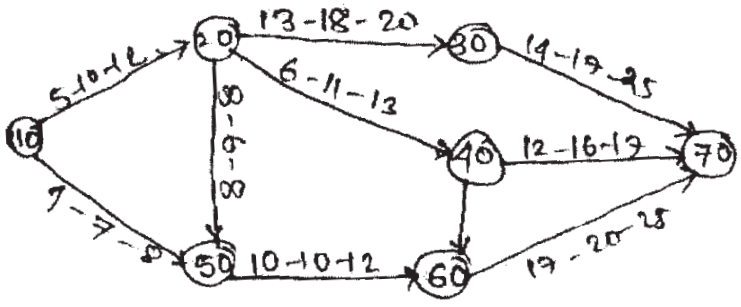
b) Explain sizing of centrifugal pump and the term cavitation **[6]**

OR

Q10) a) Give the classification of pumps and explain the principle, construction and working of centrifugal pump. **[10]**

b) Explain typical characteristics curve for the fan. **[6]**

Q11) a) Consider the network shown in fig. determine the standard deviation and expected time for each activity. For each activity the three estimates to-tm-tp are given along the arrow. **[8]**



b) 'HAZOP' is a tool of process risk assessment explain. **[4]**

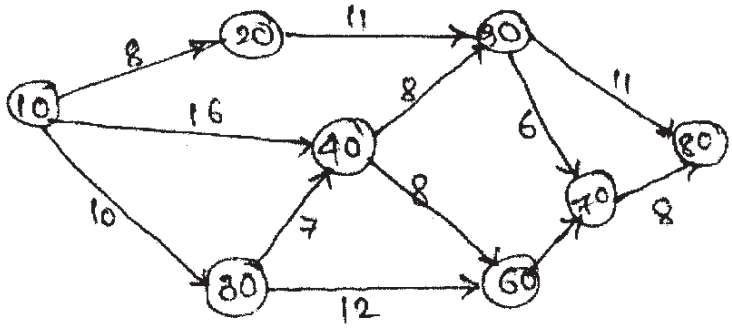
c) What is float and how is it useful in CPM networks. **[4]**

OR

Q12) a) What is float and how it is useful in CPM network. **[4]**

b) Explain static and mobile pressure vessel. **[4]**

c) Consider the network shown below. Determine the critical path. **[8]**



☒☒☒☒

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1291

[3864]-368
B.E. (Petrochemical)
REFINERY PROCESS DESIGN
(2003 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 answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Use of steam tables and electronic calculator is allowed.***
5) ***Assume suitable data wherever necessary.***

SECTION - I

Q1) a) Discuss an algorithm for calculating dew point and bubble point in context of hydrocarbon mixtures. **[8]**

b) Write in detail on meaning, procedure and utility of TBP, ASTM and EFV curves. **[10]**

Q2) Describe a suitable design procedure for design of tower for distillation of a multicomponent mixture. **[16]**

Q3) What are Packie Charts? Discuss how they can be used for the design of Atmospheric Distillation Unit. **[16]**

Q4) Write notes :

a) Use of Partial Condenser. **[5]**

b) Role of Side-stripper. **[5]**

c) Overflash. **[6]**

P.T.O.

SECTION - II

Q5) Differentiate between rating and design problems. Give a detailed procedure for rating of an existing heat exchanger in a refinery. **[16]**

Q6) Write a detailed note on need for and a procedure of Heat Exchanger Network Synthesis in a refinery. **[18]**

Q7) Discuss, with help of Perry's guidelines, how an absorption tower for multicomponent absorption can be designed. **[16]**

Q8) Write a detailed note on fired heaters with reference to the following points.

a) Heat load calculations. **[4]**

b) Constructional Features. **[6]**

c) Estimate of number of tubes in a box furnace. **[6]**

❐❐❐❐

Total No. of Questions : 8] **[Total No. of Pages :2**

P1292

[3864] - 369
B.E. (Petrochemical Engineering)
NATURAL GAS TECHNOLOGY
(2003 Course)

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

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Answer three questions from each section.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must 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) a) Give the Indian Scenario of natural gas and refining. **[9]**

b) Describe the origin of natural gas. **[9]**

Q2) a) Give the Indian Scenario of Coal Bed Methane. **[8]**

b) Describe any one technique for gas hydrate production. **[8]**

Q3) a) Elaborate of gas hydrate structure. **[8]**

b) Explain the phase diagram of a natural gas. **[8]**

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

a) Sweet and sour natural gas.

b) Coal bed methane.

c) Surface and Interfacial tension.

d) Compressibility of gas.

e) Hydrate prevention.

f) Gas reserve estimation.

P.T.O.

SECTION-II

Q5) Explain with a diagram the removal of hydrogen sulphide. **[18]**

Q6) With a suitable diagram explain the vertical and horizontal gas liquid separator. **[16]**

Q7) a) Elaborate on Existing LNG terminal in India. **[8]**

b) Explain cryogenic storage method for natural gas. **[8]**

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

a) Heat exchangers and compressos in LNG plant.

b) Corrosion protection in pipelines.

c) LNG boil-off gas.

d) Natural gas storage in an acquier.

e) Pipeline economics.

f) Natural Gas Liquids.

✪✡✪✡

Total No. of Questions : 12] **[Total No. of Pages :2**

P1297

[3864] - 410

B.E. (Computer Engineering)

ADVANCED COMPUTER ARCHITECTURE AND COMPUTING

(2003 Course)

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

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Assume suitable data wherever necessary.***
3) ***Neat diagrams must be drawn wherever necessary.***

SECTION - I

Q1) a) Explain how the parallelism can be achieved in Uni-processor architecture. **[10]**

b) Discuss Instruction level and Thread level parallelism elaborately. **[8]**

OR

Q2) a) Give Flynn's, Feng's and Handler's classification schemes for Parallel Computers. **[12]**

b) Give any two applications of Parallel Processing. **[6]**

Q3) a) What is Superscalar Architecture, explain with an example of Ultra Sparc. **[8]**

b) Explain Internal Forwarding with proper example. **[8]**

OR

Q4) a) What is the net effect of Loop Unrolling technique? Discuss with an example. **[8]**

b) Discuss various pipeline hazards. Give Hazard detection and resolution techniques. **[8]**

Q5) a) Draw and explain the architecture of Cray-I. **[10]**

b) Explain in detail anyone Multistage Dynamic Interconnection Network used in Array processors. **[6]**

OR

P.T.O.

Q6) a) Explain parallel Matrix multiplication algorithm for SIMD architecture. **[10]**

b) Discuss the issues in designing Vectorizing Compiler. **[6]**

SECTION-II

Q7) a) Differentiate Loosely coupled and Tightly coupled Multiprocessors. What are the desirable characteristics of the processor contributing to Multiprocessing? **[10]**

b) Explain the architecture of IBM Power4 processor. **[8]**

OR

Q8) a) Briefly characterize the multicache problem and describe various methods that have been suggested to cope with the problem. Comment on the advantages and disadvantages of each method to preserve the coherence among multiple shared caches used in multiprocessor system. **[12]**

b) What are Multiport Memories? Explain in brief. **[6]**

Q9) a) What are the major issues confined to Multithreaded programming? Specify the appropriate solutions accordingly. **[8]**

b) What is Synchronous and Asynchronous Message passing in parallel programming? **[8]**

OR

Q10) a) Explain an architecture of a typical multithreaded processor. **[8]**

b) What is shared memory programming? Explain in detail. **[8]**

Q11) a) What are the characteristics of Parallel algorithms for Multiprocessors? **[6]**

b) What are the various performance measures for the parallel algorithms? **[6]**

c) Comment on PThreads in Shared memory system. **[4]**

OR

Q12) a) What are the issues in Multiprocessor Operating System? Discuss in detail. **[10]**

b) Write a note on Neuro-Computing Paradigms. **[6]**

Total No. of Questions : 12] **[Total No. of Pages : 2**

P1298

[3864]-252

B.E. (Electronics)

BIOMEDICAL ELECTRONICS

(2003 Course)

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

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Explain the process of polarization, depolarization and repolarization with neat diagram. **[9]**

b) What do you mean by absolute refractory period and relative refractory period? Compare with resting potential and action potential. **[9]**

OR

Q2) a) What is bioelectric potential? Explain in detail with necessary diagram. **[9]**

b) With the help of two electrode equivalent circuit. Explain measurement of biopotential and a half cell potential. **[9]**

Q3) a) Write the equation to calculate the following. **[8]**

i) aVF
ii) aVR
iii) aVL
iv) lead II.

b) Draw the ECG waveform. Lable the critical parts of the waveform show amplitude and time duration for normal ECG. **[8]**

OR

Q4) a) Draw bipolar limb leads unipolar argumented limb leads and explain with necessary diagram. **[8]**

b) How an isolation amplifier is used in a biosignal amplification? Explain detail, working of such amplifier. **[8]**

P.T.O.

Q5) a) Explain the concept of vectorcardiography with necessary diagram. **[8]**

b) What do you mean by patient monitoring system? Explain the bed side monitoring system with the help of neat block diagram. **[8]**

OR

Q6) a) Explain any two types of cardiac pacemakers in detail with necessary waveforms. **[8]**

b) Differentiate between DC and AC defibrillators. Explain the necessity in controlling the fibrillation. **[8]**

SECTION - II

Q7) a) Explain the flame photometer with necessary diagram. **[9]**

b) Describe the working of colorimeter with the help of neat diagram. **[9]**

OR

Q8) a) Draw the circuit diagram and explain their operation for computation of
i) base excess.
ii) total CO_2.
iii) bicarbonate **[9]**

b) Name the different method of cell counting. Explain any one in detail. **[9]**

Q9) a) What are the different types of EMG. Explain the procedure to perform EMG. **[8]**

b) Define the α, β, θ, δ and ϑ activities. **[8]**

OR

Q10)a) What are the different components of central nervous system? Explain in detail. **[8]**

b) Draw the schematic diagram of an EEG machine. Explain the different blocks in detail. **[8]**

Q11)a) Explain the basic steps required to form laser beam. **[8]**

b) Give the comparison between Ruby laser and He-Ne laser. **[8]**

OR

Q12)a) Explain the operation of X-Ray Machine with the help of neat block diagram. **[8]**

b) Explain the principles of MRI. How does an MRI scanner works. **[8]**

Total No. of Questions : 10] **[Total No. of Pages : 2**

P1299

[3864]-6

B.E. (Civil)

AIR POLLUTION (Elective - II)

(1997 Course)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) Define air pollution. Enlist various pollutants and their sources in a tabular form. Discuss various classifications of air pollutants. **[8]**

b) "Industrialization and Urbanization are the major causes of air pollution". Explain with examples. **[8]**

Q2) a) Explain the mechanism of formation of photochemical smog with chemical equations. Explain any one air pollution episode. **[8]**

b) Explain effects of any four air pollutants on human health. **[8]**

Q3) a) Explain the difference between ambient air sampling and stack sampling. **[6]**

b) Draw schematically a sampling train for stack sampling indicating the equipments required. **[6]**

c) Explain the precautions taken while collecting samples for stack gas sampling. **[4]**

Q4) a) Explain the concept of plume rise. What are the factors considered in calculating plume rise? Write any two formulae for calculating plume rise. **[8]**

b) If Government wants to fix location for chemical industrial zone, explain the factors required to be considered. **[8]**

P.T.O.

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

a) Wind rose diagram.

b) Types of inversion.

c) Gaussian model and its application.

d) Atmospheric stability conditions.

SECTION - II

Q6) a) Draw a neat sketch of gravity settling chamber. Explain the working principle of gravity settling chamber. **[8]**

b) Draw a neat sketch of Electro Static Precipitator (ESP). What are the advantages and disadvantages of ESP? **[8]**

Q7) a) Discuss with sketch, principle, material collection phenomenon of cyclone. Explain advantages and disadvantages of cyclone. **[8]**

b) Explain objectives of using air pollution control equipments. What data is required to be collected before selecting control equipment? **[8]**

Q8) a) What is Environmental Impact Assessment? Explain the objectives of carrying out E.I.A. What are the limitations of E.I.A.? **[8]**

b) Explain various economic losses due to air pollution. **[8]**

Q9) a) Explain sources, effects and control of odour pollution. **[8]**

b) What is land use planning? Explain its role as an air pollution control technique. **[8]**

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

a) Bag filter.

b) Control of air pollution at source with examples.

c) Air pollution act.

d) High volume sampler.

Total No. of Questions : 12] **[Total No. of Pages : 4**

P1300

[3864]-102

B.E. (Civil)

ENVIRONMENTAL ENGINEERING - II

(2003 Course)

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 and 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) Differentiate between separate and combined sewerage system. **[6]**

b) Determine the size of a circular sewer for a discharge of 600 lps running half full. Assume S = 0.0001 and n = 0.015. **[6]**

c) Write a short note on Drop Manhole. **[4]**

OR

Q2) a) Explain how treatability index helps in deciding the type of treatment. **[6]**

b) The BOD_5 of a waste has been measured as 650 mg/l. The rate constant is 0.12. Determine ultimate BOD and 3 day BOD at 27°C. **[6]**

c) Define : **[4]**

i) B.O.D. and

ii) COD

Q3) a) Discuss the following zones of a stream which is undergoing self purification. **[6]**

i) Zone of degradation.

ii) Zone of active decomposition.

iii) Zone of recovery.

iv) Zone of clear water.

P.T.O.

b) Give the Streeter-Phelps equation and explain each term in the equation. **[6]**

c) Write short note on Oxygen sag curve. **[4]**

OR

Q4) a) Design the screen chamber of an ETP to treat a peak flow of 80 mld of sewage.

Assume inclination of bars 45° with horizontal, Size of bars : 10 mm × 70 mm; 10 mm dimension facing the flow, clear spacing between bars as 50 mm and the velocity through the screen as 0.8 m/sec at peak flow. **[6]**

b) Design a grit chamber for the following data : **[6]**

i)	Maximum flow	:	20 mld
ii)	Specific gravity of particle	:	2.65
iii)	Diameter of particle to be removed	:	0.2 mm and above
iv)	Average temperature	:	20°C
v)	Flow through velocity	:	0.23 m/sec
vi)	Width of grit chamber	:	1.2 m
vii)	Freeboard	:	0.3 m
viii)	Space for sludge accumulation	:	0.25 m.

c) What is the difference between preliminary and primary treatment of wastewater? **[4]**

Q5) a) Explain activated sludge process. What are the advantages and disadvantages of activated sludge process? **[6]**

b) Design an activated sludge process for following data : **[12]**

i)	Municipal wastewater flow rate	=	10,000 m^3/day
ii)	BOD of settled effluent	=	150 mg/lit.
iii)	BOD of treated effluent	=	5 mg/lit.
iv)	Yield coefficient, Y	=	0.5 kg/kg.
v)	Endogenous decay coefficient, kd	=	0.05 d^{-1}
vi)	MLSS, X	=	3500 mg/lit.
vii)	Return sludge solids concentration, X_r	=	15,000 mg/lit.
viii)	Mean cell residence time, θ_c	=	10 days

Determine :

1) Volume of reactor.
2) F/M ratio.
3) Volumetric loading rate.
4) Oxygen requirement.
5) Recycle ratio.
6) BOD removal efficiency.

OR

Q6) a) Design a high rate trickling filter using N.R.C. equation for following data : **[10]**

i)	Sewage flow	=	10 Mld.
ii)	Recirculation ratio	=	1.5
iii)	BOD of raw sewage	=	150 mg/lit.
iv)	BOD removal in primary clarifier	=	30%
v)	Final effluent BOD desired	=	30 mg/l.

b) Compare the conventional trickling filter and high rate trickling filter. **[8]**

SECTION - II

Q7) a) Write the design steps required for oxidation pond. **[6]**

b) Explain algae bacteria symbiosis. **[6]**

c) What is the difference between oxidation pond and aerated lagoon? **[4]**

OR

Q8) a) What is the principle involved in the design of oxidation ditch? **[6]**

b) Write about constructional details and design criteria of oxidation pond. **[6]**

c) How the detention period of oxidation pond is estimated? **[4]**

Q9) a) Design a septic tank for a hostel housing 200 persons. Also design the soil absorption system for the disposal of the septic tank effluent, assume the percolation rate as 1500 minutes per m, L/B ratio = 4 and De-sludging period = 1 year. **[10]**

b) Draw a neat figure of septic tank. Show plan, sectional elevation with baffle walls, inlet outlet positions in detail. **[6]**

OR

Q10) a) Draw a neat figure of unlined soak pit filled with broken brickbats. Explain its working. **[6]**

b) What are the advantages and disadvantages of anaerobic treatment? **[6]**

c) How does the anaerobic digestion works? **[4]**

Q11) Draw a flow diagram for treatment of wastewater and write characteristics of wastewater for **any two** of the following industry. **[18]**

a) Sugar industry.

b) Dairy industry.

c) Paper and pulp industry.

OR

Q12) a) Explain any one method of hazardous waste treatment. **[6]**

b) What is waste minimization? Write classification of waste minimization techniques. **[6]**

c) Explain Ignitability and toxicity in hazardous waste. **[6]**

❐❐❐❐

Total No. of Questions : 12] **[Total No. of Pages :5**

P1301

[3864] - 144
B.E. (Mech.)
ROBOTICS
(2003 Course) (402050) (Elective - II)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) Write a note on Robot Generations. **[6]**

b) Explain Robot Anatomy with the help of sketch. **[4]**

c) Explain difference between Repeatability and Accuracy. **[4]**

d) Explain the term "Exoskeleton" with suitable example. **[4]**

OR

Q2) a) Following is a rotation matrix having only one incorrect element. Identify and rewrite the matrix by correcting that element. **[8]**

$$\begin{bmatrix} 0.7231 & 0.1636 & -0.1167 \\ -0.4289 & 0.8679 & 0.2506 \\ -0.5415 & -0.4690 & 0.6977 \end{bmatrix}$$

b) Referring Figure – 1, write following transformation matrices; **[10]**

${}^{A}T_{D}$ and ${}^{C}T_{B}$

Assume orientation of Z-Axes so that all coordinate systems will be right handed.

P.T.O.

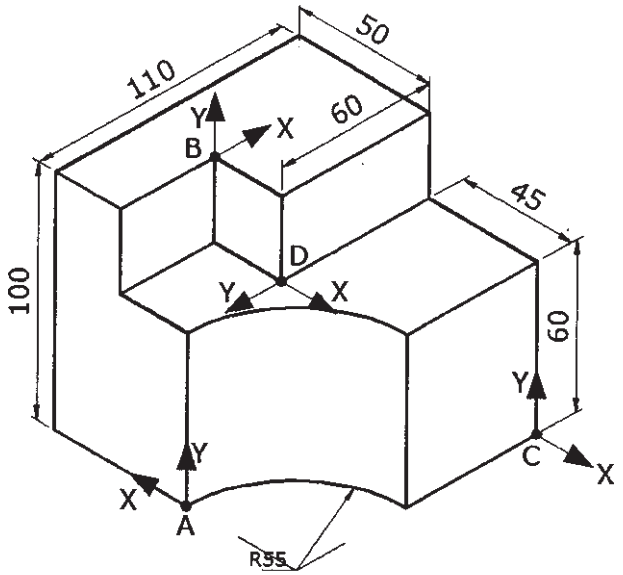


Figure-1

Q3) a) Relation between a vision system and an object is given by following transformation matrix;

$$ {}^{\text{Vision System}}T_{\text{Object}} = \begin{bmatrix} 0.7543 & -0.3936 & 0.5254 & 55 \\ 0.1921 & 0.8976 & 0.3967 & -60 \\ -0.6278 & -0.1983 & 0.7527 & 35 \\ 0 & 0 & 0 & 1 \end{bmatrix} $$

Determine the new relation if the object is rotated by 35° with respect to its own X-axis and translated by 20 units along Z-axis of vision system. **[8]**

b) Draw manipulator structure shown in Figure – 2 and attach coordinate frames at appropriate locations. List DH Parameters and determine transformation matrix between {Base} and {Gripper}. **[8]**

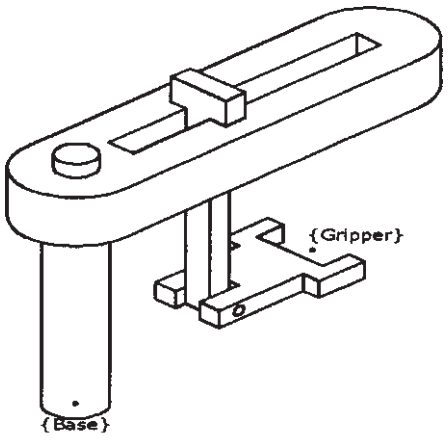


Figure – 2

OR

Q4) a) A 2R planar manipulator having link lengths L1 = 125mm and L2 = 80mm is to be arranged in such a way that the free end will be located at (75, 75) with respect to the fixed end of the manipulator. State whether it is possible; if "yes" determine orientations of the links and if "no" state the reason.

Can the manipulator reach the same point if the link lengths are interchanged? If "yes" determine orientations of the links and if "no" state the reason. **[10]**

b) A 2R planar manipulator is required to locate its free end at (30, 25) with respect to the fixed end. State whether the point is reachable if the link lengths are L1 = 180mm and L2 = 100mm. If "yes" determine orientations of the links and if "no" state the reason and suggest modification in the mechanism so as to reach the point. **[6]**

Q5) a) A planar manipulator shown in Figure – 3 is required to move in a straight line from (170, 0) to (110, 55) in 5 seconds. Determine third degree polynomial equation for its rotary joint. **[10]**

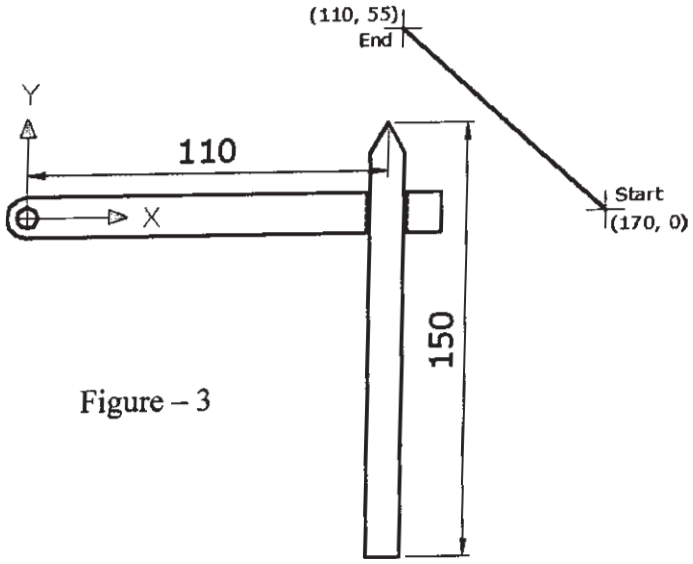


Figure – 3

b) It is required to trace certain path by a planar manipulator shown in Figure – 4 in 7 seconds (linear path in 2.5 seconds and curved path in remaining duration with constant linear and rotational speeds respectively). List the joint parameters for each second staring from 0 to 7 seconds. **[6]**

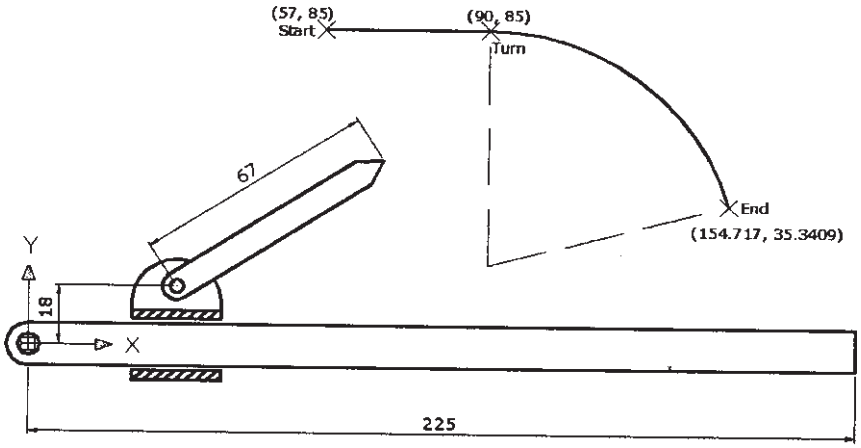


Figure – 4

OR

Q6) a) Write a note on Control Law Partitioning. **[8]**

b) The characteristic equation of a second order control system is;
$ms^2 + bs + k = 0$ where m = 1, b = 6 and k = 9.
Determine position, speed and acceleration of mass in the system at time t = 0.5 seconds if it is initially at rest and displaced to a position x = 1.5. **[8]**

SECTION - II

Q7) a) Explain mechanical grippers, what are the two ways of constraining the part in the gripper. **[6]**

b) Discuss various considerations for selection of a gripper systems. **[6]**

c) Explain typical vision system for a robot. **[6]**

OR

Q8) a) Write short note on, continuous beam laser system. **[6]**

b) What is compliance? Explain active and passive compliance in brief. **[6]**

c) A vacuum gripper is used to lift flat steel plate of dimensions 7mm × 600mm × 900mm. The gripper uses to suction cups, 125 mm in diameter each, and they are located 450 mm apart for stability. Assume a factor of safety of 1.7 to allow for acceleration of the plate. Determine the negative pressure required to lift the plates if the density of steel is $8054.3 \times 10^{-9} kg/mm^3$. **[6]**

Q9) a) Explain with principle of operations, use of wrist force sensor for force sensing. **[6]**

b) Write a note on redundant Robot. **[4]**

c) Explain use of robot in spray painting. **[6]**

OR

Q10)a) Explain different types of speed reduction & transmission systems used in robots. **[6]**

b) Explain use of robot in the welding. **[6]**

c) Write various technical features required of robot for pick and place applications. **[4]**

Q11)a) Explain various performance characteristics of DC servo motors. **[6]**

b) Write note on stepper motor. **[6]**

c) Compare hydraulic & electrical actuator based on weight, resolution, operating pressure and cost. **[4]**

OR

Q12)a) Explain various methods used to enter the programming command into the controller memory. **[6]**

b) Explain generations of robot programming languages. **[4]**

c) Explain WAIT, DELAY, SIGNAL command with suitable examples. **[6]**

Total No. of Questions : 12] [Total No. of Pages :2

P1302

[3864] - 183

B.E. (Production)

ERGONOMICS AND HUMAN FACTORS IN ENGINEERING

(2003 Course)

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

Instructions to the candidates:

1) ***Answer three questions from each section-I and three questions from section-II.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are Human-Machine Systems? Explain its characteristics. **[8]**

b) What is the meaning of term 'Accident'? Explain various factors contributing to accidents. **[8]**

OR

Q2) a) Discuss in brief the concept of Maximum Aerobic Power. How it is applied in practice? **[8]**

b) Write a note on biomechanical approach to Human Factors Engineering. **[8]**

Q3) a) Differentiate between static dimensions and dynamic dimensions. **[6]**

b) Explain the principles for arranging components with suitable examples. **[10]**

OR

Q4) Write note on following : **[16]**

a) Use of anthropometric data.

b) Ergonomics/ Human Factors Engineering meaning and applications.

c) Concept of Percentile.

d) Work and Rest Cycle.

Q5) a) Explain photometry in detail. **[8]**

b) Explain the techniques of noise reduction. **[10]**

OR

P.T.O.

Q6) a) What is Actin and Myosin? Explain their significance. **[6]**

b) What is the effect of heat on human performance. **[8]**

c) Define Luminance Ratio. **[4]**

SECTION - II

Q7) a) Write a short note on Design of MMH task and also explain how to reduce risk in MMH task. **[10]**

b) Explain the concept of Control Response Ratio. Explain its utility. **[6]**

OR

Q8) a) Write a note on mirror image arrangement. **[8]**

b) What are the design considerations while designing Foot Pedal Controls? **[8]**

Q9) Compare the following types of work stations: Seating, Standing and Seat-Stand with respect to their advantages, disadvantages and applications. **[16]**

OR

Q10) a) What are learning curves. Explain their utility in Human Factors Engineering. **[8]**

b) Comment on "It is necessary in hand tool design to avoid tissue compression stress." **[8]**

Q11) a) Mention the benefits of Pre-Determined Time Standards. What is MTM? Describe any four elements of MTM 1. **[10]**

b) Describe the utility of work study in today's situation. **[8]**

OR

Q12) a) Discuss in brief the steps involved in getting standard time using MTM 1. **[8]**

b) Explain the Mento Factor System in brief. **[6]**

c) Explain the term allowances. **[4]**

Total No. of Questions : 6] **[Total No. of Pages : 3**

P1303

[3864]-194

B.E. (Production S/W)

FINANCIAL MANAGEMENT & COSTING

(2003 Course) (411122)

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

Instructions to the candidates :

1) ***All questions are compulsory.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) What do you understand by Financial Statements? Discuss the nature of financial statements. **[8]**

b) What is common sized Balance Sheet and Income Statement? Explain technique of preparing common sized Balance Sheets. **[8]**

OR

Describe with illustrations the usefulness of following ratios. **[16]**

a) Gross-Profit Ratio
b) Net-Profit Ratio
c) Stock-Velocity Ratio
d) Net worth to fixed Assets

Q2) a) Calculate the accounting rate of return for following investment.

Year	Cash Flow (Rs.)
0	1,50,000
1	21,000
2	60,000
3	1,05,000
4	75,000

Life of the investment is four years. There is no scrap value at the end of 4 years. **[12]**

P.T.O.

b) Explain principles of Capital Budgeting. **[4]**

OR

Explain briefly following methods of ascertaining the profitability of capital expenditure projects, bringing out advantages & limitations of each (Any Two) **[16]**

a) Payback Approach.

b) Present Value Method.

c) Internal Rate of Return.

Q3) Explain following for working capital. **[18]**

a) Design of working capital.

b) Types of working capital.

c) Sources of working capital.

OR

Explain following for working capital (Any Two) : **[18]**

a) Time value of Money.

b) Cost and Capital Arrangement.

c) Funds Flow Statement.

SECTION - II

Q4) a) Describe the various methods of pricing issues of materials. Which method would you recommend for adoption in case where the prices of raw materials seldom change? **[8]**

b) Which method would you recommend for adoption when there are fluctuations in prices of materials? How is weighted arithmetic average method is superior to simple arithmetic average method for pricing issues of material? **[8]**

OR

a) How do you treat following items in cost accounts? **[9]**

i) Defectives ii) Scrap iii) Spoilage

b) Explain different methods of depreciation with respect to its applications. **[7]**

Q5) a) Discuss main groups of overheads that are formed according to functional classification. Give also the importance of such classification? **[12]**

b) Explain in brief, various bases of apportionment of service department costs over production departments. **[4]**

OR

a) What do you understand by Machine Hour Rate? How is it calculated? Give circumstances under which it may suitably be used in cost accounting. **[12]**

b) What is under and over absorption of overheads? **[4]**

Q6) a) Explain the use of standard costing from manufacturing point of view. **[12]**

b) What is meant by variance analysis? Explain its application. **[6]**

OR

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

a) Marginal costing.

b) Process costing.

c) Transfer cost.

❐❐❐❐

Total No. of Questions : 6] **[Total No. of Pages :2**

P1304

[3864] - 200
B.E. (Production S/W)
PROJECT MANAGEMENT
(2003 Course) (Elective - II) (411125)

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) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
4) ***Assume suitable data, if necessary.***
5) ***All questions are compulsory.***

SECTION - I

Q1) a) Define project. Explain difference between standard routine production and project management. **[12]**

b) Explain parameters involved in identification of project. **[4]**

OR

Enumerate Project Management under : **[16]**

a) Private sector.

b) Public sector.

c) Joint sector.

Q2) a) What do you understand by project under BMRED Balancing? Explain its significance. **[10]**

b) Explain the modernization of Project Management? How it is achieved in projects. **[6]**

OR

Explain for project management : **[16]**

a) Expansion & Diversification.

b) Replacement & life cycle management.

Q3) a) For formulation of project, what is the importance of preparing Feasibility Report? **[12]**

P.T.O.

b) How budgeting is followed in Project Management? Explain in detail. **[6]**

OR

a) What are the criteria for pre-investment decisions in establishing project? What is import-substitution? **[12]**

b) Explain types of Incentives gettable from state & central govt. **[6]**

SECTION - II

Q4) a) Explain various sources of finance for project. Include Local & Foreign investments in your answer. **[10]**

b) Explain salient features involved in financing project. **[6]**

OR

Explain following for project finance & project appraisal (Any two) : **[16]**

a) Techno-commercial aspects.

b) Socio-economic cost benefit analysis.

c) Rate-of-return.

Q5) a) Enumerate various aspects involved in project costing? How will you establish costs of contracting in detail. **[10]**

b) Explain in detail how labour & equipment costs are involved in project. **[6]**

OR

Explain following for project costing : **[16]**

Development and codification of cost data.

Q6) a) Explain what do you understand by cash flow planning for running project? **[8]**

b) Explain how project scheduling involves. **[10]**

i) PERT

ii) CPM

iii) GANTT charts

OR

Write a short note on following for project Administration : **[18]**

a) Time-cost trade off

b) Project overruns cost participation

c) Team work

Total No. of Questions : 12] **[Total No. of Pages : 2**

P1305

[3864]-226
B.E. (Electrical)
POWER QUALITY
(2003 Course) (403143) (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) ***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.***
7) ***Figures to the right indicate full marks.***

SECTION - I

Q1) Explain various power quality terms as per IEEE std. 1159. **[16]**

OR

Q2) a) Explain various terms of power quality with reference to each stake holders. Explain EMC, emission and immunity. **[10]**

b) Explain grounding practices as per IEEE std. for better operation of Electronic Equipments. **[6]**

Q3) a) Explain various causes, effects of undervoltage and various solutions. **[10]**

b) Explain various causes and effects of flicker. **[6]**

OR

Q4) a) Explain various causes, effects of overvoltage and various solutions. **[10]**

b) Explain various means to reduce flicker. **[6]**

Q5) a) Explain voltage sag characteristics. **[8]**

b) Explain with the help of relation influence of fault location and fault level on voltage sag. **[10]**

OR

P.T.O.

Q6) a) Explain in detail following voltage sag mitigation measures : **[10]**

i) DVR

ii) SMES

iii) CVT

b) Explain stepwise procedure of assessment of sensitivity of equipments to voltage sags. **[8]**

SECTION - II

Q7) a) Explain voltage Vs current distortion. **[6]**

b) Explain various AC quantities under non sinusoidal conditions. **[10]**

OR

Q8) a) Explain harmonic series and parallel resonance and consequences of harmonic resonance. **[10]**

b) Explain stepwise procedure of IEEE 519-1992 for harmonic analysis. **[6]**

Q9) a) Explain transients, their sources and effects. **[8]**

b) Explain capacitor switching transient and magnification of capacitor switching transient. **[8]**

OR

Q10) a) Explain various solutions to mitigate capacitor switching transients and various devices used to provide protection to equipments against impulsive transients. **[10]**

b) Explain transient velocity, surge impedance and the effect of line terminations. **[6]**

Q11) a) Explain why it is necessary to monitor power quality and approaches followed in power quality monitoring. **[10]**

b) Explain various power quality monitoring objectives. **[8]**

OR

Q12) a) Explain stepwise procedure to be followed during power quality monitoring. **[10]**

b) Explain selection of transducers for power quality monitoring. **[8]**

❐❐❐❐

Total No. of Questions : 12] **[Total No. of Pages : 2**

P1306

[3864]-254

B.E. (Electronics)

ARTIFICIAL INTELLIGENCE

(2003 Course)

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

Instructions to the candidates:

1) ***Answer 3 questions from Section I and 3 questions from Section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***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) Define the term "Artificial Intelligence". Explain any two applications of it in detail. **[9]**

b) What are weak search methods. Explain the hill climbing search method in detail. **[9]**

OR

Q2) a) How state space representation can be used for a water jug problem with respect to seven problem characteristics. **[9]**

b) Explain A * algorithm with suitable example **[9]**

Q3) a) What is predicate logic. Explain the procedure to convert formulas into clause form. **[8]**

b) With suitable example, explain how, simple facts are represented in logic. What are different ways to represent a class membership. **[8]**

OR

Q4) a) Write short note on secondary search. **[8]**

b) Explain Minimax search procedure. How the performance of the minimax procedure can be further improved. **[8]**

Q5) a) What is conceptual dependency. How it is used to represent knowledge. **[8]**

b) Explain how frames can be used for knowledge representation. Give an example. **[8]**

P.T.O.

OR

Q6) a) What is meant by non-monotonic reasoning. Differentiate between statistical reasoning and probabilistic reasoning. **[8]**

b) Explain how semantic nets are used for representing knowledge taking suitable example and what are conventions used. **[8]**

SECTION - II

Q7) a) Explain in detail how hard problem is solved using a goal stack planning. **[9]**

b) What are the components of a planning system. Explain these components in detail with the example of blocks world. **[9]**

OR

Q8) a) What is nonlinear planning. What are the steps involved in the nonlinear planning algorithm. **[9]**

b) Discuss hierarchical planning with suitable example. What are reactive systems. **[9]**

Q9) a) Explain in detail how the robots navigate through the world and manipulate objects. **[8]**

b) Draw and explain the architecture of image understanding. How the low level and high level knowledge is used to interpret an image. **[8]**

OR

Q10)a) What are the advantages of Artificial Neural Networks. With suitable example explain the various applications of these N/WS. **[8]**

b) State the detailed steps of waltz algorithm for labeling. Give an example for which the waltz algorithm would not find unique labeling. **[8]**

Q11)a) What is semantic analysis. With suitable example explain the conceptual parsing which uses conceptual dependency structures. **[8]**

b) Write short note on a finite state machine. **[8]**

OR

Q12)a) Draw a schematic diagram showing the various functional elements of an expert system. Explain the functions of each of them. **[8]**

b) Write a short note on Augmented Transistion Networks (ATN). How is it used for natural language understanding. **[8]**

Total No. of Questions : 6] **[Total No. of Pages : 4**

P1307

[3864]-301
B.E. (Printing)
COSTING AND ESTIMATING AND PROJECT MANAGEMENT, OPERATION RESEARCH
(2003 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 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 chats, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) How many boards of 25" × 30" size will be required for making cases for 5000 books in Demy octavo size? **[8]**

b) Comment on the following, 'Cost is Fact, Profit is Opinion, Price is Policy' **[8]**

OR

a) Estimate the cloth roll of 98 cms wide and 25 meter in length will be required for making 2500 books in A4 size and with 20 mm spine. **[8]**

b) Explain in detail what all things to be known by an estimator before doing the estimation job with suitable examples. **[8]**

Q2) a) Explain various elements of cost with suitable example. **[8]**

b) Explain the term standard cost and the standard format to find out the composite machine hour rate. **[8]**

OR

a) Differentiate between costing and estimation. **[8]**

b) What are the elements of Competitive Environment? Explain any two with suitable examples. **[8]**

P.T.O.

Q3) Explain the Six keys of Project Success with examples related to the expansion of a printing press. **[18]**

OR

a) Comment on the following, 'A good idea can be a bad project'. **[9]**

b) Explain various reasons of project failure. **[9]**

SECTION - II

Q4) a) The utility data for a network of printing press are given below. Determine the total, free, independent & interfering floats and identify the critical path. **[10]**

Activity :	0-1	1-2	1-3	2-4	2-5	3-4	3-6	4-7	5-7	6-7
Duration :	2	8	10	6	3	3	7	5	2	8

b) What is the difference between PERT and CPM. **[4]**

c) Explain the following terms : **[2]**

i) Slack.
ii) Dummy Activity.

OR

The time estimates (in weeks) for the activities of a PERT network are given below :

Activity	t_o	t_m	t_p
1-2	1	1	7
1-3	1	4	7
1-4	2	2	8
2-5	1	1	1
3-5	2	5	14
4-6	2	5	8
5-6	3	6	15

a) Draw the project network and identify all the paths through it.

b) Determine the expected project length.

c) Calculate the standard deviation and variance of the project length.

d) What is the probability that the project will be completed.

i) Atleast 4 weeks earlier than expected time?
ii) No more than 4 weeks later than expected time?

e) If the project due data is 19 weeks, what is the probability of not meeting the due date?

f) The probability that the project will be completed on schedule if the scheduled completion time is 20 weeks.

g) What should be the scheduled completion time for the probability of completion to be 90%. **[16]**

Q5) $Z_{max} = 2x_1 + 3x_2 + 10x_3$, **[16]**

Subject to $x_1 + 2x_3 = 0$,

$x_2 + x_3 = 1$,

$x_1, x_2, x_3 \geq 0$.

OR

$Z_{min} = x_1 - 3x_2 + 3x_3$ **[16]**

Subject to $3x_1 - x_2 + 2x_3 \leq 7$

$2x_1 + 4x_2 \geq 12$,

$-4x_1 + 3x_2 + 8x_3 \leq 10$.

$x_1, x_2, x_3 \geq 0$.

Q6) a) There are five jobs, each of which is to be processed through 3 machines A, B, & C is the order A B C processing times in hours are **[8]**

Job	A	B	C
1	3	4	7
2	8	5	9
3	7	1	5
4	5	2	6
5	4	3	10

Determine the optimum sequence for the five jobs and the minimum elapsed time. Also find the idle time for the three machines & waiting time for the jobs.

b) Solve the following assignment problem. **[10]**

	I	II	III	IV	V
1	11	17	8	16	20
2	9	7	12	6	15
3	13	16	15	12	16
4	21	24	17	28	26
5	14	10	12	11	13

OR

a) Solve the following transportation problem where cell entries are unit costs. **[10]**

	D_1	D_2	D_3	D_4	D_5	Available
O_1	68	35	4	74	15	18
O_2	57	88	91	3	8	17
O_3	91	60	75	45	60	19
O_4	52	53	24	7	82	13
O_5	51	18	82	13	7	15
Required	16	18	20	14	14	82/82

b) A particular has demand of 9000 units per year. The cost of one procurement is Rs.100 & the holding cost per unit is Rs.2.40/year. The replacement is instanteneous & no shortages are allowed. **[8]**

Determine :

i) The economic lot size.
ii) The number of orders per year.
iii) The time between orders.
iv) The total cost per year if the cost of one unit is Rs.1.

Total No. of Questions : 6] **[Total No. of Pages : 2**

P1309

[3864]-342

B.E. (Petroleum Engineering)

PETROLEUM EXPLORATION

(2003 Course)

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

Instructions to the candidates :

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams should be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Explain gravity anomalies caused by **[8]**

i) Sphere and

ii) Horizontal slab with a vertical fault.

b) Describe principle, construction and working of Worden Gravimeter. **[8]**

OR

a) Describe various corrections applied in magnetic exploration survey. **[8]**

b) Explain the working of Proton Free Precession magnetometer with suitable diagram. **[8]**

Q2) a) What is a Lateral Profiling Method? Explain with the help of Wenner and Schlumberger arrangements? **[8]**

b) How is heterogeneous nature of subsurface taken into consideration while interpreting the electrical resistivity survey data? **[8]**

OR

a) How are the radioactivity surveys used in petroleum exploration survey? Comment on the advantages and disadvantages of radioactivity survey petroleum exploration. **[8]**

b) Explain the working principle of Scintillation Counter with suitable diagram. **[8]**

P.T.O.

Q3) a) Give the characteristics of conceptual model outlining the microseepages of hydrocarbons. **[12]**

b) What are different the different geochemical parameters used for crude oil studies? **[6]**

OR

a) How are geochemical methods used in the exploration of hydrocarbons? Discuss in brief the advantages and disadvantages of geochemical methods in petroleum exploration. **[12]**

b) What are the different ways in which weathering of petroleum seepages may take place? **[6]**

SECTION - II

Q4) a) What are the different sources used in seismic exploration method? Explain non explosive sources. **[10]**

b) What are the static and dynamic corrections used in seismic reflection survey? **[6]**

OR

a) What is 3D seismic reflection survey? How does it differ from a closely spaced 2D survey? **[8]**

b) What are geophones? List their types. Draw diagrams showing working principle of any one type of geophones and explain its working. **[8]**

Q5) a) What is time lapse seismic monitoring? **[8]**

b) Write a note on the concept of seismic stratigraphy. **[8]**

OR

a) How would you apply 3D AVO interpretation technique in seismic survey? **[8]**

b) What are bright spots? How are these bright spots recognized on seismic sections? **[8]**

Q6) a) What are the different unconventional hydrocarbon resources? Explain in brief the methodology to ascertain their profitability. **[10]**

b) Explain the steps involved in effective exploration of stratigraphic traps. **[8]**

OR

Explain any two methods of reserves estimation. Discuss the utility of these methods in different stages of oil exploration. **[18]**

❐❐❐❐

Total No. of Questions : 6] **[Total No. of Pages : 3**

P1310

[3864]-343

B.E. (Petroleum Engineering)

FORMATION EVALUATION

(2003 Course)

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

Instructions to the candidates :

1) ***Answers to the questions of both the sections should be written in separate answer books.***
2) ***All questions are compulsory.***
3) ***Draw neat diagrams wherever necessary.***

SECTION - I

Q1) Describe borehole environment with the help of a neat sketch. Explain how does borehole environment influences on (a) various types of logs and (b) quality of log data. **[15]**

OR

Explain important resistivity logging methods with the help of neat sketches. **[15]**

Q2) Describe two important Density Logging Tools. **[15]**

OR

Explain how will you evaluate the quality of cementation. **[15]**

Q3) Write notes on **any four** of the following : **[20]**

a) Logs used to measure geometry of borehole,

b) Temperature Log,

c) Induction Logs,

d) Self Potential Log,

e) Logging problems in deviated wells,

f) MWD.

P.T.O.

SECTION - II

Q4) Outline the procedure for determination of water saturation using logs. **[20]**

OR

Write notes on **any four** of the following : **[20]**

a) Planning of logging surveys,

b) Cross Plots,

c) Detection of over pressures,

d) Perforation,

e) DST,

f) Radioactivity detectors used in logging.

Q5) a) What is production logging? List important tools and the kind of data obtained from these tools. **[10]**

b) Interprete the log given in figure 1. **[5]**

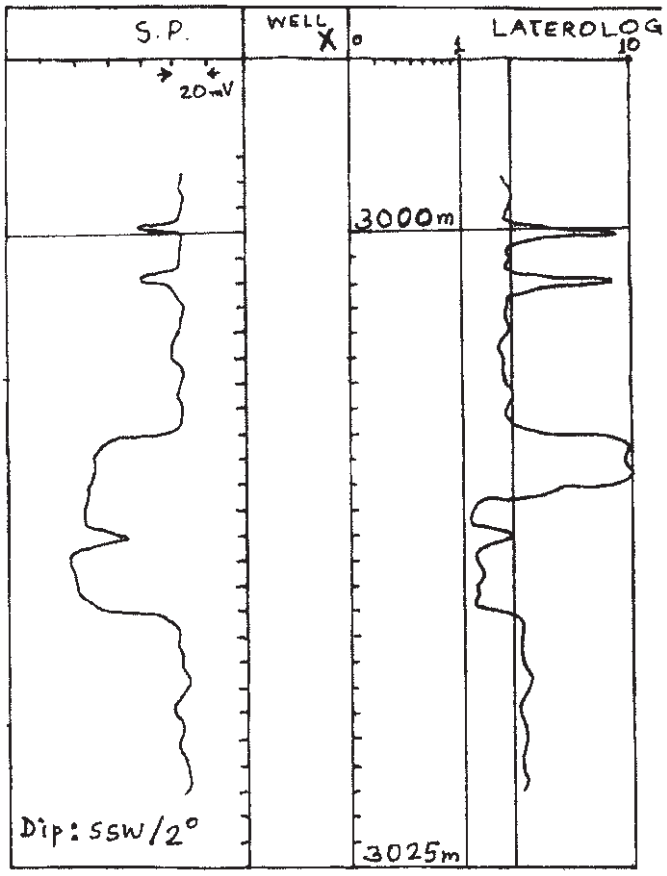


Figure 1. for Q. 5 b.

OR

Write notes on **any two** of the following : **[15]**

a) Mud logging,

b) Core Analysis,

c) Magnetic Resonance Technology in Formation Evaluation,

d) Importance of Clay Analysis in Formation Evaluation.

Q6) How will you recognize various depositional environments using log derived data? Draw sketches to explain. **[15]**

❐❐❐❐

Total No. of Questions : 06] **[Total No. of Pages : 4**

P1311

[3864]-351

B.E. (Petroleum Engineering)

PETROLEUM ECONOMICS

(2003 Course)

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

Instructions to the candidates:

1) ***Solve any <u>two questions</u> each from section I and section II.***
2) ***Answers to the questions of both the sections should be written in separate answer books.***
3) ***Use graph paper wherever necessary.***
4) ***Assume additional data if required.***

SECTION - I

Q1) a) List the projects which would be acceptable under **Payout Period (PP), Actual Value Profit / Investment Ratio (AVI), and Net Present Value (NPV) at 12%**. If a budget of $ 2000 M is available for investment, which two projects would be recommended by using above investment yardsticks? **[15]**

Table 1: Net Cash Flow, in $ M ($M=10^6$ $)

Year	A	B	C	D	E
0	-1000	-1000	-1000	-1000	-1000
1	600	700	210	10	900
2	400	500	210	20	200
3	300	200	210	50	100
4	200	100	210	100	50
5	50	50	210	200	50
6	20	10	210	300	10
7	10	10	210	400	10
8	10	10	210	500	10
9	5	10	210	500	0
10	5	10	210	400	0

b) Explain Exponential Decline and Hyperbolic Decline models with suitable diagrams. **[10]**

P.T.O.

Q2) a) Write notes on **any two** of the following: **[16]**

i) Oil price differentials,

ii) Resource classification system recommended by SPE,

iii) Factors controlling oil pricing in international market,

iv) Reserves to production ratio,

v) Reserves accretion and discovery of field size scenario in past 20 years.

b) The company management is interested in investing fifteen million dollars in a medium size field, which has economically producing capacity of 12 years. The project would require an investment of $ 150,000 at year 6 and again at year 9 of $ 70,000. Annual maintenance cost will be $ 35,000 throughout the tenure of the project. The interest rate for the first six years is 10%, and for the next six years will be 12%.

What is the Present Worth of this cash flow? Draw a cash flow diagram for the above data. **[9]**

Q3) a) Oil is currently sold for $ 60 /bbl from an oil field. It is anticipated that the price will increase at a rate of general inflation, which is forecast to be at the rate of 4.25% per year for first three years and then drop to an annual rate of 3.75% thereafter.

Develop a forecast of oil prices for the period of 6 years from the level of $ 60 /bbl.

It is believed that particularly for last two years of production, produced oil will have low API and, higher sulphar content. As a result price differential of 6% would be anticipated. What would be the oil price during last two years if oil differential is encountered? **[10]**

b) Three alternatives are available for consideration where the factors of risk and uncertainty are same for all proposals. Details of investments are given below:

Details	X	Y	Z
Initial Investment	$5,00,000	$8,00,000	$9,00,000
Annual Expenses	$15,000	$22,000	$25,000
Annual Revenue	$75,000	$100,000	$1,40,000
Tenure (Years)	20	20	20
Salvage Value	$50,000	$60,000	$70,000

If company's cost of capital is 15% which alternative should be selected? The company has enough funds to invest in all alternatives.

Give your decision on Net Present Value (NPV), and incremental investment analysis. Also find out preferred investment ranking using above methods. **[15]**

SECTION - II

Q4) a) Give a broad classification of Petroleum Fiscal System. Write a detailed note on Production Sharing Contract (PSC) in exploration and production of oil and gas in India. What is the importance of tax holidays in PSC? **[15]**

b) A piece of equipment having a negligible salvage is estimated to have a service life of 10 years. The original cost of equipment is $ 80,000.

Determine the following:

i) Depreciation charge for the fifth year, if Double Declining Balance (DDB) and Sum of Years Digit Depreciation (SYD) are used.

ii) Percent of the original investment paid off in the first half of the service life using DDB and SYD method. **[10]**

Q5) a) A wildcat well is being considered in a relatively unknown but highly promising area. Available data indicates that three separate horizons independent from one another would most possibly be producing.
Create a decision tree for the success and failure for the horizons(X,Y, and Z) to illustrate the probability of occurrence of these events with possible outcome of events. **[10]**

b) Construct a critical path to develop a medium size field for which details are given below: **[10]**

i) Twenty four development wells ($1.5MM each)-one third will be injectors.

ii) Three platforms - two for wells, the other for production/injection equipment and pipeline terminus. ($ 200 MM each)

iii) Wells take about one month to drill. Up to two rigs/platform.

iv) Platforms manufactured in one and a half years- tow out time one month during weather window in Summer.(Tow out costs $10MM) Setup time is three months for drilling/well platform, five months for production platform.

v) Pipeline lay time is about 14 months. (Cost $150 MM)

vi) Production "commissioning" and final permit take two months. ($ 5 MM)

vii) Overhead and other ongoing costs = $ 1 MM/month.

The main idea of this exercise is to avoid waste of time, labor and material.

1) Draw a critical path diagram for this project. Assume a starting date of December, 1, 2010.

2) Determine the time length of the critical path.

3) Plot cumulative costs as a function of time.

c) How cost in E and P business varies as a function of different factors like climate and depth of water. **[5]**

Q6) Details of production profile and expenditure required are given in the following table for a field under consideration for procurement. **[25]**

Year	Oil production, MM bbl/year	Exploration and Development cost, $ MM	Production cost, $MM
1		25	
2		25	
3		25	
4		25	
5		250	
6	4.56	250	27
7	6.84		41
8	9.12		54
9	9.12		54
10	9.12		54
11	9.12		54
12	9.12		54
13	9.12		54
14	9.12		54
15	7.69		46
16	6.49		38
17	5.47		32
18	4.62		27
19	3.90		23
20	3.29	50	19
Total	106.7	650	631

Prepare a tabular form of the data giving details of annual production, cumulative production, gross cash flow, royalty, net cash flow BFIT and AFIT, government share and contractor share, NPV for contractor BFIT and AFIT.

Following are the assumptions in the preparation of spreadsheet and further calculations:

a) Oil price is $ 68 per barrel and will remain constant throughout the project tenure.
b) Royalty is 10% of annual revenue/ annual production.
c) Time value of money is 10%.
d) Cost recovery is 70% , and remaining cost is allowed to carry forward for next year.
e) Profit petroleum is shared between government and contractor at 60: 40 proportions respectively.
f) Income tax is 30%.

Calculate the contractors NPV before tax and after tax.

Derive distribution for one barrel of oil or $ 68 using above assumptions keeping in mind contractor and government?

☛ ☛ ☛

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1312

[3864]-362

B.E. (Petrochemical Engineering)

PETROCHEMICAL PROCESSES

(2003 Course)

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

Instructions to the candidates :

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

SECTION - I

Q1) a) Describe with flow sheet the hydrodealkilation process for conversion of toluene to benzene. **[12]**

b) Mention applications of acrylonitrile and isoprene. **[4]**

Q2) a) Describe the process of steam reforming for production of hydrogen and detail out PSA cycle. **[14]**

b) Mention end uses of butadiene and propylene. **[4]**

Q3) a) Describe with flow sheet the oxidation process for conversion of cumene to acetone. Mention applications of acetone. **[12]**

b) Mention end uses of isopropanol and ethylene glycol. **[4]**

Q4) a) Describe with flow sheet the oxidation process for conversion of methanol to formaldehyde. **[12]**

b) Mention health and handling precautions and applications of acetic anhydride. **[4]**

P.T.O.

SECTION - II

Q5) a) Discuss in details about Molecular weight distribution in polymers. What are the factors which affect Molecular weight distribution? **[6]**

b) Compare different techniques of polymerization with examples. **[6]**

c) Explain step and chain polymerization with examples. **[6]**

Q6) a) Describe with flow sheet the Mitsubishi Gas Chemical Process for direct extraction of m-xylene. **[12]**

b) Mention health and handling precautions and applications of acetic anhydride. **[4]**

Q7) a) Describe the low pressure Ziegler process with flow sheet for conversion of ethylene to polyethylene. **[12]**

b) Mention end uses of isopropanol and ethylene glycol. **[4]**

Q8) Write a short note on following (any four) : **[16]**

a) Inhibition of Gas Hydrates.

b) Gas Hydrate as novel energy source.

c) Advantages and disadvantages of Gas hydrates.

d) Major challenges associated with Gas Hydrates.

e) Different structures of Gas Hydrates.

f) Gas hydrates as cause of Tsunamis.

❐❐❐❐

Total No. of Questions : 12] **[Total No. of Pages : 3**

P1313

[3864]-381
B.E. (Polymer)
POLYMER STRUCTURE-PROPERTY RELATIONSHIPS
(2003 Course)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) Enlist various monomeric ingredients present in final polymer composition which affect polymer properties? Explain any one in brief. **[5]**

b) Polyethylene can not conduct electricity while polyactylene can. Justify. **[2]**

c) Write a short note on "Hydrogen" as side group in different polymers. **[5]**

d) Why is glass transition temperature (Tg) of polystyrene significantly higher than that of polypropylene? **[3]**

e) What do you understand by "Equilibrium" and "Dynamic" flexibility of polymer chains? **[3]**

OR

Q2) a) Explain the effect of "Fluorine" as side group in various polymers. **[4]**

b) Explain the effects of change in flexibility on melting (Tm) and glass transition (Tg) temperatures w.r.t. PE (Tm = 135^{o}C, Tg = – 125^{o}C) and PET (Tm = 265^{o}C, Tg = 70^{o}C). **[4]**

c) Enlist the factors those cause polydimethylsiloxane (PDMS) to be one of the most flexible polymer known. **[4]**

d) Explain in brief with examples the effect of various types of Carbon and Oxygen linkages on properties of polymers. **[6]**

P.T.O.

Q3) a) Comment on the effect of chemical groups on the adhesive properties of polymer. Explain with suitable examples. **[6]**

b) Explain how tacticity affects the properties of polypropylene. **[4]**

c) The morphology of polymeric product gets affected by processing conditions. True or False. Justify. **[6]**

OR

Q4) a) With a suitable example of thermoplastic polymer explain the effect of its structure on mechanical, chemical, thermal, optical and electrical properties. **[10]**

b) Can processing conditions alter the crystallinity in the processed product? Explain with suitable examples. **[6]**

Q5) a) What are different additives used in polymer compound? Explain the role of additive in modifying polymer properties with proper examples. **[8]**

b) Write a short note on Conducting Polymers. **[4]**

c) Comment on the choices of different molecular weight grades while processing by injection moulding and extrusion techniques. **[4]**

OR

Q6) a) Explain with suitable examples how molecular weight and molecular weight distribution affect polymer properties. **[6]**

b) What decides the polarity of bond? Explain how does polarity affects electrical properties of polymer? **[4]**

c) What are plasticizers? With suitable example, explain how plasticizer affects processing as well as properties of polymer? **[6]**

SECTION - II

Q7) a) Explain with examples the role of freedom of rotation of bonds required for molecular flexibility. **[6]**

b) What makes elastomers flexible? **[3]**

c) Explain what is supercooled state and its significance towards rate of crystallization. **[6]**

d) Why Nylon 612 has less modulus than Nylon 66 but still is expensive? **[3]**

OR

Q8) a) Write short note on Liquid Crystalline Polymers. **[6]**

b) Explain effect of reheating on crystallization. **[4]**

c) Explain what is meant by intermolecular order? Also, explain 1st and 2nd order transition. **[4]**

d) Explain how polystyrene and PVC can be made flexible. **[4]**

Q9) a) Explain the kinetic factors affecting crystallization. **[5]**

b) Give the effect of crystallization on any five polymer properties. **[5]**

c) Explain how to determine percent crystallinity in the polymer? **[6]**

OR

Q10) a) Explain what is orientation? Compare the effect of uniaxial and biaxial orientations on polymer properties. What kind of orientation is obtained in injection and blow moulded products. **[7]**

b) State the reasons for not getting complete (100%) crystallinity in polymers. **[3]**

c) Processwise how can one differentiate between orientation and crystallization **[3]**

d) State the structural requirements which facilitate crystallinity in polymers. **[3]**

Q11) a) How size and shape of atoms will affect LDF forces? Explain with examples. **[6]**

b) Give list of all possible factors that contributes towards the intermolecular forces within a polymer. **[10]**

OR

Q12) a) Explain why solubility parameter needs to be known for polymers and how can it be found? **[6]**

b) Give the effect of different types of intermolecular bonding forces on properties. **[10]**

Total No. of Questions : 6] **[Total No. of Pages : 2**

P1315

[3864]-387

B.E. (Polymer Engineering)

SURFACE COATING AND ADHESIVES

(2003 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 books.***
3) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Define paint. Enlist various types of paints and their intended applications. **[8]**

b) Explain the role of thinners and solvents used in paints. **[9]**

OR

a) What do you understand by short oil and long oil paints? **[8]**

b) Write a note on driers in paint. **[9]**

Q2) a) Discuss marine paints in detail. Give its distinct features. **[8]**

b) Discuss water based paints with their properties and applications. **[9]**

OR

a) Compare paints, enamels, varnishes and lacquers. **[8]**

b) Write a note on surface treatment for application of paints. **[9]**

Q3) a) Discuss the test to study the impact performance of a paint film. **[8]**

b) Enlist various chemicals in paint industry and their health hazards. **[8]**

OR

a) How will you correlate the mechanical properties and applications of paint? **[8]**

b) Discuss the tests to study the gloss of a paint film. **[8]**

P.T.O.

SECTION - II

Q4) a) Explain adhesion. Explain the basic requirements for a material to show adhesive properties. **[8]**

b) Write a note on surface energetics and wettability. **[9]**

OR

a) Explain the importance of surface preparation in adhesion process with any one method. **[8]**

b) What are the guidelines for good adhesion? Write a note on advantages and disadvantages of adhesives. **[9]**

Q5) a) Write a note on any one type of adhesive. **[8]**

b) Explain health and safety factors involved in adhesive industry. **[9]**

OR

a) Explain the manufacture of electrometric modified adhesives. **[8]**

b) Write a note on advantages of synthetic adhesives over natural ones. **[9]**

Q6) a) Explain any two ASTM testing standards in adhesive manufacture. **[8]**

b) Discuss the manufacturing of any two adhesives. **[8]**

OR

a) Explain the criteria for selection of an adhesive for particular application. **[8]**

b) Explain the role of various types of joints used in adhesion. **[8]**

❐❐❐❐

Total No. of Questions : 12] **[Total No. of Pages : 3**

P1316

[3864]-392

B.E. (Polymer Engineering)

SPECIALITY POLYMERS

(2003 Course)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) Define liquid crystalline polymers. Classify them. **[5]**

b) What is the difference between lyotropic and thermotropic LCP's. **[4]**

c) What are the structural factors responsible for liquid crystalline behaviour. Explain. **[5]**

d) State the properties of LCP's. **[4]**

OR

Q2) a) What is a mesophase? **[2]**

b) List and show pictorially different types of mesophases. **[5]**

c) Enlist at least three commercially important liquid crystalline polymers. Give their applications. **[5]**

d) What is a mesogen? Classify LCP's on the basis of presence of mesogen in a chain. Give suitable examples. **[6]**

Q3) a) Draw structures of 5 conducting polymers. **[5]**

b) Name 3 conducting polymers and give their applications. **[5]**

c) Explain the band theory of conduction in conducting polymers. **[6]**

OR

P.T.O.

Q4) a) What are the structural features responsible for intrinsic conduction in polymers. Explain doping in intrinsically conducting polymers. **[5]**

b) Give synthesis of conducting polymers. Illustrate with suitable examples. **[5]**

c) Explain the following terms soliton, polaron, bipolaron. **[6]**

Q5) a) Explain the structural criteria required to get heat resistance in a polymer. **[5]**

b) Give 3 examples with structures of heat resistant polymers. **[5]**

c) List the applications of heat resistant polymers. **[6]**

OR

Q6) a) Give the synthesis and applications of any 2 of the following polymers PPS, PPO, PEEK, Polyetherimide. **[5]**

b) What are the parameters or criteria by which heat resistance of a polymer is measured? **[6]**

c) Describe the experimental techniques to measure these parameters. **[5]**

SECTION - II

Q7) a) What are photosensitive polymers? Give 3 examples of photopolymers. **[6]**

b) Define the terms photolithography, positive photoresist and negative photoresist. **[6]**

c) State the applications of photosensitive polymers in various fields. Explain any one in detail. **[6]**

OR

Q8) a) How is a photoresist applied on a substrate? Give 2 examples of materials used as positive and negative photoresists. **[8]**

b) Define a membrane. Give various applications of polymeric membranes. **[5]**

c) List 5 polymeric materials used in making of membranes. **[5]**

Q9) a) What are biopolymers? How are synthetic biopolymers made? Explain any 2 case studies. **[6]**

b) Explain the mechanism of controlled drug delivery. Which are the polymers used for the same? **[5]**

c) Write a brief note on biocatalysts. **[5]**

OR

Q10)a) What are the physical properties required to choose a polymer for use in biomedical applications. State polymers used in orthopaedic applications. **[5]**

b) Write a short note on biopolymers. **[5]**

c) What are biomaterials? List their applications. What are the requirements for a material to function well as a biomaterial? **[6]**

Q11)a) State the reasons for increasing use of plastics in construction both non-structural and structural. List the share of various plastics in construction with their corresponding applications. **[6]**

b) What is the principle used in fiber optics? What is the structure of a fibre optic cable? Which polymers are used in making it? **[5]**

c) What is the composition of a polymer concrete? What are the advantages and disadvantages of polymer concrete? **[5]**

OR

Q12)a) What is polymer impregnated concrete? Give approximate formulation of the same. **[5]**

b) List the various applications of plastics in the field of construction. **[5]**

c) What is the purpose of coating of agricultural seeds and chemicals? What are the desirable properties polymers should possess to be used in coatings? Which polymers are used for the same? **[6]**

Total No. of Questions : 12] **[Total No. of Pages : 4**

P1317

[3864]-402

B.E. (Computer Engineering)

OPERATING SYSTEMS

(2003 Course)

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

Instructions to the candidates :

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

SECTION - I

Q1) a) What is Mutual Exclusion? State the requirements to support Mutual Exclusion. Explain hardware approach for Mutual Exclusion with its advantages and disadvantages. **[8]**

b) What is binary and general semaphore? Write implementation of both the semaphore primitives. Also write an implementation of general semaphore using binary semaphore. **[8]**

OR

Q2) a) Write a solution to reader/writer problem using semaphore with writers have priority. **[6]**

b) Is busy waiting always less efficient than a blocking wait? Explain. **[2]**

c) What is monitor construct? Write a solution to dining philosopher problem using a monitor. **[8]**

Q3) a) What is deadlock? Explain with example. What is difference among deadlock avoidance, detection and prevention? Also state the four necessary conditions that create deadlock. **[8]**

b) Differentiate between authentication and threat. Explain how security is ensured for authorized access by using encryption technique. **[8]**

OR

P.T.O.

Q4) a) Write Banker's algorithm for deadlock avoidance. **[12]**

Consider a system with a total of 150 units of memory, allocated to three processes as shown :

Process	Max	Hold
1	70	45
2	60	40
3	60	15

Apply the banker's algorithm to determine whether it would be safe to grant each of the following requests. If yes, indicate a sequence of terminations that could be guaranteed possible. If no, show the reductions of the resulting allocation table.

i) A fourth process arrives, with a maximum memory need of 60 and an initial need of 25 units.

ii) A fourth process arrives, with a maximum memory need of 60 and an initial need of 35 units.

b) Compare public and private key cryptography. What are merits and demerits of each? **[4]**

Q5) a) Explain UNIX file system characteristics and UNIX file system organization. Write UNIX shell commands with its syntax and examples for following functionalities – **[10]**

i) Creation of a file.

ii) Displaying all the file attributes.

iii) Modifying file access permissions.

b) Write and explain Block Read Ahead algorithm. Explain its advantages if any. **[8]**

OR

Q6) a) Explain various kernel level data structures involved in process management subsystem with their role and inter relationship with each other. **[8]**

b) In the algorithm getblk, if kernel removes a buffer from the free list, it must raise the processor priority level to block interrupts before checking the free list. Why?

For the following sequence of blocks use getblk algorithm to allocate a buffer for a disk block and explain with neat diagram all scenarios for retrieval of buffer.

Use < mod 3 > hash function.

Existing Buffer sequence and Status is – (21, busy), (62, busy), (34, busy), (90, busy), (17, busy), (44, busy), (30, free), (32, delayed write), (120, free) Request is for allocation for block numbers – 44, 59, 67, 88, 120. **[10]**

SECTION - II

Q7) a) What is a role of super block in assigning inode to a new file and in allocation of disk blocks? Explain in detail with examples. **[10]**

b) Write an algorithm for mknod and read system call. **[8]**

OR

Q8) a) Write namei algorithm. Which system calls uses namei algorithm and in what context? Explain in brief. **[10]**

b) What is inode? Explain the fields of disk inodes. **[4]**

c) Compare the permissions a process must have for the following operations and comment – **[4]**

i) Creating a new file requires write permission in a directory.

ii) Creating an existing file requires write permission on the file.

Q9) a) Draw and explain Unix process state transition diagram in detail. **[8]**

b) What is region? Explain with example conversion of virtual addresses to physical addresses in UNIX. Also explain the role of data structures involved in that. **[8]**

OR

Q10) a) Which are the functions of clock interrupt handler in UNIX? Explain in detail kernel and user process profiling. **[8]**

b) What are signals? How kernel handles a signal? Explain in detail with example. Which system call process uses to send a signal explain with example? **[8]**

Q11) a) How page faults are handled in UNIX? Explain with examples. **[8]**

b) What is control terminal in UNIX? Explain. Explain the algorithm for user logging into a system. **[8]**

OR

Q12) a) Write a note on disk driver. Also list out utility programs that deals directly with the disks. **[8]**

b) State and explain in detail various conditions for swapping processes in and swapping processes out in UNIX. **[8]**

❐❐❐❐

Total No. of Questions : 12] **[Total No. of Pages : 6**

P1318

[3864]-404

B.E. (Computer Engineering)

PRINCIPLES OF COMPILER DESIGN

(2003 Course)

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

Instructions to the candidates :

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

SECTION - I

Q1) Write Lex specifications and auxiliary procedures to perform following tasks by reading the input text file. **[16]**

a) Count and display number of letters, words, vowels.

b) Copy the contents to an output file by

- Writing each sentence from the input file in "title case" with all vowels converted to uppercase and omitting all words that begin with letters x, y or z.
- Inserting a newline character after reading each full stop ('.') character.
- Insert a line number at the beginning of each line.
- Replace each letter 'v' with the letter 'w' if followed by the letter 'a'.
- Replace each letter 's' with the letter 'p' if preceded by the letter 'u'.

OR

Q2) a) In 'C' language, an integer constant can be expressed in decimal, octal or hexa-decimal number systems. An integer constant could be long or short. Write regular expressions to identify integer constants expressed in any of these forms. Construct DFA from these regular expressions.**[10]**

P.T.O.

b) Why it is not possible to design a lexical analysis tool that can detect the strings having equal number of two characters, say a and b. **[6]**

Q3) Construct LALR (1) parsing table for the following grammar. **[18]**

$D \rightarrow L : T$

$L \rightarrow L, id \mid id$

$T \rightarrow integer$

$T \rightarrow real$

$T \rightarrow array\ of\ [num\ DOTDOT\ num]\ of\ T$

Show the moves of the parser for the strings.

i) a, b, c : integer

ii) p, q : array of [10 .. 20] of array of [20 .. 10] of real.

OR

Q4) a) Construct an LL(1) parsing table for the following grammar. Also compute the synchronization entries (that can be used for error recovery) **[10]**

$S \rightarrow aBDh$

$B \rightarrow cC$

$C \rightarrow bC \mid \varepsilon$

$D \rightarrow EF$

$E \rightarrow g \mid \varepsilon$

$F \rightarrow f \mid \varepsilon$

b) Prove that no left recursive grammar can be LL(1). **[4]**

c) Let X be a nullable nonterminal that derives to at least two terminal strings. Show that in a LL(1) grammar, no production rule can have two consecutive occurrences of symbol X on the right side of the production. **[4]**

Q5) a) Consider the following CFG.

$S \rightarrow for\ (E_1; E_2; E_3)\ S_1$

Use marker non terminal(s), write syntax directed translation to translate the for statement into three address code statements. Describe the data structure and auxiliary functions needed. **[10]**

b) For the following source language statement, show the generated three address code statements using the translation scheme you have designed in Q. 5 (a) above. **[6]**

```
for (i = 1; i < = 20; i++)
    x = y + z
```

OR

Q6) a) Consider the following CFG.

S → switch E {caselist}

caselist → caselist case V : S

caselist → case V : S

caselist → default : S

caselist → caselist default : S

Use marker non terminal(s), write syntax directed translation to translate the for statement into three address code statements. Describe the data structure and auxiliary functions needed. **[10]**

b) For the following source language statement, show the generated three address code statements using the translation scheme you have designed in Q. 6 (a) above. **[6]**

```
switch (a + b)
{
    case 2: {x = y; break;}
    case 5: {switch x
            {
                case 0: {a = b + 1; break;}
                case 1: {a = b + 3; break;}
                default: {a = 2;    break;}
            }
            break;
    case 9: {x = y – 1; break;}
    default: {a = 2;    break;}
}
```

SECTION - II

Q7) a) Explain with suitable example code fragments, various parameter passing methods. **[8]**

b) 'C' compiler uses static, stack and heap allocation methods for storage management. Explain these mechanisms using a suitable example 'C' program. **[8]**

OR

Q8) a) Explain the 'Display' mechanism used by the PASCAL compiler to provide access to non-local names with nested procedures. Compare this technique with other techniques. **[8]**

b) Explain storage management techniques that are used to support variable length arrays and to handle function calls with variable number of arguments. **[8]**

Q9) Construct a DAG for the following three-address code. **[16]**

i) $t_1 = a + b$

ii) $t_2 = c + d$

iii) $t_3 = e - t_2$

iv) $t_4 = t_1 - t_3$

Label the DAG using labeling algorithm and show the generated code. Assume there are only two registers R_0 and R_1 and the machine supports all necessary instructions.

OR

Q10) a) Consider the three address code and assumptions about the underlying machine such as registers and instructions as given in Q. 9 above. Assume all three address code statements given in Q. 9 above are in one single basic block. **[8]**

Using the straightforward code generation algorithm, for each of the three address code statements, show

i) the location L that describes the entity where required computation are to be performed.

ii) generated instruction(s).

iii) contents of the register and address descriptor.

iv) cost in terms of memory words.

What is the total size of the code in terms of number of memory words?

b) If three address code statements (ii) and (iii) as given in Q. 9 above are swapped, show the generated code as in question 10 (a) above. What is the total size of the code in terms of number of memory words? **[8]**

Q11) a) 'Loop Unrolling' involves replicating the body of the loop to reduce the required number of tests if number of iterations are constant. Apply the technique to the loop shown below (i) Once and (ii) twice and explain its purpose in code optimization. **[6]**

```
k = 200;
while (k > = 0)
{
    arr [k] = 0;
    k--;
}
```

b) 'Loop Jamming' is a technique that merges the bodies of two loops if the two loops have the same number of iterations and they use the same indices. Apply this technique to following code fragment and explain its role in optimization. **[6]**

```
for (I = 0; I < 10; I++)
        for (I = 0; I < 10; I++)
                X[I, J] = 0;
        for (I = 0; I < 10; I++)
                X[I, J] = 1;
```

c) Write a note on Peephole Optimization. **[6]**

OR

Q12) a) 'Loop Test Replacement' is a technique that replaces a loop termination test phrased in terms of one variable, by a test phrased in terms of another variable. Apply this technique to the following code fragment and explain its purpose in optimization.

```
        temp = 5;
        i = 1;
L10:    x = temp
        i = i + 1
        temp = temp + 5
        if (i < = 10)
                goto L10;
```

[6]

b) 'Loop reversal' is a technique that reverses the order in which values are assigned to the index variable. Apply this technique to the following code fragment that finds the last occurrence of *x* in an integer array val[50]. Illustrate its significance in code optimization. **[6]**

```
for (i = 0; i < = 49; i++)
{
    k = 49 – i;
    if (val [k] == x)
        break;
}
```

c) Explain the following : **[6]**

i) Reaching definitions.

ii) Live variables.

iii) Available expressions.

❐❐❐❐

Total No. of Questions : 12] **[Total No. of Pages : 7**

P1319

[3864]-417

B.E. (IT)

ADVANCED DATABASE MANAGEMENT

(2003 Course) (414442)

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

Instructions to the candidates :

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data, if necessary.***
4) ***Section I : Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6.***
5) ***Section II : Q. 7 or Q. 8, Q. 9 or Q. 10, Q. 11 or Q. 12.***

SECTION - I

Q1) a) Explain Parallel Hash Join with suitable example. **[6]**

b) Histogram are used for constructing load balanced range partition. **[6]**

i) Suppose a histogram where values are between 1 and 100, and are partitioned into 10 ranges, 1-10, 11-20, ..., 91-100, with frequencies 15, 5, 20, 10, 10, 5, 5, 20, 5 and 5, respectively. Express a load balanced range partitioning function to divide the values into 5 partition.

ii) Write an algorithm for computing a balanced range partition with p partitions, given a histogram of frequency distributions containing n ranges.

c) Explain a nonuniform memory architecture (NUMA). **[5]**

OR

Q2) a) Describe interoperation parallelism, left-deep trees versus bushy trees, and query cost estimation. **[6]**

P.T.O.

b) Evaluate how well partitioning techniques support the following types of data access. **[6]**

i) Scanning the entire relation.

ii) Locating tuple associatively.

iii) Locating all tuples such that the value of given attribute lies within a specified range.

c) Explain cache-coherency protocol. **[5]**

Q3) a) State different types of failures in distributed systems and explain failure handling in distributed database using 2 Phase Commit Protocol. **[5]**

b) Consider the relations : **[7]**

Employee (name, address, salary, plant_number)

Machine (machine_number, type, plant_number)

Assume that the employee relation is fragmented horizontally by plant_number, and that each fragment is stored locally at its corresponding plant site. Assume that machine relation is stored in its entirely at the Armonk site. Describe a good strategy for processing each of the following queries.

i) Find all employees at the plant that contains machine number 101.

ii) Find all machines at the Almaden plant.

iii) Find employee ∞ machine.

c) Explain the technique that the database system you are using provides for dealing with inconsistent states that can be reached with lazy propagation of updates. **[5]**

OR

Q4) a) Define semi-join. Compute semi-join $r \alpha s$ for the relations r and s. **[5]**

Relation *r*				Relation *s*	
A	B	C	C	D	E
1	2	3	3	4	5
4	5	6	3	6	8
1	2	4	2	3	2
5	3	2	1	4	1
8	9	7	1	2	3

b) Consider multiple-granularity locking protocol. In distributed databases, the site containing the root object in the hierarchy can become a bottleneck. Modify the protocol to allow only intension locks on the root and implicitly grant all possible intension locks to every transaction. **[7]**

i) Explain why this modification works correctly, in that transactions continue to be able to set locks on desired parts of the hierarchy.

ii) Explain how it reduce the demand on the root.

c) Explain how LDAP can be used to provide multiple hierarchical view of data, without replicating the base-level data. **[5]**

Q5) a) Consider following DTD for bibliography. **[12]**

<!ELEMENT bib (book*)>

<!ELEMENT book (title, (author+ | editor+), publisher, price)>

<!ATTLIST book year CDATA #REQUIRED>

<!ELEMENT author (last, first)>

<!ELEMENT editor (last, first, affiliation)>

<!ELEMENT title (#PCDATA)>

<!ELEMENT last (#PCDATA)>

<!ELEMENT first (#PCDATA)>

<!ELEMENT affiliation (#PCDATA)>

<!ELEMENT publisher (#PCDATA)>

<!ELEMENT price (#PCDATA)>

Create XML document, XML Schemas and solve the following queries in XQuery on the bibliography fragment.

i) List books published by Addison-Wesley after 1991, including their year and title.

ii) Find pairs of books that have different titles but the same set of authors (possibly in a different order).

iii) For each book in the bibliography, list the title and authors, grouped inside a "result" element.

b) Describe the various issues for efficient evaluation of XML Queries. **[4]**

OR

Q6) a) <?xml version = "1.0" encoding = "UTF-8"?> **[8]**

<!ELEMENT bids (bid_tuple*)>

<!ELEMENT bid_tuple (userid, itemno, bid, bid_date)>

<!ELEMENT userid (#PCDATA)>

<!ELEMENT itemno (#PCDATA)>

<!ELEMENT bid (#PCDATA)>

<!ELEMENT bid_date (#PCDATA)>

Create XML document, XML Schemas and solve the following queries in XQuery on the bibliography fragment.

i) List the item number and description of the item(s) that received the largest number of bids, and the number of bids it (or they) received.

ii) List item numbers and average bids for items that have received three or more bids, in descending order by average bid.

b) Explain XML schemas restrictions and facets. **[4]**

c) Write a short note on SOAP. **[4]**

SECTION - II

Q7) a) Explain Binning method and Regression method to handle noisy data in Data Warehouse. **[6]**

b) Explain Data Reduction strategies in Data Warehouse. **[6]**

c) Write a short note on Materialized view. **[5]**

OR

Q8) a) Design conceptual model for Financial Services data warehouse. **[6]**

b) List various features of fact data and explain the guidelines to be followed while determining facts from dimensions. **[6]**

c) Explain how meta data can be used for data transformation and loading, and query generation in data warehouse. **[5]**

Q9) a) Consider following training set : **[10]**

Outlook	Temperature	Humidity	Wind	Class Attribute
Sunny	Hot	High	False	N
Sunny	Hot	High	True	N
Overcast	Hot	High	False	P
Rain	Mild	High	False	P
Rain	Cool	Normal	False	P
Rain	Cool	Normal	True	N
Overcast	Cool	Normal	True	P
Sunny	Mild	High	False	N
Sunny	Cool	Normal	False	P
Rain	Mild	Normal	False	P
Sunny	Mild	Normal	True	P
Overcast	Mild	High	True	P
Overcast	Hot	Normal	False	P
Rain	Mild	High	True	N

Write ID3 Classification algorithm. Construct a decision tree based on above training set using ID3.

b) Explain how to handle candidate item sets using hash tree with suitable example. **[7]**

OR

Q10) a) Consider following data set : **[9]**

Object	Attribute 1	Attribute 2	Attribute 3
A	1	1	2
B	3	2	4
C	3	4	6
D	4	6	3

Write K-means clustering algorithm. Find the cluster for the objects in data set with K = 2.

b) Consider following training data set : **[8]**

Age	Income	Student	Credit_rating	Buys_Computer
< = 30	high	No	Fair	no
< = 30	high	No	Excellent	no
31...40	high	No	Fair	yes
> 40	medium	No	Fair	yes
> 40	low	Yes	Fair	yes
> 40	low	Yes	Excellent	no
31...40	low	Yes	Excellent	yes
< = 30	medium	No	Fair	no
< = 30	low	Yes	Fair	yes
> 40	medium	Yes	Fair	yes
< = 30	medium	Yes	Excellent	yes
31...40	medium	No	Excellent	yes
31...40	high	Yes	Fair	yes
> 40	medium	No	Excellent	no

Write Naïve Bayesian Classifier algorithm. Consider Buys_Computer as a Class Attribute with values yes and no classes. Find the class label for data sample.

X = (age < = 30, Income = medium, Student = yes Credit_rating = Fair) using Naïve Bayesian Classifier.

Q11) a) Define Information Retrieval System. Describe how it is differ from database system. **[6]**

b) Write short notes on Signature Files. **[5]**

c) Explain the following terms in Information Retrieval with suitable example. **[5]**

i) Synonyms

ii) Homonyms

iii) Proximity

iv) TF-IDF

OR

Q12) a) Explain any two techniques that support the evaluation of Boolean and Ranked queries. **[6]**

b) Write short notes on : **[10]**

i) Web Crawler.

ii) Document Indexing.

❐❐❐❐

Total No. of Questions : 12] **[Total No. of Pages : 2**

P1320

[3864]-437

B.E. (Biotechnology)

PHARMACEUTICAL BIOTECHNOLOGY

(416281) (Sem . - I) (Elective - I)

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

Instructions to the candidates :

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

SECTION - I

Q1) Classify various types of solid and liquid dosage forms. Write in detail about Solid dosage forms with suitable example. **[18]**

OR

Q2) What is pharmacokinetics? Explain principles of first-order kinetics along with mathematical equations and graphical representation. **[18]**

Q3) Enlist different biopharmaceuticals drugs derived from plants. Explain in detail with any three examples. **[16]**

OR

Q4) Derive pharmacokinetic equations and explain in detail one compartment open model for intravenous infusion. **[16]**

Q5) a) Write in detail about G protein coupled and Nuclear receptors. **[12]**

b) What is ADME profile of a drug? **[4]**

OR

Q6) Write short notes (Any Four) : **[16]**

a) Mechanism of anti-infectives.
b) Bioavailability.
c) Drugs acting on CNS.
d) Friability test.
e) Parentrals.
f) Target oriented drug delivery.
g) Ligand gated Ion channels.

P.T.O.

SECTION - II

Q7) What are various strategies adopted for drug discovery process? Explain in detail any one technique. **[18]**

OR

Q8) What is In-silico drug discovery? Explain in detail the various steps involved in it. **[18]**

Q9) a) Write in detail about Phase I and Phase II clinical trials. **[12]**

b) Explain the terms NDE and IND. **[4]**

OR

Q10) a) Explain in detail various side effects and adverse effects induced by drugs. **[12]**

b) What are antidotes? Explain with suitable example. **[4]**

Q11) Write in detail about New drug application and Abbreviated New drug application. **[16]**

OR

Q12) Write short notes (Any Four) : **[16]**

a) Allergic reaction to drugs.

b) Teratogenesis.

c) Indian Pharmacopoeia.

d) FDA.

e) Food, drug and cosmetic act.

f) QSAR.

g) Prototype drug.

❐❐❐❐

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1329

[3867]-1174

S.Y.M.Arch. (Arch. Conservation)

AC313:CONSERVATION POLICIES & PRACTICES

(2008 Course) (Sem. - III)

Time : 3 Hours] ***[Max. Marks :75***

Instructions to the candidates:

1) ***Use separate answer-book for each Section.***
2) ***Question No.1 from Section I & Question No. 5 from Section II are compulsory.***
3) ***Answer any two of the remaining questions from each section.***

SECTION - I

Q1) Write short notes on any four of the following: **[20]**

a) Origin & concept of legislation.

b) Criteria for nomination of World Heritage Sites.

c) General Provisions of UN Charters on Heritage Conservation.

d) Ancient Monuments Act in India.

e) JNNURM & Heritage Conservation.

f) Regulations for Heritage Conservation.

Q2) Write your opinion on effectiveness of Urban Arts Commission in Conservation practice in New Delhi. **[10]**

Q3) Give your opinion on the logic behind the UN Charters for conservation of built Heritage. **[10]**

Q4) Does INTACH Charter reflect the Indian perception of Conservation of Built heritage? Explain your viewpoint. **[10]**

P.T.O.

SECTION - II

Q5) Write short notes on any three of the following: **[15]**

a) Rent Control Act.

b) TDR (Transfer of Development Right).

c) Definition of Historic precincts in GDCR.

d) Provisions for protection of monuments in GDCR & MRTP.

Q6) Give your analysis of the General development Control Regulations. **[10]**

Q7) Explain how provision of TDR be effectively used for Conservation of Old Cities. **[10]**

Q8) Have the provisions of MRTP & GDCR of various cities in Maharashtra actually helped the Conservation of built heritage in Maharashtra? Give your opinion. **[10]**

Total No. of Questions : 12] **[Total No. of Pages : 2**

[3864]-112

P1331 **B.E. (Civil)**

ADVANCED CONCRETE TECHNOLOGY (Elective - II)

(2003 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 books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator allowed.***
6) ***Assume suitable data, if necessary.***
7) ***Your answers will be valued as a whole.***
8) ***Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, from section I, Q7 or Q8, Q9 or Q10, Q11 or Q12 from Section II.***

SECTION - I

Q1) a) Explain the process, hydration of cement. **[6]**

b) Explain the grading curves of aggregates. **[6]**

c) Explain the relationship between cement, aggregate and bond strength. **[6]**

OR

Q2) a) Write a note on water requirement for hydration process of cement. **[6]**

b) Explain the gel space ratio. **[6]**

c) Explain alkali aggregate reaction. **[6]**

Q3) a) Explain Light weight concrete and ultra light weight concrete. **[6]**

b) Explain sulphur concrete and sulphur infiltrated concrete. **[6]**

c) Write a note on waste material based concrete. **[4]**

OR

Q4) a) Explain vacuum concrete and mass concrete. **[6]**

b) Explain high strength concrete and high performance concrete. **[6]**

c) Write a note on Recycled concreting. **[4]**

Q5) a) Design a concrete mix, M25 by IS 10262-1982 for following data. **[10]**
Maximum size of aggregate = 20 mm, Fine aggregates confirm to Zone-III Compaction factor = 0.9, Quality control = good, type of exposure = mild, Water absorption for both aggregate = 1%, free moisture content = 2%. Specific gravity of OPC=3.15 and that of both aggregates = 2.7, Slump=50mm.

b) Explain the nuclear method and infrared thermo-graphy method of non-destructive testing. **[6]**

OR

P.T.O.

Q6) a) Design fly ash cement concrete mix, M50 by IS 10262-1982 for following data. Maximum size of aggregate=20mm, Fine aggregates confirm to Zone-III. Compaction factor = 0.9, Quality control = good, type of exposure = mild, Water absorption for both aggregate = 1%, free moisture content = 2%. Specific gravity of OPC=3.15 and that of both aggregates = 2.7, Slump = 80 mm. **[10]**

b) Explain the break off maturity method and stress wave propagation method of non destructive testing. **[6]**

SECTION - II

Q7) a) Explain the major parameter affecting fiber interaction with homogeneous uncracked matrix with axial stress and shear stress. **[6]**

b) Explain the natural fibers with their mechanical properties in tension and bending. **[6]**

c) Explain the metallic fiber with their properties. **[6]**

OR

Q8) a) Explain the major parameter affecting fiber interaction with homogeneous cracked matrix with axial stress and shear stress. **[6]**

b) Explain carbon fibers and glass fibers. Mention its uses. **[6]**

c) Explain the properties of polymeric fiber. **[6]**

Q9) a) Explain properties of hardened SFRC under compression, tension and flexure. **[6]**

b) Explain Properties of hardened GFRC under compression, tension and flexure. **[6]**

c) Explain the techniques for toughness measurement for FRC. **[4]**

OR

Q10)a) Explain the Properties of hardened polymeric fiber concrete under compression, tension and flexure. **[6]**

b) Explain the compliance mechanics. **[6]**

c) Write a note on SIFCON development. **[4]**

Q11)a) Explain the Precast concrete pole with reference to Material requirement, Analysis and design principals, Manufacturing method, Testing methodology and Quality control. **[10]**

b) Explain the term Ferro-cement with reference to its material requirements, casting process, testing and its application. **[6]**

OR

Q12)a) Explain with schematic diagram the construction of chimney using slip form construction technique. **[10]**

b) Explain the rehabilitation of heritage structure. **[6]**

Total No. of Questions : 12] **[Total No. of Pages : 2**

P1332

[3864]-146

B.E. (Mechanical Engineering)

ENERGY MANAGEMENT

(402050) (2003 Course)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) Why should we conserve energy? What should be the energy strategy for the future of a nation? **[9]**

b) Discuss environmental impacts due to conventional energy use. **[9]**

OR

Q2) a) Discuss the relevance of renewable energy for national energy security policy. **[9]**

b) List out and explain energy efficiency benefits for industry. **[9]**

Q3) a) How to conduct a detailed energy audit? **[8]**

b) State and explain the functions of measuring instruments used for energy audit. **[8]**

OR

Q4) a) Define and explain the followings: **[9]**

i) Return on Investment (ROI).

ii) Net Present Value (NPV).

iii) Internal Rate of Return (IRR).

b) Explain 'Simple Payback Period' method of financial analysis with its advantages and limitations. **[7]**

P.T.O.

Q5) a) Discuss the following terms for the efficient operation of compressed air system: **[8]**

i) Quality of air.
ii) Capacity control of compressor.
iii) Piping layout.

b) State any eight energy saving opportunities in compressed air system. **[8]**

OR

Q6) a) Explain in detail direct method and indirect method for finding out boiler efficiency. **[8]**

b) What are the benefits of condensate recovery? **[8]**

SECTION - II

Q7) a) What are the benefits of power factor improvement? **[9]**

b) What possible improvement measures you would look for in general lighting system. **[9]**

OR

Q8) a) State different desirable properties and selection criteria of refractory material. **[9]**

b) Write short notes on:

i) Economic thickness of insulation.
ii) Energy efficient motors. **[9]**

Q9) a) Explain importance of waste heat recovery. **[8]**

b) What is cogeneration? Explain the concept of topping cycle and bottoming cycle. **[8]**

OR

Q10)a) Define and explain different terms used in performance assessment of water pumps. **[8]**

b) Explain the following terms for waste heat recovery.

i) Economizer.
ii) Shell and Tube heat exchanger. **[8]**

Q11)a) State different conservation opportunities in pumping systems. **[8]**

b) Explain the importance of maintenance of heat exchanger surface in HVAC and refrigeration systems. **[8]**

OR

Q12)a) Suggest minimum ten tips for energy conservation in thermal power plant. **[8]**

b) Discuss in brief different energy efficient technologies in electrical systems used in pumps and fans. **[8]**

Total No. of Questions :6] **[Total No. of Pages : 2**

P1334

[3864]-294
B.E. (Instrumentation & Control)
FIBER OPTIC INSTRUMENTATION
(2003 Course) (406264 (3))

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

Instructions to the candidates:

1) ***Answer 3 questions from Section Iand 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) ***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) Compare the advantages and disadvantages of Multimode step index fiber and Single-mode step index fiber. **[8]**

b) A silica optical fiber with a core diameter enough to be considered by ray theory analysis has a core refractive index of 1.49 and a cladding refractive index 1.40. Determine the critical angle at the core-cladding interface, numerical aperture for the fiber and the acceptance angle in air for the fiber. **[9]**

OR

a) Briefly discuss with the aid of a suitable diagram what is meant by the acceptance angle for an optical fiber.Show how this is related to the fiber numerical aperture and the refractive indices for the fiber core and cladding. **[9]**

b) Describe with the aid of suitable diagrams, the concepts of Evanescent field in optical fiber transmission. **[8]**

Q2) a) Explain what is meant by the critical bending radius for an optical fiber.**[9]**

b) Describe various attenuation mechanisms in optical fiber transmission in detail. **[8]**

OR

a) Explain the reasons for pulse broadening in optical fiber. **[8]**

b) Describe the role of OTDR in distributed optical fiber sensing. **[9]**

P.T.O.

Q3) a) What are the three types of fiber misalignments, which may contribute to insertion loss at an optical fiber joint? **[8]**

b) Discuss the principles of operation of the injection laser. **[8]**

OR

a) Compare p-n photodiode with the p-i-n photodiode. **[8]**

b) What are the advantages and drawbacks of the LED in comparison with the injection laser for use as a source in optical fiber sensing? **[8]**

SECTION - II

Q4) a) Discuss 'Encoding-based Position Sensors'. **[8]**

b) What are the characteristics, advantages and drawbacks of Optical Fiber Sensors? **[8]**

OR

a) Describe one technique of sensing which is based on intensity modulation. Also enlist various parameters, which can be sensed by using this technique. **[8]**

b) What do you understand by intrinsic and extrinsic Optical Fiber Sensors? With the aid of suitable diagrams describe one intrinsic Optical Fiber Sensor. How do you calibrate this sensor? **[8]**

Q5) a) Discuss 'Fiber Grating Manufacturing'. **[9]**

b) Explain one optical fiber sensor in which Fiber Bragg Grating is used. **[9]**

OR

a) What are the advantages and limitations of Distributed Optical Fiber Sensing? Explain Distributed Optical Fiber temperature Sensing. **[10]**

b) Explain different performance parameters, which characterize any Distributed Optical Fiber Sensing. **[8]**

Q6) a) Give major reasons which have led to the development of optical amplifiers, outlining the attributes and application areas for these devices. **[8]**

b) Explain with the aid of suitable diagrams, Beam splitter and Directional coupler. **[8]**

OR

a) Sketch the major elements of a fiber amplifier and describe the operation of the device.Indicate the benefits of fiber amplifier technology in comparison with that associated with silicon laser amplifiers (SLAs). **[10]**

b) Discuss' Integrated Optics'. **[6]**

⌘⌘⌘⌘

Total No. of Questions : 12] **[Total No. of Pages : 4**

P1337

[3864]-105

B.E. (Civil)

ADVANCED GEO TECH. ENGINEERING

(2003 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) The following table gives results of dry sieve analysis and liquid limit (W_{LL}); plastic limit (W_{PL}) of six samples. Classify soil as per I.S. classification and state for which work each is most suitable. **[18]**

Sample	Sieve size & % retained				Uniformity Coefficient Cu	W_{LL}	W_{PL}
	75μ	1.18 mm	2.36 mm	4.75 mm			
A	10%	5	2	–	–	55	20
B	10	5	2	60	–	55	20
C	28	60	5	2	3	–	–
D	28	60	5	2	7	–	–
E	8	10	8	60	7	–	–
F	8	60	8	–	–	55	40

OR

Q2) State the criteria in connection with dry sieve analysis results and consistency test results, which should be satisfied, so as to classify the soil as

GP SW MI CI SC GM

State, for which work, each of above soil is most suitable. **[18]**

P.T.O.

Q3) Explain with suitable diagrams. (Any Four) **[16]**

a) Inter particle attractive forces.

b) Inter particle repulsive forces.

c) Flocculated structure.

d) Dispersed structure.

e) Structure of montmonillonite.

f) Structure of Kaolinite.

OR

Q4) a) Explain difference between the assumptions made in theory of earth pressure by Rankine and Coulomb.

b) 4 m high retaining wall is inclined at 20° to vertical, and is back filled with sandy soil with an angle of internal friction of 30°. The wall has angle of wall friction of 10° and earth behind the retaining wall is inclined at 15° to the horizontal. Determine :

i) Co-efficient of active earth pressure.

ii) Active earth pressure.

iii) Direction and point of application of earth pressure.

[16]

Q5) a) 6 m steel sheet pile is embeded in sandy soil for 2 m, to serve as FIXED END. A tie bar is provided at 1 m from top. Draw resulting following :

i) Pressure Distribution Diagram.

ii) Bending Moment Diagram.

iii) Deflection Diagram.

b) Solve question No. 4 (b) <u>GRAPHICALLY</u>.

c) Solve question No. 4 (b) GRAPHICALLY, considering following change :

"..... earth behing retaining wall is inclined at 30°, instead of 15° to the horizontal."

[16]

OR

Q6) a) Answer the following in connection with Geo Textiles :

i) State 4 functions of Geo Textiles.

ii) Draw sketches illustrating arrangement made in field, to achieve the four functions.

b) Draw neat sketch of vertical reinforced earth retaining wall. Explain how length and cross sectional area of reinforcement is designed.

[16]

SECTION - II

Q7) a) Explain with sketches, how you will model :

i) Elastic deformation.

ii) Newtonian deformation.

iii) Yield stress deformation.

b) Explain following in connection with consolidation of clayey soil :

i) Primary consolidation.

ii) Secondary consolidation.

iii) Creep.

[18]

OR

Q8) Explain the following with suitable graphs : **[18]**

a) Combining yield stress and elastic stress in series.

b) Combining Newtonian stress with Elastic stress in parallel.

Q9) Discuss the following with suitable sketch : **[16]**

a) Impact type machine foundation.

b) Label various components of the foundation. State function of each part.

c) Explain points to be observed while designing the foundation.

OR

Q10) Explain the following in connection with machine foundation : **[16]**

a) Explain how natural frequency is found out.

b) Explain difference between frequency and amplitude. How later is calculated?

c) Explain relation between permissible bearing capacity by :

i) Static load.

ii) Dynamic load.

State and explain relation between the two.

Q11) a) In connection with sand drain and blanket explain the following :

i) Labelled sketch showing plan and section.

ii) Principle, procedure and precautions.

b) In connection with Dynamic consolidation explain following :

i) Line diagram to explain technique.

ii) Method.

iii) Applications.

iv) Limitations.

[16]

OR

Q12) a) Draw grain size distribution curve, showing different types of soils Label curves. Indicate on the same curve, 6 different methods suitable for soil improvement.

b) Discuss any three methods of soil improvement.

[16]

❐❐❐❐

Total No. of Questions : 12] **[Total No. of Pages : 4**

P1338

[3864] - 113

B.E. (Civil)

EARTHQUAKE ENGINEERING

(2003 Course) (Elective - I)

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

Instructions to the candidates:

1) ***From Section - I answer Q1 or Q2, Q3 or Q4, Q5 or Q6, and from Section - II answer Q7 or Q8, Q9 or Q10, and Q11 or Q12.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***IS 456, IS 1893, IS 13920 are allowed in the examination.***
5) ***Neat diagrams must be drawn wherever necessary.***
6) ***If necessary, assume suitable data and indicate clearly.***
7) ***Use of electronic pocket calculator is allowed.***

SECTION - I

Q1) a) What are earthquakes. Explain the various causes of it. **[9]**

b) Explain how earthquakes are measured. **[8]**

OR

Q2) a) Explain plate tectonic theory. **[9]**

b) With neat sketches explain the different types of waves generated by an earthquake. **[8]**

Q3) a) Derive the equation of motion for a damped free vibration of a SDOF system. **[9]**

b) A cantilever of length *l* has a mass M attached to its free end. Find the frequency of lateral vibrations in the lateral plane. **[8]**

OR

P.T.O.

Q4) a) For the system shown in Fig. 4 a, find the mass m such that the system has a natural frequency of 10 Hz. Take k1 = 2000 N/m, k2 = 1500 N/m, k3 = 3000 N/m and k4 = k5 = 500 N/m. **[9]**

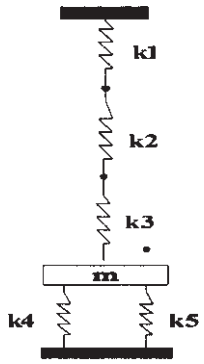


Fig. 4 a

b) Explain transient and steady state response. **[8]**

Q5) Obtain the natural frequency and mode shapes for different modes for the system shown in Fig. 5. **[16]**

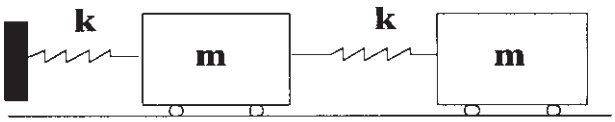


Fig. 5

OR

Q6) Calculate the natural frequency and mode shapes for a three-storied single bay building with uniform stiffness of columns in each storey. Take $m_1 = m_2 = m_3$. **[16]**

SECTION - II

Q7) Calculate the seismic forces for the building shown in Fig. 7. The building is located in Zone V. The frames are spaced at 4 m c/c. **[18]**

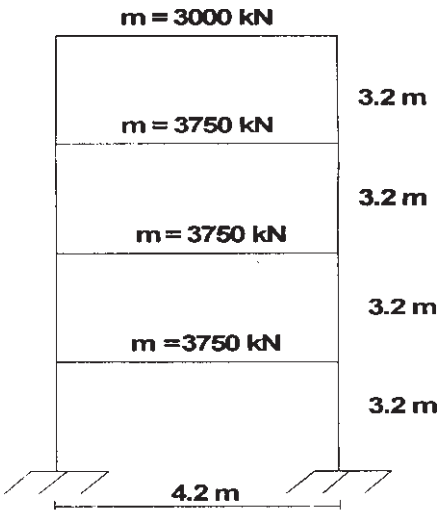


Fig. 7

OR

Q8) Design a shear wall for a 10 storied building with the given details **[18]**

Storey No.	1	2	3	4	5	6	7	8	9	10
Storey shear (kN)	5	10	30	80	140	200	360	500	700	850

- storey height – 3.2 m
- length of shear wall – 6.5 m
- seismic weight of building – 55×10^3 kN
- axial load on the wall – $2.85\ 10^3$ kN
- the building is loacated in Zone V
- materials – M20 grade concrete and HYSD bars of grade Fe 415.

Q9) What is ductile detailing of members. Explain the same for RC beams as per the provisions of IS 13920. **[16]**

OR

Q10) A rectangular column of size (350 × 650) mm carries a load of 1700 kN and a moment of 1800 kN m along its major axis. Design the column footing and sketch the details of reinforcement. The SBC of the soil may be taken as 220 kN/m^2. **[16]**

Q11) Explain the following terms : **[16]**

a) Torsional irregularity.

b) Vertical irregularity in buildings.

c) Weak storey.

OR

Q12) Write short notes on : **[16]**

a) Tuned mass dampers.

b) Retrofitting of buildings.

❖❖❖❖

Total No. of Questions : 8] [Total No. of Pages :7

P1339

[3864] - 341
B.E. (Petroleum Engineering)
RESERVOIR ENGINEERING - I
(2003 Course) (412381)

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 No.1 (One) and 8 (eight) are compulsory.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Use of a non-programmable calculator, log-log semi-log paper is allowed.***
6) ***Assume suitable data, if necessary.***
7) ***If you attempt question 7, detach Figure 1 & 2 and attach inside the answer booklet.***
8) ***If you attempt question 8, detach Figure 1 and attach inside the answer booklet.***

SECTION - I

Q1) a) What are the activities of a reservoir engineer? **[6]**

b) Explain in detail classification of reserves and how are they are calculated? **[6]**

c) Which drive index has the highest value, explain with the help of an equation? **[6]**

Q2) a) Derive the material balance equation for an undersaturated reservoir considering rock and fluid expansion. **[7]**

b) An undersaturated reservoir producing above the buble point had an initial pressure of 5000 psia, at which pressure Bo was 1.510 bbl/STB. When the pressure dropped to 4600 psia, owing to the production of 100,000 STB of oil, the Bo was 1.52. The connate water saturation was 25%, water compressibility 3.2E-6/psi and porosity was 16%, rock compressibility was 4.0E-6. Average compressibility of oil between 5000 and 4600 psia relative to volume at 5000 is 17E-6.

i) Assuming a volumetric reservoir, calculate IOIP

ii) It was desired to inventory the initial stock tank barrels in place at the second production interval. When the pressure had dropped to 4200 psia, Bo was 1.531, 205 M STB had been produced. If average compressibility was 17.65E-6, what was IOIP.

P.T.O.

iii) After analysis of cores and logs, volumetric estimate of IOIP was 7.5 MMSTB. If his figure is correct, how much water entered the reservoir when the pressure declined to 4600 psia. **[9]**

Q3) a) Derive an equation for OGIP using material balance. **[4]**

b) The initial volume of gas in place in a certain reservoir is calculated from electric log and core data to be 200MMMSCF(14.7 and 60 F) underlying 2250 productive acres, at an initial pressure of 3500 psia and 140F. The pressure production history is

Pressure	Production MMMSCF	Gas deviation factor at 140F
3500(initial)	0.0	0.85
2500	75.0	0.82

i) What is the initial volume of gas in place as calculated from the pressure production history assuming no water influx

ii) Assuming uniform sand thickness, porosity, and connate water, if the volume of gas in place from pressure-production data is believed to be correct, how many acres of extension is the reservoir.

iii) If, the gas in place is calculated from log and core data is correct, how much water influx must have occurred during the 75 MMMSCF of production to make the two figures agree. **[12]**

Q4) Explain in detail any one of the decline rate type curves (Blasingame, Carter, Fetkovich) used for decline curve analysis. **[16]**

SECTION - II

Q5) Derive a new diffusivity equation in Cartesian co-ordinate system by assuming the pressure derivative with respect to distance in NEGLIGIBLE. **[16]**

Q6) a) What is an isochronal test, why is it required? **[2]**

b) Define AOFP **[2]**

c) The following data is for an isochronal test.

The data in the table is reported for a flow after flow test. Initial shut in BHP is determined to be 408 psia. Estimate AOFP of this well by the empirical plot and the theoretical equation. **[12]**

Test	Pwf or Pws(psia)	Qg(MMscf/D)	Duration (hrs)
Initial Shut-in	1952	-	48
First Flow	1761	2.6	12
First Shut-in	1952	-	15
Second flow	1694	3.3	12
Second Shut -in	1952	-	17
Third Flow	1510	5.0	12
Third Shut-in	1952	-	18
Fourth flow	1320	6.3	12
Extended flow (stabilized)	1151	6.0	72
Final Shut-in	1952	-	100

Q7) (If you attempt this question, attach Figure 1 and 2 inside the answer booklet). Analyse the pressure transient test in Figure 1 and 2 for a well producing oil which has produced 13220 STB. Data: φ=0.17, qo=1135 STB/D, μo=0.6 cp, Bo=1.214bbl/STB, ct=18E-6/psi, rw=0.5 ft, h=28ft, pwf=2752 psia, re=1320 ft, well centered in square drainage area(160 acres) Determine.

a) Time at which afterflow distortion ceased **[1]**

b) Time at which boundary effects begin **[1]**

c) On the graph draw a Unit Slope line, and identify ETR, MTR, LTR on both graphs. Explain the terms ETR, MTR, LTR. **[4]**

d) Formation permeability, skin, ri. **[3]**

e) Find delp skin and flow efficiency. **[2]**

f) Is there a fault in the vicinity of the well, at what distance? **[5]**

Q8) (If you attempt this question, attach Figure 1 inside the answer booklet).

a) What is a Derivative Plot? How is it obtained. **[2]**

b) Draw approximately the Derivative plot for the above problem(Q7) on Figure 1 if there is a fault in the vicinity of the well.? State all other well, near well and boundary assumptions for your plot. **[6]**

c) Give five examples of pressure derivative plots for different reservoir models and explain them. **[10]**

TABLE 1.1* – VALUES OF THE EXPONENTIAL INTEGRAL, $-Ei(-x)$

$-Ei(-x)$, $0.000 < 0.209$, interval $= 0.001$

x	0	1	2	3	4	5	6	7	8	9
0.00	$+\infty$	6.332	5.639	5.235	4.948	4.726	4.545	4.392	4.259	4.142
0.01	4.038	3.944	3.858	3.779	3.705	3.637	3.574	3.514	3.458	3.405
0.02	3.355	3.307	3.261	3.218	3.176	3.137	3.098	3.062	3.026	2.992
0.03	2.959	2.927	2.897	2.867	2.838	2.810	2.783	2.756	2.731	2.706
0.04	2.681	2.658	2.634	2.612	2.590	2.568	2.547	2.527	2.507	2.487
0.05	2.468	2.449	2.431	2.413	2.395	2.377	2.360	2.344	2.327	2.311
0.06	2.295	2.279	2.264	2.249	2.235	2.220	2.206	2.192	2.178	2.164
0.07	2.151	2.138	2.125	2.112	2.099	2.087	2.074	2.062	2.050	2.039
0.08	2.027	2.015	2.004	1.993	1.982	1.971	1.960	1.950	1.939	1.929
0.09	1.919	1.909	1.899	1.889	1.879	1.869	1.860	1.850	1.841	1.832
0.10	1.823	1.814	1.805	1.796	1.788	1.779	1.770	1.762	1.754	1.745
0.11	1.737	1.729	1.721	1.713	1.705	1.697	1.689	1.682	1.674	1.667
0.12	1.660	1.652	1.645	1.638	1.631	1.623	1.616	1.609	1.603	1.596
0.13	1.589	1.582	1.576	1.569	1.562	1.556	1.549	1.543	1.537	1.530
0.14	1.524	1.518	1.512	1.506	1.500	1.494	1.488	1.482	1.476	1.470
0.15	1.464	1.459	1.453	1.447	1.442	1.436	1.431	1.425	1.420	1.415
0.16	1.409	1.404	1.399	1.393	1.388	1.383	1.378	1.373	1.368	1.363
0.17	1.358	1.353	1.348	1.343	1.338	1.333	1.329	1.324	1.319	1.314
0.18	1.310	1.305	1.301	1.296	1.291	1.287	1.282	1.278	1.274	1.269
0.19	1.265	1.261	1.256	1.252	1.248	1.243	1.239	1.235	1.231	1.227
0.20	1.223	1.219	1.215	1.210	1.206	1.202	1.198	1.195	1.191	1.187

$-Ei(-x)$, $0.00 < x < 2.09$, interval $= 0.01$

0.0	$+\infty$	4.038	3.335	2.959	2.681	2.468	2.295	2.151	2.027	1.919
0.1	1.823	1.737	1.660	1.589	1.524	1.464	1.409	1.358	1.309	1.265
0.2	1.223	1.183	1.145	1.110	1.076	1.044	1.014	0.985	0.957	0.931
0.3	0.906	0.882	0.858	0.836	0.815	0.794	0.774	0.755	0.737	0.719
0.4	0.702	0.686	0.670	0.655	0.640	0.625	0.611	0.598	0.585	0.572
0.5	0.560	0.548	0.536	0.525	0.514	0.503	0.493	0.483	0.473	0.464
0.6	0.454	0.445	0.437	0.428	0.420	0.412	0.404	0.396	0.388	0.381
0.7	0.374	0.367	0.360	0.353	0.347	0.340	0.334	0.328	0.322	0.316
0.8	0.311	0.305	0.300	0.295	0.289	0.284	0.279	0.274	0.269	0.265
0.9	0.260	0.256	0.251	0.247	0.243	0.239	0.235	0.231	0.227	0.223
1.0	0.219	0.216	0.212	0.209	0.205	0.202	0.198	0.195	0.192	0.189
1.1	0.186	0.183	0.180	0.177	0.174	0.172	0.169	0.166	0.164	0.161
1.2	0.158	0.156	0.153	0.151	0.149	0.146	0.144	0.142	0.140	0.138
1.3	0.135	0.133	0.131	0.129	0.127	0.125	0.124	0.122	0.120	0.118
1.4	0.116	0.114	0.113	0.111	0.109	0.108	0.106	0.105	0.103	0.102
1.5	0.1000	0.0985	0.0971	0.0957	0.0943	0.0929	0.0915	0.0902	0.0889	0.0876
1.6	0.0863	0.0851	0.0838	0.0826	0.0814	0.0802	0.0791	0.0780	0.0768	0.0757
1.7	0.0747	0.0736	0.0725	0.0715	0.0705	0.0695	0.0685	0.0675	0.0666	0.0656
1.8	0.0647	0.0638	0.0629	0.0620	0.0612	0.0603	0.0595	0.0586	0.0578	0.0570
1.9	0.0562	0.0554	0.0546	0.0539	0.0531	0.0524	0.0517	0.0510	0.0503	0.0496
2.0	0.0489	0.0482	0.0476	0.0469	0.0463	0.0456	0.0450	0.0444	0.0438	0.0432

$2.0 < x < 10.9$, interval $= 0.1$

x	0	1	2	3	4	5	6	7	8	9
2	4.89×10^{-2}	4.26×10^{-2}	3.72×10^{-2}	3.25×10^{-2}	2.84×10^{-2}	2.49×10^{-2}	2.19×10^{-2}	1.92×10^{-2}	1.69×10^{-2}	1.48×10^{-2}
3	1.30×10^{-2}	1.15×10^{-2}	1.01×10^{-2}	8.94×10^{-3}	7.89×10^{-3}	6.87×10^{-3}	6.16×10^{-3}	5.45×10^{-3}	4.82×10^{-3}	4.27×10^{-2}
4	3.78×10^{-3}	3.35×10^{-3}	2.97×10^{-3}	2.64×10^{-3}	2.34×10^{-3}	2.07×10^{-3}	1.84×10^{-3}	1.64×10^{-3}	1.45×10^{-3}	1.29×10^{-3}
5	1.15×10^{-3}	1.02×10^{-3}	9.08×10^{-4}	8.09×10^{-4}	7.19×10^{-4}	6.41×10^{-4}	5.71×10^{-4}	5.09×10^{-4}	4.53×10^{-4}	4.04×10^{-4}
6	3.60×10^{-4}	3.21×10^{-4}	2.86×10^{-4}	2.55×10^{-4}	2.28×10^{-4}	2.03×10^{-4}	1.82×10^{-4}	1.62×10^{-4}	1.45×10^{-4}	1.29×10^{-4}
7	1.15×10^{-4}	1.03×10^{-4}	9.22×10^{-5}	8.24×10^{-5}	7.36×10^{-5}	6.58×10^{-5}	5.89×10^{-5}	5.26×10^{-5}	4.71×10^{-5}	4.21×10^{-5}
8	3.77×10^{-5}	3.37×10^{-5}	3.02×10^{-5}	2.70×10^{-5}	2.42×10^{-5}	2.16×10^{-5}	1.94×10^{-5}	1.73×10^{-5}	1.55×10^{-5}	1.39×10^{-5}
9	1.24×10^{-5}	1.11×10^{-5}	9.99×10^{-6}	8.95×10^{-6}	8.02×10^{-6}	7.18×10^{-6}	6.44×10^{-6}	5.77×10^{-6}	5.17×10^{-6}	4.64×10^{-6}
10	4.15×10^{-6}	3.73×10^{-6}	3.34×10^{-6}	3.00×10^{-6}	2.68×10^{-6}	2.41×10^{-6}	2.16×10^{-6}	1.94×10^{-6}	1.74×10^{-6}	1.56×10^{-6}

*Adapted from Nisle, R.G.: "How To Use The Exponential Integral," *Pet. Eng.* (Aug. 1956) B171-173.

Table 1.2

1. $P = P_i + 70.6\frac{qB\mu}{kh} Ei\left(\frac{-948\,\phi\mu c_t r^2}{kt}\right)$

2. $S = 1.151\left[\frac{P_{1hr} - P_{wf}}{m} - \log\left(\frac{k}{\phi\mu c_t r_w^2}\right) + 3.23\right]$

3. $\Delta p_s = 141.2\frac{qB\mu}{kh}\left(\frac{k}{k_s} - 1\right)\ln\left(\frac{r_s}{r_w}\right) = 0.869\,ms = \left(1 - \frac{k_{wb}}{k_f}\right)\Delta p_d$

4. $r_i = \left(\frac{kt}{948\,\phi\mu c_t}\right)^{1/2}$; $r_{wa} = r_w e^{-S}$

5. $J = \frac{0.00708\,kh}{B\mu\left[\frac{1}{2}\ln\left(\frac{10.06A}{C_A r_w^2} - \frac{3}{4} + S\right)\right.} = \frac{k_J h}{141.2B\mu\left[\ln\left(\frac{r_e}{r_w}\right) - \frac{3}{4}\right]}$

6. $\frac{3.79\times10^5\,\phi\mu c_t r_w^2}{k}(948 r_e^2)$, $\frac{\phi\mu c_t A}{0.000264k}$

7. $S = \frac{h_t}{h_p}S_d + S_p$; $S_p = \left(\frac{h_t}{h_p} - 1\right)\left[\ln\left(\frac{h_t}{r_w}\sqrt{\frac{k_H}{k_V}}\right) - 2\right]$

8. $\theta_w' = \tan^{-1}\left(\sqrt{\frac{k_V}{k_H}}\tan\theta_w\right)$; $h_D = \frac{h}{r_w}\sqrt{\frac{k_H}{k_V}}$

9. $S_\theta = -\left(\frac{\theta_w'}{41}\right)^{2.06} - \left(\frac{\theta_w'}{56}\right)^{1.86}\log\left(\frac{h_D}{100}\right)$

10. $\frac{250\,\phi\mu c_t r_e^2}{k}(750)$; $V_p = \frac{-0.2349qB}{c_t\left(\frac{\partial p_{wf}}{\partial t}\right)}$

11. $t_{DA} = \frac{0.00264\,k\,t_p}{\phi\mu c_t A}$; $P_{D_{MBH}} = \frac{2.303\,(p^* - \bar{p})}{m}$

12. $\Delta p_{ws}^* = -70.6\frac{qB\mu}{kh}Ei\left(\frac{-3792\,\phi\mu c_t L^2}{k\,\Delta t}\right)$; $L = \left(\frac{0.000148\,k\,\Delta t_x}{\phi\mu c_t}\right)^{1/2}$

13. $S = 1.151\left[\left.\frac{P_i - P_{wf}}{q}\right|_{1hr}\cdot\frac{1}{m'} - \log\left(\frac{k}{\phi\mu c_t r_w^2}\right) + 3.23\right]$

14. $\frac{P_i - P_{wf}}{q_n} = 162.6\frac{\mu B}{kh}\left[\sum_{j=1}^{n}\left(\frac{q_j - q_{j-1}}{q_n}\right)\cdot\log(t_n - t_{j-1})\right]$
$+ 162.6\frac{\mu B}{kh}\left[\log\left(\frac{k}{\phi\mu c_t r_w^2}\right) - 3.23 + 0.869S\right]$

15. $P_i - P_{ws} = 162.6\frac{q_{n-1}\mu B}{kh}\left[\frac{q_1}{q_{n-1}}\log\left(\frac{t}{t - t_1}\right) + \cdots \log\left(\frac{t - t_{n-2}}{t - t_{n-1}}\right)\right]$

16. $k = 141.2\frac{qB\mu\Delta p_D (t_L/\Delta t_c)^2}{h\Delta p\,(t_L/\Delta t_c)^2}$; $\phi c_t = \frac{0.000264\,k\,t_L}{\mu r^2\left[(t_L)_D / r_D^2\right]}$

Table 1.3

Gas, Using Pressure and Time		
	Flow Test	Buildup Test
Semilog graph variables	p_{wf} vs. t	p_{ws} vs. $(t_p + \Delta t)/\Delta t$
Permeability	$k = \frac{162.6 q_g \bar{B}_g \bar{\mu}}{mh}$	$k = \frac{162.6 q_g \bar{B}_g \bar{\mu}}{mh}$
Skin factor	$s' = 1.151\left[\frac{p_i - p_{1hr}}{m} - \log\left(\frac{k}{\phi \bar{\mu} \bar{c}_t r_w^2}\right) + 3.23\right]$	$s' = 1.151\left[\frac{p_{1hr} - p_{wf}}{m} - \log\left(\frac{k}{\phi \bar{\mu} \bar{c}_t r_w^2}\right) + 3.23\right]$
Definition of $p_{MBH,D}$	NA	$\frac{kh(p^* - \bar{p})}{70.6 q_g \bar{B}_g \bar{\mu}}$
Gas, Using Pressure Squared and Time		
	Flow Test	Buildup Test
Semilog graph variables	p^2_{wf} vs. t	p^2_{ws} vs. $(t_p + \Delta t)/\Delta t$
Permeability	$k = \frac{1637 q_g T \bar{z} \bar{\mu}}{mh}$	$k = \frac{1637 q_g T \bar{z} \bar{\mu}}{mh}$
Skin factor	$s' = 1.151\left[\frac{p_i^2 - p_{1hr}^2}{m} - \log\left(\frac{k}{\phi \bar{\mu} \bar{c}_t r_w^2}\right) + 3.23\right]$	$s' = 1.151\left[\frac{p_{1hr}^2 - p_{wf}^2}{m} - \log\left(\frac{k}{\phi \bar{\mu} \bar{c}_t r_w^2}\right) + 3.23\right]$
Definition of $p_{MBH,D}$	NA	$\frac{kh(p^{*2} - \bar{p}^2)}{711 q_g T \bar{z} \bar{\mu}}$
Gas, Using Pseudopressure and Time		
	Flow Test	Buildup Test
Semilog graph variables	p_p vs. t	p_p vs. $(t_p + \Delta t)/\Delta t$
Permeability	$k = \frac{1637 q_g T}{mh}$	$k = \frac{1637 q_g T}{mh}$
Skin factor	$s' = 1.151\left[\frac{p_{p,i} - p_{p,1hr}}{m} - \log\left(\frac{k}{\phi \bar{\mu} \bar{c}_t r_w^2}\right) + 3.23\right]$	$s' = 1.151\left[\frac{p_{p,1hr} - p_{p,wf}}{m} - \log\left(\frac{k}{\phi \bar{\mu} \bar{c}_t r_w^2}\right) + 3.23\right]$
Definition of $p_{MBH,D}$	NA	$\frac{kh(p_p^* - \bar{p}_p)}{711 q_g T}$

Figure 1: log-log plot

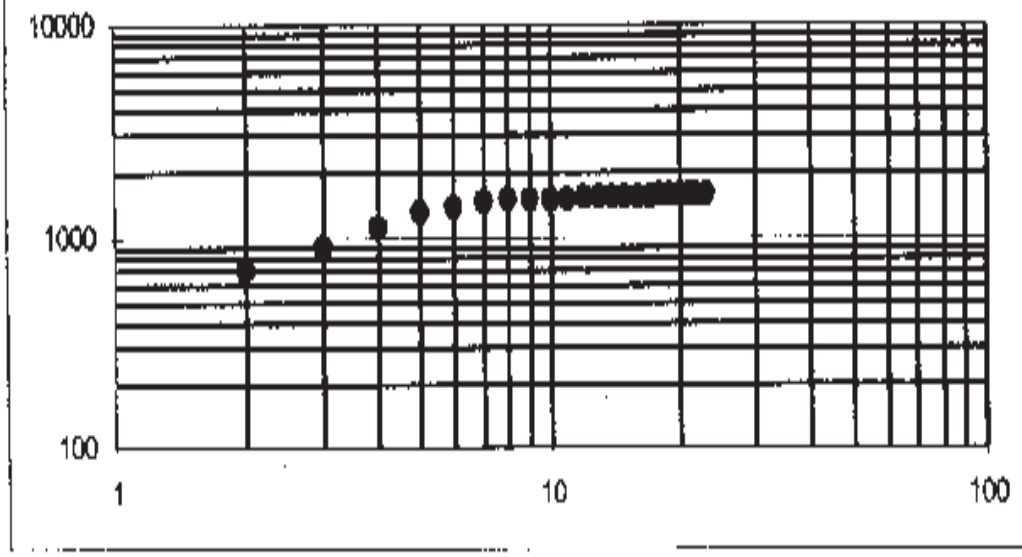
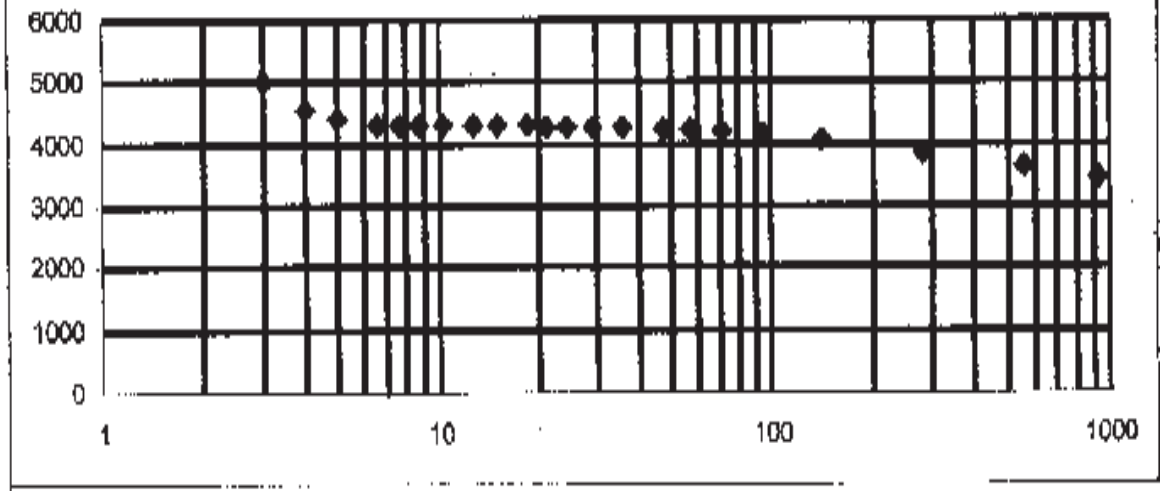


Figure 2: Horner plot



✪✡✪✡

Total No. of Questions : 12] **[Total No. of Pages : 2**

P1345

[3864]-277
B.E. (E & TC)
SYSTEM PROGRAMMING & OPERATING SYSTEMS

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) What are different components of system software? **[8]**

b) Define following terms. **[8]**

i) Operating system.
ii) Re-entrant code.
iii) Language processor.
iv) Preprocessor.

OR

Q2) a) Explain the following term. **[8]**

i) Lexical analyzer.
ii) Semantic analysis

b) What are phases of compliers? Explain in brief? **[8]**

Q3) a) Explain the term forward referencing. Explain how forward referencing is handled in single-pass assembler? **[8]**

b) Explain how the macro call handle inside a macro definition? **[10]**

OR

Q4) a) What are advantages & disadvantages of combining macro processor with pass-I of an assembler? **[8]**

b) With help of neat flowchart explain the pass-II of an assembler. **[10]**

Q5) a) What is program relocation? With suitable example & data structure explain the relocatable code. **[8]**

b) Name various types of loader & enlist the function of each in brief. **[8]**

P.T.O.

OR

Q6) a) i) Enlist the basic function of a loader. **[4]**

ii) Write down step for the implementation of MS-DOS linker. **[4]**

b) Explain the following loader. **[8]**

i) Direct linking loader.

ii) Dynamic linking loader.

SECTION - II

Q7) a) Explain the basic functions of O.S. **[8]**

b) Explain different state of task & PCB. **[8]**

OR

Q8) a) Explain preemptive & non preemptive scheduling. **[8]**

b) How the synchronization is obtained between interacting process. **[8]**

Q9) a) Explain memory allocation for processor. **[8]**

b) Explain **[10]**

i) Swapping

ii) Paging.

OR

Q10)a) Write down algorithm for page replacement. **[8]**

b) Explain concept of **[10]**

i) Virtual memory.

ii) Demand paging.

Q11)a) Explain IO time, access time & transfer time for magnetic tape & disks. **[8]**

b) Explain devices driver for serial port & parallel port. **[8]**

OR

Q12)a) Explain different requests & responses across the PIOCS Interfacing. **[8]**

b) Explain the algorithm for USB drivers. **[8]**

Total No. of Questions : 12] **[Total No. of Pages : 3**

P1346 **[3864]-282**

B.E. (Instrumentation)

PROJECT ENGINEERING AND MANAGEMENT

(1997 & 2003 Course)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) Define the following terms w.r.t. Project **[10]**

i) Time Driven OR Cost Driven Project.

ii) Lump-Sum Project.

iii) Turnkey Project.

iv) EPC Project.

v) Cost-Plus Project.

b) Give the full form and scope in brief for following standards. **[7]**

i) ISA S-5.1.

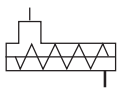
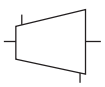
ii) ISA S-5.20.

iii) SAMA.

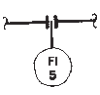
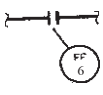
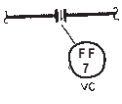
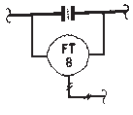
iv) ASME.

OR

Q2) a) Name the following symbols. **[5]**

a)  b)  c)  d)  e) 

b) Identify and Differentiate between following pair of symbols. **[4]**

1a.  1b.  2a.  2b. 

P.T.O.

c) Identify following Tags. **[4]**

i) FICV-100.
ii) LSHL-20.
iii) TDRT-100.
iv) TDCV-10.

d) Draw the symbol for : **[4]**

i) Hydraulic Signal.
ii) Pneumatically Operated Control valve in Line.
iii) Safety Valve.
iv) Any Valve Fail Intermediate.

Q3) a) Draw and explain PFD & P & ID for the simple Feed Back control of Heat Exchanger. **[10]**

b) What are the responsibilities of a Project Manager? Elaborate with examples. **[7]**

OR

Q4) a) Draw a Typical Instrument Index Sheet? Elaborate its use in Project Engineering Documentation. **[10]**

b) What is the importance of Pressure & Temperature Sheet? How it differs from Mechanical Flow Sheet. **[7]**

Q5) a) Enlist the various important documents required for I & C group in Project Engineering. State its importance in 2-3 sentences each. **[8]**

b) What is MBOM? How it differs from MBOM? Elaborate its importance in project engineering. **[8]**

OR

Q6) a) Explain Interdepartmental, Inter organizational and Multi agency interaction. **[6]**

b) i) Draw a simple flow control loop with minimum basic components & using ISA symbols. **[4]**
ii) Develop Loop wiring diagram for the same. **[6]**

SECTION - II

Q7) a) What is Hot commissioning & Cold commissioning of project? **[4]**

b) What is FAT? Where it is Conducted? Enlist various test activities involved in FAT? **[8]**

c) Prepare a sample FAT test report simple system you know. **[5]**

OR

Q8) a) What is Competitive Bidding? How any suppliers are needed for it? What is the criterion for a acceptable supplier? **[9]**

b) Draw the installation sketch for DP transmitter used for liquid flow measurement showing tubing connection and equalizing valves. **[8]**

Q9) a) What is UTP cable? Give detailed category wise classification & use of different UTP cables. **[8]**

b) Explain various Network Topologies with its advantages & disadvantages. **[9]**

OR

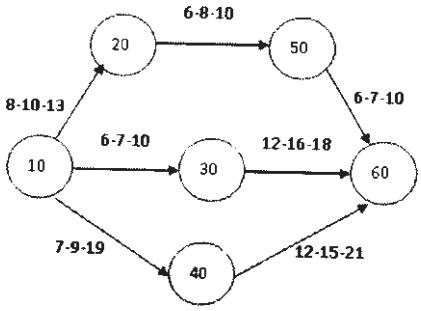
Q10) a) Explain the pneumatic component testing procedure of a Control Panel. **[8]**

b) Draw and Explain consoles with all dimensional details. **[9]**

Q11) a) What are different life cycle phases? **[3]**

b) Explain steps involved in Conceptual Phase and Divestment Phase. **[6]**

c) For the network shown below find the critical path. **[7]**



OR

Q12) a) Discuss various methods of project cost estimation with its success index. **[6]**

b) Define following w.r.t. PERT. **[4]**

i) Optimistic Time. ii) Most likely Time.
iii) Pessimistic Time. iv) Expected Time.

c) What is WBS? What is its use? Define and explain Mile stone planning? **[6]**

Total No. of Questions : 12] **[Total No. of Pages : 2**

P1347

[3864]-293

B.E. (Instrumentation)

POWER PLANT INSTRUMENTATION

(1997 & 2003 Course)

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

Instructions to the candidates :

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

SECTION - I

Q1) a) What are essential equipments needed for thermal energy generation? How they are interconnected? Explain with neat sketch. **[10]**

b) What is grid? How it works? **[6]**

OR

Q2) a) Whether Nuclear Energy is safe source of energy? Explain the basic technique of Nuclear Energy generation? **[10]**

b) Explain Solar Energy generation as Natural Source of Energy generation. **[6]**

Q3) a) What is the importance of Boiler in Power Plant? How are they classified? Draw the neat sketch of any one boiler. **[9]**

b) Explain the construction of pulverized fuel fired water tube boilers. Also show Air and Flue gas paths for it. **[9]**

OR

Q4) a) Explain coal mill temperature control scheme in Thermal Power Plant. **[9]**

b) Explain combustion control (Main steam pressure control) method in detail. **[9]**

Q5) a) Why the vibrations measurement is essential in turbine? How it is measured & controlled? **[8]**

b) Explain frequency & power measurement method with neat drawing. **[8]**

P.T.O.

OR

Q6) a) What is Turbine Automatic run up? Why it Occurs? How it is controlled? **[8]**

b) What is meant by Grid coordinated operation of power plant? How it is done? **[8]**

SECTION - II

Q7) a) How a water turbine differs from steam turbine? How its speed regulation is achieved? **[8]**

b) What is the need of Waste heat recovery boiler in gas Turbine Power Plant? Explain its construction & working. **[8]**

OR

Q8) a) What are various types of coolants used in Nuclear Plant? Explain the control of chain reaction. **[10]**

b) What is the role of Surge Tank? Why its level control is must? Explain. **[6]**

Q9) a) Explain in brief the basic architecture of DCS system used for power plant. **[9]**

b) Draw the control room layout for Power plant. Explain its features. **[9]**

OR

Q10) a) What is significance of Boiler Regulations? Who prepares it? Write detail note on it. **[9]**

b) Explain role of electrostatic Precipitators in Pollution control. **[9]**

Q11) a) Explain the phenomenon of Tidal energy generation. **[8]**

b) Write note on Baggase Fired Boilers. **[8]**

OR

Q12) a) What are Hydrogen cells? How much energy it generates? Explain its working. **[8]**

b) What is the criterion for wind power generation plant? Explain its working. **[8]**

❐❐❐❐

Total No. of Questions : 12] **[Total No. of Pages : 3**

P1350

[3864]-401

B.E. (Computer)

DESIGN AND ANALYSIS OF ALGORITHMS

(2003 Course)

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

Instructions to the candidates :

1) ***Answer THREE questions from each section.***
2) ***Answers to the TWO sections should be written in SEPARATE answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain what are different ways of measuring the running time of an algorithm? **[8]**

b) With the help of an example, explain the general strategy/method that can be applied for analyzing the efficiency of Recursive and non-recursive algorithms. **[10]**

OR

Q2) a) Prove by contradiction : There are infinitely many prime numbers. **[8]**

b) Prove by mathematical induction on the integer n such that $m = 2^n$. **[8]**

c) State and justify whether the function : $100n + 6 = O(n)$ is CORRECT or INCORRECT. **[2]**

Q3) a) Write an algorithm for Merge Sort algorithm. Draw the tree structure of the recursive calls made. **[8]**

b) Explain the concept of Divide and Conquer technique and explain its three major variations. **[8]**

OR

Q4) a) Write a greedy algorithm to solve the knapsack problem and prove : if $p_1/w_1 \geq p_2/w_2 \geq ..... \geq p_n/w_n$, then Greedy knapsack generates an optimal solution to the given instance of the knapsack problem. **[8]**

b) Find an optimal solution for the following knapsack instance
$n = 7$, $m = 15$, $(p_1, p_2, ... p_7) = (10, 5, 15, 7, 6, 18, 3)$ and $(w_1, w_2, ... w_7) = (2, 3, 5, 7, 1, 4, 1)$ **[8]**

P.T.O.

Q5) a) Explain how dynamic programming method can be used for formulating k-stage graph. **[8]**

b) Define the Traveling Salesperson Problem. Solve the TSP problem using Dynamic programming where the edge lengths are given as :

0	10	15	20
5	0	9	10
6	13	0	12
8	8	9	0

[8]

OR

Q6) a) Consider a complete graph of 4 nodes, where the vertices are v_i for i between 1 and 4 and the weight of an edge (v_i, v_j) is i + j. Obtain a minimum spanning tree for the graph. What is the time complexity of your algorithm? Discuss. **[8]**

b) Write Greedy Algorithm for sequencing unit time jobs with dead lines and profits. **[8]**

SECTION - II

Q7) a) What are the constraints that must be satisfied while solving any problem using backtracking? Explain briefly. **[6]**

b) Explain how branch and bound method can be used to solve knapsack problem? **[6]**

c) Write an algorithm to solve the knapsack problem. **[6]**

OR

Q8) a) Explain in detail Control Abstraction of LC-Search. **[6]**

b) Write an upper bound function for 0/1 knapsack problem. **[6]**

c) What is n-Queen's problem? Generate the state space tree for n = 4. **[6]**

Q9) a) Prove that : any depth-d, size-n combinational circuit with bounded fan-in can be simulated by a p-processor CREW algorithm in O(n/p + d) time. **[8]**

b) Explain with a neat diagram Randomized-list-Prefix Parallel algorithm for performing prefix computations on a linked list of n = 9 objects. **[8]**

OR

Q10) a) What is satisfiability problem? Prove that CNF - Satisfiability reduces to Directed Hamiltonian Cycle. **[8]**

b) Write an algorithm to find the sum of n-elements of a complete binary tree. What is the time complexity of this algorithm? **[8]**

Q11) a) Prove, if $L_1, L_2 \subseteq \{0, 1\}^*$ are languages $L_1 \leq_p L_2$, then $L_2 \in p$ implies $L_1 \in p$. **[8]**

b) Prove that vertex cover problem is NP complete. **[8]**

OR

Q12) a) The Hamiltonian circuit problem for directed graphs is polynomially transformable to the Hamiltonian circuit problem for undirected graph. Prove that the problem of determining whether there is a Hamiltonian circuit in an undirected graph is NP complete. **[8]**

b) Consider the following search algorithm :

```
j = any value between 1 to n
If (a[j] = x) then
        print “Success”;
else
        print “Fails”
```

Is this algorithm non-deterministic? Justify your answer. **[8]**

❐❐❐❐

Total No. of Questions : 8] **[Total No. of Pages : 2**

P1351

[3864]-115

B.E. (Civil)

ADVANCED STRUCTURAL DESIGN

(Elective - II) (401007) (2003 Course)

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

Instructions to the candidates :

1) ***Attempt Q.1 or Q.2, Q.3 or Q.4 from Section-I and Q.5 or Q.6, Q.7 or Q.8 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.***
6) ***Use of cell phone is prohibited in the examination hall.***
7) ***Use of electronic pocket calculator, steel table and relevant IS code is allowed.***

SECTION - I

Q1) Design an open web (castellated beam) for a span of 15 m. The dead load coming on roofing is 750 N/m^2 and live load on the roof is 2000 N/m^2. Cut the section at 45° and adjust the section such that overall depth of section should not exceed 900 mm. Assume f_y = 250 MPa. **[25]**

OR

Q2) Select suitable configuration of the truss and determine the maximum compressive and tensile force in the leg at the base for a 50 m microwave antenna tower is to be built near Mumbai. The terrain at the location is a level ground. It has to carry a 3 m diameter hemispherical antenna disc at the top. **[25]**

a) the width at the top of tower = 3.2 m
b) weight of platform at top = 1 kN/m^2
c) weight of railing at top = 0.25 kN/m.
d) weight of ladder and cage = 0.6 kN/m
e) weight of antenna disc and fixture = 10 kN
f) self weight of truss = 6 kN/m
g) Terrain category II and class of building B

P.T.O.

Q3) Two channel sections without bent lips 200 mm × 50 mm and 2.5 mm thick are connected with webs to act as beam. The effective span of a simply supported beam is 8 m. The beam is laterally supported throughout its length. Determine the maximum uniformly distributed load inclusive of self weight which can be supported by the beam. Assume f_y = 232 N/mm^2 and I_x = 2 × 390.307 × 10^4 mm^4. **[25]**

OR

Q4) The bottom chord tension member of a roof truss is subjected to an axial pull of 450 kN. A differential chain hoist arrangement is attached to the bottom chord and gives a point load of 50 kN at the centre. The length of the member between panel points is 5 m. Design the section consisting of two unequal angles with long legs kept back and turn upward. Also design the connection. Assume f_y = 250 N/mm^2. **[25]**

SECTION - II

Q5) Design an exterior panel of size 5 m × 5 m of a flat slab with suitable drop to support a live load of 4000 N/m^2. The slab is provided with floor finish of 1000 N/m^2. The floor system is supported by columns of size 500 mm × 500 mm. Floor to floor distance is 4 m. Use M_{20} grade of concrete and Fe_{415} grade of steel. **[25]**

OR

Q6) Design an intz type water tank of capacity 8,00,000 liters. The height of staging is 10 m up to bottom of tank. The bearing capacity of soil to be taken as 200 kN/m^2. Wind pressure intensity is 1.8 kN/m^2. Use M_{20} grade of concrete and Fe_{415} grade of steel. **[25]**

Q7) Design a counterfort retaining wall for the following data. **[25]**
Height of wall above ground level = 6 m
Safe bearing capacity of soil = 160 kN/m^2
Angle of repose = 30°
Unit weight of soil = 16000 N/m^3
Spacing of counterfort = 3 m
Coefficient of friction between soil and concrete = 0.5
Use M_{20} grade of concrete and Fe_{415} grade of steel.

OR

Q8) Design simply supported circular slab of 6 m diameter, subjected to service live load of 3.5 kN/m^2 and floor finish of 1 kN/m^2. Use M_{20} grade of concrete and Fe_{415} grade of steel. **[25]**

❐❐❐

Total No. of Questions : 12] **[Total No. of Pages : 2**

P1352

[3864]-256

B.E. (Electronics)

SYSTEM PROGRAMMING & OPERATING SYSTEM

(2003 Course)

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, Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12.***
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 different data structures used for language processing. **[8]**

b) Explain different phases of complier. **[10]**

OR

Q2) a) What is complier? What are the features of compliers? Explain how compliers works? **[10]**

b) Define with example: **[8]**

i) Operating system.
ii) Linker.
iii) System programming.
iv) Translator.

Q3) a) What feature of assembly language makes it mandatory to design a two pass assembler? Explain with suitable example. **[8]**

b) What macro? Explain features of macro processor. **[8]**

OR

Q4) a) Explain algorithm of pass-I assembler with example. **[8]**

b) Explain nested macro call with an example. **[8]**

Q5) a) Explain the design of direct linking loader? Mention & give significance of required data structure. **[8]**

b) Explain the working of dynamic linking loader. **[8]**

OR

Q6) a) What is function of loader & linker in operating system. Explain any one type of linker in detail. **[8]**

b) Explain relocation loader & absolute loaders. **[8]**

P.T.O.

SECTION - II

Q7) a) What are the functions of operating system? Explain different type of operating of operating system in brief. **[10]**

b) What is process? Explain how semaphore are used for process synchronization. **[8]**

OR

Q8) a) What are functions of scheduler? Explain different policies of process scheduling. **[10]**

b) What is deadlock? How deadlock is detected & which technique is used to avoid deadlock. **[8]**

Q9) a) What is Memory? Explain non-contiguous memory allocation and its advantages. **[8]**

b) What is virtual memory? Explain how paging technique is used for virtual memory. **[8]**

OR

Q10)a) What is difference between file & directory? Explain directory structure in normal operating system. **[8]**

b) Explain difference between .EXE & .DLL file? Explain how the file is access in operating system. **[8]**

Q11)a) Why I/O buffering is needed? State & Explain different approaches of I/O buffering. **[8]**

b) Explain in brief. **[8]**

i) Programmed I/O &

ii) Interrupt driven I/O.

OR

Q12)a) What are different I/O devices? What is physical IOCS? Explain IOCS in detail. **[8]**

b) Explain driver for: **[8]**

i) USB.

ii) Serial port.

Total No. of Questions : 8] **[Total No. of Pages : 4**

P1353

[3864]-344

B.E. (Petroleum Engineering)

NATURAL GAS ENGINEERING

(2003 Course)

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

Instructions to the candidates :

1) ***Answers to the two sections must be written in separate answer books.***
2) ***Question number three (3) and six (6) are compulsory.***
3) ***Answer three questions from each section.***
4) ***Figures to the right indicate full marks.***
5) ***Neat diagrams should be drawn wherever necessary.***
6) ***Use of a non-programmable calculator is allowed.***
7) ***Assume suitable data if necessary and clearly state it.***
8) ***Graph of z factor attached.***

SECTION - I

Q1) a) A wet gas reservoir is producing 30 STB / MMSCF of condensate production at an API gravity of 50. The separator gas has a gravity of 0.7. Calculate the gas gravity of reservoir gas. **[10]**

b) Draw the graph of viscosity, cg, Bg versus pressure and explain. **[6]**

Q2) a) Pick the correct answer: **[5]**

i) In the transient flow regime's equation:

1) Time is a parameter.
2) Time is not a parameter.
3) Time is a parameter sometimes, but not always.
4) All of the above.

ii) At any given time in the producing life of a reservoir, the fluid flow regime may be characterized by:

1) Either a) transient, b) natural depletion, c) constant state
2) Either a) transient, b) water influx, c) pseudo-steady state
3) Either a) transient, b) pseudo-steady state, c) steady state
4) Either a) steady state, b) inflow performance, c) transient state
5) All of the above

P.T.O.

iii) Darcy's equation corresponds to:

1) Laminar flow in porous media
2) Turbulent flow in porous media
3) Laminar and turbulent flow in porous media
4) All of the above
5) None of the above

iv) The non-Darcy flow coefficient accounts for the non-Darcy effects due to turbulence. Where do you think these effects are most dramatic?

1) They are never dramatic during the gas flow of a reservoir
2) They are most dramatic at the outer boundary of the reservoir
3) They are most dramatic at the near-wellbore region
4) None of the above

v) For using a conventional vertical well IPR equation for a vertical fractured well purpose, what would you change

1) Nothing
2) r_w and r_e
3) r_w has to be substituted for equivalent wellbore radius r_w
4) bottomhole flowrate is replaced by surface flowrate
5) None of the above

b) Explain all the constants in the Gas metering equation. **[11]**

Q3) Given data:

a. P_r = 5100 psi
b. r_e = 2100 ft
c. h = 30 ft
d. k = 15 md
e. r_w = 0.45 ft
f. Sp.Gr = 0.7
g. s = 0
h. Reservoir Temperature = 200 deg F

Calculate the inflow performance relationship curves using the pressure squared method. Take p_{wf} values from 0 to 5000 psi, with an increment of 1000 psi. Assume that the flow is in pseudo-steady state. **[18]**

Q4) For the well with the following parameters; depth of 5790 ft, gas gravity is 0.6, Pts = 2300 psia, and average temperature of the flow string is 117 F., Gas flow rate = 5 MMscfd, D = 2 inches, Twf = 160 F, Ttf = 83 F, Ptf = 2122 psia, Length of tubing = 5700 ft, well is vertical. State your assumed values clearly and only do one iteration to find the flowing bottom hole pressure, and temperature and static bottom hole pressure. Tpc = 358 R, Ppc = 672 psia, f = 0.015, z = 0.82. **[16]**

SECTION - II

Q5) a) Name six conditions to promote gas hydrates.

b) Draw the process diagram for glycol dehydration and explain the design considerations.

[16]

Q6) Calculate the flow capacity of the pipeline using the three approximations of single phase gas flow in a horizontal pipeline, if the following data is given: **[18]**

a. P_1 = 550 psi

b. P_2 = 250 psi

c. T = 95 deg F

d. L = 100 miles

e. D = 10 inches

f. Specific gravity of gas = 0.65

Q7) a) Find the horsepower required with and without intercooling when compressing 16,000 cfm of natural gas, k = 1.28, measured at 60F and 14.7 psia from atmospheric pressure of 14.4 to 125 psig. Inlet temperature is 70F. Allow a 4% discharge at each stage. **[10]**

b) Explain in detail a two stage compressor cycle. **[6]**

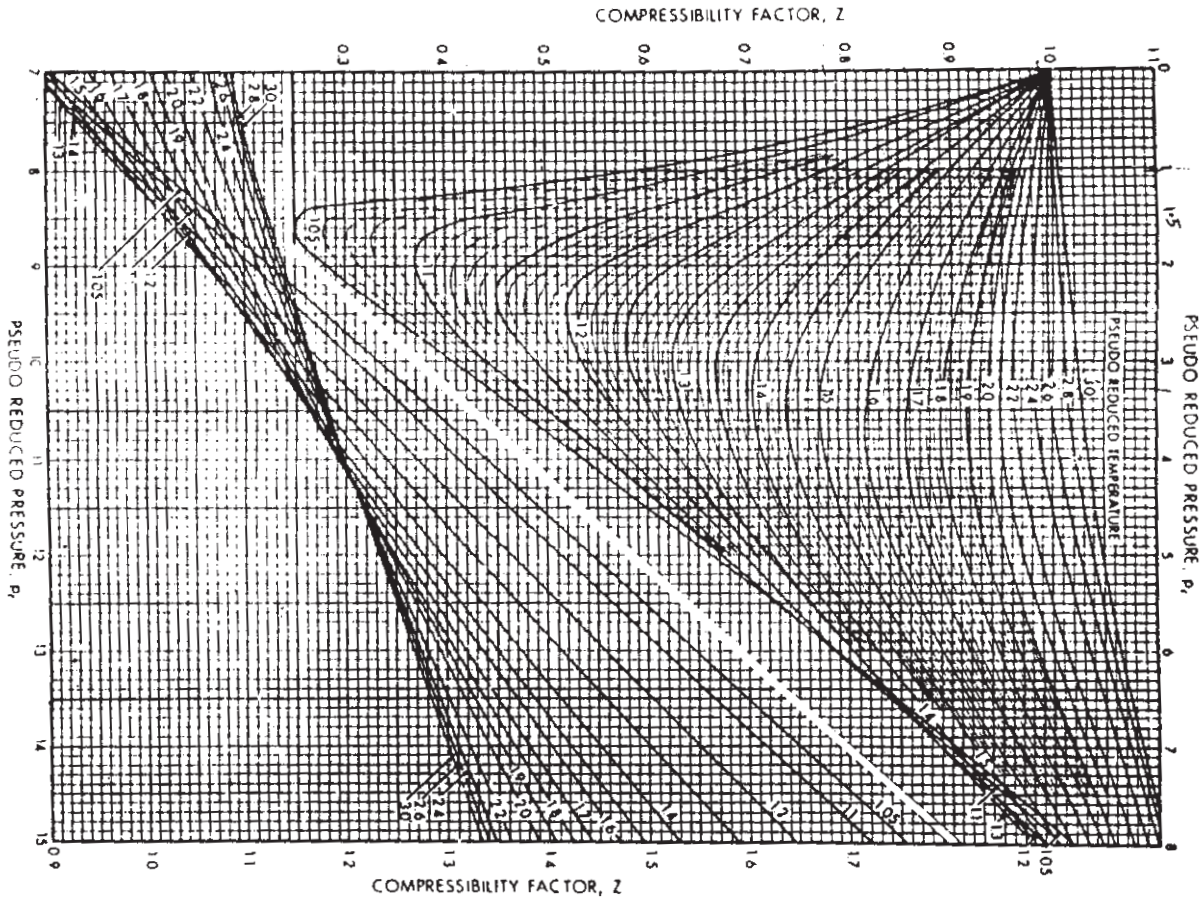
Q8) Write short notes on: **[16]**

a) Pipeline efficiency and Transmission factor.

b) Liquid Unloading.

c) Gas hydrates.

d) Two phase flow.


COMPRESSIBILITY FACTOR, Z
PSEUDO REDUCED PRESSURE, p_r
PSEUDO REDUCED TEMPERATURE
COMPRESSIBILITY FACTOR, Z
PSEUDO REDUCED PRESSURE, p_r

❑❑❑

Total No. of Questions : 6] **[Total No. of Pages : 6**

P1354

[3864]-191

B.E. (Prod./SW)

OPERATIONS RESEARCH & MANAGEMENT

(2003 Course) (411126)

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

Instructions to the candidates :

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

SECTION - I

Q1) a) Solve the following L.P.P. by Simplex method. **[11]**

Max. $Z = 3x_1 + 5x_2$, s.t. $x_1 \leq 4$, $2x_2 \leq 12$, $3x_1 + 2x_2 \leq 18$ & $x_1, x_2 \geq 0$.

b) Form the dual of above & write values of dual decision variables from primal final table. **[5]**

c) Do the RHS ranging for 3rd constraint of primal. **[2]**

OR

a) 'Mathematics of OR is mathematics of optimization' - Explain. **[3]**

b) Explain Big-M method of solving L.P.P. **[6]**

c) Explain sensitivity analysis in L.P.P. w.r.t. addition of new variable. **[2]**

d) Define the following w.r.t. L.P.P. **[4]**

i) Feasible region

ii) Redundant constraint

iii) Degenerate solution

iv) Slack variable

e) Sketch the graphical solution for alternate & unbounded solution. **[3]**

P.T.O.

Q2) a) Solve the following transportation problem for minimization. **[10]**

		To			a_i
From		2	7	4	5
		3	3	1	8
		5	4	7	7
		1	6	2	14
b_j		7	9	18	

b) Write the L.P. form of Transportation problem. **[3]**

c) What is a meaning of sub-optimal solution for 'travelling salesman problem'? **[3]**

OR

a) The Captain of a cricket team has to allot five middle batting positions. The average runs scored by each batsman at these positions are as follows.

Batsman↓	Batting Positions				
	II	III	IV	V	VI
P	40	40	35	25	50
Q	42	30	16	25	27
R	50	48	40	60	50
S	20	19	20	18	25
T	58	60	59	55	53

i) Find the assignment of batsmen to positions which would give the maximum number of Re. runs. **[5]**

ii) If it is decided to give 4^{th} position to 'P', how the decision is going to change? **[5]**

b) What are trans-shipment problems? How they are solved? **[4]**

c) Write mathematical expression for assignment problem. **[2]**

Q3) a) Find the sequence that minimises the total time required in performing the following jobs on three machines in order ABC. Processing time in minutes is given below: **[7]**

Jobs →		I	II	III	IV	V
M/C	A	8	10	6	7	11
	B	5	6	2	3	4
	C	4	9	8	6	5

b) Derive the basic EOQ formula with inventory cycle sketch. **[6]**

c) Define: **[3]**

i) Reorder level

ii) Buffer stock

iii) Average inventory level.

OR

a) Mention any six optimality criteria in sequencing problems. **[6]**

b) Discuss the concept of service level & its use in probabilistic inventory model. **[3]**

c) Find the optimal order quantity for a product for which the price breaks are as follows. **[7]**

Q	Unit cost (Rs.)
$0 < Q < 600$	Rs. 10/-
$600 < Q < 750$	Rs. 9.25/-
$750 < Q$	Rs. 8.75/-

SECTION - II

Q4) a) State the advantages of simulation. **[4]**

b) A dentist schedules all his patients for 30 min. appointments. Some of the patients take more or less time than 30 min. depending on the type of dental work to be done. The following summary shows the various categories of work, their probabilities and time needed to complete the work. Simulate the dentist's clinic for 4 hours starting from 8.00 am & determine average waiting time for patients as well as dentist. **[12]**

Random nos. → 40, 82, 11, 34, 25, 66, 17, 19

Category	Time required (min.)	Probability of category
Filling	45	0.40
Crowning	60	0.15
Cleaning	15	0.15
Extraction	45	0.10
Check up	15	0.20

OR

a) Discuss the replacement policy for items that fail suddenly. **[4]**

b) State the limitations of simulation. **[3]**

c) Two functionally identical machines P & Q are available in market with no scrap value. Machine P costs Rs. 12,000/- & its annual cost is Rs.400/- in 1st year, progressively increases by Rs.100/- in next 2 years, then by Rs.200/- in next 2 years & finally by Rs.300, 400, 600 & 800 in subsequent years. Machine Q costs Rs. 13,000/- & annual cost is Rs. 200, 350, 550, 750, 1000, 1300, 1800, 2400 & 3000 from year to years. If worth of money remains constant, which is better choice, P or Q? And in that case, what should be the replacement policy? **[9]**

Q5) a) On an average 96 patients per 24 hours day require the service of an emergency clinic. Also on the average, a patient requires 10 min. of active attention. Assume that the fascility can handle only one emergency at a time. Suppose it costs clinic Rs. 100/- per patient treated to obtain an average servicing time of 10 min. and that each minute of decrease in this average time would cost the clinic Rs. 10/- per patient treated. How much would have to be budgeted by the clinic of decrease the average size of queue from present 4/3 patients to 1/2 patients? **[9]**

b) Mention the costs involved in queuing theory. Sketch cost-service level tradeoff. **[3]**

c) Discuss Column & Row Dominance. **[4]**

OR

a) Write LP form of the following game from view point of player B. **[6]**

		B		
		4	1	–3
A		3	1	6
		–3	4	–2

b) North & South Korea armies are at war. N Korea has 2 air bases, one of which is 3 times valuable than other. S Korea can destroy an undefended air base, but it can destroy only one of them. N Korea can also defend only one of them. Find the best strategy for N Korea to minimizes it's losses. **[6]**

c) Explain Kendall's notations used in queuing models. **[4]**

Q6) a) A small project is composed as follows -

Activity	1-2	1-3	1-4	2-5	3-5	4-6	5-6
Lowest time	1	1	2	1	2	2	3
Medium –"–	1	4	2	1	5	5	6
Highest –"–	7	7	8	1	14	8	15

i) Draw the Network & show C.P. **[3]**

ii) Find expected duration & variance of each activity. **[4]**

iii) What is relative probability (compare to expected duration of project) of project completion two days latter than expected? **[2]**

b) A small project has following data.

Activity		1-2	1-3	1-4	2-4	2-5	3-6	4-6	5-6
Time (Week)	Normal	6	8	5	3	5	12	8	6
	Crash	4	4	3	3	3	8	5	6
Cost penalty/ Week (Rs.)		2400	2700	1500	—	1200	6000	1500	—

The cost of completing all activities in normal time is Rs.2,00,000/- without overheads or indirect cost, which is Rs. 4,900/- per week.

i) Identify critical path, find out normal duration & normal cost for project. **[4]**

ii) Find out optimum duration & minimum cost for project. **[3]**

iii) Calculate total float for activity 2-5. **[2]**

OR

a) A project data is given below.

Activity	1-2	1-3	1-4	2-5	2-6	3-7	4-8	5-9	6-9	7-8	8-9
Duration	2	2	0	2	5	4	5	6	3	4	6
Man Power requirement	5	4	0	2	3	6	2	8	7	4	3

There are 11 persons employed on this project. Carry out approximate man-power levelling so that the fluctuations of work force requirement from day to day is as small as possible. **[15]**

b) Discuss Fulkerson's rules for numbering the events. **[3]**

❐❐❐

Total No. of Questions : 12] **[Total No. of Pages : 7**

P1358

[3864]-388

B.E. (Polymer)

ADVANCED POLYMER RHEOLOGY

(2003 Course)

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

Instructions to the candidates :

1) ***All questions from Section-I and II are compulsory.***
2) ***Marks are given on Right hand side.***
3) ***Use of calculator is allowed.***
4) ***Assume suitable data very necessary.***

SECTION - I

Q1) a)

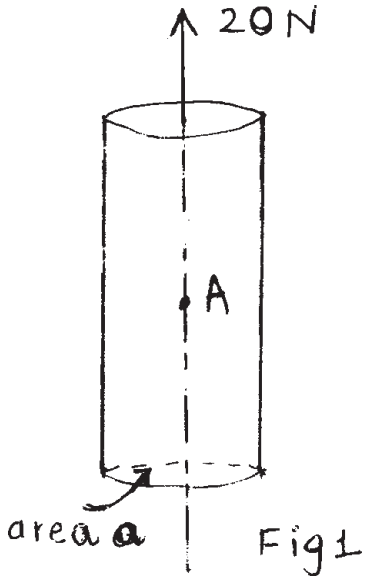


Fig 1

Find the state of stress at a point A in fig. 1. Also, find the magnitude of stress vector acting on a surface whose normal is $\hat{n} = \frac{1}{\sqrt{2}}(\hat{x}_1 + \hat{x}_2)$. **[6]**

b) Derive the equation of conservation of momentum. **[6]**

c)

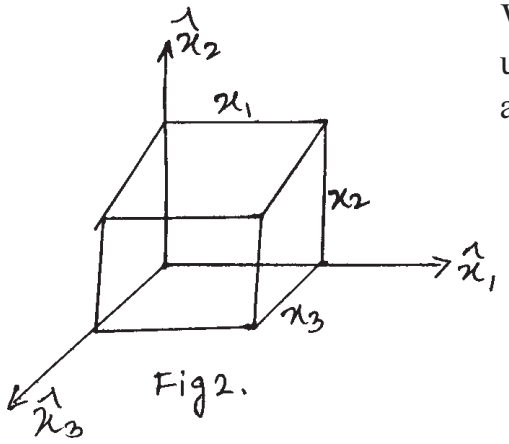


Fig 2.

Write down the deformation tensor for uniaxial extension and simple shear for a block of material in the fig. 2. **[4]**

P.T.O.

OR

Q2) a) Forces measurements were made around 1 mm^2 test surfaces around a point in a fluid. The vectors normal to the test surfaces correspond to co-ordinate directions $\hat{x}_1, \hat{x}_2$ and $\hat{x}_3$. The measured force vectors on these surfaces are f_1 = 1N in $\hat{x}_1$ direction; f_2 = 2N in $-\hat{x}_3$ direction and f_3 = 2N in $-\hat{x}_2$ direction. Find (i) The state of stress at the point. (ii) Calculate invariants of the stress tensor. (iii) Calculate net force on 1 mm^2 surface whose normal is $\hat{x}_1 + \hat{x}_2$. **[9]**

b) Write a note on different flow phenomena attributed to the first normal stress difference and second normal stress difference. **[4]**

c) Write down the rate of deformation tensor for steady uniaxial extensional flow and steady simple shear flow. Also mention the invariants of the tensor. **[3]**

Q3) a) Polypropylene melt obeying power law model gave the following rheological data. Calculate the value of $\lambda = r/r_0$ at which Ryan Johnson stability parameter is maximum. Also calculate reynolds number for the transition between laminar & turbulent flow. **[10]**

Rate of Shear S^{-1}	Shear Stress kPa
3.67	22.4
7.73	32.7
22.8	53.6
51.4	61.8
114.0	87.1
306.0	111.0
682.0	148.0
1380.0	173.0
3340.0	202.0
6390.0	221.0

b) Write a note on Hank's criteria used to study transition between laminar and turbulent flow. **[6]**

OR

Q4) a) Explain TOM's effect. **[4]**

b) Write down expression for pressure drop due to shear and extensional flow through a wedge shaped die. **[6]**

c) Derive an expression for swelling ratio due to tensile stresses for flow through a short capillary (zero length). **[6]**

Q5) a) The behaviour of a plastic in consideration is according to the Kelvin-Voight model. It is subjected to stress history as shown in fig. 3. Use Boltzman's superposition principle to calculate strain in the material after (i) 90 seconds (ii) 150 seconds. The spring constant is 12 GN/m^2 & dash pot constant is 360 GN-s/m^2. **[8]**

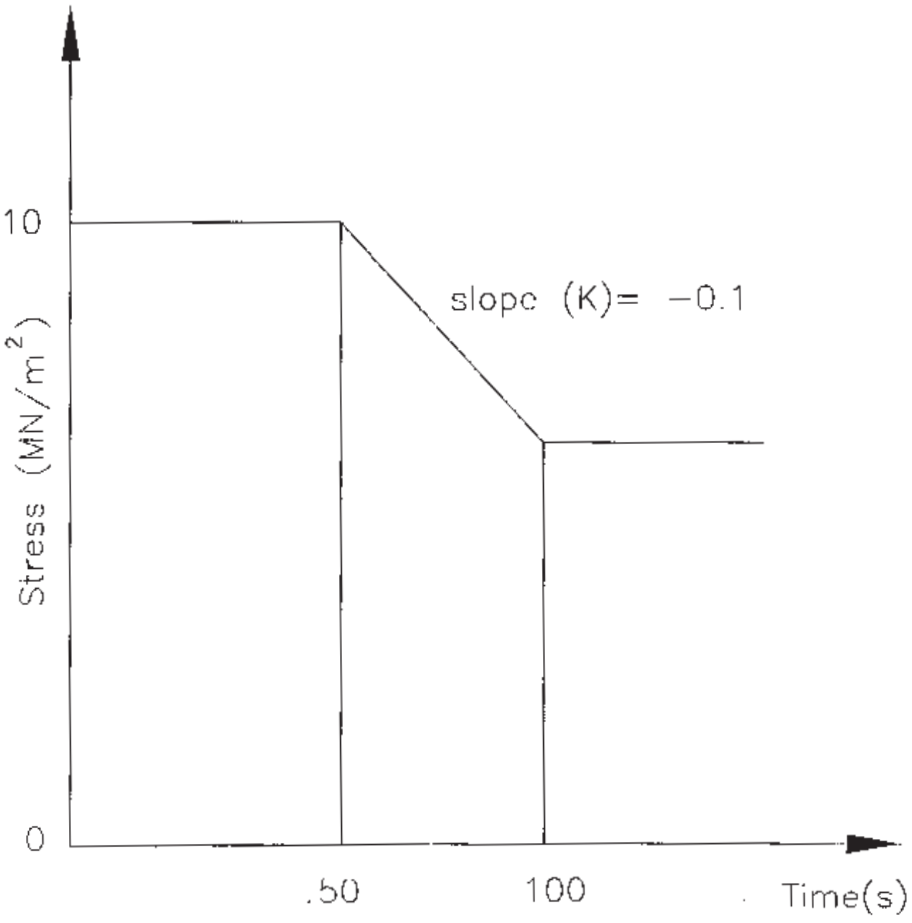


Figure3

b) Derive an expression for creep stress relaxation and recovery for a Maxwell model. **[6]**

c) Write a short note on Rouse theory. **[4]**

OR

Q6) a) A plastic is subjected to stress history as shown in fig.4 The behaviour of the material is as per the Maxwell model with elastic constant E = 25 GN/m^2 and viscous component η = 1200 GNs/m^2. Determine strain in the material (i) after u_1 seconds and (ii) after u_2 seconds. **[6]**

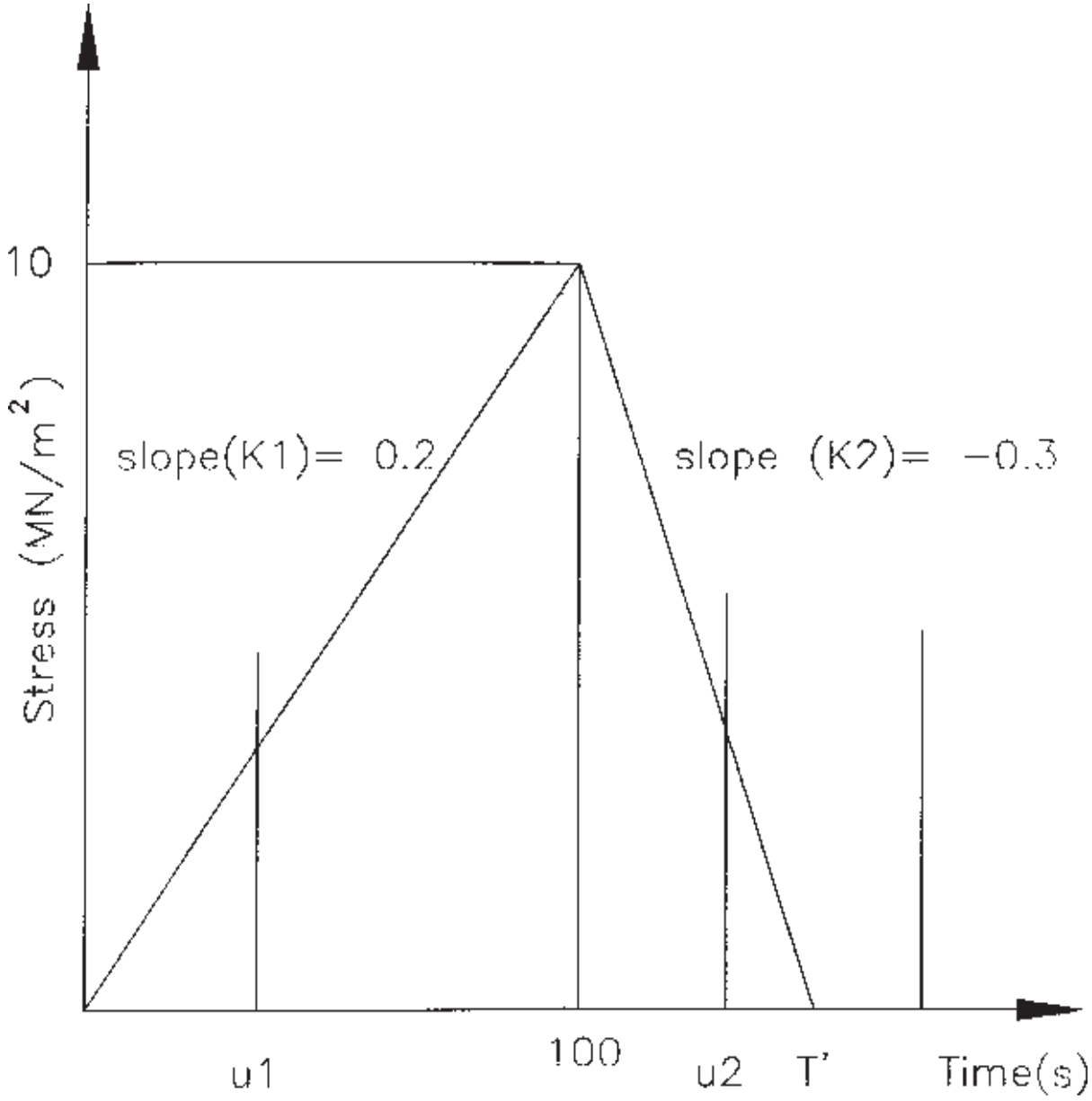


Figure4

b) Write a note on Boltzman's superposition principle. **[6]**

c) Derive an expression for creep, stress relaxation and recovery for standard linear solid model. **[6]**

SECTION - II

Q7) a) Discuss the effect of melt temperature and molecular branching on polymer melt viscosity. **[8]**

b) Discuss activation energy of flow and factors on which it depends. **[4]**

c) Write a note on storage modulus and storage compliance. **[4]**

OR

Q8) a) Derive an expression for flow behaviour index n in terms of activation energy at constant shear stress and activation energy at constant shear rate. **[10]**

b) Discuss the effect of molecular weight on melt rheology of polymers. **[6]**

Q9) a) Explain how Bagley's correction factor is estimated using a capillary rheometer. A rubber based compound gave the following pressure drop-volumetric flow rate data when extruded through a capillary rheometer through a capillary diameter of 1.5 mm. The pressure drop for different L/D ratio capillaries for flow rate of 330×10^{-9} m^3/s are as follows: **[8]**

L/D ratio	20.0	10	5.0	1.0
p.r. drop ΔP (MPa)	64.3	37.0	24.8	14.5

b) Derive an expression for apparent viscosity for a Brookfield viscometer. **[8]**

OR

Q10) a) Explain the effect of wall slip phenomena on rheological measurements using a capillary rheometer. **[7]**

b) For a cone and plate rheometer with plate diameter of 12 cm and cone angle 2°, the frequency of rotation and the torque data as recorded is given below. Determine the rheological behaviour of the melt. Assuming that power law model applies.

Frequency of rotation rad/mt	6	30	54	90	180	360	600
Torque	9	14.5	17.1	20.0	24.2	30.6	34.4

Find the power law constants. **[9]**

Q11) a) The runner layout given in the figure 5 is to be balanced by finding dimensions ϕx and ϕy. The polymer follows the power law form $\tau = 1{,}75{,}000\ \dot{r}^{0.3}$ where z is in N/m^2 and $\dot{r}$ in S^{-1}. The mass flow rate of the polymer is 75 g/s and melt density is 0.7 g/cm^3. Calculate the total pressure drop across the runners and the gates. **[10]**

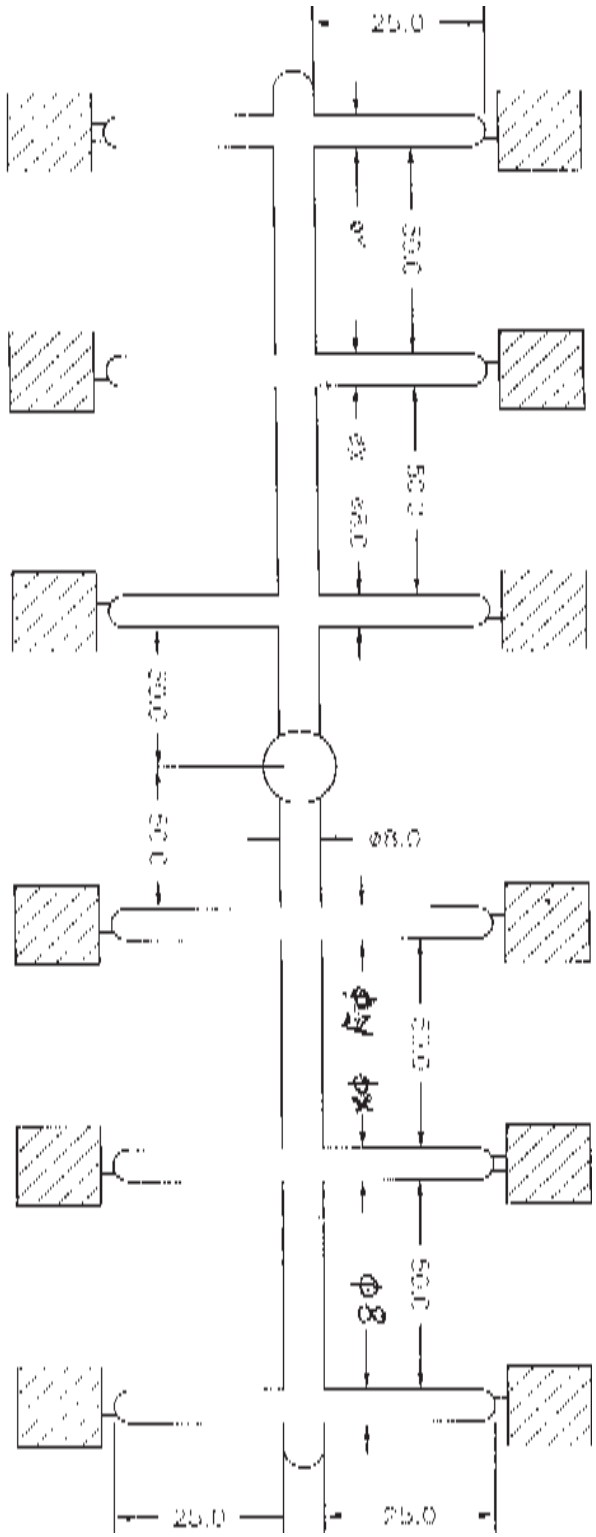


Figure 5

b) Derive an expression for pressure drop through a wire coating die. **[8]**

OR

Q12) a) Plot the thickness distribution along the wall of a 150 mm diameter, 480 mm deep cylindrical container thermoformed out of a polystyrene sheet initially 2.5 mm thick. **[6]**

b) Derive an expression for compaction force for compression molding of a disc with radius R and thickness H. **[7]**

c) A power law fluid with constants $\eta_0 = 1.5 \times 10^4$ N s/m^2 and $n = 0.35$ is injected through a centre gate into a disc 3 mm in depth and 220 mm in diameter. If injection rate is constant at 6.5×10^{-5} m^3/s, find the time taken to fill the cavity and minimum injection pressure for non-isothermal condition. **[5]**

❐❐❐

Total No. of Questions : 10] **[Total No. of Pages : 3**

P1359

[3864]-30
B.E. (E & TC)
ADVANCE POWER ELECTRONICS
(1997 Course) (404185)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) What are phase controlled converters? Explain with circuit diagram & W/F'S, working of 3ϕ semiconverter with R-load. Deduce the equation for o/p voltage. **[10]**

b) Justify why p.f is poor in FCC compared to HCC. **[3]**

c) What is the effect of 'L_s' on converter o/p? Explain. **[3]**

Q2) a) What are inverters? Explain with circuit diagram & W/F'S working of 3 ϕ VSI with 180° conduction mode feeding star connected resistive load. **[10]**

b) Why PWM inverters are preferred over sq.wave & quass-sq.wave inverters? Justify. **[6]**

Q3) a) What are resonant converters? Explain with circuit diagram & W/F'S working of ZVS resonant converter. **[8]**

b) Compare linear, switched mode & resonant converters. **[4]**

c) What is SMPS? Explain in brief. **[4]**

P.T.O.

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

a) UPS.

b) ΣMI/EMC.

c) ZCS.

d) Harmonic ellimination technique.

e) ASCSI (3ϕ).

Q5) a) Explain with circuit diagram & W/F'S working of 1ϕ Half controlled converter bridge with RL-load. **[8]**

b) Explain with circuit diagram & W/F'S working of triac based power controller ckt with applications. **[8]**

SECTION - II

Q6) a) What are DC motor performance parameters? Explain in brief. **[4]**

b) Explain with circuit diagram & W/F'S, working of single phase full controlled converter with highly inductive load. **[8]**

c) What is regenerative braking in DC motors? Explain. **[4]**

Q7) a) What are dual converters? Explain with circuit diagram & W/F'S, working of 1ϕ dual converter operating with highly inductive load. Derive equation for (icr) circulating current. **[10]**

b) Compare Circulating & non-circulating mode converter. **[6]**

Q8) a) What are DC- to DC converters? Explain with circuit diagram & W/F'S, working of 2 Q-step-down chopper operating with RL-load. **[10]**

b) Justify, why choppers are preferred over phase controlled converters for power control application. **[6]**

Q9) a) What are AC-drives? Explain with block diagram speed control technique of 1ϕ I.M by using $\frac{V}{f}$ method. Comment on T_q & speed characteristics. **[10]**

b) Explain braking mechanisms in I.M. **[6]**

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

a) Brushless DC motor.

b) Stepper motor drive.

c) DC current sensing & speed measurement techniques.

d) Reversible drives (chopper based).

e) Protection circuits for DC/AC motors.

❖❖❖❖

Total No. of Questions : 12] **[Total No. of Pages : 4**

P1360

[3864] - 138

B.E. (Mechanical)

KINEMATIC ANALYSIS AND SYNTHESIS

(2003 Course)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) Derive formulas for the degree of freedom of planar and spatial mechanisms. State the limitations of these formulas. Give one example of an exception to the above formula. **[8]**

b) Explain the following concepts with examples : **[8]**

i) Equivalent linkage.

ii) Kinematic Inversions in Planar Mechanisms.

OR

Q2) a) Explain Grashoff's Criterion of relative motion in a planar four bar mechanism. **[6]**

b) Explain the terms 'Mechanical Advantage' and 'Transmission Angle' with reference to a four bar mechanism. Obtain an expression for the mechanical advantage, stating the assumption made, if any. **[10]**

P.T.O.

Q3) Crank O_2 A rotates at 1 rad/s in clockwise direction. Given O_2 A = 2 cm, AB = 8.5 cm, BC = 7.5 cm, CD = 5.25 cm, O_5C = 7 cm, O_2O_5 = 7 cm. The line of action of slider D is at a perpendicular distance of 5 cm from point O_5. Use the auxiliary point method to obtain the velocity and acceleration of any one point on link BCD. Refer fig (1). **[16]**

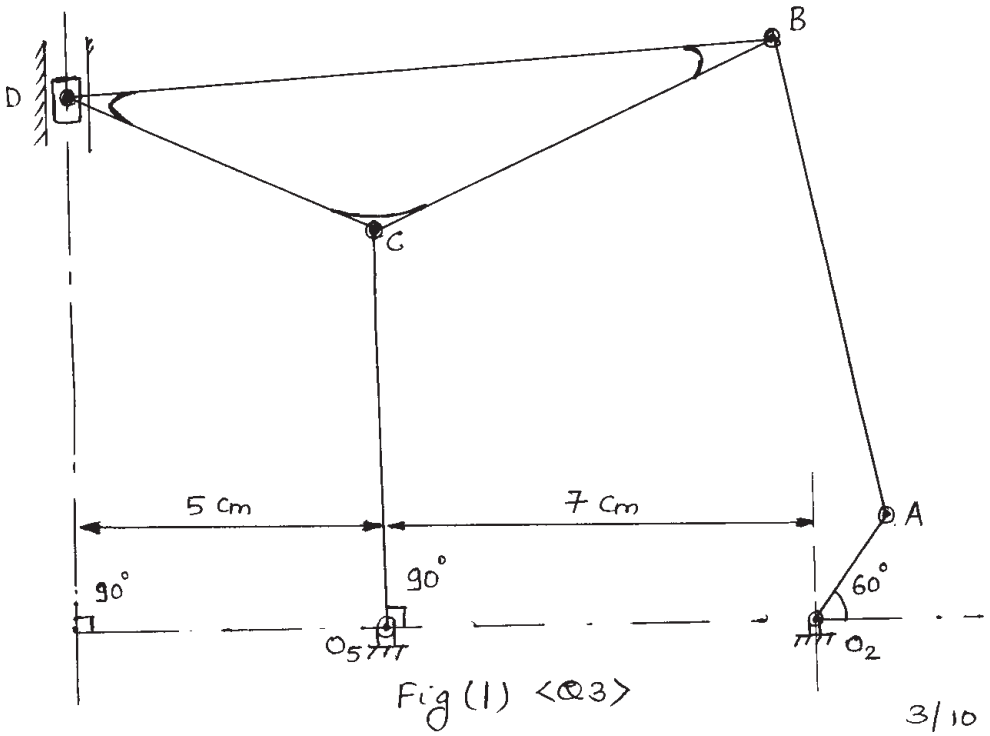


Fig (1) <Q3>

3/10

OR

Q4) a) Explain the complex algebra method for displacement, velocity and acceleration analysis of a Crank and slotted lever quick return mechanism. Explain how the resulting equations are solved. **[10]**

b) State and explain Freudenstein's theorem. **[6]**

Q5) a) State any two forms of Euler-Savary Equation and discuss their significance and uses with reference to the rolling motion of the moving centrode over the fixed centrode. **[10]**

b) Explain how Curvature theory is used in Synthesizing dwell linkages to replace Cam-follower mechanisms. **[8]**

OR

Q6) a) Explain with neat sketch the Bobillier construction for drawing inflection circle for motion of connecting rod with respect to frame in a slider Crank mechanism. Show all construction lines. **[10]**

b) Write note on any two : **[8]**

i) Ball's point any its uses.

ii) Fixed and Moving centrodes.

iii) Hartmann Construction.

SECTION - II

Q7) Synthesize a 4 bar function generator to generate the function $y = 1/x$ in the interval $1 \leq x \leq 2$ using pole method. Taking starting position of input link as 45°, range of motion for input link $\Delta\phi = 60°$ and range of motion for output link $\Delta\psi = 90°$. Use three accuracy points with chebychev spacing. **[16]**

OR

Q8) Synthesize slider Crank mechanism in which the slider displacement is proportional to the square of Crank rotation.

$$\frac{S_i - S_s}{S_f - S_s} = \left(\frac{\phi_i - \phi_s}{\phi_f - \phi_s} \right)^2$$

where, starting positions of Crank and slider are $\phi_s = 45°$ and $S_s = 8$ cm respectively. Also range for Crank rotation and linear displacement of slider are $\Delta\phi = 60°$ and $\Delta S = 4$ cm respectively. Use three accuracy points with chebychev spacing. Use Graphical method. **[16]**

Q9) a) Determine the link lengths of a 4 bar linkage using Freudenstein's equation, that satisfies following specifications in one of its positions :

$\theta_2 = 60°$ $\theta_4 = 90°$

$\omega_2 = 5$ rad/sec $\omega_4 = 2$ rad/sec

$\alpha_2 = 2$ rad/sec^2 $\alpha_4 = 7$ rad/sec^2

Subscripts 2 and 4 represents input and output link respectively. The length of the input link is to be unity. **[10]**

b) State and prove Roberts-chebychev theorem. **[6]**

OR

Q10)a) Using complex number method, synthesize a four bar linkage that satisfies following specifications in one of its position :

ω_2 = 15 rad/sec α_2 = 0 rad/sec^2

ω_3 = 6 rad/sec α_3 = 85 rad/sec^2

ω_4 = 8 rad/sec α_4 = –160 rad/sec^2

Draw the mechanism obtained above. **[10]**

b) Explain Double point and Symmetry of a Coupler Curve. **[6]**

Q11)a) Explain Transformation matrix method of displacement analysis of spatial mechanisms. Obtain displacement relationship for Hooke's joint. **[10]**

b) Write a note on - Eulerian Angles. **[8]**

OR

Q12)a) Classify various types of Spatial mechanisms and mention their applications. **[8]**

b) Obtain an expression for the transformation matrix relating two cartesian frames which are translated and rotated with respect to each other.**[10]**

❖ ❖ ❖ ❖

Total No. of Questions : 11] **[Total No. of Pages : 5**

P1361

[3864]-175
B.E. (Production) (Common to S/W)
RELIABILITY ENGINEERING
(2003 Course) (411085)

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) a) Derive an expression $\text{MTTF} = \frac{1}{N}\sum n_k k\Delta t$ **[6]**

b) In a survival test conducted on 160 cardboard boxes for their strength under impact loading, the following results were obtained:

Number of impacts	20	30	34	36	39	42	45	47	50
Number of boxes failed	17	20	25	24	25	23	13	8	5

For this case, how will you define failure density, failure rate? **[6]**

c) Explain with neat sketch early failure, random failure & wear out failure of 'Bath tub' curve. **[4]**

OR

Q2) a) The results of tests conducted under severe adverse conditions on 250 safety valves are tabulated as given below. Calculate failure density (f_d) and hazard rate Z(t) when the time interval is four hours instead of one hour. Also calculate number of survivors. **[8]**

Time interval	00	0-4	4-8	8-12	12-16	16-20	20-24
No. of failures	00	135	35	32	22	15	11

P.T.O.

b) In the life testing of 200 specimens of a particular device, the number of failures during each time interval of 20 hrs. is shown in table. Estimate MTTF for these specimens. **[4]**

Time Interval {Hours}	Number of failures during the interval
T<=1000	00
1000<=T<=1020	30
1020<=T<=1040	40
1040<=T<=1060	35
1060<=T<=1080	40
1080<=T<=1100	20
1100<=T<=1120	25
1120<=T<=1140	05
1140<=T<=1160	05

c) Explain with neat sketch meaning of different types of Gates used in the fault tree analysis. **[4]**

Q3) a) Explain the concept of "Techno-physico Constraints" with a conceptual system. **[6]**

b) Construct a fault tree from **Fig.1** such that the top event is a system failure and component failures are basic events. If Pr {A} = Pr {B} = 0.9, Pr {C} = Pr{D} = 0.8 and Pr {E} = Pr{F} = 0.75, compute the probability of the top event. **[10]**

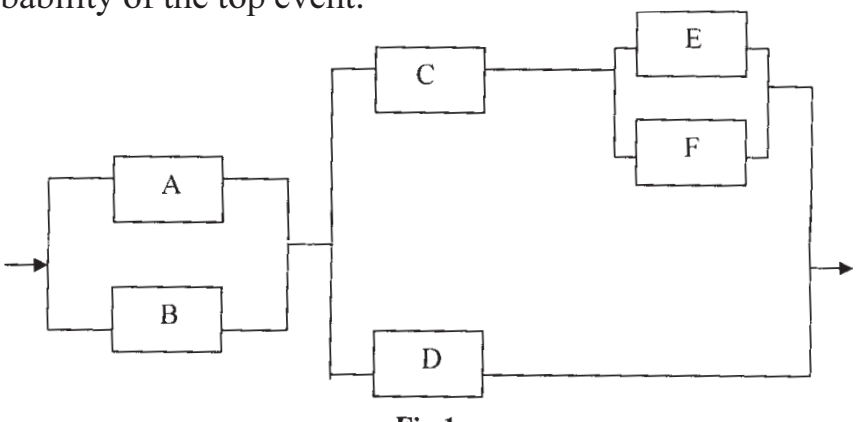


Fig.1

OR

Q4) a) Construct a reliability block diagram for given fault tree. **Fig. 2** **[8]**

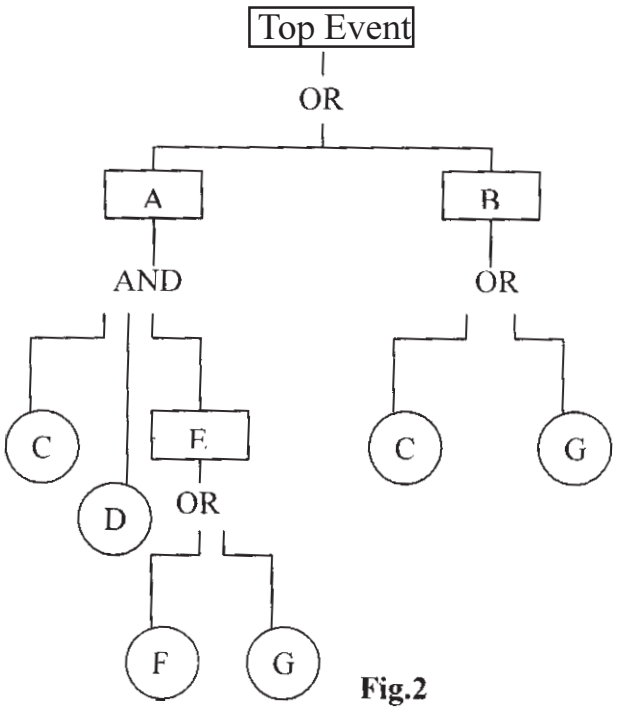


Fig.2

b) Differentiate between:Design FMEA and Process FMEA. Explain methodology of system analysis. **[8]**

Q5) a) Explain with neat sketch **[10]**

i) Series Configuration.

ii) General Series-Parallel configuration.

b) Find the system reliability of the configuration in **Fig. 3** **[8]**

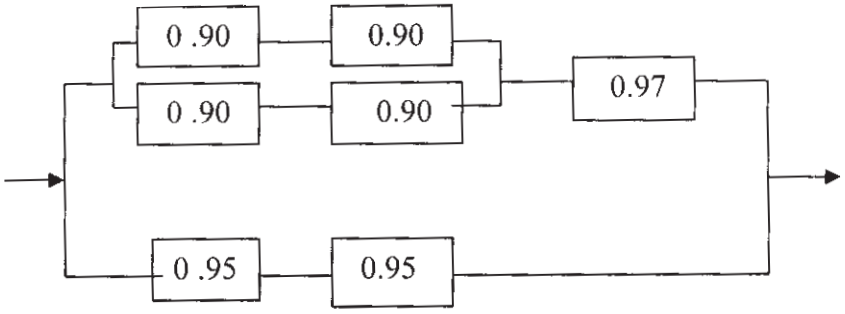


Fig.3

OR

Q6) a) Find the reliability of the configurations shown below in **Fig.4** **[8]**

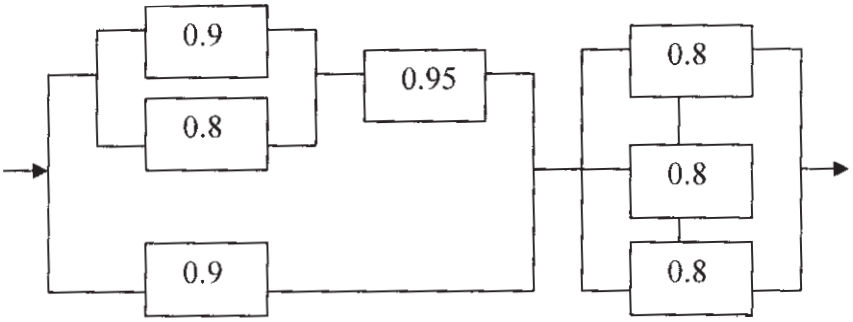


Fig. - 4

b) Explain with neat sketch
   i) Parallel Configuration.
   ii) General Parallel - Series configuration. **[10]**

SECTION - II

Q7) a) Define Terotechnology and explain various elements of LCC. **[8]**

b) A company is planning to acquire a truck. Two makes of trucks are available in the market. The cost of garaging and the driver's wages are same for both. The other data on cost are provided in the table.

Parameters	Truck A	Truck B
Capital cost	Rs. 5 Lakhs	Rs. 3 Lakhs
Annual Road Tax & Insurance	Rs. 8,000	Rs. 7,000
Operating Cost a) fuel consumption b) oil consumption c) fuel cost d) oil cost	 20km/Lit. 2 lit/1000km Rs.3/lit. 25/lit.	 20km/ Lit. 2 lit/1000km Rs. 3/lit. 21/lit.
Maintenance Cost a) service interval b) cost of service c) random breakdown d) cost of breakdown	 Every 7,000 km. Rs.3,000 Every30,000 km. Rs.9,000.	 Every 4,000 km. Rs.5,000 Every10,000 km. Rs.6,000.
Expected life	10 yrs.	10 yrs.

Calculate annual maintenance cost for a period of 30,000 km & find out which truck is advantageous? **[8]**

OR

Q8) a) Explain mean and median ranking method. **[8]**

b) The following data refer to 'Mean time to failure' of a equipment used in electric power house installation: **[8]**

No. of failure	1	2	3	4	5	6	7	8	9
MTTF/MTBF (Hrs)	31.3	45.9	78.3	22.1	2.3	4.8	8.1	11.3	17.3

Plot the reliability against time using the method median statistics. How will values changes with mean statistics?

Q9) a) Explain : **[6]**

i) Inherent availability.

ii) Achieved availability.

iii) Operational availability.

b) If two components having failure rates λ_1, λ_2 respectively are connected in parallel show that the Reliability of this parallel configuration at time t is given as.

$Rp(t) = e^{-\lambda 1t} + e^{-\lambda 2t} - e^{-(\lambda 1+\lambda 2)t}$ **[10]**

OR

Q10)a) Derive and expression for techno-economic life of equipment given maintenance function (at^n), operating cost per year (v) and first cost (C). **[6]**

b) The following data have been collected at the plant: **[6]**

Mean time before failure = 30hrs.

Mean time to repair = 15hrs.

Administrative logistic time is 30% of Mean Down Time(MDT).

Calculate the operational availability and inherent availability of the plant.

c) Explain the term availability and maintainability of system. **[4]**

Q11)Write short note on (Any 3) **[18]**

a) k out of m systems.

b) Types of maintenance system.

c) Risk priority number in FMEA.

d) "Tie-set" & " cut set".

e) Redundancy.

⊙⊙⊙⊙⊙

Total No. of Questions : 12] **[Total No. of Pages : 3**

P1362

[3864]-227
B.E. (Electrical)
ILLUMINATION ENGINEERING
(2003 Course) (403143) (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) ***Neat diagrams must be drawn wherever necessary.***
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) Explain the properties of light. **[6]**

b) Deduce the relation to find the illumination at any point on the plane surface due to light source suspended at a height 'h' meters from the plane surface. **[6]**

c) State and explain the laws of illumination. **[6]**

OR

Q2) a) Enlist various effects of bad lighting. Explain methods of controlling natural light. **[6]**

b) Explain the following : **[6]**

i) Illumination ii) Reflection factor

iii) Luminous intensity iv) M.H.C.P.

c) What is stroboscopic effect? How it can be avoided. **[6]**

Q3) a) Enlist advantages of gas discharge lamp over incandescent lamp. **[6]**

b) Write short note on L. E.D.'s. **[4]**

c) Describe the construction and working of Mercury vapour lamp with sketch. **[6]**

OR

Q4) Explain any two with sketch : **[16]**

i) Compact fluorescent Lamp (C.F.L.) ii) LASERS

iii) Metal Halide lamp iv) Sox lamp

P.T.O.

Q5) a) Discuss the importance of reflectors and refractors with reference to illumination. **[8]**

b) Explain with neat sketch starting ballast for. **[8]**

i) Sodium vapour.

ii) Mercury vapour lamp.

OR

Q6) a) Explain the following with neat sketches **[8]**

i) Specular reflection.

ii) Diffused reflection.

b) Discuss with neat sketches various types of electric light fitting used for illumination. **[8]**

SECTION - II

Q7) a) Enumerate the various factors to be consider while designing good Lighting scheme. **[8]**

b) What is polar curve? Describe its types. How it is helpful for an illumination engineer. **[8]**

OR

Q8) a) What is glare? Discuss the type of glare and the remedies over them. **[8]**

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

i) Payback Period. ii) Waste light factor.

iii) C.O.U. iv) Space height ratio.

Q9) a) Give the comparison between different types of light sources with reference to their lumens per Watt and life. **[8]**

b) Write short notes on: **[8]**

i) Street lighting.

ii) Flood lighting.

OR

Q10) a) What is energy efficient lighting? Discuss its advantages. What are the difficulties related with energy efficient lighting? **[8]**

b) Explain the terms with suitable example. **[8]**

i) Pay back calculation.

ii) Life cycle coasting.

Q11) a) Write notes on Emergency lighting scheme for **[6]**

i) Central system.

ii) Stand alone system.

b) Explain the components of day light factor with neat diagram. **[6]**

c) Explain Switching control of lighting. **[6]**

OR

Q12) Write short note on following: **[18]**

a) Cold lighting.

b) Photo voltaic lighting.

c) O.F.C.

Total No. of Questions :12] **[Total No. of Pages :2**

P1363

[3864]- 421
B.E. (IT)
GIS AND REMOTE SENSING
(2003 Course) (414445)

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 answerQ.1 or Q.2, Q.3 or Q.4 ,Q.5 or Q.6 and answer Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12 from section II.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Explain in detail IRS series of satellites. **[9]**

b) Define remote sensing. What are the advantages of computers in remote sensing. **[9]**

OR

Q2) a) What are different sensor parameters? Describe them with examples. **[9]**

b) Explain the radar principle with required theoretical background. What are the factors affecting microwaves. **[9]**

Q3) a) Explain the pre-processing correction methods used in processing of remote sensed data. **[8]**

b) Explain in detail logarithmic and exponential contrast stretch. **[8]**

OR

Q4) a) Describe the image enhancement techniques used in processing of remote sensed data. **[8]**

b) What are the key elements of visual image interpretation? **[8]**

Q5) a) What are the components of GIS architecture/Give the classification of GIS. **[8]**

b) What is grid system? Which grid systems are used in the GIS applications? **[8]**

OR

Q6) a) What are maps? What is map scale? Explain special referencing system. **[8]**

b) What is map projection? Describe different types of map projections. **[8]**

P.T.O.

SECTION - II

Q7) a) What are the functions of DBMS supporting GIS applications? **[9]**

b) What is raster data representation? Explain it with suitable example. **[9]**

OR

Q8) a) What is vector data representation? Explain it with suitable example. **[9]**

b) What is spatio-temporal data? Explain different types in representations used for spatio-temporal data. **[9]**

Q9) a) What are the common errors in GIS databases? Explain the process of data cleaning. **[8]**

b) Explain the process of digital terrain modelling with the tasks involved. **[8]**

OR

Q10)a) What are various guidelines for digitization in GIS? **[8]**

b) What are different types of accuracies used in GIS? **[8]**

Q11)a) Explain the issues in integration of remote sensing with GIS. **[8]**

b) How is GIS used in land use or land cover classification system? **[8]**

OR

Q12)a) What are the challenges which have occurred due to usage of GIS in urbanization? Write a short note. **[8]**

b) Describe the software scenario in GIS focusing on functionalities, products and developers? **[8]**

⌘⌘⌘⌘

Total No. of Questions :12] **[Total No. of Pages :3**

P1364

[3864]- 419
B.E. (I.T.)
BIO-INFORMATICS
(2003 Course) (Elective - I)

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

Instructions to the candidates:

1) ***From section I answerQ.1 or Q.2 , Q.3 or Q.4 ,Q.5 or Q.6 and answer Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12 from section II.***
2) ***Answer to the two sections should be wirtten 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) The probability of a patient having a particular genetic disease is 0.6. Calculate the pretest odds? If the Likelihood ratio is given as 2.75, calculate the post-test odds? Find the probability of the patient suffering from the genetic disease? Explain any two limitations of Bayes' Theorem? **[16]**

OR

Q2) a) Explain Microarray Spotting Process Flow. **[8]**

b) Explain the Gene Mapping Process in detail. **[8]**

Q3) a) What is data mining? Mention the various tools used in Data Mining? **[8]**

b) What is Clustering? Explain Hierarchical Clustering. Explain K-means clustering. **[8]**

OR

Q4) a) For the given fluorescence data as x[n] in the table below, calculate mean, standard deviation and variance? **[8]**

n	1	2	3	4	5	6	7
x[n]	2.2	8.6	3.4	13.3	52.7	1.3	4.8

b) Explain the concept of True Positives, True Negatives, False Positives and False Negatives? **[4]**

c) Explain the concept of Sensitivity and Specificity along with the formulae. **[2]**

d) Explain the concept of Receiver Operating Characteristics? **[2]**

P.T.O.

Q5) a) List different computational methods of sequence alignment and discuss any two in detail? **[8]**

b) Explain the Central Dogma of Molecular Biology. **[10]**

OR

Q6) a) Explain following terms : **[10]**

i) Neural Networks.

ii) Hidden Markov Models.

b) Explain Inductive Logic Programming and Deductive Logic Programming along with the differences between the two **[8]**

SECTION - II

Q7) What is an E-value? You do a databank search using FASTA with an amino acid sequence as a query. The only reported match has an E-value of 10. What does this mean for the similarity of the two sequences? **[16]**

OR

Q8) a) BLAST and FASTA are two widely used tools for sequence alignment. Explain only the differences in their approaches? **[8]**

b) Discuss the applications of PSI-BLAST program exploring protein family relationships? **[8]**

Q9) Explain in detail-FASTA algorithm for database search with an example. **[16]**

OR

Q10)a) What is Genetic Engineering? Explain Genetic Markers. What are the dangers of genetic engineering? **[8]**

b) Explain the process of interchange and transformation of pollutant in atmosphere, hydrosphere and lithosphere. **[8]**

Q11)a) For the given two nucleotide sequences calculate the alignment score. Use gap penalty of (-0.5) per gap. Assuming opening cost and extension cost of (-0.5) each calculate the penalty gap, using this also calculate expanded gap penalty. **[12]**

Sequence 1 : ATTCGGCATTCAGAGCTAGA.

Sequence 2 : ATTCGACATT-----GCTAGTGGTA.

b) Given A = [2 3 8 4 1] and B = [911 1 0 2 4 5 6 7 3 2], calculate Max Value = $f(A_1, B_i)$, where, i = 1, 2, ...,11 . **[6]**

OR

Q12)Explain the methods of protein structure prediction and determination : **[18]**

a) Experimental.

b) Ab-initio.

c) Heuristic.

⌘⌘⌘⌘

Total No. of Questions : 12] **[Total No. of Pages : 4**

P1518

[3864]-248
B.E. (Electronics)
ADVANCED COMMUNICATION ENGINEERING
(2003 Course)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) Explain microwave characteristics. **[4]**

b) Discuss-Tee junctions, E-plane tees (series tee), H-plane tee (shunt tee), Magic Tees (Hybrid Tees), Hybrid Rings (Rat-Race circuits), waveguide corners, Bends and Twists. **[14]**

OR

Q2) a) Show that the TM_{01} and TM_{10} modes in a rectangular waveguide do not exist. **[6]**

b) What is Q factor of cavity resonator? **[4]**

c) Discuss in detail the types of cavity resonators. **[8]**

Q3) a) A silicon n-p-n transistor operates in common-base mode at 300°K and has the following parameters : **[10]**

Silicon intrinsic density :	$n_i = 1.5 * 10^{10}$ cm^{-3}
Acceptor density in base region :	$N_a = 5 * 10^{16}$ cm^{-3}
Donor density in emitter region :	$N_d = 5 * 10^{18}$ cm^{-3}
Hole lifetime :	$\tau_p = 1$ μs
Electron lifetime :	$\tau_n = 1$ μs
Cross section :	$A = 10^{-4}$ cm^2
Base width :	$W = 10^{-3}$ cm
Emitter length :	$L_E = 10^{-2}$ cm

P.T.O.

Determine :

i) The mobilities μ_n and μ_p.
ii) The diffusion coefficients D_n and D_p.
iii) The emitter efficiency factor γ.
iv) The transport factor β.
v) The current gain α.

b) Write a note on types of Diodes. **[6]**

OR

Q4) a) For a transit time domain mode, the domain velocity is equal to the carrier drift velocity and is about 10^7 cm/s. Determine the drift length of the diode at a frequency of 8GHz. **[4]**

b) An IMPATT diode has a drift length of 2μm. determine : **[4]**

i) The drift time of the carriers and
ii) The operating frequency of the IMPATT diode.

c) Discuss principle of operation of BJT. **[8]**

Q5) a) What are the types of tracking Radar Systems? **[6]**

b) Explain conical scan tracking. **[4]**

c) What should be the pulse repetition frequency of radar in order to achieve a maximum unambiguous range of 60nmi. If the radar has a peak power of 800mw, what is its average power? **[6]**

OR

Q6) a) Explain Radar Range Equation. **[4]**

b) Discuss delay line cancellers. **[4]**

c) How do you distinguish stationery targets and moving targets. Explain the principle and working of MTI radar. **[8]**

SECTION - II

Q7) a) Compare multimode step index and graded index optical fibre. **[8]**

b) A manufacturer wishes to make a silica core step index fibre with V = 75, and a numerical aperture NA = 0.30 to be used at 820nm. If n_1 = 1.458, what should be the core size and cladding index? **[4]**

c) Explain types of losses in fiber optic communication. **[6]**

OR

Q8) a) Explain principle, concept and applications of OTDR for optical fibre communication. **[6]**

b) Explain the following terms : **[9]**

i) Acceptance angle.
ii) Numerical aperture.
iii) Critical angle.

c) Significance of optical power budgeting. **[3]**

Q9) a) Explain GSM architecture. **[6]**

b) What is the significance of fixed channel assignment? **[4]**

c) Compare different multiple access techniques. **[6]**

OR

Q10) a) If there are 50 channels in a cell to handle all the calls and the average is 100s per call, how many calls can be handled in this cell with a blocking probability of 2 percent? **[4]**

b) Explain : **[12]**

i) Cell splitting.
ii) Channel assignment.
iii) Handover.
iv) spread spectrum technology.

Q11) a) Explain different orbital parameters and give significance of each. **[12]**

b) Discuss Satellite constellation? **[4]**

OR

Q12) a) Explain spot beam and its significance. **[4]**

b) A satellite communication system is expected to provide 17000 two-way digital telephone circuits. Individual satellite transponders have the capacity to carry 120 Mbps of traffic. Using the link parameters given below determine : **[12]**

i) Uplink EIRP.
ii) Energy per bit to noise power density (E_b/N_o) at the satellite input.
iii) Power flux density at the earth station (downlink).
iv) Receive antenna gain.
v) Earth station GIT.
vi) Carrier-to-noise power density at the receiver.
vii) E_b/N_o at the receiver

Available link parameters :
Uplink
Transmitter output power at saturation = 2kW
Backoff and combining loss = 7dB
Transmit antenna diameter = 15m
Antenna efficiency = 55%
Frequency of transmission = 14GHz
Atmospheric loss = 0.6Db
Satellite G/T = – 5.3dB/K
Downlink
Satellite EIRP at beam edge = 40.2 dBW
Free space loss = 205.6dB
Downlink frequency = 11.7 GHz
Atmospheric loss = 0.4 dB
Receive system noise temperature = 270K
Feeder loss = 0.7 dB
Assume noise from other sources as negligible and that link maergin is adequate for propogation losses due to rain.etc.

☒☒☒☒

Total No. of Questions : 10] **[Total No. of Pages : 2**

P1294

[3864]-440

B.E. (Biotechnology)

BIOINFORMATICS AND REGULATIONS

(2003 Course) (416288) (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) ***Answer to the two sections should be written in separate answer books.***
3) ***Neat diagrams should be drawn whenever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) Define databases. Classify nucleotide databases. Write in detail about Secondary nucleotide databases. **[18]**

OR

Q2) What is BLAST? Explain in detail its working. **[18]**

Q3) Align the following two sequences using Needleman wunsch algorithm, and write the optimal alignment.

[Match - 2, Mismatch - 1. Gap - 1]

Seq. 1 GTTG

Seq. 2 GTG **[16]**

OR

Q4) What is SQL? What are different formats used for representation of a sequence? **[16]**

Q5) Write short notes. (Any two) 8 marks each. **[16]**

a) Global alignment.
b) Object oriented database.
c) Specialized genomic recourses.
d) Secondary protein databases.

P.T.O.

SECTION - II

Q6) What is Dot plot analysis? Explain with suitable example. **[18]**

OR

Q7) Explain in detail various regulatory requirements involved in starting of a biotechnology company. **[18]**

Q8) Write in detail profiles of various companies involved in bioinformatics software development. **[16]**

OR

Q9) Explain in detail various methods of phylogenetic analysis. **[16]**

Q10) Write short notes. (Any Two) 8 marks each **[16]**

a) Phase II trials.

b) cGMP.

c) Distance method.

d) Epitope prediction.