

Total No. of Questions : 10]

[Total No. of Pages : 2

P 1112

[3664] - 52

**B.E. (Electronics Engg.)**  
**PROCESS INSTRUMENTATION**  
**(1997 Course) (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.*
- 6) Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) Define the term automatic control system. With suitable block diagram explain closed loop control system. [8]  
b) Define the term transducer. Explain in detail classification of transducer. [8]
- Q2)** a) Explain the following terms related to thermocouple [8]  
i) Seebeck effect.  
ii) Peltier effect.  
iii) Thomson effect.  
iv) Thermopiles.  
b) Explain any one method for non contact type speed measurement. [8]
- Q3)** a) Explain in detail variable area flowmeter. [8]  
b) Explain any one method for pH measurement. [8]
- Q4)** a) With neat diagram explain V/F converter. [8]  
b) A strain gauge is bonded to a beam 0.1m. long & has a cross sectional area 4 cm<sup>2</sup>. Young's modulus for steel is 207 GN/m<sup>2</sup>. The strain gauge has an unstrained resistance of 240Ω & a gauge factor of 2.2. When a load is applied, the resistance of strain gauge changes by 0.013

Total No. of Questions : 6]

[Total No. of Pages : 2

**P 1351**

**[3664] - 259**

**B.E. (Printing)**

**SURFACE PREPARATION - II**

**(2003 Course)**

**Time : 3 Hours]**

**[Max. Marks : 100**

**Instructions to the candidates:**

- 1) Question Nos. 1 and 4 are compulsory. Out of remaining attempt 2 questions from Section I and 2 questions from Section II.**
- 2) Answers to the two sections should be written in separate books.**
- 3) Neat diagrams must be drawn wherever necessary.**
- 4) Figures to the right indicate full marks.**

**SECTION - I**

- Q1) a) Explain in detail stages in Rubber plate-making. [10]**  
**b) Explain the benefits of Photopolymer over Rubber plates. [8]**

**OR**

- a) Explain in detail Design specifications for Flexography. [12]**  
**b) State the benefits of Flexography. [6]**

- Q2) a) Write notes on [6]**  
**i) Insufficient density of a negative.**  
**ii) Effect of Main exposure.**  
**b) Calculate % shortening and new negative length for 2.84 mm plate thickness having printed length of 50 cm. [10]**

**OR**

- a) Mention the requirements of negative for Flexo Plate. [8]**  
**b) Mention the safety precaution for Flexo Plate. [8]**

- Q3) Explain in detail processing of 2.84 mm Flexo Plate. [16]**

**OR**

- a) Explain various Flexo Plate mounting techniques. [10]**  
**b) Write notes on [6]**  
**i) Measuring the Plate thickness.**  
**ii) Orientation of Photopolymer plate.**

**P.T.O.**

## **SECTION - II**

- Q4)** a) Explain in detail processing of Digital Flexo Plate. [10]  
b) Write notes on [8]  
i) Components and Properties of PerC/Bu.  
ii) Checking the Wash-out Solvent.

OR

Explain in detail stages involved in optimization of a Flexo Plate. [18]

- Q5)** a) Explain in detail Chemical Etching process for Gravure. [10]  
b) Write notes on [6]  
i) Benefits of Gravure Process.  
ii) Image Carrier.

OR

- a) Explain in detail processing of electronic engraved Gravure cylinder.[10]  
b) Write notes on [6]  
i) Gravure Cells and Ink release.  
ii) Gravure Proofing.

- Q6)** a) Explain in detail workflow from Press to Press of Gravure. [10]  
b) Write notes on [6]  
i) Benefits of Chrome in Gravure cylinder making.  
ii) Ballard Shell Technique.

OR

Explain in detail effect of plating variables on Gravure cylinder. [16]



**QUANTITY SURVEY, CONTRACTS AND TENDERS**

(2003 Course)

Time : 4 Hours]

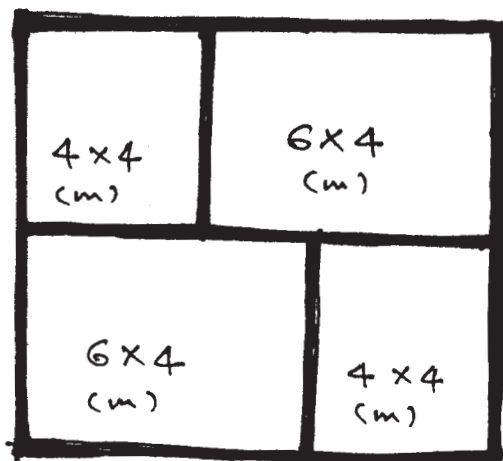
[Max. Marks : 100

Instructions to the candidates :

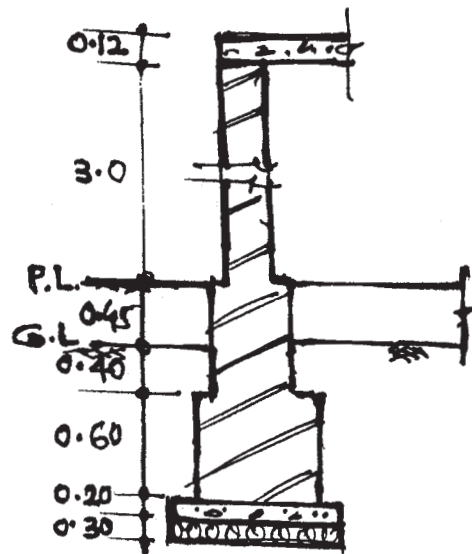
- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 from Section I and Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12 from Section II.
- 2) Answers to the two sections should be written in separate answer books.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Figures to the right indicate full marks.
- 5) 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) Referring fig. no. 01 of a residential building workout quantities of the following items of construction by centre line method, describing them in a format of measurement sheet. All walls have same cross section. Consider lintel of C/S 0.3 x 0.15 m on all openings with a bearing of 0.15 m on either side.



**FIG NO 1**  
(Q. No. 1)



All dimensions are in m  
Sketch not to scale.



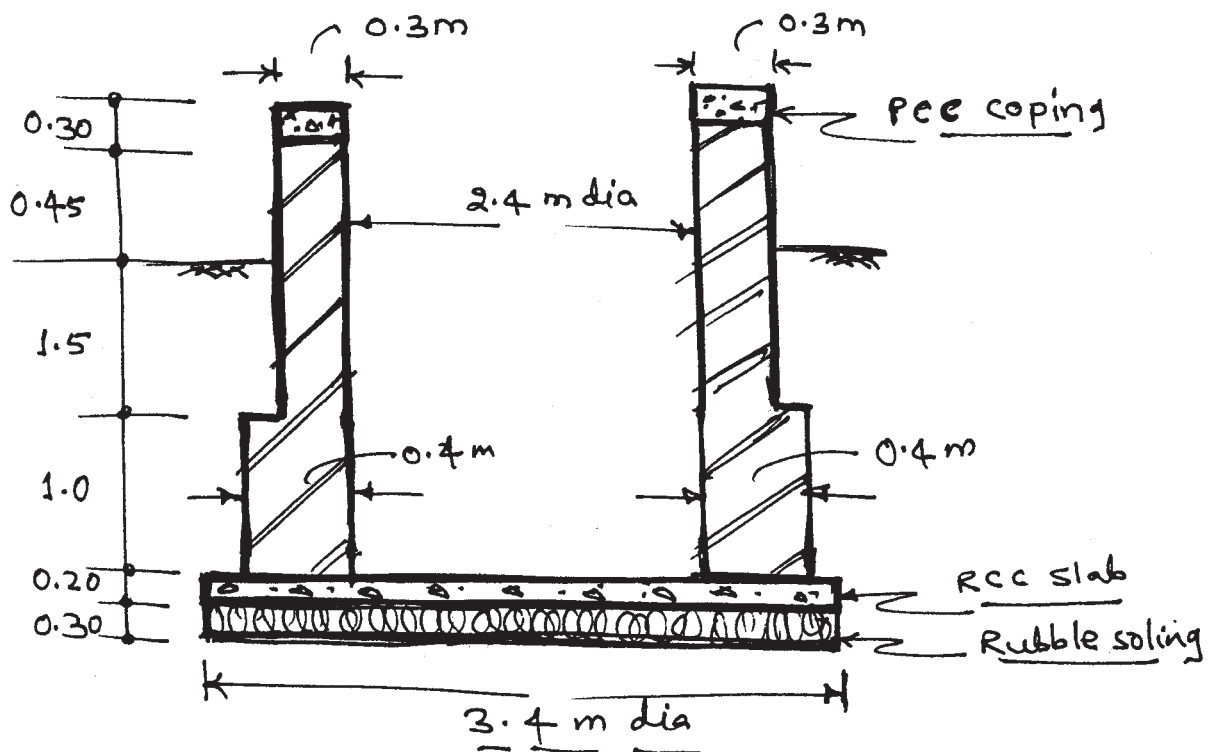
### Details of Openings :

Sr No.	Item	Size in m	nos	Remark
01	Door (D)	1.2 x 2.1	01	In external wall
02	Door (D2)	0.9 x 2.1	03	In internal wall
03	Windows (W)	1.2 x 1.2	06	In external wall

- Excavation. [4]
  - Masonry in foundation. [4]
  - Masonry in superstructure. [6]
- b) State the rules for deductions to be made from brick masonry in superstructure. [4]

OR

- Q2) a) Referring fig. no. 2. of an intake well of internal diameter 2.4m, workout quantities of following items of constructions describing them fully in a format of measurement sheet.



All dimensions in m  
Figure not to scale

Fig. No. 2  
(Q. No. 2)

- Excavation. [3]
- Rubble soling, RCC in bottom slab, and PCC in coping. [6]
- Brick masonry. [5]
- Pointing to external exposed surface of brick masonry. [2]

- b) State the approximation to be made while working out quantity of reinforcement in a circular slab. [2]

- Q3)** a) Explain in detail the elemental bill method of approximate estimate for an irrigation project. [8]  
b) State various methods of approximate estimate for building and explain any one of that in detail. [8]

OR

- Q4)** a) Write in detail the method adopted in preparing an approximate estimate of a road project. [8]  
b) Explain with reasons why an approximate estimate should not be too approximate. [4]  
c) State the mode of measurement for colouring internal plastered wall surface of building. [4]

- Q5)** a) Explain how the various basic costs and indirect costs are considered in analysis of rates of building items. [8]  
b) Work out rate per cu.m for one brick thick first class brick masonry in cement mortar 1:6 in superstructure. [8]

OR

- Q6)** a) Write the detail specification for second class BB masonry in cement mortar (1 : 6) in superstructure. [8]  
b) Calculate requirement of cement colour for colouring 100 sq.m. of sand faced plastered surface with two coats. [4]  
c) Write short note on 'District Schedule of rates'. [4]

## **SECTION - II**

- Q7)** a) What is book value? Explain in detail the constant percentage or declined balance method for working out book value. [8]  
b) State the different methods of valuation of building and explain the one which can be used for valuation of a cinema hall. [8]  
c) What is standard rent. [2]

OR

- Q8)** a) A building costing Rs. 8,00,000/- has been constructed on a plot costing Rs. 3,00,000/-. The estimated life of the building is 80 yrs. The owner

desires to have 10% return on construction cost & 8% on the land cost. Assuming the annual repair to be at 0.5% of construction cost and other out goings at 30% of the gross income (i.e. rent). Workout the annual rent that should be charged for the building. Consider rate of interest for redumption of sinking fund as 6%. [8]

- b) Explain the following terms: [10]
- i) Annual sinking fund.
  - ii) Year's purchase at dual rate.
  - iii) Reversionary value of land.
  - iv) Belting of land.
  - v) Occupation lease.

**Q9)** a) State and explain in brief various types of specifications. [8]

b) What is 'Pre tendering'? Explain it in detail. [8]

OR

**Q10)** a) Briefly state the IS 1200 provisions for measurement of following items.

- i) Brick work.
- ii) Earthwork in excavation. [10]

b) Briefly state various points to be kept in mind while writing specifications. [6]

**Q11)** a) Explain 'percentage rate contract' with respect to following points. [12]

- i) Nature of aggrement.
- ii) List of documents required.
- iii) Mode of payment to contractor.
- iv) Suitability.
- v) Advantages.
- vi) Limitations.

b) Draft a specimen tender notice for the construction of a bridge assuming suitable details. [4]

OR

**Q12)** Write short notes on: [16]

- a) Departmental method of execution of work.
- b) Secured advances to contractor.
- c) Conditions of contract with respect to appointment of subcontractor.
- d) Termination of contract.



Total No. of Questions : 12]

[Total No. of Pages : 4

**P963**

**[3664]-112**

**B.E. (Civil)**

**ADVANCED CONCRETE TECHNOLOGY**

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

**SECTION - I**

- Q1)*** a) Compare the fly ash and silica fume cement with Portland pozzolana cement. [5]
- b) Explain the role of each compound during hydration process of cement.[5]
- c) Explain the concept of blended cement with respect to chemistry of reaction of cement and effect due to blending of cement on concrete.[6]

OR

- Q2)*** a) What do you understand by gel space ratio. [5]
- b) What is maturity concept related to concrete. [5]
- c) Explain relationship between aggregate and cement bond strength. [6]
- Q3)*** a) Explain waste material based concrete. [5]
- b) What is carbonation of concrete? Explain rate of carbonation and factors affecting it. [5]
- c) Explain how to obtain vacuum concrete and mass concrete. [6]

OR

***P.T.O.***

- Q4)** a) Explain jet cement concrete. [5]  
b) Explain no fine concrete. [5]  
c) Explain high strength concrete and high performance concrete. [6]

- Q5)** a) Design fly ash cement concrete mix, M40 by IS 10262-1982 for following data. [12]

Characteristic strength of concrete after 28 days = 40 MPa,

Slump = 50 mm, Maximum size of aggregate = 20 mm,

Fine aggregates confirm to Zone - II. Cement Grade = 53

Specific gravity of cement = 3.15 and that of both aggregates = 2.7,

Compaction factor = 0.9. Quality control = good, type of exposure = mild,

Water absorption for both aggregate = 1%, free moisture content = 2%.

- b) Design light weight concrete mix of **any grade** mentioning proper proportions of materials used. Use any method for design with following data. [6]

Slump = 70 mm, size of aggregate available = 12 and 20 mm,

Fine aggregates confirm to Zone - II. Cement Grade = 53

Specific gravity of cement = 3.15 and that of aggregates = 2.7

Compaction factor = 0.9. Quality control = good, type of exposure = mild,

Water absorption for both aggregate = 1%, free moisture content = 2%.

OR

- Q6)** a) Explain importance and procedure of pull out test for hardened concrete at field. [5]  
b) Explain nuclear method and infrared thermography non destructive test on concrete. [5]  
c) Explain following methods of non destructive testing. [8]  
i) Ground penetration Radar.  
ii) Break off maturity method.

## **SECTION - II**

- Q7)** a) Explain the historical development of fibre reinforced concrete till today. [5]
- b) Explain the role of metallic fibre in concrete related to tension and bending property. [5]
- c) Explain the effect of fiber type, volume fraction and specimen size and notch on fiber composites toughness. [6]

OR

- Q8)** a) Explain use of naturally occurring fibres in concrete and in mud houses. [5]
- b) Explain any two mechanical properties improved by addition of fibres in concrete. [5]
- c) Explain the major parameter affecting fiber interaction with homogeneous uncracked matrix with axial stress and shear stress. [6]

- Q9)** a) Describe the behaviour of polymeric FRC under compression and tension. [5]
- b) Explain the development and use of GFRC and SIFCON. [5]
- c) Write a brief technical report of site you visited, with reference to type of product manufactured, specifications of material used, Analysis and design principals involved, Testing methodology adopted and Quality control. [6]

OR

- Q10)** a) Describe the behaviour of steel FRC under compression and tension. [5]
- b) Enlist the different light weight material used for civil construction and state the physical properties of any one in detail. [5]
- c) Write a brief technical report of site you visited, with reference to type of product manufactured, specifications of material used, Analysis and design principals involved, Testing methodology adopted and Quality control. [6]

- Q11)**a) Explain the techniques and construction of G + 10 building using element / panels of Precast concrete construction. Draw the sketches of joint connection between beam to beam, beam to column, column to column, joint between slab units, etc. [10]
- b) Write a brief note on Ferro - cement with respect to productivity, properties and application. [4]
- c) Explain the design, construction and testing of any precast element to be used for building. [4]

OR

- Q12)**a) Explain the details of any industrial Precast concrete product with reference to the Material required, Analysis and design principals, Manufacturing method with flow chart, Testing methodology and Quality control. [10]
- b) Explain different erection and assembly techniques in precast concrete construction. [4]
- c) Explain the design, construction and testing of any precast element to be used for bridge. [4]



Total No. of Questions : 12]

[Total No. of Pages : 4

**P1341**

**[3664] - 114**

**B.E. (Civil)**

**ADVANCED TRANSPORTATION ENGINEERING**

**(Elective) (2003 Course)**

*Time : 4 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, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 6) Assume suitable data, if necessary.*

**SECTION - I**

**Q1)** Which are the various surveys needed for preparation of a comprehensive transport plan? Explain any 4 surveys in detail. **[18]**

OR

- Q2)** a) Explain the Furness method with an example. **[8]**  
b) Explain the working of the gravity model with an example. **[10]**

- Q3)** a) Explain the salient features of any 2 major urban transport planning projects being envisaged / executed in Maharashtra. **[8]**  
b) Discuss limitations of the BRT system and measures required to be taken to overcome these limitations. **[8]**

OR

- Q4)** a) Explain the importance of the statistical method of regression analysis in the transportation planning process with an example. **[8]**  
b) Explain the procedure adopted at the Bandra-Worli sea-link project for modelling the benefits and the costs of the project. **[8]**

- Q5)** a) Explain the methodology by way of which the toll should be decided on any BOT road project in order to maximize the revenues. **[8]**

*P.T.O.*



- b) What is economic analysis? Which are the commonly used methods for the same? Explain any 2 methods brief. [2 + 2 + 4]

OR

- Q6)** a) Differentiate between BOLT, BT, BOT and BOO with an example. [8]  
b) Explain the SION flyovers w.r.t.  
i) Economic appraisal.  
ii) Social benefits.  
iii) Traffic forecasting. [4 + 2 + 2]

### **SECTION - II**

- Q7)** a) Compare and contrast between the manual count method and the moving vehicle method with an example. [8]  
b) Explain the term "Classified count" with an example. State the PCU conversion factors as per IS for  
i) Horse driven vehicles. ii) Hand Carts.  
iii) Scooters. iv) Heavy vehicles.  
v) Cars. vi) Cycle rickshaw. [4 + 6]

OR

- Q8)** a) Graphically, explain the procedure of determining the peak hours during the morning and evening traffic movement. Why are these hours determined? [6 + 2]  
b) Explain with examples.  
i) Spot and speed delay studies.  
ii) Parking surveys. [5 + 5]

- Q9)** a) Explain the role of the Benkelmen Beam test in the overlay design. How is the test conducted? Explain with a neat sketch. [2+6]  
b) Compare and contrast between flexible and rigid pavements on any 8 points. [8]

OR

- Q10)** a) Design a flexible pavement for construction of a new bypass with the following data:  
i) Type of road - single lane single carriage way.  
ii) CVPD in one direction before start of construction = 1000.

- iii) Traffic growth rate = 3% per annum.
- iv) Construction period = 2 years.
- v) Design life = 15 years.
- vi) Terrain → plain.
- vii) CBR of subgrade 5%.

Draw a neat sketch showing all the layers. [12]

- b) Explain importance of proper drainage on flexible pavements. [4]

**Q11)** Explain the step-by-step procedure of carrying out the rigid pavement design, including the dowel bar and tie bar design, as per IRC - 58. [16]

OR

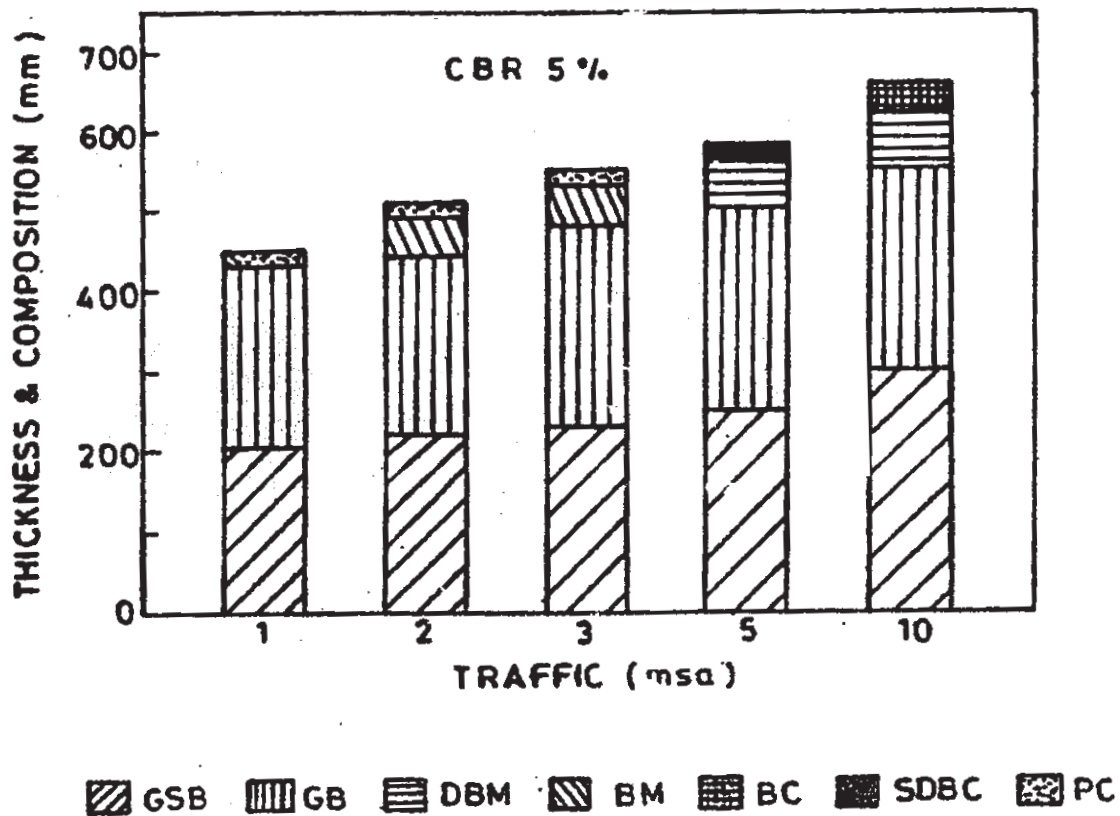
- Q12)**
- a) Draw a neat sketch showing proper arrangements of tie bars and dewel bars. [5]
  - b) Draw a typical cross - section of the rigid pavement clearly showing various layers and the drainage arrangement. [5]
  - c) Explain the method of carrying out axle load surveys and state its importance in rigid pavement design. [6]



## PAVEMENT DESIGN CATALOGUE

## PLATE 1 – RECOMMENDED DESIGNS FOR TRAFFIC RANGE 1-10 msa

CBR 5%					
Cumulative Traffic (msa)	Total Pavement Thickness (mm)	PAVEMENT COMPOSITION			
		Bituminous Surfacing		Granular Base (mm)	Granular Sub-base (mm)
		Wearing Course (mm)	Binder Course (mm)		
1	430	20 PC		225	205
2	490	20 PC	50 BM	225	215
3	530	20 PC	50 BM	250	230
5	580	25 SDBC	55 DBM	250	250
10	660	40 BC	70 DBM	250	300



Contd.

Total No. of Questions : 11]

[Total No. of Pages : 3

**P964**

**[3664]-116**

**B.E. (Civil)**

**CONSTRUCTION MANAGEMENT**

**(Elective - II) (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) 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)** In 21<sup>st</sup> Century, India is developing very fast in all directions especially in infrastructure projects. To name a few amongst them are: **[9]**

- i) Sardar Sarovar / Narmada Project.
- ii) Worli Bandra Sea Link Project.
- iii) Golden Quadrilateral Project.

Discuss any one of the above project w.r.t. following points.

- 1) Environmental impact.
  - 2) Social impact.
  - 3) Economical aspect.
- b) As an Executive Engineer for a prestigious Spine Road Project, discuss the Principles of Management viz. Planning, Organising, Execution and Controlling in day to day working of the project. **[9]**

**Q2) a)** Write short notes on: **[8]**

- i) JIT system.
- ii) MRP system.

b) What are the duties and responsibilities of a material manager? **[8]**

**OR**

**P.T.O.**

- Q3)** a) Discuss 4M's in construction in detail. Also discuss its importance in Resource Mngt. [8]  
b) Write short notes on: [8]  
i) Music 3D rule.  
ii) EOQ.

- Q4)** a) Discuss the procedure for getting financial aid from World Bank for an infrastructure project. [8]  
b) What are the different Project Feasibility Analysis Reports for a construction project? Discuss any two of them in detail. [8]

OR

- Q5)** a) Why it is necessary to grade a construction company? What are the guidelines given by ICRA in this respect. [8]  
b) Discuss the points that are included in Environmental Assessment Studies of a dam project. [8]

## **SECTION - II**

- Q6)** a) What are the phases of Disaster Management System? Explain each one in brief. [9]  
b) What are the steps involved in mitigation of Earthquake disaster. [9]

OR

- Q7)** a) What are the major disasters that are faced by Indian subcontinent? Discuss any one it. [9]  
b) Discuss the situation under which Evacuation of a building and Evacuation of a town is carried out. [9]

- Q8)** a) Discuss various clauses described in Works Contract Act. [8]  
b) Design a training programme for the site engineers before implementing new technique on site. [8]

OR

- Q9)** a) Discuss Indian Arbitration Act in detail. [8]  
b) What are the advantages and drawbacks of Training? What are different types of training programmes? [8]

- Q10)a)** Write a detail note on CIDC w.r.t Role of CIDC in construction scenario, policies, etc. [8]
- b) Write the application and use of MIS for construction industry. [8]

OR

- Q11)a)** What are the types of risks? What are the methods followed for Risk Mitigation? [8]
- b) Write a detail note on Risk Mitigation. [8]



Total No. of Questions : 12]

[Total No. of Pages : 4

**P968**

**[3664]-123**

**B.E. (Mechanical)**

**DYNAMICS OF MACHINERY**

**(2003 Course) (402042)**

*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**

**Unit - I**

- Q1)** a) Define the following terms related to gyroscope with neat sketch:  
(i) Axis of spin, (ii) Axis of couple, (iii) Axis of precession, (iv) Active and Reactive gyro. couple. [8]
- b) A disc of mass 5 kg and of radius of gyration of 90mm is mounted centrally on a horizontal shaft of 120mm length between the bearings. The disc is spinning about the axis of the shaft at 620 rpm anticlockwise, when viewed from the right-hand side bearing. The shaft precesses about a vertical axis at 35rpm in the clockwise direction when observed from the top. Determine the resultant reaction at each bearing due to the mass and the gyroscopic effect. [8]

OR

- Q2)** a) Explain the terms - steering, pitching and rolling in a ship. Discuss their gyroscopic effects. [8]
- b) A pair of flanged wheels 1.2m in diameter are mounted on axle rolls along rails spaced at 1.3m apart. The axle negotiates a curve of 150 m mean radius at a speed of 60 km/hr. Determine the reactions at the rails. The wheels are thin discs of 270 kg mass each. The rails are at the same level. Neglect the mass of the axle. [8]

**Unit - II**

- Q3)** a) What do you understand by (i) static unbalance and (ii) Dynamic unbalance. [4]
- b) With the help of a neat sketch, explain in brief the working of static and Dynamic balancing machines. [4]
- c) A shaft rotates in two bearings A and B, 1.8m apart and projects 0.45m

*P.T.O.*

beyond A and B. At the extreme ends of the shaft are attached two pulleys of masses 20kg and 48 kg; their centre of gravity being 12.5mm and 15.5mm respectively, from the axis of the shaft. In the middle of the bearings is attached a third pulley of mass 50kg with centre of gravity out by 15.5mm. If the three pulleys have been arranged so as to obtain static balance; Determine the dynamic force produced on the bearings when the shaft speed is 300 rpm. [8]

OR

- Q4)** a) What are V-engines? How do they differ from the rest of the reciprocating engines. [4]
- b) Explain the direct and reverse Crank method for determining unbalanced forces in radial engines. [4]
- c) The cranks of a four cylinder marine oil engine are arranged at angular intervals of  $90^\circ$ . The engine speed is 70rpm and the reciprocating mass per cylinder is 800 kg. The inner cranks are 1m apart and are 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 and also magnitude of the unbalanced primary couple for that arrangement. [8]

### Unit - III

- Q5)** a) Describe the following method to find natural frequency of vibratory system. (i) Equilibrium method, (ii) Energy method, (iii) Rayleigh method. [6]
- b) A cylindrical disc of mass 'm' and radius 'r' is suspended from a point on its circumference. Determine its natural frequency of oscillation. [6]
- c) A homogeneous solid cylinder of length "L", cross - sectional area 'A' and specific gravity 'S' ( $S < 1.0$ ) is floating in water with its vertical. Neglecting any accompanying motion of water, determine the differential equation of motion and the period of oscillation of the cylinder if it depressed slightly and then released. [6]

OR

- Q6)** a) Derive an expression for the motion of spring-mass-dashpot system in case of - (i) over damped system, (ii) critically damped system, (iii) under damped system. [6]
- b) A horizontal spring mass system with coulomb damping has a mass of 5.0 kg attached to a spring of stiffness 980 N/m. If the c.o.f. is 0.025; calculate.
- the frequency of free oscillations.
  - the number of cycles corresponding to 50% reduction in amplitude if the initial amplitude is 50 mm and.
  - the time taken to achieve this reduction. [6]
- c) An underdamped shock absorber is to be designed for a motor cycle of



mass 200 kg such that during road bump, the damped period of vibration is limited to 2 sec and the amplitude of vibration should reduce to one-sixteenth in one cycle. Find the necessary (i) stiffness; (ii) Damping coefficient of the shock absorber. [6]

## **SECTION - II**

### **Unit - IV**

- Q7)** a) Define motion and force transmissibility and derive expression for it, incase of spring-mass-dashpot vibratory system. [8]
- b) A body of mass 75 kg is suspended from a spring which deflects 18 mm under the load. It is subjected to a damping effect adjusted to a value 0.25 times that required for critical damping. Find the natural frequency of undamped and damped vibrations and ratio of successive amplitude for damped vibrations. If the body is subjected to a periodic disturbing force of 625N and of frequency equal to 0.63 times the natural undamped frequency, find the amplitude of forced vibrations and phase difference with respect to the disturbing force. [8]

OR

- Q8)** a) Draw and explain transmissibility versus frequency response curves and phase angle versus frequency response curves. [4]
- b) A mass of 250 N is supported by a spring and dashpot. The spring is stretched by 150 mm due to weight and the dashpot has coefficient of damping 1000N per metre per sec. If the support is oscillation in S.H.M. with amplitude 25 mm and frequency 6 rad / sec. Find. [12]
- i) The amplitude of load;
  - ii) The relative amplitude between load and support.
  - iii) The amplitude of the load when the frequency of disturbing force is equal to the natural frequency.
  - iv) The amplitude of the load when the dash pot has been grounded and the frequency of support is (a) 6 rad / sec; (b) equal to natural frequency of load.

### **Unit - V**

- Q9)** a) What do you understand by torsionally equivalent shaft? Derive an expression for the equivalent length of a shaft which have several steps. [4]
- b) A periodic torque having a maximum value of 0.65 N-m, at a frequency corresponding to 5 rad / sec is impressed upon a flywheel suspended from a wire. The wheel has a moment of inertia of 0.15 kg-m<sup>2</sup> and the wire is having diameter of 6 mm and length of 1.2 m. The modulus of rigidity of the material of wire is equal to  $0.8 \times 10^{11}$  N/m<sup>2</sup>. A viscous dashpot applies damping couple of 0.693 N-m at an angular velocity of 1.5 rad / sec.
- Calculate : (i) The maximum angular displacement from the rest position, (ii) The maximum couple applied to dashpot, and (iii) The angle by which the angular displacement lags the torque. [12]

OR

- Q10)a)** Derive an expression for natural frequency of torsional vibrations of a two and three rotor system. [4]
- b) An electric motor running at 2250 rpm drives a centrifugal pump running at 650 rpm through a single stage gear reduction. The motor armature has a moment of inertia of  $32 \text{ kg m}^2$  and the pump impeller of  $84 \text{ kg m}^2$ . The shaft from the pump to gears is 90 mm diameter and 3600 mm long and that from motor to the gears is 600 mm long.
- What should be the diameter of the shaft from the motor to the gears to ensure the node for natural torsional vibrations is at the gears? Determine the frequency of these vibrations and the amplitude of the impeller vibrations for an amplitude of one degree of the motor. [12]

### Unit - VI

- Q11)a)** How will you determine the critical speed of a rotor shaft? State its significance in the design of a shaft of a rotating machine? Explain the method of determining whirling of shafts carrying single rotor. [9]
- b) A vertical shaft 12.5 mm in diameter rotates in sleeve bearings and disc of mass 15 kg is attached to the shaft at mid span. The span of the shaft between bearings is 0.5 m. The mass centre of the axis is 0.5 mm from the axis of the shaft.
- Determine the critical speed of rotation of the shaft.
- What is the speed range in which the bending stress in the shaft will exceed  $125 \text{ N/mm}^2$ ?
- Assume  $E = 2 \times 10^5 \text{ N/mm}^2$ . [9]

OR

- Q12)a)** Explain the basic principle of Seismic pick-up used for measurement of displacement and acceleration. [6]
- b) What is FFT? With the help of block diagram, explain the working of FFT analyzer. State the applications of FFT analyzer with reference to vibrations and noise. [6]
- c) A vibration measuring device is used to find the displacement, velocity and acceleration of a machine running at 150 rpm. If the natural frequency of the instrument is 4 Hz and it shows  $5 \mu\text{m}$  what are the three readings? Assume no damping. [6]



Total No. of Questions : 12]

[Total No. of Pages : 4

**P1343**

**[3664]-142**

**B.E. (Mechanical Sandwich)**

**INDUSTRIAL HYDRAULICS AND PNEUMATICS**

**(402062) (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) Discuss important factors considered for selection of hydraulic fluids.[6]  
b) What types of heat exchangers are used in conjunction with hydraulic systems? [6]  
c) Explain with the help of graphs, the effect of temperature and pressure on hydraulic fluids. [6]

OR

- Q2)** a) What is the difference between static and dynamic seal? [6]  
b) What are the sources of oil contamination? How to control it? [6]  
c) Explain applications of fluid power in farm industry. [6]

- Q3)** a) What is the function of a Hydraulic Power Unit? Explain with neat diagram. [8]  
b) What are the different applications of an accumulator? Explain with circuits. [8]

OR

- Q4)** a) Classify positive displacement pumps based on constructional features and oil flow. [8]  
b) An axial piston pump running at 1000 rpm. Pump has nine 15mm diameter pistons arranged on a 125mm diameter piston circle. The offset angle is set at 10° and the volumetric efficiency is 94%. Find the flow rate in L/s. [8]

**P.T.O.**

- Q5) a)** What is the difference between a standard check valve and a pilot operated check valve? In what applications are the pilot operated check valves useful? [8]
- b)** What is a pressure compensated flow control valve? Explain with neat sketch. [8]

OR

- Q6) a)** State rules followed in Indian Standard of Graphical symbols for fluid power systems. Draw symbols for 1. Two pressure valve 2. Pressure reducing valve 3. Quick exhaust valve 4. Accumulator 5. Hydraulic motor 6. Intensifier 7. Direction control valve and 8. Flow control valve. [8]
- b)** Define the terms Cracking pressure, full flow pressure, and pressure override. Why are the pressure override characteristics of a pressure relief valve important? [8]

### **SECTION - II**

- Q7) a)** A horizontally mounted cylinder is required to extend against a load of 22000 N that is at an angle of 30° to the cylinder axis. The cylinder has a bore diameter of 50 mm. What is the required pressure? [8]
- b)** Draw and explain motor breaking circuit. [8]

OR

- Q8) a)** Draw and explain circuit for hydraulic press with accumulator and intensifier. [8]
- b)** Design a circuit to show how two sequence valves can be used in conjunction with a four way control valve to operate two cylinders in sequence. [8]

- Q9) a)** Draw and explain a typical compressed air generation and distribution system. [8]
- b)** A suction cup with an inside diameter of 50mm is used in a vacuum system that pulls 500mm Hg. What is the maximum lifting force? [8]

OR

- Q10) a)** How do pneumatic actuators and control valves differ from hydraulic actuators and control valves? [8]
- b)** A double acting pneumatic cylinder with a 80 mm bore, 25mm rod and a 100mm stroke length must cycle (extend and retract) 40 times per minute. The supply pressure is 700 kPa gauge. What is the air consumption of the cylinder in standard m<sup>3</sup>/min. [8]

- Q11)a)** Analyze the two hand safety pneumatic circuit shown in figure for the continuous reciprocation of cylinder piston. What will happen to the cylinder piston if one or both the control valves are released? Valve 7 is shuttle valve. [10]

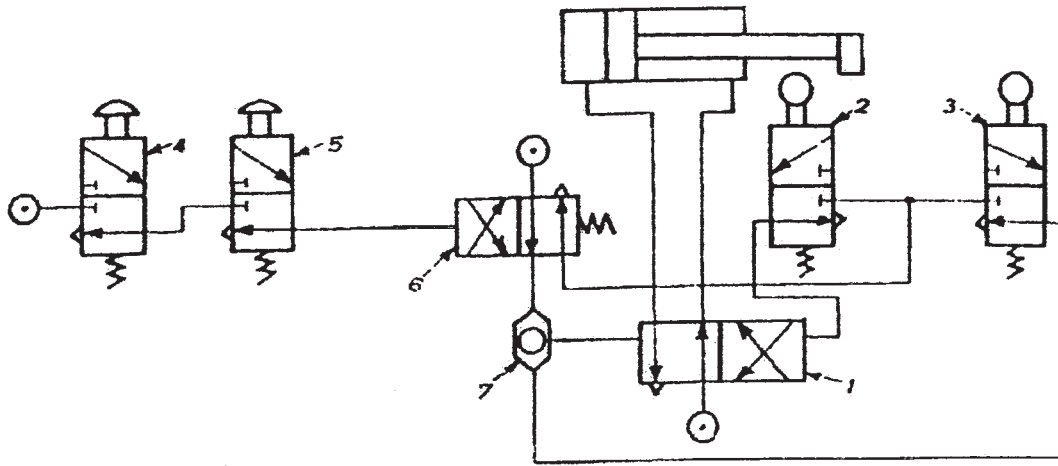


Figure 1

- b) Explain the operation of a double acting cylinder when started with a push button valve as shown in figure 2. Indicate the limitation of the circuit. [8]

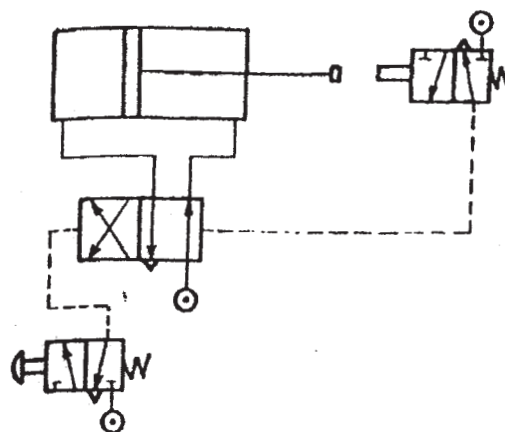


Figure 2

OR

**Q12)a)** A pilot operated 3/2 direction control valve 'A' is used in regenerative circuit as shown in figure 3. Draw the circuit to show the following operations.

- i) Fast movement of extension stroke.
- ii) Extension with full force applied.
- iii) Retraction at normal speed.

And also derive equation for the same extension and retraction speeds.

[10]

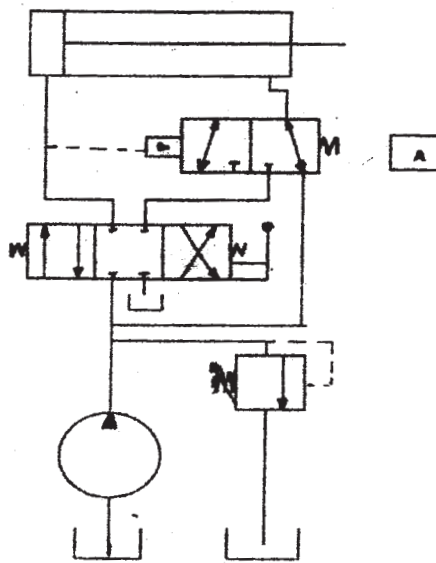


Figure 3

b) Explain with proper circuit the counterbalance valve in the hydraulic power equipment. [8]



Total No. of Questions : 10]

[Total No. of Pages : 3

**P1306**

**[3664]-16**

**B.E. (Mechanical Sandwich)**  
**FLUID MACHINERY & FLUID POWER**  
**(1997 Course) (402062)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates :*

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

**SECTION - I**

- Q1)** a) Show that when a jet of water impinges on a series of curved vanes, maximum efficiency is obtained when the vane is semi-circular in section and the velocity of vane is half that of jet. **[8]**
- b) A 2.5 cm diameter jet of water strikes a symmetrical vane tangentially at one end and leaves at the other end. After impingement, the jet gets deflected through  $160^\circ$  by the vane. Calculate the thrust exerted by jet on the vane if the discharge is  $0.00736 \text{ m}^3/\text{s}$ . Presume the vane to be smooth. **[8]**
- Q2)** a) Explain the characteristic features of the cup of a Pelton wheel. What are the limitations in keeping the deflection angle of the cup as  $180^\circ$ ? **[6]**
- b) A Pelton wheel works at the foot of a dam because of which the head available at the nozzle is 220 m. The nozzle diameter is 20 cm and the coefficient of velocity is 0.98. The wheel operates at 250 rev / min and develops 3.75 MW of power. Assuming that the blade outlet angle is  $16^\circ$  and the wheel of jet speed ratio is 0.46, make calculations for the wheel diameter at the pitch circle of the blades, the hydraulic efficiency and the turbine efficiency. **[10]**
- Q3)** a) Discuss in general the main & operating characteristics of a hydraulic turbine. **[6]**

*P.T.O.*

- b) For a Kaplan turbine with runner diameter 4m, the discharge is 60 m<sup>3</sup>/s and the hydraulic and mechanical efficiencies are stated to be 90% and 94% respectively. The diameter of boss is 0.3 times the runner diameter and the speed ratio is 2. Assuming that discharge is free and there is no swirl at outlet, calculate net available head on the turbine, the power developed and specific speed. [10]

- Q4)** a) Draw a neat sketch of centrifugal pump and explain how it operates.[6]  
b) The impeller of a centrifugal pump has diameter of 16 cm, width 1.6 cm and vanes bent at 60° to the tangent at outlet. The flow velocity is constant and the pressure increase through the impeller is 70% of the total head generated by the pump. If the pump has to deliver water against a total head of 25 m with manometric efficiency 80%, determine the operating speed in rev / min and the discharge in liters / min. Neglect losses in the impeller and assume radial entry at inlet. [10]

**Q5)** Write short note on the following: [18]

- a) Centrifugal pumps versus reciprocating pumps.
- b) Cavitations in hydraulics machines.
- c) Variable speed characteristics of centrifugal pumps.

## **SECTION - II**

- Q6)** a) List and explain in short eight applications of fluid power in the automotive industry. [8]  
b) What is the difference between static and dynamic seal? [4]  
c) Name and explain four types of materials used for seals. [4]
- Q7)** a) Explain in detail ways in which directional control valves may be actuated. [8]  
b) How can displacement be varied in an axial piston pump? [8]
- Q8)** a) Draw and explain circuit for shaper machine. [8]  
b) Why is pneumatic control system termed as low cost automation? [8]



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

b) Draw symbols of the following fluid power components:

- i) Gas charged accumulator.
- ii) Flow meter.
- iii) Cylinder with cushion.
- iv) Pressure reducing valve.
- v) Pressure relief valve.
- vi) Pilot operated check valve.
- vii) Quick exhaust valve.
- viii) Shuttle valve.

[8]

**Q10)** Write short note on the following :

[18]

- a) Unloading valve.
- b) Sequence valve.
- c) Pressure Reducing valve.



Total No. of Questions : 12]

[Total No. of Pages : 4

**P980**

**[3664]-162**

**B.E. (Production Engg.)**

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

**SECTION - I**

- Q1)** a) Define the following terms: [6]  
i) Part print                      ii) Specifications                      iii) Routing  
iv) Process picture                      v) Equipment                      vi) Assembly chart  
b) Explain in detail with a neat line diagram how the manufacturing processes are classified. [10]

OR

- Q2)** a) Explain the functions of process engineering department. [8]  
b) What is an organization chart? Explain the significance of process engineer and product engineer location in the organization. [8]

- Q3)** a) Explain the following with symbols used on part print: [8]  
i) Flatness                                      ii) Concentricity  
iii) Angularity                                      iv) Squareness  
b) What key points are to be considered in determining the nature of the work to be performed and functional surfaces on the workpiece? [8]

OR

- Q4)** a) Distinguish between the angular and rectangular dimensions. [4]  
b) What is the purpose of grouping related surfaces or areas? Explain. [8]  
c) Define the following: [4]  
i) Superfluous dimensions                      ii) Functional dimensions

**P.T.O.**

- Q5)** a) What causes workpiece variations? What are the variables which interface with workpiece control? [8]  
b) What is a tolerance chart? What are the symbols used in tolerance chart? Why is it necessary to balance a tolerance chart? [10]

OR

- Q6)** a) What are the rules for locating long cylindrical and short cylindrical work pieces? Explain with a neat line diagram. [8]  
b) Explain the following w.r.t work piece control. [10]  
i) Dimensional control                      ii) Mechanical control

## **SECTION - II**

- Q7)** a) Explain the steps involved in machine selection method with a neat flowchart. [8]  
b) What are the factors affecting machine selection? Explain. [4]  
c) Distinguish between general purpose machines and special purpose machines? [4]

OR

- Q8)** a) What are the factors affecting tool selection? Explain in brief. [8]  
b) What are the rules to be followed while assigning operation numbers in process sheet design? [4]  
c) Explain the difference between commercial tooling and regular tooling. [4]

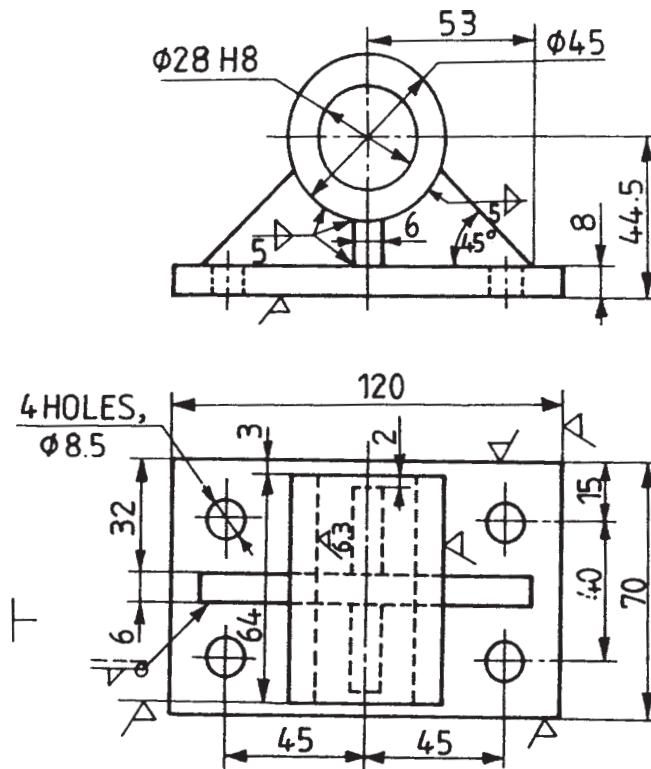
- Q9)** a) What are the advantages and limitations of computer aided process planning? [6]  
b) Explain in detail the steps involved in variant process planning. List any four CAPP software packages used in manufacturing industry. [10]

OR

- Q10)** a) Explain the following with examples: [12]  
i) Basic processes                      ii) Principal processes  
iii) Qualifying operations              iv) Secondary operations  
b) Explain the differences between product critical areas with process critical areas with a sketch. [4]

**Q11)** Prepare the process sheet for the welded shaft support shown in Fig.1. which is to be manufactured on batch production basis. The process sheet must contain manufacturing plan with operation sequence, equipment, tooling, process parameters and sample calculation of operation time. Design a proper work holding device to drill and bore  $\varnothing 28$  mm dimension. Study the welding symbols carefully before planning. **[18]**

Material - Mild Steel



$\varnothing 28$  H8  $\begin{matrix} +0.033 \\ +0.000 \end{matrix}$

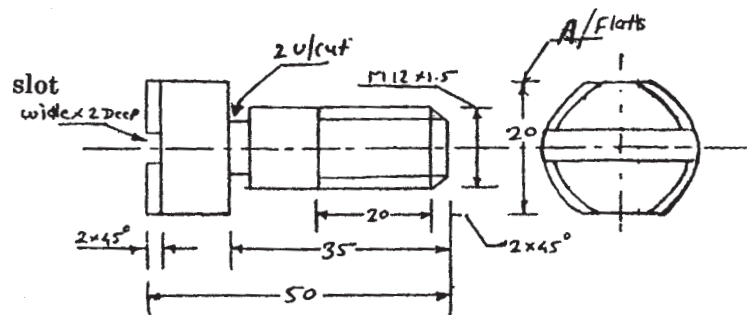
MATL		TOL.	FINISH
		$\pm 0.5$	$\frac{6.3}{12.5}$ ( $\nabla$ )
		Welded shaft support	

**Fig.1 Welded shaft support**

OR

**Q12)** Prepare the process sheet for a special bolt shown in Fig.2. which is to be manufactured on batch production basis with 1200 Nos/Week. The process sheet must contain detailed manufacturing plan with operation sequence, equipment, tooling, process parameters and sample calculations of operation time. Design a milling fixture to machine the flats and slot in the head of a special bolt. [18]

Material - C - 40 steel



**Fig.2. A special bolt**

□□□

Total No. of Questions : 12]

[Total No. of Pages : 4

**P1120**

**[3664]-163**

**B.E. (Production Engineering)**

**CAD / CAM / CIM**

**(2003 Course)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) Attempt one question from each unit in Section-I and Section-II.*
- 2) Answer to the two sections should be written on separate answer books.*
- 3) Figures to the right indicate full marks.*
- 4) Assume suitable data if necessary.*

**SECTION - I**

**Unit - I**

- Q1)** a) Perform the following transformation if the co-ordinates of the vertices of the pentagon are P(1, 2), Q(13, 2), R(19, 5), S(19, 8) & T(13, 12). The transformation are **[8]**
- i) Scale the object by factor 1.5
  - ii) Rotate the scaled object about P by  $60^\circ$  in counter clockwise direction.
- b) What is the best kind of geometric modeling system? What are the primitives used in solid modeling? **[8]**

OR

- Q2)** a) Write note on: **[10]**
- i) Random scan display
  - ii) Direct view storage tube
- b) Draw the sketches for following primitives used in modeling & also write their mathematical representation. **[6]**
- i) Sphere
  - ii) Torus
  - iii) Wedge

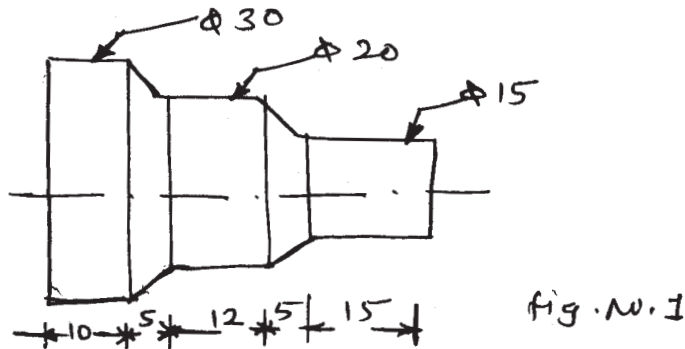
**P.T.O.**

## Unit - II

- Q3)** a) Explain the different elements of FMS. [8]  
b) Explain in detail word address format with some example for CNC programming. [10]

OR

- Q4)** a) With neat sketch explain FMS, FMC & FMM. [9]  
b)



for job shown in Fig. No. 1 write down CNC program in G&M code. [9]

## Unit - III

- Q5)** a) Write a note on: [10]  
i) Bill of material module  
ii) Standard Product Routing  
b) Explain Role of computer in production management system. [6]

OR

- Q6)** a) Discuss MRP I & MRP II in modern manufacturing system with sketch. [8]  
b) Explain shopfloor control module in CIM. [8]

## SECTION - II

## Unit - IV

- Q7)** a) Differentiate product manufacturing by RP technique with other manufacturing technique. [8]  
b) With neat sketch explain a solid ground curing process. [7]

OR

**Q8)** a) What is Rapid prototyping? List out different RP techniques. Write advantages of RP. [7]

b) What is 3-D printing? Explain how product is manufacturing from it. [8]

**Unit - V**

**Q9)** a) Explain different methods of cell formation in Group technology. [8]

b) Determine the most logical sequence for a given data according to To-From Ratios. Construct flow diagram, develop feasible plant lay out for cell where the part enters & exists the cell. [6]

	1	2	3	4	5
1	0	5	75	0	0
2	0	0	0	80	0
3	0	0	0	0	0
4	65	0	15	0	0
5	0	70	0	15	0

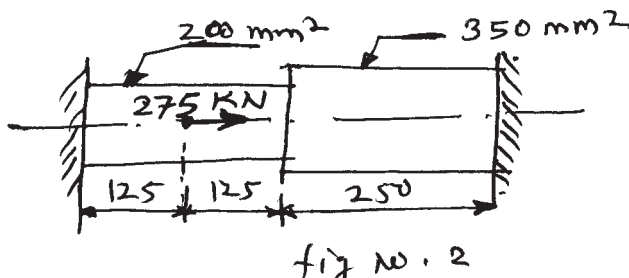
c) Explain the following with sketch related to FEA. [6]

- i) Node & member
- ii) Global axis
- iii) Degree of freedom

OR

**Q10)** a) Consider the bar shown in Fig No. 2. Determine the nodal displacement, element stresses & reactions. [15]

Assume  $E = 200 \times 10^9 \text{ N/m}^2$



$$A_1 = 200 \text{ mm}^2$$

$$A_2 = 350 \text{ mm}^2$$

$$\text{Load} = 275 \text{ kN}$$

b) What do you understand by term Group Technology? Explain how it should be implemented in manufacturing company. [5]



### **Unit - VI**

- Q11)*** a) Explain with flow chart the concept of the NIST-AMRF hierarchical model. [8]
- b) What is CIM OSA model? How it will be apply in operating environment? [7]

OR

- Q12)*** a) Define 'Design for quality' & discuss its importance in manufacturing era. [7]
- b) Explain the scope of integration of CIM model of Digital Equipment Corporation (DEC). [8]

□□□

Total No. of Questions : 12]

[Total No. of Pages : 2

**P938**

**[3664]-166**

**B.E. (Prod. / Prod. S/W)**

**ADVANCED MATERIAL PROCESSING**

**(1997 Course & 2003 Course) (Elective - II)**

**Time : 3 Hours]**

**[Max. Marks : 100**

**Instructions to the candidates :**

- 1) Attempt one question from each unit in Section - I and Section - II.**
- 2) Answers to the two sections should be written on separate answer books.**
- 3) Figures to the right indicate full marks.**
- 4) Assume suitable data, if necessary.**

**SECTION - I**

**Unit - I**

**Q1) a)** Explain with suitable example the necessity of development in tool geometry for higher productivity. **[8]**

**b)** Compare the dynamic turning with oscillating turning operation. **[8]**

**OR**

**Q2) a)** Explain the requirements of machine tool for high speed machining. **[8]**

**b)** Explain with neat sketches the development in insert used for milling operation. **[8]**

**Unit - II**

**Q3) a)** Draw a neat sketch of electro chemical grinding process. State & explain the process characteristics of it? **[8]**

**b)** Related to EDM process explain following- **[8]**

**i)** Electrode material.

**ii)** Requirement of electrode material.

**iii)** Function of dielectric fluid.

**iv)** Electrode shapes.

**OR**

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

**i)** Voltage drop across gap between electrode in ECM process.

**ii)** STEM process.

**b)** Explain chemical milling process in detail. **[6]**

**P.T.O.**

### **Unit - III**

- Q5)** a) Differentiate between isothermal forging & hotdie forging. [9]  
b) What is ring rolling? Explain the different stages in ring rolling. [9]

OR

- Q6)** a) What is may netoforging? Explain the process consideration in it. [9]  
b) What is hydroforming? Explain different methods of hydroforming.[9]

### **SECTION - II**

#### **Unit - IV**

- Q7)** a) Draw a sketch for a component casted by injection casting process. Explain in detail how it is casted in injection casting process. [8]  
b) Listout different casting process for brass component. Explain any one in detail. [8]

OR

- Q8)** a) Write a note on - [10]  
i) No-flask casting process. ii) Direct chill process.  
b) With neat sketch explain in short Reciprocating mould process. [6]

#### **Unit - V**

- Q9)** a) Explain different joining processes used in joining of plastic, glass. [8]  
b) Explain the process for manufacturing a product like blown film Jar, bucket, Racket, Plug. [10]

OR

- Q10)a)** Write a note on- [12]  
i) Thermoforming process for plastic product.  
ii) Slip casting process for ceramic.  
b) Explain how will you do printing on plastic. [6]

#### **Unit - VI**

- Q11)a)** Listout different coating processes for metal coating? Explain any one in detail. [8]  
b) List out different defect of paint coating. Explain few defect along with causes & remedies. [8]

OR

- Q12)a)** Explain the different methods for surface cleaning. [8]  
b) Explain the LIGA process. [8]



Total No. of Questions : 12]

[Total No. of Pages : 2

**P1121**

**[3664]-167**

**B.E. (Production)**

**ADVANCED PRODUCTION TECHNOLOGY**

**(Elective-II) (2003 Course)**

*Time : 3 Hours]*

*[Max. Marks : 100*

**Instructions :**

- 1) *Solve one question from each unit from Section-I and Section-II.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Draw block diagram wherever necessary.*

**SECTION - I**

**Unit - I**

- Q1)** a) What are the key features of Toyota's production system? [8]  
b) What is Kanban? Explain how Kanban system is implemented in production industry. [8]

OR

- Q2)** a) Explain how toyota's production system is different from other production system. [8]  
b) What is meant by production smoothing in TPS and how it will achieve? [8]

**Unit - II**

- Q3)** a) What is Business process Reengineering? Explain stages in BPR. [9]  
b) Explain the concept of value stream mapping. [9]

OR

- Q4)** a) Explain different technique for single minute exchange of die with suitable example. [9]  
b) What is meant by Bench marking? Explain how it is set with suitable example. [9]

**Unit - III**

- Q5)** a) Define productivity. How will you measure a productivity explain with suitable example. [8]  
b) What is meant by performance? Explain different ways for performance measurement. [8]

OR

- Q6)** a) Differentiate productivity and it's measurement related to small and batch type engineering industries. [8]  
b) What is meant by MBO? State it's importance. [8]

**P.T.O.**

## **SECTION - II**

### **Unit - IV**

- Q7)** a) Explain knowledge based system in manufacturing system. [8]  
b) What do you understand by the process interaction approach? [8]

OR

- Q8)** a) Explain use of inference engine in knowledge base expert systems. [8]  
b) Explain the various steps used in simulation study. [8]

### **Unit - V**

- Q9)** a) Explain the concept of system and it's application in engineering design. [8]  
b) Explain design synthesis and function analysis of design. [8]

OR

- Q10)** a) Explain methodology of system design. [8]  
b) What are the different product attributes and explain different product attributes? [8]

### **Unit - VI**

- Q11)** a) Define technology management and it's characteristics. [9]  
b) Explain the use of technology management in manufacturing industry. [9]

OR

- Q12)** Related to Technology management write note on :- [18]  
a) Levels of development.  
b) Technological Environment.  
c) Evolution and diffusion.

□□□

Total No. of Questions : 6]

[Total No. of Pages : 6

**P1153**

**[3664]-168**

**B.E. (Production S/W)**

**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.*
- 6) *All questions are compulsory.*

**SECTION - I**

- Q1)** a) 'Operations Research' is the out of giving bad answers to the problems, to which, otherwise have worse answers - Discuss. **[4]**
- b) A paper mill produces rolls of paper used in cash registers. Each roll of paper is 100 m in length and can be used in the widths of 3, 4, 6 and 10 cm. The company's production process results in rolls that are 24 cm in width. Thus the company must cut its 24 cm roll to the desired widths. It has six basic cutting alternatives as follows.

Cutting alternatives	Width of rolls (cm.)				Waste (cm.)
	3	4	6	10	
I	4	3	—	—	—
II	—	3	2	—	—
III	1	1	1	1	1
IV	—	—	2	1	2
V	—	4	1	—	2
VI	3	2	1	—	1

The minimum demand for four rolls is as follows

Roll width (cm.)	-	2	4	6	10
Demand	-	2000	3600	1600	500

**P.T.O.**

The paper mill wishes to minimise the waste resulting from trimming to size.

- i) Construct the L.P. model. Do not solve the problem. [6]
- ii) Write the dual of the above L.P. model. [4]
- c) Define the following terms in L.P.P. [4]
  - i) Redundant constraint
  - ii) Unbounded solution
  - iii) Basic variable
  - iv) Basic solution

OR

- a) Solve the following L.P.P. [13]

$$\begin{aligned}
 &\text{Maximise } z = 4x_1 + 3x_2 + 6x_3 \\
 &\text{S.t. } 2x_1 + 3x_2 + 2x_3 \leq 440 \\
 &\quad 4x_1 + 3x_3 \leq 470 \\
 &\quad 2x_1 + 5x_2 \leq 430, \quad x_1, x_2, x_3 \geq 0
 \end{aligned}$$

- b) If above represent mathematical model for 3 resource, 3 product mix problem then -
  - i) Which resource is not fully utilised? By what amount? [2]
  - ii) If a new product (Say 4<sup>th</sup>) consumes 3 units of all three resources for what profit, this product should be manufactured? [3]

- Q2)** a) Solve the following transportation problem for minimisation of cost. [10]

	To			ai
From	2	7	4	5
	3	3	1	8
	5	4	7	7
	1	6	2	14
bj	7	9	18	

- b) Write the L.P. form of an assignment problem. [3]
- c) 'Travelling Salesman Problem', if solved by assignment method may have a sub-optimal solution. Comment. [3]

OR

- a) A city corporation has decided to carry out road repairs on main four roads of city. The government has agreed to make a special grants of Rs. 50 lakhs towards the cost with a condition that the repairs should be done at lowest cost & if work is completed within time, additional grants, if required, can be considered. Five contractors are quoted for all roads, whose costs are given below. In order to expedite the work, one road will be awarded to only one contractor.

		Roads			
		R <sub>1</sub>	R <sub>2</sub>	R <sub>3</sub>	R <sub>4</sub>
Contractors	C <sub>1</sub>	9	14	19	15
	C <sub>2</sub>	7	17	20	19
	C <sub>3</sub>	9	18	21	18
	C <sub>4</sub>	10	12	18	19
	C <sub>5</sub>	10	15	21	16

Costs in Rs. lakhs

- i) Find out the best way of assigning the repair work to contractors and the corresponding costs. [8]
- ii) If required, what is the amount of additional grants? [1]
- iii) Which contractor will not get the work? [1]
- b) Write short note on: [6]
- i) Unbalanced Transportation Problem.
- ii) Degeneracy in Transportation Problem.
- Q3)** a) Derive basic EOQ formula. [5]
- b) A firm uses every year 12,000 units of raw material costing Rs.1.25 per unit. Ordering cost is Rs.15 per order and the carrying cost is 5% per year of unit cost.
- i) Determine EOQ and the corresponding cost. [4]
- ii) If firm operates for 300 days per year and if lead time is 14 days with safety stock of 400 units, determine reorder point, maximum inventory level and the average inventory level. [3]
- c) Mention any four optimality criteria in sequencing problem. [4]



OR

- a) A workshop has six machines A, B, C, D, E, F. Two jobs have to be processed through each of these machines. The processing time on each machine and technological sequence of jobs is given below.

Job 1 - A C D B E F

Job 2 - A C B D F E

Time in minutes on Machine

Machines	A	B	C	D	E	F
Job 1	20	30	10	10	25	15
Job 2	10	15	30	10	20	15

In which order should the jobs be done on each machine to minimise the total time required to process the job? Also find the minimum elapsed time. [6]

- b) A machine operator has to perform two operations, turning & threading on different jobs. The time required to perform these operations in minutes is as follows.

Job	-	1	2	3	4	5	6
Time for turning	-	3	12	5	2	9	11
Time for threading	-	8	10	9	6	3	1

Determine the order in which the jobs should be processed in order to minimise the total time required to complete all jobs. [3]

Also find out total processing time and idle time for turning and threading operations. [3]

- c) Write a short note on ABC analysis in inventory control. [4]

**SECTION - II**

- Q4)** a) What are the advantages and limitations of simulation? [4]

- b) Preventive maintenance work in a factory can be carried by a single-man crew or by two-men crew. One-man crew is expected to take 2, 3, 3.5 or 4 hours with probabilities of 0.2, 0.3, 0.4, 0.1 resp. Two-men crew may take 1.25, 1.5, 2, 3 hours with probabilities of 0.2, 0.4, 0.25, 0.15 resp. The labour cost is Rs. 15/hour while the machine idle cost is Rs. 40/hr. Using Monte Carlo Simulation, decide one-man or two-men crew should be selected. Use following random Nos. (for both crew) - 39, 82, 06, 43, 29, 62, 31 & 36, 23, 54. [12]

OR

- a) Two functionally identical machines P & Q are available in the market with no scrap value. Machine P costs Rs. 12,000 & its annual cost is Rs. 400 in the first year, progressively increases by Rs. 100/- in next two years, then by Rs. 200/- in next two 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, and 3000 from year to year. If the worth of money increases by 10% every year, which is the better choice, P or Q ? And in that case what would be the replacement policy? [12]
- b) What is the replacement policy for the items that fail suddenly? [4]

- Q5)** a) A repairman is to be hired to repair machines which breakdown at an average rate of 3 per hr. The breakdown follows Poisson distribution, Non-productive time of machine is considered to cost Rs. 16 per hour. Two repair men have to be interviewed: One is slow but cheap, while the other is fast but expensive. The slow repairman charges Rs. 8 per hr. and he services broken down machines at a rate of 4 per hr. The corresponding values for fast repairman are Rs.10 per hr. and 6 machines per hr. Which repairman should be hired? Assume an 8-hour working day. [9]
- b) Explain linear programming method to solve higher size game. [7]

OR

- a) Two players A & B play a game of matching coins in which each has 3 coins: Rs.1, Rs.2 & Rs.5. Each player selects a coin without knowledge of other player's choice. If sum of the coins is odd, A wins B's coin & if its even, B wins A's.
- i) Prepare pay off Matrix. [3]
- ii) Find the value of Game and best strategies. [6]
- b) Explain Dominance in game theory. [3]
- c) Explain the terms: [4]
- i) Service discipline
- ii) Customer behaviour

**Q6)** A small project has following data.

Activity		1-2	1-3	1-4	2-4	2-5	3-6	4-6	5-6
Time	Normal	6	8	5	3	5	12	8	6
(Weeks)	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 as per normal time is Rs.1,54,000/- without overheads. The overheads (indirect cost) are Rs. 4800/- per week. Identify C.P., find normal duration and corresponding cost. Find out optimum duration and corresponding cost and minimum duration and corresponding cost. **[18]**

OR

- a) Discuss PERT calculations wrt. probability considerations in detail. **[8]**
- b) Define. **[10]**
  - i) Activity and Event
  - ii) Dummy activity
  - iii) Earliest start and latest start for activity
  - iv) Slack and float
  - v) Resource levelling.

□□□

Total No. of Questions : 8]

[Total No. of Pages : 2

**P939**

**[3664]-175**

**B.E. (Production S/W)  
SUPPLY CHAIN MANAGEMENT  
(411125) (2003 Course) (Elective)**

***Time : 3 Hours]***

***[Max. Marks : 100***

***Instructions to the candidates :***

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

**SECTION - I**

- Q1)*** a) Consider a supply chain involved when an engineering student purchases a Casio brand scientific calculator from a shop. Identify the cycles in this supply chain and the location of the push / pull boundry. **[9]**
- b) What is meant by supply chain strategy? Illustrate with examples. **[7]**
- Q2)*** a) Discuss in brief the drivers affecting? Supply chain performance & mention the obstacles in achieving the performance. **[9]**
- b) How does the availability of subcontracting affect the aggregate planning? Problem? Give suitable examples. **[7]**
- Q3)*** a) Explain the 'Managerial Levers' to improve the supply chain profitability. **[8]**
- b) What are different methods of forecasting? Discuss them in brief. **[8]**
- Q4)*** Write short notes on any three of the following: **[18]**
- a) Economies of scale.
  - b) Role of safety stock in supply chain.
  - c) Product availability.
  - d) Quantity discounts in supply chain.
  - e) Strategic fit.

***P.T.O.***

## **SECTION - II**

- Q5)** a) Discuss the importance and role of transportation in supply chain network. Mention the various modes of transportation with their strengths & weaknesses. [8]
- b) Discuss the importance of information and information technology in supply chain. [8]
- Q6)** a) What is a role & importance of Revenue Management in supply, chain?[8]
- b) 'Changing the distribution network affects the supply chain cost' - Discuss. [8]
- Q7)** a) How can postponement of product differentiation be used to improve supply chain profitability. [8]
- b) What is a 'decision tree'? Summarise the basic steps in decision tree analysis. [8]
- Q8)** Explain the following key terms, used in the context of SCM. (Any Six)[18]
- a) Core Competence.
  - b) Discounted Cash Flow.
  - c) e-business.
  - d) Landed cost & its elements.
  - e) Bullwhip effect.
  - f) POS - data & its collection technique.
  - g) Warehouse Management System.
  - h) Network design.



Total No. of Questions : 11]

[Total No. of Pages : 4

**P940**

**[3664]-180**

**B.E. (Electrical)**

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

**SECTION - I**

- Q1)** a) Explain speed torque conventions and multi-quadrant operation of drives. [8]
- b) A drive has following parameters :  $J = 1 \text{ kg} \cdot \text{m}^2$ ,  $T = 15 - 0.01 N$ , N-m and passive load torque,  $T_e = 0.005 N$ , N-m, where  $N$  is the speed in rpm. Initially the drive is operating in steady - state. Now it is to be reversed. For this, motor characteristic is altered such that  $T = -15 - 0.01N$ . N-m for positive as well as negative values of  $N$ . Calculate the reversal time. [8]

OR

- Q2)** a) State essential parts of electric drives and function of each parts. [8]
- b) A weight of 500 kg is being lifted up at a uniform speed of 1.5 m/s by a winch driven by motor running at speed of 1000 rpm. The moments of inertia of the motor and winch are 0.5 and 0.3 kg-m<sup>2</sup> respectively. Calculate the motor torque and the equivalent moment of inertia referred to the motor shaft. In the absence of weight motor develops a torque of 100 N-m when running at 1000 rpm. [8]
- Q3)** a) What do you mean by braking while lowering the load? What is the objective of such braking. [8]

*P.T.O.*

- b) A 400 V, 750 rpm, 70A dc shunt motor has an armature resistance of  $0.3\Omega$ . When running under rated conditions, the motor is to be braked by plugging with armature current limited to 90A. What external resistance should be connected in series with the armature? Calculate the initial braking torque and its value when the speed has fallen to 300 rpm. Neglect saturation. [10]

OR

- Q4)** a) Explain d.c. dynamic braking of 3 phase induction motor along with speed torque curves. [8]
- b) A 3-phase, 440V, 50Hz, 10 pole star connected induction motor has the following parameters :  $R_1 = 0.15\Omega$ ,  $R_2 = 0.45\Omega$ ,  $X_1 = 0.6\Omega$ ,  $X_2 = 1.8\Omega$ ,  $S_f = 0.05$  and the ratio of effective stator to rotor turns  $1/\sqrt{3}$ . The motor is to be braked at rated speed and an external resistance of  $1.75\Omega$ /phase (referred to stator) has been inserted into the rotor circuit. Determine the initial braking torque for the following two cases of braking. [10]
- i) dc rheostatic braking.
  - ii) reverse current braking.

- Q5)** a) Draw the circuit diagram of 3 phase half controlled converter. Explain switching sequence of the devices. Draw switching pulses output voltage waveform. [8]
- b) A 200V, 875rpm, 150A separately excited dc motor has an armature resistance of  $0.06\Omega$ . It is fed from a single phase fully controlled rectifier with an ac source voltage of 220V, 50Hz. Assuming continuous conduction, calculate
- i) firing angle for rated motor torque and 750 rpm.
  - ii) firing angle for rated motor torque and  $(-500)$  rpm.
  - iii) motor speed for  $\alpha = 160^\circ$  and rated torque. [8]

OR

- Q6)** a) Explain closed loop control of d.c. series motor. [8]
- b) A 3-phase dual converter feeds a 500V, 60A, dc motor with separate excitation.  $R_a = 1.5 \Omega$ . The converter is fed from a 420V, 50Hz supply. Assuming a voltage drop of 20V in the converter, determine the firing angle and back emf for
- i) Motoring operation at full load current with motor terminal voltage of 450V.
  - ii) Regeneration operation at full load current with terminal voltage of 450V.
  - iii) The motor is plugged at a terminal voltage of 400V with a current limiting resistor of  $5 \Omega$ . [8]

### **SECTION - II**

- Q7)** a) Why is it that the variable frequency requirement is always accompanied by a variable voltage requirement in a.c. machines. [8]
- b) A three phase, 400V, 50Hz four pole, delta connected squirrel cage induction motor is fed from a six pulse bridge inverter supplied from a dc source, such that the fundamental of the motor voltage is the same as the motor rated voltage at 50Hz. The equivalent circuit parameters of the motor are as follows: Stator impedance  $(Hj 2.6) \Omega$  rotor impedance referred to stator  $(0.5 + j 2.4) \Omega$  full load speed is 1425 rpm at 50 Hz calculate (1) speed for frequency of 25 Hz and 80% full-load torque (2) torque for frequency of 25Hz (3) frequency for a speed of 1000 rpm & full load. [8]

OR

- Q8)** a) Compare CSI and VSI for induction motor drive. [8]
- b) Justify variable frequency control of induction motor is more efficient than stator voltage control. [8]
- Q9)** a) Explain different classes of motor duty and how it affects the choice of selection of motor rating. [8]



- b) A motor has a heating time constant of 60 min and cooling time constant of 90 min. When run continuously on full load of 20kW, the final temperature rise is 40°C.
- i) What load motor can deliver for 10 min if this is followed by a shut down period long enough for it to cool.
- ii) If it is on an intermittent load of 10 min followed by 10 min shut down, what is the maximum value of load it can supply during the on load period. [8]

OR

- Q10)**a) Explain how the variable speed drives allows saving of energy in pump drives. [8]
- b) The temperature rise of an electric motor is 40°C after hour and 60°C after 2 hours. The motor current is 100A. Determine approximately its final temperature rise when it works on load cycle of 4 minutes working, 8 minutes rest with a current of 125A. Neglect the effects of iron losses. [8]

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

- a) Drives used in Sugar mill.
- b) Drives used in Textile mill.
- c) Drives used in machine tool application.
- d) Commutator less D.C. motor.
- e) Drives used in Rolling mills.



**P1157****[3664]-181****B.E. (Electrical)****CONTROL SYSTEMS - II****(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) Figures to the right indicate full marks.
- 4) Neat diagrams must be drawn wherever necessary.
- 5) Use of logarithmic tables, slide rule, non-programmable electronic pocket calculator is allowed.
- 6) Assume suitable data, if necessary.

**SECTION - I**

**Q1)** a) Compare the state space technique with the transfer function methods. [8]

b) Obtain the state model in Jordan's canonical form of a system whose transfer function is [8]

$$\frac{Y(s)}{U(s)} = \frac{2s^2 + 6s + 5}{s^3 + 4s^2 + 5s + 2}$$

OR

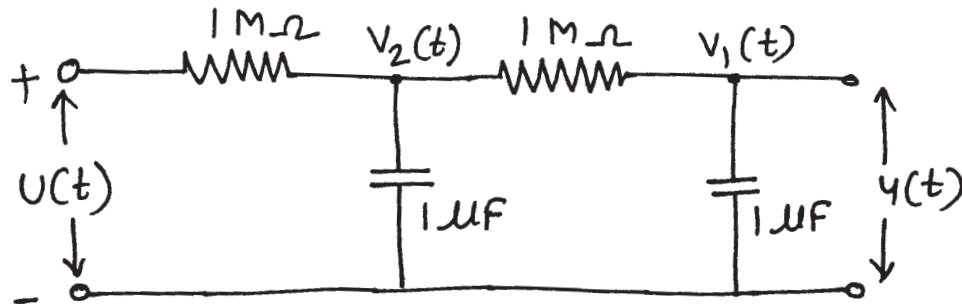
**Q2)** a) Define following terms: [8]

- i) Physical Variables
- ii) Phase Variables
- iii) Canonical Variables

b) For the system shown in Fig. 1, obtain the state model choosing  $V_1(t)$  and  $V_2(t)$  as the state variables.

$U(t)$  is the input and  $Y(t)$  is the output.

[8]

Fig 1

P.T.O.

**Q3)** a) Explain the concept of diagonalization and discuss how this is achieved. [8]

b) Obtain the state transition matrix of the following system using Cayley Hamilton theorem. [8]

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & -3 \\ -2 & -1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

OR

**Q4)** a) Define and explain the state transition matrix. State and prove the properties of state transition matrix. [8]

b) Obtain the state transition matrix of the following system. [8]

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 3 \\ -2 & -5 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

**Q5)** a) Define Controllability and observability of a system. Give the necessary and sufficient conditions for complete state controllability and complete observability of a system represented by [9]

$$\dot{x} = Ax + Bu$$

$$y = Cx$$

b) A system is represented by the state equation [9]

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -1 & -2 & -3 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u$$

$$y = \begin{bmatrix} 1 & 2 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$$

Find the controllability and observability of the system.

OR

**Q6)** a) Explain the principle of Duality, due to Kalman. Using duality principle find the relation between state observer gain matrix  $K_e$  and state feedback gain matrix  $K$ . [9]

b) A regulator system has the plant [9]

$$\dot{x} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -6 & -11 & -6 \end{bmatrix} x + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u$$

$$y = [1 \ 0 \ 0]x$$

Design a state feedback controller which will place the closed loop poles at  $-2 \pm j3.464$ ,  $-5$ .

### SECTION - II

**Q7)** a) Classify the different types of non linearities generally encountered in the feedback control system. Give example of each. [6]

b) In a unity feedback control system, an ideal relay with output equal to  $\pm 1$  unit is connected in cascade with linear transfer function [10]

$$G(s) = \frac{10}{s(s+1)(s+2)}$$

Construct  $G(j\omega)$  and  $-1/k_N(x, \omega)$  plots. Determine the amplitude and the frequency of the limit cycle if it exists.

OR

**Q8)** a) What is limit cycle? How the existence of a limit cycle and its type is determined for Non linear control systems using Describing function method? [6]

b) Determine the stability of the system as shown in Fig.2. [10]

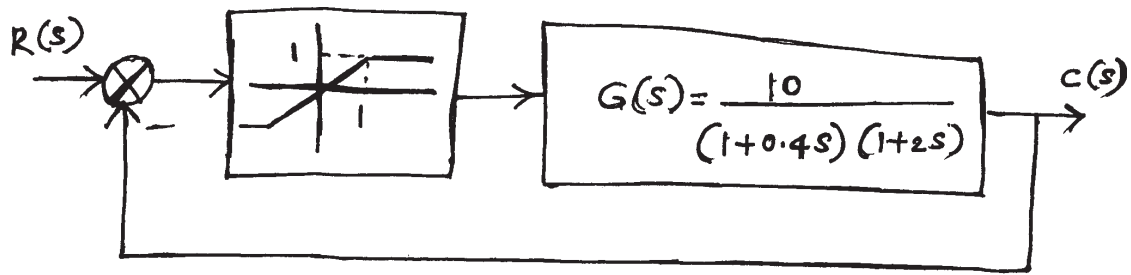


Fig 2

**Q9)** a) Discuss the different types of singular points that occur in phase plane method. [6]

b) A linear second order servo is described by the equation

$$\ddot{E} + 2\xi\omega_n\dot{E} + \omega_n^2 E = 0$$

where  $\omega_n = 1$ ,  $\xi = 0.15$ ,

$$E(0) = 1.0, \dot{E}(0) = 0$$

Construct phase trajectory using method of isocline. [10]

OR

**Q10)** a) Explain the direct method of Liapunov to determine the stability of a nonlinear control systems. [7]

b) Classify the following scalar functions with justifications. [9]

i)  $V(x) = 10x_1^2 + 4x_2^2 + x_3^2 + 2x_1x_2 - 2x_2x_3 - 4x_1x_3$

ii)  $V(x) = -x_1^2 - \frac{2x_2^2}{1+x_2^2}$

iii)  $V(x) = x_1x_2 + x_2^2$

**Q11)** Write detailed notes on the following.

a) "Performance Index" as used in optimal control theory. [6]

b) Various factors considered while designing optimal controller. [6]

c) Calculus of variation method as used for optimal control design. [6]

OR

**Q12)** Write detailed notes on the following.

a) Switches and relays as control system components. [6]

b) Proximity sensors. [6]

c) Various types of actuators. [6]



Total No. of Questions : 12]

[Total No. of Pages : 3

**P941**

**[3664]-188**

**B.E. (Electrical)**

**SWITCHGEAR & PROTECTION**

**(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) What do you mean by Protective Relaying? Explain the concept with basic block diagram? Why it is essential? **[10]**
- b) Explain the terms with reference to relay. **[6]**
- i) Plug setting.
  - ii) Time setting.

**OR**

- Q2)*** a) What do you mean by zones of protection? Explain Primary and Backup Protection. **[12]**
- b) List out the essential qualities of Protective Relaying. **[4]**

- Q3)*** Describe in detail concept of: **[16]**
- a) Resistance switching.
  - b) Current chopping of capacitive current.

**OR**

- Q4)*** a) Derive the expression for **[12]**
- i) Restriking voltage.
  - ii) Maximum R.R.R.V.
  - iii) Frequency of oscillations.
- State factors affecting Restriking voltage.

***P.T.O.***

- b) In a system of 220 kV, the circuit phase to ground capacitance is of 0.04  $\mu\text{F}$  and circuit inductance is 7H. The circuit breaker interrupts a magnetic current of 8Amp. (Peak). Find [4]
- The voltage across the circuit breaker contacts after the current interruption.
  - The value of resistance to be used across the contacts to suppress restriking voltage.

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

- Ratings of circuit breaker.
- Classification of high voltage circuit breaker.
- Auto reclosing.

OR

**Q6)** Explain the following circuit breakers:

- $\text{SF}_6$  circuit breaker
  - Vacuum circuit breaker
- in reference to
- Constructional features.
  - Working principle.
  - Advantages and limitations.

[18]

## SECTION - II

**Q7) a)** Explain the effect of inrush magnetising current on the protective system of transformers. Also explain the principle of harmonic restraint with the help of necessary schematic diagram. [8]

- b) A 11 kV, 3 phase alternator has full load rated current of 250A. Reactance of armature winding is 15 percent. The differential protection system is set to operate on earth fault currents of more than 250A. Find the neutral earthing resistance so as to give earth fault protection to 90% of stator winding. [8]

OR

**Q8) a)** A 11 kV, 100 MVA alternator is provided with differential protection. The percentage of winding to be protected against phase to ground fault is 85%. The relay is set to operate when there is 20% out of balance current. Determine the value of the resistance to be placed in the neutral to ground connection. [8]

- b) Draw a neat and labelled sketch of Buchholz relay and explain it with reference to its operation, installation merits and limitations. [8]

- Q9)** a) Explain the carrier current scheme of protection with the help of block diagram and neat sketch. Also discuss how the phase comparison scheme can be used for protecting a feeder from (i) one end (ii) both the ends.[9]
- b) Explain the three step distance protection scheme for transmission. Also draw the neat sketch for the same. [7]

OR

- Q10)**a) Explain the effect of power swings and arc resistance on the performance of distance relay. [7]
- b) What are the merits of carrier current relaying? Where is it used? Compare pilot wire relaying with carrier current protection. [9]

- Q11)**a) Draw a neat block diagram of static relays and explain function of each block. Compare the static relays with electromagnetic relays. [8]
- b) Explain the realisation of over current relay by using a microprocessor.[5]
- c) Justify the preference of half cycle data over full cycle data window for numerical protective relaying. [5]

OR

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

- a) Walsh Hadamard transform technique.
- b) Principle of duality.
- c) Sampling theorem.
- d) Time delay ckts in static relays.





Total No. of Questions : 12]

[Total No. of Pages : 4

P942

[3664]-189

B.E. (Electrical)

DIGITAL CONTROL SYSTEMS

(403149) (2003 Course)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates :

- 1) Answer any one question from each pair of questions Q.1 & Q.2, Q.3 & Q.4, Q.5 & Q.6, Q.7 & Q. 8, Q.9 & Q.10, 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 indicate full marks.
- 5) Use of logarithmic tables, electronic unprogrammable pocket calculator is allowed.
- 6) Assume suitable data, if necessary.

**SECTION - I**

- Q1) a) Explain the sampling & reconstruction process, state sampling theorem. [6]
- b) Draw graphical representation of: [6]
- (i) Unit impulse or Delta function; (ii) Unit step sequence; (iii) Unit ramp sequence.
- c) Sketch a D.T. signal  $x(n) = z^{-n}$  for  $-2 \leq n \leq 2$  and obtain  $y(n) = 2x(n) + \delta(n)$ . [5]

OR

- Q2) a) Determine whether the following systems are shift (time) invariant or not? [9]
- i)  $y(n) = x(n) - x(n - 1)$ .
- ii)  $y(n) = n x(n)$ .
- iii)  $y(n) = x(-n)$ .
- b) For the given sequence  $x(n) = \{4, -1, 5, -2, 2\}$ . [8]
- i) Delay the sequence by 2 samples,
- ii) Compress the sequence by time scale 2,
- iii) Attenuate the sequence by amplitude scale 2,
- iv) Fold the sequence and advance by one sample.

P.T.O.

- $$X(n) = \{1, \underset{\uparrow}{2}, 1, 2\} \text{ and } h(n) \{2, 2, \underset{\uparrow}{-1}, 1\}$$
- OR

- Q5)** a) Define Z - transform and state important properties of Z - transform.[5]  
 b) Obtain Z - transform of the following functions: [12]  
 i)  $f(t) = e^{-at} \cos \omega t$ .  
 ii)  $f(t) = \sin \omega t$ .  
 iii) Find initial and final values of function

$$X(z) = \frac{1 + z^{-1}}{1 - 0.25z^{-2}}.$$

**Q6)** a) Explain any two methods of obtaining the inverse Z-transform. [7]  
b) Evaluate the inverse - Z transform of the, [10]

i)  $x(z) = \frac{10z}{(z-1)(z-2)}$ .      ii)  $x(z) = \frac{3z^2 + 2z + 1}{z^2 + 3z + 2}$ .

**Q7)** a) Explain precisely “Schurcohn Stability Criterion”, as applied to the discrete time systems. [8]

b) The characteristic polynomial of a certain discrete time control system is given by

By applying Jury's Stability Test, Find whether the system is stable or not. [8]

2

- Q8)** a) Define “Pulse Transfer Function”, obtain the pulse transfer function for impulse sampler located at the input of ZOH in cascade with  $G(s)$ . [8]  
 b) Show how a mapping of left half of the S-plane is done into Z-plane. Mark the stable and unstable regions in both the planes. [8]

- Q9)** a) Discuss the various methods used for the computation of State Transition Matrix (STM) from given state difference equation: [8]

$$x(k+1) = G x(k) + H u(k)$$

- b) Obtain STM  $\phi(k)$  of the following difference equation.

$$x(k+1) = G x(k) + H u(k) \quad \text{where}$$

$$G = \begin{bmatrix} 0 & 1 \\ -0.2 & -1 \end{bmatrix}; \quad H = \begin{bmatrix} 1 \\ 1 \end{bmatrix}. \quad [9]$$

OR

- Q10)**a) Derive the solution of a non-homogeneous state equation of a discrete time system from the first principles. [8]

- b) Consider the system  $x(k+1) = G x(k) + H u(k)$ ;

$$\text{Where } G = \begin{bmatrix} 0 & 1 \\ -0.16 & -1 \end{bmatrix}; \quad H = \begin{bmatrix} 0 \\ 1 \end{bmatrix}.$$

Determine a suitable state feed back Gain Matrix  $K$  such that the system will have closed loop poles at  $z = 0.5 + j 0.5$ ,  $z = 0.5 - j 0.5$ . [9]

- Q11)**a) Explain the terms, characteristic equation, eigen values, eigen vectors, and vander monde matrix. [8]

- b) Obtain the state - space representation of a DT system by Direct Decomposition method, from the pulse transfer function given by; [9]

$$\frac{Y(z)}{U(z)} = \frac{4z^3 - 12z^2 + 13z - 7}{z^3 - 4z^2 + 5z - 2}.$$

OR

**Q12)a)** Explain clearly the concept of controllability and observability of a Discrete Time (DT) system. How these are determined? [8]

b) Determine the controllability and observability of the following DT system; [9]

$$x(k+1) = \begin{bmatrix} -1 & 0 \\ 0 & -2 \end{bmatrix} x(k) + \begin{bmatrix} 2 \\ 3 \end{bmatrix} u(k);$$

$$y(k) = [1 \quad 5] x(k).$$



Total No. of Questions : 12]

[Total No. of Pages : 2

**P986**

**[3664]-197**

**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 answer books.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Use of electronic pocket calculator is allowed.*
- 5) Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) Write VHDL code for 8 byte RAM. Write test bench to verify write & read operations. What are the timing constraints? [8]  
b) What is need of package? Write VHDL code to explain utility of package. [8]

OR

- Q2)** a) Compare with suitable examples the architectural modeling techniques. [8]  
b) Write VHDL code for 16 bit bidirectional bus. [8]

OR

- Q4)** a) Why is state minimization required? How is it achieved? [8]  
b) Draw FSM state diagram for traffic light controller & write VHDL code for it. [8]

- Q5)** With the help of primitive building blocks draw & explore the architecture of CPLD in detail. [18]

OR

- Q6)** What are the architectural differences between CPLD & FPGA? What is selection criterion of CPLD / FPGA in the application. Explore in detail.[18]

*P.T.O.*

## **SECTION - II**

**Q7)** a) What is necessity of DRC? With suitable examples list different errors in CMOS layout. [8]

b) What are the penalties of nonuniform clock distribution? What are the techniques of CLK distribution? Explain any one in brief. [8]

OR

**Q8)** a) List the merits & demerits of DRAM. Draw the schematics of different DRAM cells. [8]

b) What are the characteristics of I/O architecture? How to fulfill them? [8]

**Q9)** a) Draw the equivalent model of MOSFET & explain the parasitics in detail. [8]

b) Design CMOS logic for  $F = \overline{ABC + DE + F}$ . Compute area on chip. [8]

OR

**Q10)** a) Why is device sizing so important? List the parameters on which it is dependent. [8]

b) Design 8 : 1 MUX using transmission gates compare with conventional method. [8]

**Q11)** a) What are stuck at faults? With suitable examples explain stuck at faults in detail. [9]

b) Draw the architecture of TAP controller in detail & explain in brief. [9]

OR

**Q12)** a) What is controllability & observability? What are the constraints while adding testability? [9]

b) What is necessity of boundary scan? Explain with suitable examples. List JTAG pins. [9]



Total No. of Questions : 12]  
**P1122**

[Total No. of Pages : 2

**[3664]-222**  
**B.E. (Electronics)**  
**BIOMEDICAL ELECTRONICS**  
**(2003 Course)**

*Time : 3 Hours]*

*[Max. Marks : 100*

**Instructions :**

- 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 the process of polarization, depolarization and repolarization with the help of neat diagrams. [9]

b) What do you mean by relative refractory period and absolute refractory period. Compare with resting potential and action potential. [9]

OR

**Q2)** a) Draw the set-up of Two Electrode equivalent circuit. Explain the process for measurement of biopotential and a half cell potential. [9]

b) Describe the transducers which are used for biomedical applications with reference to following parameters i) Force, ii) Pressure, iii) Temperature. [9]

**Q3)** a) What is Einthorens triangle? Explain its significance with the help of neat sketch. [8]

b) Explain the working of ECG machine with isolated patient lead. [8]

OR

**Q4)** a) With the help of neat diagram, explain the finger plethysmography for peripheral pulse monitoring. [8]

b) Describe the ultrasonic blood flow meters with neat diagrams. [8]

**Q5)** a) What is vectorcardiography? Explain with typical normal loop patterns recorded in three planes on the direct writing vectorcardiograph. [8]

b) Explain the working of bedside patient monitoring with necessary diagrams. [8]

OR

**P.T.O.**

- Q6) a)** What are the basic requirements of implantable pacemaker? With the help of block diagram, explain the operations of ventricular synchronous demand pacemaker. [8]
- b)** Explain the DC and AC defibrillators with necessary diagram. [8]

### **SECTION - II**

- Q7) a)** Draw the neat block schematic of Flame photometer. Explain its working with its essential parts. [9]
- b)** Describe the operations of PCO<sub>2</sub> machine with the help of neat sketch. [9]

OR

- Q8) a)** Name the different methods of cell counting. Explain any one in detail. [9]
- b)** Explain the difference between medical CRO and conventional laboratory CRO. Explain the non-fade CRO and its features. [9]

- Q9) a)** Draw the schematic diagram of an EEG machine. Explain with the help of pictorial representation of closely spaced electrodes. [8]
- b)** Explain the 10-20 system of Electrode placement. [8]

OR

- Q10) a)** What are the different methods of EEG recording. Explain in detail. [8]
- b)** Draw the block diagram of a typical EMG-set-up. Explain the procedure to perform EMG. [8]

- Q11) a)** Explain the Basic steps required to form LASER Beam. [8]
- b)** State the applications of LASER in Medicine. Explain any two applications in detail. [8]

OR

- Q12) a)** Define : [8]
- i) X-ray radiations.
  - ii) Ionizing radiations.
  - iii) Non-ionizing radiations.
  - iv) Gamma radiations.
- b)** Explain the Doppler ultrasound and 3-D ultrasound imaging in detail. [8]





Total No. of Questions : 12]

[Total No. of Pages : 3

**P1348**

**[3664] - 224**

**B.E. (Electronics)**

**ARTIFICIAL INTELLIGENCE**

**(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) Discuss various definitions of artificial intelligence (AI). What are various applications of AI. [8]

b) Compare Depth First and Best First Search methods. [8]

OR

***Q2)*** a) Explain A\* algorithm with an example. [8]

b) What are weak search methods? [4]

c) Explain the following terms: [4]

- i) Depth limit.                      ii) Search tree.

***Q3)*** a) Write notes on Waiting for Quiescence, Alpha-Beta cut-offs and Secondary search. [8]

b) Explain Minimax algorithm using an example. [8]

c) Explain the Unification algorithm. [4]

OR

***Q4)*** a) Write a set of logical predicates that will perform simple automobile diagnostics (eg., if the engine won't turn over and the lights won't come on, then the battery is bad). Don't try to be too elaborate, but cover the cases of bad battery, out of gas, bad spark plugs and bad starter motor.[8]

b) Explain ISA hierarchy. [4]

c) Enumerate the issues in Knowledge Representation. [4]

d) What are the challenges faced by Minimax algorithm? [4]

***P.T.O.***

- Q5)** a) What is the theory of Fuzzy logic? [4]  
b) Consider the problem of deciding which place to be visited.  
i) If summer Mount Abu.  
ii) If winter Jodhpur.  
iii) If rainy Shimla.  
iv) If spring Nainital.  
v) It is winter.

Build the TMS style database of necessary facts to solve this problem.[8]

- c) Explain semantic nets with its disadvantages. [4]

OR

- Q6)** a) Explain how scripts can be used for knowledge representation. Write a script of setting a drama. [8]  
b) What is meant by non-monotonic reasoning? Differentiate between statistical reasoning and probabilistic reasoning. [8]

### **SECTION - II**

- Q7)** a) Explain Blocks World Problem with an example. [8]  
b) Describe least commitment approach using an example. [8]

OR

- Q8)** a) Give algorithm for TWEAK and STRIPS. [8]  
b) Describe various Planning methods. [8]

- Q9)** a) Discuss Waltz algorithm. [8]  
b) Explain types of Neural Network architectures. [8]

OR

- Q10)** a) Explain the ANN for Pattern recognition. [8]  
b) Write short note on: [8]  
i) Action.  
ii) Vision.

- Q11)** a) Discuss the architecture of Expert systems. [8]

b) Parse each of these sentences using Top-down as well Bottom-up approach- [8]

i) Mary watered the plants.

ii) The brown dog ate the bone.

OR

**Q12)**a) Write short note on Finite state machine. [4]

b) Generate an expert system for two-wheeler servicing. [8]

c) Discuss Parsing qualities. [4]



Total No. of Questions : 12]

[Total No. of Pages : 3

**P1006**

**[3664]-248**

**B.E. (Instrumentation & Control)**

**LASER APPLICATIONS IN INSTRUMENTATION**

**(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) Figures to the right indicate full marks.*
- 4) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 5) Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) What are the various processes due to which the small gain coefficients of laser get affected? Explain in detail. [8]
- b) Explain in detail how the axial modes and transverse modes of Laser output are formed. [8]

OR

- Q2)** a) Explain in detail the process of emission and absorption of radiation. [8]
- b) Calculate the value of population inversion required to give a gain coefficient of 1 per meter in a Nd:YAG laser with 1.06 micrometer for which the spontaneous life time is 230 microseconds, refractive index of 1.82 and line width of 3 THz. [8]
- Q3)** a) Estimate the threshold current density of a GaAs junction laser of 0.84 micrometer wavelength, 14.5 THz line width, loss coefficient 3500 per meter, refractive index 3.6, dimensions length = 300 micrometer, thickness = 2 micrometer and internal quantum efficiency = 1. [9]
- 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 0.4 mm. The loss coefficient is 900 per meter length and the internal quantum efficiency is 0.75. [4]
- c) What are the steps that should be followed in a safe laser laboratory operation? [5]

**P.T.O.**

OR

- Q4)** a) Explain the construction and working of He-Ne laser. [8]  
b) Calculate the efficiency of a He-Ne laser operating with a current of 10mA at a d.c. voltage of 2500 V and gives an optical power of 5 mW. [4]  
c) Calculate the threshold pumping power of a Nd: Glass laser for critical population inversion of  $8 \times 10^{21}/\text{m}^3$  and spontaneous life time of  $200\mu\text{s}$ . The upper level is at an energy of 1.5eV. [6]
- Q5)** a) What are the basic optical interferometers? Explain each in short. [8]  
b) What is mean by Speckle Pattern? Describe speckle properties in short. [8]

OR

- Q6)** a) Write short note on White light interferometer. [8]  
b) What are the properties of speckle pattern? Describe each in short. [8]

### **SECTION - II**

- Q7)** a) Explain the frequency domain processing of Doppler signal in detail.[8]  
b) What are the performance parameters of operation of laser velocimeter? Discuss. [8]

OR

- Q8)** a) What is the principle of operation of Laser velocimeter? Explain. [8]  
b) What are the two options for the electronic processing of the Doppler signal? Compare it. [8]
- Q9)** 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 closed loop configuration of Fiber Optic Gyroscope. [8]

OR

- Q10)** a) What is Sagnac effect? Show how is the phase shift is proportional to the angular velocity. [8]  
b) What are the components required for all fiber FOG configuration? Explain each in short. [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) List out the applications of holographic interferometer that you know. Explain any one in detail. [10]



Total No. of Questions : 12]

[Total No. of Pages : 4

**P1007**

**[3664]-249**

**B.E. (Instrumentation & Control)**  
**ADVANCED CONTROL SYSTEM**  
**(Elective - I)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

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

**SECTION - I**

- Q1)** a) Explain the concept of Jump resonance with the help of soft and hard spring. [6]
- b) Find the Describing Function for the Nonlinear system having characteristic as shown in figure 1. [12]

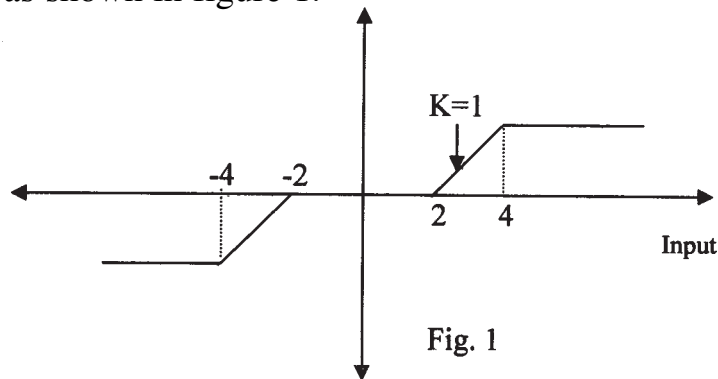


Fig. 1

OR

- Q2)** a) Distinguish between linear and non-linear systems. [4]
- b) Explain the procedure to construct phase plane. [4]
- c) Find Frequency and Amplitude of Limit Cycle(s) for the system as shown in figure 2. [10]

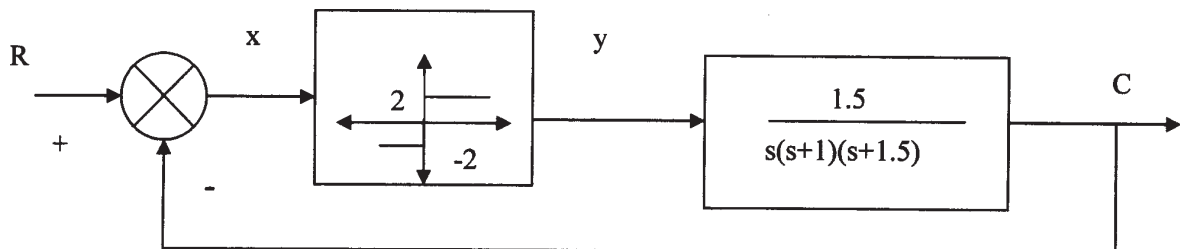


Fig. 2

P.T.O.

**Q3)** An amplifier as shown in figure 3 drives a Two Phase Servomotor. The transfer function of the motor is

$$G(s) = \frac{Ke^{-0.2s}}{s(0.2s + 1)}$$

Investigate the stability of the system for  $K=0.2$ . What is the largest value of  $K$  for no limit cycle to exist? [16]

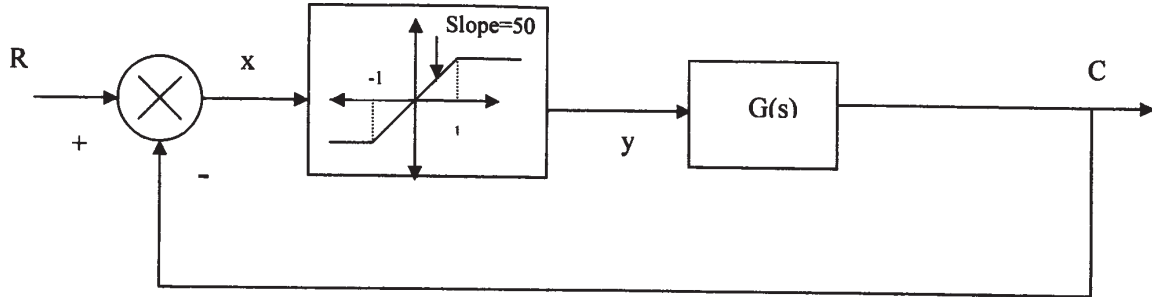


Fig. 3

OR

**Q4)** Consider a System as shown in figure 4. Find the amplitude and frequency of limit cycles. Also Comment on nature of limit cycle(s) and Stability of system. [16]

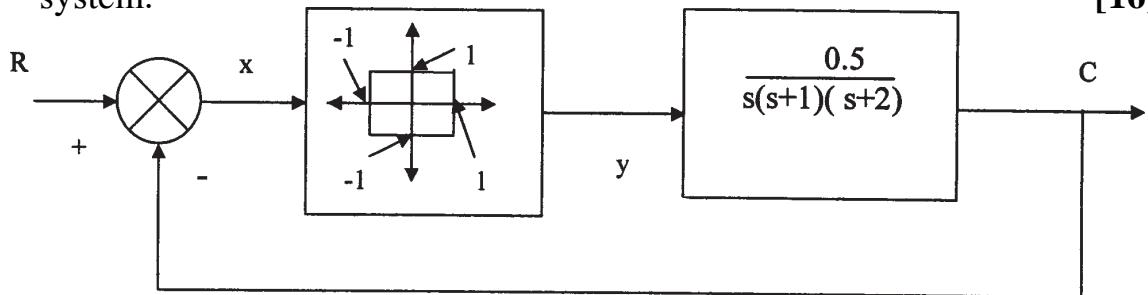


Fig. 4

**Q5)** a) Explain MIT rule for adaptive systems. [8]

b) What are the different components of Model reference adaptive systems? Explain each in short. [8]

OR

**Q6)** a) Consider the Dynamics of Mass-Spring-damper system given by

$$M \frac{d^2 y}{dt^2} + B \frac{dy}{dt} + Ky = u$$

where

$$M = B = K = 2,$$

$y = \text{output}$

$u = \text{input}$



Design Model Reference Adaptive Control (MRAC) system to follow the response of reference model given by [10]

$$\frac{d^2 y_m}{dt^2} + 15.14 \frac{dy_m}{dt} + y_m = r$$

*select  $r = 1$*

- b) Explain Lyapunov approach for stability analysis of continuous non linear time system. [6]

### **SECTION - II**

- Q7)** a) In Self-Tuning Regulator (STR) following input output data has been obtained from real plant

Time(t)	Input data [u(t)]	Output data [y(t)]
1	1.0	0.0
2	0.5	0.5
3	1.0	-0.5
4	1.0	1.25
5	0.0	0.35

Use any regression method to fit a model with the structure [10]

$$y(t) + ay(t-1) = bu(t-1) + e(t)$$

*where  $e(t)$  is error signal*

- b) Derive Least Squares (LS) as a real time parameter estimator. [8]  
OR

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

- a) Indirect self tuning regulator
- b) Continuous time self tuners
- c) Linear Quadratic self tuning regulator

- Q9)** a) Explain any two industrial products, which incorporate adaptive control techniques. [8]

- b) Explain feed control of a distillation column using adaptive control technique. [8]

OR

- Q10)** Explain following industrial adaptive controllers with reference to parameter estimation, control design, prior information and industrial experiences. [16]

- a) EXACT: The Foxboro adaptive controller
- b) DPR 900

**Q11) a)** Obtain the control law that minimizes the performance index

$$J = \int_0^{\infty} (x_1^2 + u^2) dt$$

for the system

$$\begin{bmatrix} \frac{dx_1}{dt} \\ \frac{dx_2}{dt} \end{bmatrix} = \begin{bmatrix} 0 & 0.1 \\ 0 & 0.1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u$$

using reduced matrix Riccati equation. [8]

**b)** Consider the feedback system shown in figure 5. The output required to track unit step. Find the value of alpha ( $\alpha$ ) that minimizes integral square error. [8]

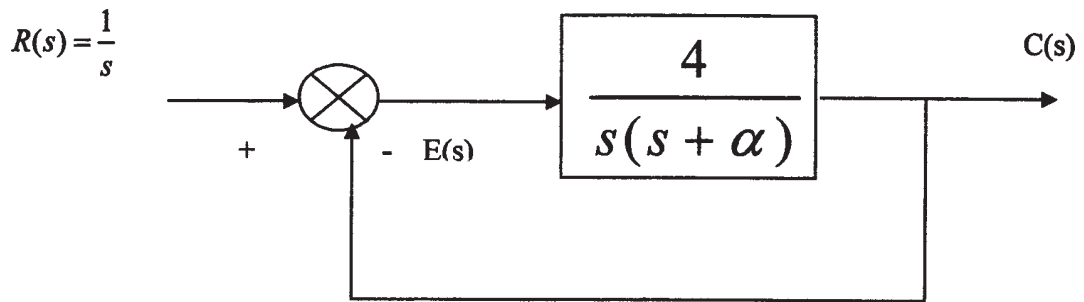


Fig. 5

OR

**Q12)** Consider the plant

$$\begin{bmatrix} \frac{dx_1}{dt} \\ \frac{dx_2}{dt} \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ -1 & 0.2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 1 \\ 0 \end{bmatrix} u$$

- Is the given system stable?
- Is the given system controllable?
- Select the values for matrices Q and R with the constraint that they are positive definite and design a controller for the plant so as to minimize

$$J = \frac{1}{2} \int_0^{\infty} (x^T Q x + u^T R u) dt$$

Check that the resulting overall system is stable. [16]

□□□

Total No. of Questions : 12]

[Total No. of Pages : 2

**P1123**

**[3664]-250**

**B.E. (Instrumentation & Control)**

**PROCESS INSTRUMENTATION - II**

**(1997 & 2003 Course)**

*Time : 3 Hours]*

*[Max. Marks : 100*

**Instructions :**

- 1) *Answer any 3 questions from each section.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *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)** For a typical chiller, you are supposed to configure a industry standard PID controller. Explain controller configuration procedure for the same. Which different parameters you will enter in the controller? [9]

**b)** Apply instrumentation for a heat exchanger which will implement following equation : [9]

$$\Delta Q = k (T_2 - T_1)$$

Where

$\Delta Q$  = change in steam flow rate.

$T_2$  = exit temperature of fluid.

$T_1$  = inlet temperature of fluid.

$k$  = constant.

Draw instrumentation scheme.

OR

**Q2) a)** How heat exchangers are classified? Explain any one instrumentation scheme for heat exchanger. [9]

**b)** What shall be fail-safe actions of the valves used in Chillers and Heat-exchangers? Justify your answer. [9]

**Q3) a)** What are difficulties in controlling CSTR? How they are overcome? [8]

**b)** Compare controlling a CSTR with PLC (Programmable Logic Controller) and a multiloop PID controller. [8]

OR

**P.T.O.**

- Q4)** a) What is difference between cold startup and hot startup of a CSTR?  
What is runaway reaction? [8]  
b) How reactor safety can be assured? Explain. [8]

- Q5)** a) Explain a typical water distribution system using pump instrumentation. [8]  
b) Which factors shall be taken into consideration for Q5) a)? Explain in detail. [8]

OR

- Q6)** a) Explain different types of compressors in detail. Also enlist their control methods. Explain any one. [8]  
b) Give specifications of a typical compressor. [8]

### **SECTION - II**

- Q7)** Enlist different control loops in Boiler Instrumentation. Explain any four in details. [16]

OR

- Q8)** a) How turbine instrumentation is important? Explain with speed as a particular parameter. [8]  
b) How following types of optimization are implemented / taken into consideration with reference to Boilers :  
i) Fuel side optimization.  
ii) Water side optimization.  
Explain. [8]

- Q9)** a) Explain Auctioneering in a typical distillation column control system with diagram. [8]  
b) Why distillation column control is considered as most complex? Explain. [8]

OR

- Q10)** a) How feed forward control of distillation column will be implemented? Explain with block diagram. [8]  
b) Write a note on Role of Analyzers in distillation column control. [8]

- Q11)** a) Enlist different dryer types. Explain any one in detail with instrumentation scheme. [9]  
b) How crystallizers are controlled? Explain with block diagram. [9]

OR

- Q12)** a) List manipulated variables and controlled variables in Evaporators. [9]  
b) How multieffect evaporation is achieved? Where are evaporators used? [9]

□□□

Total No. of Questions : 12]

[Total No. of Pages : 2

**P1008**

**[3664]-252**

**B.E. (Instrumentation & Control)**  
**INDUSTRIAL AUTOMATION**  
**(406269) (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 term control system audit. What are the advantages of Control System Audit? [8]
- b) With the help of block diagram explain the different stages of preparing Functional Design Specifications [8]

OR

- Q2)** a) Explain the general consideration while justifying the automation strategy. [8]
- b) With an example explain, “What is SCADA?” [8]
- Q3)** a) With an example explain the “Sequential Function Chart”. [8]
- b) Explain the difference between Master-Slave and Server-Client Communication. [8]

OR

- Q4)** a) Explain the PLC programming methods as Per IEC 1131-3. [8]
- b) With an example explain the role of PLC in a SCADA system. [8]
- Q5)** a) What is “Multidrop connection?” Explain the benefits of the same. [8]
- b) List and explain at least five common-practice commands used in HART. [10]

**P.T.O.**

OR

- Q6)** a) Explain the message frame structure in “Modbus (RTU)” protocol. [8]  
b) List and explain at least five common-practice commands used in HART. [10]

**SECTION - II**

- Q7)** a) With an example explain at least four major components of the DCS system. [8]  
b) With the help of block diagram explain the Architecture of Generic DCS. [10]

OR

- Q8)** a) List and explain the basic functions of DCS system. [8]  
b) With the help of block diagram explain the Architecture of Generic DCS. [10]

- Q9)** a) With the help of an example explain what is “Third party interface”? [8]  
b) What is alarm? Explain the how the alarms are classified and prioritized. [8]

OR

- Q10)** a) Explain the user access management system in any DCS system. [8]  
b) Explain the four level display hierarchy. [8]

- Q11)** With the help of block diagram explain what are the different stages involved in developing the automation for batch process. [16]

OR

- Q12)** What is meant by safety system “architecture”? What are the different safety architectures? Which are commonly used, in industrial applications? [16]

□□□

Total No. of Questions : 12]

[Total No. of Pages : 3

**P1009**

**[3664]-255**

**B.E. (Instrumentation)**

**406264(3) : FIBER OPTIC INSTRUMENTATION**

**(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) 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 what is meant by a graded index optical fiber, giving an expression for the possible refractive index profile? Using simple ray theory concepts, discuss the transmission of light through the fiber. Indicate the major advantage of this type of fiber with regard to multimode propagation. **[10]**
- b) Briefly indicate with the aid of suitable diagrams the difference between meridional and skew ray paths in step index fibers. **[6]**

**OR**

- Q2)** a) An optical fiber has a numerical aperture of 0.20 and a cladding refractive index of 1.59. Determine: **[8]**
- i) The acceptance angle for the fiber in water which has a refractive index of 1.33;
  - ii) The critical angle at the core-cladding interface.
- b) Describe with the aid of simple ray diagram:
- i) Multimode step index fiber
  - ii) Single-mode step index fiber

Compare the advantages and disadvantages of these two types of fiber for use as an optical channel. **[8]**

**P.T.O.**

- Q3)** a) Discuss absorption losses in optical fibers, comparing and contrasting the intrinsic and extrinsic absorption mechanisms. [9]
- b) Briefly describe linear scattering losses in optical fibers with regard to: [8]
- i) Rayleigh scattering
  - ii) Mie scattering.

OR

- Q4)** a) Compare stimulated Brillouin and stimulated Raman scattering in optical fibers. [8]
- b) Explain Micro bending and Macro bending in optical fiber. Also explain what the critical bending radius for an optical fiber means. [9]
- Q5)** a) Briefly describe the processes by which light can be emitted from an atom. Discuss the requirements for population inversion in order that stimulated emission may dominate over spontaneous emission. Illustrate your answer with an energy level diagram of a common nonsemiconductor laser. [9]
- b) Compare P-I-N diode with avalanche photodiode. [8]

OR

- Q6)** a) Describe what is meant by the fusion splicing of optical fibers. Discuss the advantages and drawbacks of this jointing technique. [8]
- b) Discuss the principles of operation of the two major categories of demountable optical fiber connectors. Describe in detail a common technique for achieving a butt jointed fiber connector. [9]

## **SECTION - II**

- Q7)** What are the advantages of Intensity Modulated Optical Sensors (IMOS)? Describe following techniques of sensing which is based on intensity modulation. Also enlist different parameters, which can be sensed by using these techniques. [18]
- a) evanescent field
  - b) coupling
  - c) encoding based position sensors.



OR

- Q8)** a) What do you understand by intrinsic and extrinsic Optical Fiber Sensors? With the aid of suitable diagrams describe one Extrinsic Optical Fiber Sensor. How do you calibrate this sensor? [10]  
b) What are the advantages and drawbacks of Optical Fiber Sensors? [8]
- Q9)** a) What are the advantages and disadvantages of Distributed Optical Fiber Sensing? Explain role of Optical Time Domain Reflectometer (OTDR) in Distributed Optical Fiber Sensing. [8]  
b) How various parameters are sensed by using Fiber Bragg Grating?[8]

OR

- Q10)** a) Explain working of Fiber Bragg Grating. Also explain the manufacturing technique of Fiber Bragg Grating. [8]  
b) Explain working of Distributed Optical Fiber stress-strain sensor. [8]
- Q11)** 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) Write a note on 'Integrated Optics'. [6]

OR

- Q12)** 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, following integrated optical devices: [8]  
i) Beam splitter  
ii) Directional coupler

□□□

Total No. of Questions : 12]

[Total No. of Pages : 2

**P1124**

**[3664]-257**

**B.E. (Instrumentation)  
BUILDING AUTOMATION - I  
(2003 Course)**

*Time : 3 Hours]*

*[Max. Marks : 100*

**Instructions :**

- 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) Draw the block diagram of Building life safety system. Explain each block. [10]  
b) Explain fire stages and detectors used for various stages. [8]

OR

- Q2)** a) Explain FAS field components with suitable examples. [10]  
b) Explain fire triangle. [8]

- Q3)** a) Give the classification FAS loops and explain. [8]  
b) Discuss supplementary operations to be executed during fire. [8]

OR

- Q4)** a) List automatic fire detectors. Explain any one. [8]  
b) Explain elements of FACP. [8]

- Q5)** a) Explain single and dual action manual stations. [8]  
b) Describe linear heat sensing cable. [8]

OR

- Q6)** a) List type of fire alarm sprinkler system. Explain any one. [8]  
b) Describe input to output mapping of FAS components. [8]

**SECTION - II**

- Q7)** a) What is access control system. Discuss important of access control system. [10]  
b) Explain biometrics for access control system. [8]

OR

**P.T.O.**

- Q8)** a) List access control devices. Explain any one with application. [10]  
b) Discuss false acceptance and false rejection in biometric access control system. [8]

- Q9)** a) Draw and explain typical CCTV system. [8]  
b) Discuss selection criteria for CCTV camera. [8]

OR

- Q10)** a) Give the classification of camera for CCTV. [8]  
b) Differentiate between MPEG-4 and MJPEG. [8]

- Q11)** a) Discuss importance and applications of perimeter intrusion detection system. [8]  
b) Explain components of perimeter intrusion detection system. [8]

OR

- Q12)** a) Explain various types intrusion detection system. [8]  
b) Explain various technologies used for perimeter intrusion detection system. [8]



Total No. of Questions : 6]

[Total No. of Pages : 4

**P1010**

**[3664]-258**

**B.E. (Printing) (Sem. - I)**

**COSTING ESTIMATING, PROJECT MANAGEMENT  
AND OPERATION RESEARCH**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) Answer 3 questions from Section-I and 3 questions from Section-II.*
- 2) Figures to the right indicate full marks.*
- 3) Assume suitable data, if necessary.*

**SECTION - I**

**Q1)** a) Explain the various elements to be considered in today's competitive environment while running a business. **[8]**

b) Comment on the following with suitable examples: **[8]**

- i) Standard cost.
- ii) Estimation of the job.
- iii) Final costing of the job.

OR

a) Explain the term Market, and classify various types of markets in the industry. **[8]**

b) Explain the term Accounting, and classify the accounting operations of the company. **[8]**

**Q2)** a) Find out the total paper requirement for printing the following job with given details. **[8]**

Job: College Brochure

Size: 21.5 cm × 27.5 cm

No. of copies: 1000

No. of pages: Text (B/W) 16

Cover: 04 (four color)

Paper available: 63.5 cm × 91 cm for Text (80 GSM)

58.5 cm × 45.5 cm for cover (120 GSM Art)

**P.T.O.**

- b) Vikram Printers is having 4 departments Design, Plate making, Printing and Binding. The actual costs for a period are as follows.

- i) Rent: Rs. 15000/-                      ii) Repairs: Rs. 8000/-  
iii) Depreciation: Rs. 20000/-      iv) Lighting: Rs. 6000/-  
v) Insurance of employees: Rs. 5000/-  
vi) Supervision: Rs. 10000/-

Following data of all the four departments is available.

S.R. NO.	PARTICULARS	DESIGN	PLATE	PRINTING	BINDING
1	Area Square Feet	80	120	220	110
2	Value of Plant	100000	220000	540000	130000
3	No. of Workers	4	3	6	4

From the above data prepare the cost sheet finding out the department wise costs. [8]

OR

- a) Find out the number of plates required for printing the following job with given details. [8]

Job: College Brochure

Size: 21.5 cm × 27.5 cm

No. of copies: 1000

No. of pages: Text (B/W) 16

Cover: 04 (four color)

Paper available: 63.5 cm × 91 cm for Text (80 GSM)

58.5 cm × 45.5 cm for cover (120 GSM Art)

Size of the machine: 23" × 36" for text

18" × 23" for cover

- b) Explain various elements of costs along with suitable examples. [8]

**Q3)** a) Explain the Project Defining and Planning stages with the help of any appropriate example. [9]

- b) Explain the Project performance measurement and control techniques with the suitable example. [9]

OR

- a) Explain the Project Executing and Delivery stages with the help of any appropriate example. [9]

- b) Explain the term Project Management, its characteristics and need in the competitive environment. [9]

## SECTION - II

**Q4)** A project is represented by network as shown below. Determine:

- The expected task time and their variance.
- The earliest and latest time expected to reach the activity.
- Determine the critical path.
- Probability of an event occurring at the purpose completion date if original contrast time of completing the project is 41.5 bits.
- The duration of project that will have 95% chance of been completed.

Activity	Precedence	$t_o$	$t_m$	$t_p$	[16]
a	-	5	10	8	
b	-	18	22	20	
c	-	26	40	33	
d	a	16	20	18	
e	a	15	25	20	
f	b	6	12	9	
g	c	7	12	10	
h	d	7	9	8	
i	e, f	3	5	4	

OR

- A departmental head has four subordinates and four tasks to be performed. The subordinates differ in efficiency and the tasks differ in their intrinsic difficulty. His estimate, of the time each man would take to perform each task, is given in matrix below. [8]

Tasks	Men			
	E	F	G	H
A	18	26	17	11
B	13	28	14	26
C	38	19	18	15
D	19	26	24	10

- A marketing manager has 5 salesmen and 5 districts. Considering the capabilities of the salesmen and the nature of districts, the marketing manager estimates that sales per month (in hundred rupees) for each salesman in each district would be follows. [8]

Job	Machine				
	A	B	C	D	E
1	32	38	40	28	40
2	40	24	28	21	36
3	41	27	33	30	37
4	22	38	41	36	36
5	29	33	40	35	39

**Q5)** Minimize  $z = x_2 - 3x_3 + 2x_5$   
 Subjected to,  $3x_2 - x_3 + 2x_5 \leq 7$   
 $-2x_2 + 4x_3 \leq 12$   
 $-4x_2 - 3x_3 + 8x_5 \leq 10$   
 $x_2, x_3, x_5 \geq 0$  [16]

OR

Max.  $z = 3x_1 + 2x_2 + 5x_3$   
 $x_1 + 2x_2 + x_3 \leq 430$   
 $3x_1 + 2x_3 \leq 460$   
 $x_1 + 4x_2 \leq 420$   
 $x_1, x_2, x_3 \geq 0$  [16]

**Q6)** a) Find the sequence that minimize the total elapsed time required to complete the following task on two machines. [8]

Jobs	A	B	C	D	E	F	G	H	I
M/c I	2	5	4	9	6	8	7	5	4
M/c II	6	8	7	4	3	9	3	8	11

b) The cost requirement table for the transportation problem is given below. [10]

	$W_1$	$W_2$	$W_3$	$W_4$	$W_5$	Available
$F_1$	4	3	1	2	6	40
$F_2$	5	2	3	4	5	30
$F_3$	3	5	6	3	2	20
$F_4$	2	4	4	5	3	10
Required	30	30	15	20	5	

OR

a) Solve 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

b) Derive the Relation for EOQ for Inventory Model. [8]

□□□

Total No. of Questions : 6]

[Total No. of Pages : 2

**P1187**

**[3664]-260**

**B.E. (Printing)**

**OFFSET MACHINES - 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.***

**SECTION - I**

***Q1)*** a) With help of neat diagrams explain 'V' and 'W' patterns during preparation of splice. [10]

b) Describe function of roll and roll coverings (web roll). [6]

OR

a) Draw a neat figure of Dancer Roller and explain function and operation. [10]

b) Explain working of metving unit. [6]

***Q2)*** a) State and explain recent developments in plate changing / loading. [8]

b) Compare metal backed and fabric backed blankets. [8]

OR

a) Explain anilox offset inking system. [8]

b) Explain dampening systems for web offset. [8]

***Q3)*** a) Explain a Heatset Press. Describe its design, significance & function.[9]

b) Explain chilling mechanism & chill roll design (evolution). [9]

OR

a) Explain heatset coldset & newsink. [9]

b) State different folding techniques, explain any one. [9]

***P.T.O.***



## **SECTION - II**

- Q4)** a) State any four factors resulting web break. Describe in detail. [8]  
b) Draw neat diagrams of all types of web turning device. [8]

OR

Write short notes on: [16]

- a) Draw.
- b) Tension roller.
- c) Slip.
- d) Modulus of elasticity of paper.

- Q5)** State any 6 auxilliary equipments used on web offset press. [18]

OR

- a) State and explain maintenance checklist for Former folder. [9]
- b) State and explain maintenance of chill Rollers. [9]

- Q6)** State any 4 troubles in reel (reel defects). [16]

OR

State any 4 print troubles due to printing unit (Plate & blanket). [16]



Total No. of Questions : 6]

[Total No. of Pages : 2

**P1167**

**[3664]-261**

**B.E. (Printing)**

**ELECTRONIC IMAGE SETTING**

**(2003 Course)**

***Time : 3 Hours]***

***[Max. Marks : 100***

***Instructions to the candidates :***

***1) All questions are compulsory.***

**SECTION - I**

***Q1)*** a) Explain any four image file formats.

b) Describe the PS format & its architecture.

OR

a) What are raster & vector type of files? Explain in details.

b) Compare various output file formats for their advantages, features, utility & limitations if any.

**[16]**

***Q2)*** Explain the concept of display file & display processor in details

OR

Write short notes on:

a) Thermal CTP.

b) Plotters

c) Line & character Printers.

d) Dot matrix Printers.

**[18]**

***Q3)*** Explain in details workflow in digital image processing.

OR

Mention in details elements of digital image processing systems.

**[16]**

**SECTION - II**

***Q4)*** Write activities of RIP while screening text, graphics & illustrations.

OR

***P.T.O.***

Answer the following:

- a) Write features of RIP.
- b) Write on resolution & spot size.

[18]

**Q5)** Explain with neat diagram the technology being used for Capstan imagesetters.

OR

Explain with neat diagrams.

- a) External drum imagesetters.
- b) Flat Bed Recorder of CTP.

[16]

**Q6)** Explain in details the features of & application of PDF workflow.

OR

Explain with neat diagrams any two types of inkjet printers.

[16]



Total No. of Questions : 12]

[Total No. of Pages : 3

**P1011**

**[3664]-272**

**B.E. (Chemical)**

**PROCESS DYNAMICS AND 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) Figures to the right indicate full marks.*
- 5) Use of electronic pocket calculator is allowed.*
- 6) Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) Derive the Input-Output model for a Stirred Tank Heater. [8]  
b) What are various forcing functions to study the dynamic response of a system? Explain with neat sketches. [10]

OR

- Q2)** a) Compare simple feedback and feedforward control configurations based upon performance alongwith proper justifications. [8]  
b) What are SISO and MIMO systems? Give examples of chemical processes for both the systems. [10]

- Q3)** a) Study the response of a first order lag to a unit impulse input. [8]  
b) Show that a tank with variable cross sectional area along its height also has variable time constant and static gain. [8]

OR

- Q4)** a) A first order process is described by a transfer function:

$$G(s) = \frac{1}{1 + \tau_p \cdot s}$$

Establish the time response for unit step change in input. [6]

*P.T.O.*

- b) Consider a second order system with following transfer function:[10]

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

Introduce a step change of magnitude 1 into the system and find

- i) % overshoot
- ii) Decay ratio
- iii) Ultimate value of  $Y(t)$
- iv) Rise time

**Q5)** a) Explain the Routh Criteria for stability. [6]

- b) Discuss the effects of  $K_C$ ,  $T_I$  and  $T_D$  on the closed loop response of a process controlled with PID. [10]

OR

**Q6)** A first order process having transfer function [16]

$$G_p(s) = \frac{K_p}{1 + \tau_p \cdot s}$$

is controlled by integral controller with  $K_C = 1$ .

Assuming  $G_m = G_f = 1$  find:

- a) Closed loop transfer function
- b) Order of response
- c) Closed loop time constant
- d) Offset.

Assume Servo problem.

## **SECTION - II**

**Q7)** a) Sketch the root locus for the following transfer function:

$$G(s) = \frac{K}{s(s^2 + 2s + 2)} \quad [10]$$

- b) Using Routh-Hurwitz criteria, check the stability of a system described by the equation. [8]

$$s^3 + 6s^2 + 11s + 6 = 0$$

OR

**Q8)** a) Draw the root locus of a closed system with

$$G_p(s) = \frac{2}{s-4}, \quad G_c(s) = K_c \left( 1 + \frac{1}{s} \right)$$

$$G_m(s) = G_f(s) = 1 \quad [10]$$

b) If a closed loop response is stable with respect to changes in set point, is it stable to changes in the load? Justify your answer. [8]

**Q9)** a) Explain override control for steam distribution system. [6]

b) Explain cascade control system to control CSTR. Draw neat block diagram and sketch the system. [10]

OR

**Q10)** a) Explain the Ratio Control System. [8]

b) With block diagrams, state the advantages and disadvantages of Feedback and Feedforward control systems. [8]

**Q11)** Explain in details all the elements and their working in Distillation column control with neat instrumentation diagram. [16]

OR

**Q12)** Draw the process instrumentation diagram of Heat Exchanger Control. Discuss in detail all the elements of the system. [16]

□□□

Total No. of Questions : 12]

[Total No. of Pages : 4

**P1012**

**[3664]-273**

**B.E. (Chemical)**

**CHEMICAL REACTION ENGINEERING - II**

*Time : 3 Hours]*

*[Max. Marks : 100*

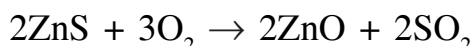
*Instructions to the candidates:*

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

**SECTION - I**

**Q1)** a) In case of shrinking core model derive the rate expression for the case of chemical reaction resistance is rate controlling step for solid as reactant. **[9]**

b) Spherical particles of zinc blende of size  $R=1$  mm are roasted in an 8% oxygen stream at  $900^{\circ}\text{C}$  and 1 atm. The stoichiometry of the reaction is:



Assuming that the reaction proceeds by the shrinking-core model calculate the time needed for complete conversion of a particle and the relative resistance of ash layer diffusion during the operation. Data: Density of solids =  $4.13 \text{ gm/cm}^3 = 0.0425 \text{ mol/cm}^3$ . Reaction rate constant  $k'' = 2 \text{ cm/sec}$ , For gases in the ZnO layer,  $D_e = 0.08 \text{ cm}^2/\text{sec}$ . Note that film resistance can safely be neglected as long as growing ash layer is present. **[8]**

OR

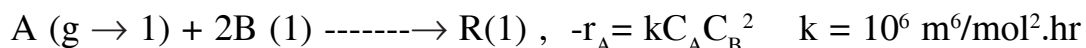
**Q2)** Uniform sized spherical particles of  $\text{UO}_3$  are reduced to  $\text{UO}_2$  in a uniform environment with the following results:

t, hr	0.180	0.347	0.453	0.567	0.733
$X_B$	0.45	0.68	0.8	0.95	0.98

If the reaction follows shrinking core model, find the rate controlling mechanism and a rate equation to represent this reaction. **[17]**

**P.T.O.**

**Q3)** Air with gaseous A bubbles through a tank containing aqueous B. Reaction occurs as follows: [17]



For this system  $k_{Ag} \cdot a = 0.01 \text{ mol/hr}\cdot\text{m}^3\cdot\text{Pa}$ ,  $f_l = 0.98$ ,  $k_{Al} \cdot a = 20 \text{ hr}^{-1}$ ,  $H_A = 10^5 \text{ Pa}\cdot\text{m}^3/\text{mol}$  (very low solubility),  $D_{Al} = D_{Bl} = 10^{-6} \text{ m}^2/\text{hr}$ ,  $a = 20 \text{ m}^2/\text{m}^3$

For a point in the absorber reactor where  $P_A = 5 \cdot 10^3 \text{ Pa}$  and  $C_B = 100 \text{ mol/m}^3$ ,

- locate the resistance to reaction (what % is in the gas film, in the liquid film, in the main body of liquid)
- locate the reaction zone
- determine the behavior in the liquid film (whether pseudo first-order reaction, instantaneous, physical transport, etc)
- calculate the rate of reaction ( $\text{mol/m}^3\cdot\text{hr}$ )

OR

**Q4)** a) In case of fluid-fluid reactions derive rate expression for fast reactions. [8]

- In case of fluid- fluid reaction taking place in the tower reactor the inlet partial pressure of reactant is 0.002 atm and outlet partial pressure is 0.003 atm. The concentration of liquid phase reactant entering is  $132 \text{ mol/m}^3$ . Following operating parameters have been determined.  $k_{Ag} \cdot a = 32000 \text{ mol/hr}\cdot\text{m}^3 \cdot \text{atm}$ ,  $k_{lA} \cdot a = 0.1/\text{hr}$   $H_A = 125 \cdot 10^{-6} \text{ atm m}^3/\text{mol}$ ,  $G = 1 \cdot 10^5 \text{ mol/hr m}^2$ ,  $C_T = 56000 \text{ mol/m}^3$ ,  $L = 7 \cdot 10^5 \text{ mol/hr}\cdot\text{m}^2$ ,  $\Pi = 1 \text{ atm}$ . Determine the height of the tower. [9]

**Q5)** a) Compare physical and chemical adsorption. [6]

- An 8.01 g sample of Glaucosil is studied with  $N_2$  adsorption at  $-195.8^\circ\text{C}$ . The following data are obtained. The vapour pressure of  $N_2$  at  $-195.8^\circ\text{C}$  is 1 atm. Estimate the surface area of the sample. [10]

P mm Hg	6	25	140	230	285	320	430	505
V $\text{cm}^3$ 0°C, 1atm	61	127	170	197	215	230	277	335



OR

- Q6)** a) Write short note on catalyst poisoning. [6]  
 b) Low temperature ( $-195.8^{\circ}\text{C}$ ) nitrogen adsorption data were obtained for an  $\text{FeAl}_2\text{O}_3$  ammonia catalyst. The result for 50.4 g sample were:

P mm Hg	8	30	50	102	130	148	233	258	330	442	480	550
V $\text{cm}^3$ $0^{\circ}\text{C}, 1\text{atm}$	103	116	130	148	159	163	188	198	221	270	294	365

Estimate the surface area for this catalyst. [10]

### SECTION - II

- Q7)** An experimental rate measurement on the decomposition of A is made with a particular catalyst. Is it likely that film resistance or mass transfer influences the rate? Could this run have been made in the regime of strong pore diffusion? Would you expect to have temperature variations within the pellet or across the gas film? The data is as given below:

Data:

For the spherical particle:

$d_p = 2.4 \text{ mm}$ ,  $L=R/3=0.4\text{mm}$ ,  $D_e=5 \times 10^{-5} \text{ m}^2/\text{hr.m cat}$ ,  $k_{\text{eff}}=1.6 \text{ kJ/hr.m cat.K}$

For gas film surrounding the pellet:

$h = 160 \text{ kJ/hr.m}^2.\text{cat.K}$ ,  $kg = 300 \text{ m}^3/\text{hr.m}^2 \text{ cat}$

For the reaction:

$\Delta H_r = -160 \text{ kJ/mol A}$ ,  $C_{A_g} = 20 \text{ mol/m}^3$ ,  $-r_{A_{\text{obs}}}''' = 10^5 \text{ mol/hr.m}^3 \text{ cat}$

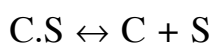
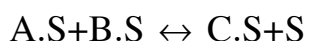
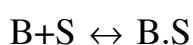
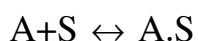
Assume that the reaction is of first order. [18]

OR

- Q8)** Derive the expression for effectiveness factor in case of cylindrical pore. State clearly the assumptions made if any. Explain the Thiele's modulus and its importance. [18]

- Q9)** a) Explain steps involved in solid catalyzed reaction with neat diagram. [6]

- b) For the following reaction mechanism derive the rate expression for the case of surface reaction as rate controlling step. [10]



OR

- Q10) a)** In case of fluid-fluid reaction taking place in the tower reactor the inlet partial pressure of reactant is 0.01 atm and outlet partial pressure is  $1 \times 10^{-6}$  atm. The concentration of liquid phase reactant entering is 0.35 mol/l. Following operating parameters have been determined.  $k_{Ag} \cdot a = 6 \times 10^{-5}$  mol/sec.cm<sup>3</sup>·atm,  $k_{IA} \cdot a = 0.03$ /sec,  $k_{IB} \cdot a = 0.02$ /sec,  $H_A = 115$  atm.cm<sup>3</sup>/mol,  $G = 3 \times 10^{-3}$  mol/sec.cm<sup>2</sup>,  $C_T = 56000$  mol/m<sup>3</sup>,  $L = 6.6 \times 10^{-3}$  mol/sec.cm<sup>2</sup>,  $\Pi = 1$  atm. Determine the height of the tower. [10]
- b) Explain the procedure to determine rate controlling step in case of solid catalyzed reactions. [6]

- Q11) a)** Substrate A and enzyme E flow through a mixed flow reactor (V=6 liter). From the entering and leaving concentrations and flow rate find a rate equation to represent the action of enzyme on substrate. [8]

$C_{E0}$ mol/lit	$C_{A0}$ mol/lit	$C_A$ mol/lit	$v$ lit/hr
0.02	0.2	0.04	3
0.01	0.3	0.15	4
0.001	0.69	0.60	1.2

- b) Discuss design of fermentor design with emphasis on air velocity and agitation speed. [8]

OR

- Q12) a)** Explain Michaelis-Menten kinetics. Discuss how to determine the parameters of the model. [8]
- b) Compare relative merits and demerits of fluidized and packed bed reactors. [8]

□□□

Total No. of Questions : 12]

[Total No. of Pages : 2

**P1210**

**[3664]-274**

**B.E. (Chemical)**

**CHEMICAL PROCESS SYNTHESIS**

**(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 - I and question 7 or 8, 9 or 10 from section - II.
- 2) Question 11 is 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) Assume suitable data, if necessary.

**SECTION - I**

- Q1) a)** Explain the difference between the following: **[10]**
- i) Verification and validation.
  - ii) Load and stress testing.
  - iii) Test plan and test strategy.
  - iv) Defect severity and defect priority.
  - v) Integration testing and incremental integration testing.
- b) What defect types are most likely to be detected during integration tests of a software system? Describe your choices in terms of both the nature of integration test and the nature of the defect types you select. **[8]**

**OR**

- Q2) a)** An air traffic control system can have one or many users. It interfaces with many hardware devices such as displays, radar detectors and communication devices. This system can occur in a variety of configurations. Describe how you would carry out configuration test on this system. **[10]**
- b) Product requirements are incomplete and ambiguous. What are the other sources of information you will use to understand requirements better?**[8]**

**P.T.O.**

- Q3)** a) Considering online and / or catalog shopping. Develop a use case to describe an user purchasing a television set with a credit card from an online vendor using web-based software. With the aid of your use case, design a set of tests you could use during system test to evaluate the software [8]
- b) Explain various parameters which governs reactor performance. [8]

OR

- Q4)** Explain the effect of following parameters on choice of reactor: [16]
- a) Temperature.
- b) Catalyst.

- Q5)** a) Explain the principle degrees of freedom in evaporator design. [10]
- b) Discuss various types of dryers. [8]

OR

- Q6)** Write short notes on: [18]
- a) Practical reactors.
- b) Absorption.
- c) Fluidized bed catalytic reactor.

## **SECTION - II**

- Q7)** a) Explain the direct and indirect sequences of simple distillation columns for a three component separation. [8]
- b) Discuss in brief thermal coupling of prefractionator arrangement. [8]

OR

- Q8)** a) Discuss optimization of a reducible structure. [8]
- b) Explain composition profiles for the middle product in the columns of the direct sequence for remixing effects. [8]

- Q9)** a) Explain the concept table Algorithm. [8]
- b) Explain the process constraints for a low temperature distillation process. [8]

OR

- [3664] - 274  
**Q10)** a) State and explain simple furnace model. [8]
- b) Discuss threshold problems in utility selection. [8]

Total No. of Questions : 12]

[Total No. of Pages : 3

**P1125**

**[3664]-276**

**B.E. (Chemical)**

**ENVIRONMENTAL ENGINEERING**

**(Elective - I) (2003 Course)**

*Time : 3 Hours]*

*[Max. Marks : 100*

**Instructions :**

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 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) Discuss about hydrological cycle. [8]  
b) The exhaust gas from a motor vehicle shows CO concentration of 2 percent by volume. What is the concentration of CO in mg/m<sup>3</sup> at 0°C and 1 atm. [8]

OR

- Q2)** A capacitive power plant of MW with 40% thermal efficiency is to be designed which will use residual oil with 1% sulphur content. The emission factors for burning 1m<sup>3</sup> of oil are : particulates = 1 kg, NO<sub>2</sub> = 10 kg and SO<sub>2</sub> = 16 S kg. Where S is the % sulphur content of oil. What are the rates of emission of particulates NO<sub>2</sub> and SO<sub>2</sub> to the atmosphere if no control devices are provided. The heating value of oil is 8000 KCal/kg and its density may be taken as 950 kg/m<sup>3</sup>. [16]

- Q3)** a) Discuss about types of Plumes. [8]  
b) Give the types of inversion. [8]

OR

- Q4)** a) Write briefly about air quality modeling. [8]  
b) One model of the atmosphere assumes a constant density. Find the lapse rate for the atmosphere and indicate whether this is stable or unstable case. Assume that the atmosphere obeys perfect gas law. [8]

**P.T.O.**

- Q5) a)** Draw a neat sketch of cyclone separator, compare the dimensions of conventional and high efficiency cyclone. [10]
- b)** Before the installation of an ESP, the stack gas of a power plant contained 6.0 gm particulates per m<sup>3</sup> of gas. The gas flow rate is 350 m<sup>3</sup>/min and the new precipitator can move 2500 kg particulate/day. [8]
- What is the emission rate of particulates before and after pollution control in kg/day?
  - What is the efficiency of the ESP?
  - Will the new system meet an emission standard of 0.7 gm/m<sup>3</sup>.

OR

- Q6)** Water is used in a spray chamber as the spray fluid to treat standard air containing particles with a density of 1000 kg/m<sup>3</sup>. The flow of air is 120 m<sup>3</sup>/min. and that of water is 0.3 m<sup>3</sup>/min. The average drop size is 1000 µm. The spray chamber has a diameter of 1 m and a height of 3 m. What is the overall collection efficiency of the chamber if the average particle size is 2.5 µm. For the above particles the individual drop collection efficiency may be taken as 9.0 %. [18]

## SECTION - II

- Q7)** Derive  $t_c = \frac{1}{K_2 - K_1} \ln \left[ \frac{K_2}{K_1} (1 - T) \cdot \frac{K_2 - K_1}{K_1 L_4} \right]$  for oxygen Sag curve. [18]

OR

- Q8)** A typical wastewater treatment plant of a industry discharges secondary effluent to the stream which is on the surface. In the summer, measurements are taken and found that a maximum flow rate of 15000 m<sup>3</sup>/day, a BOD of 40 mg/lit, DO is 2 mg/lit and temperature of 25°C. The upstream from the point of discharge of wastewater is found to have a minimum flow rate of 0.5 m<sup>3</sup>/s, a BOD of 3 mg/lit, a DO of 8 mg/lit and a temperature of 22°C. The velocity of the mixture is 0.2 m/s from the flow regime, the reaction constant is estimated to be 0.4 day<sup>-1</sup> for 20°C conditions. Draw a DO profile a 100 km reach of the stream below the discharge. [18]

- Q9)** Discuss about the primary, secondary and tertiary treatment in detail. [16]

OR

- Q10)** Show that for a completely mixed activated system, the concentration of microorganism (X) is given by [16]

$$X = Y \frac{\theta_c (S_o - S_c)}{\theta (1 + \theta_c K_d)}$$

Where  $\theta_c$  is mean cell residence time.

$Y$  is the mass of micro-organism produced per unit mass of substrate utilised,  $S_0$  is the influent substrate concentration,  $\theta$  is the hydraulic retention time.  $S_e$  is the soluble food concentration in the reactor and  $K_d$  is the microbia decay coefficient.

**Q11)** Write short note on :-

**[16]**

- a) Trickling Filter
- b) Aerobic digester.

OR

**Q12)** Write short note on :-

**[16]**

- a) Waste management Hierarchy.
- b) Composting.



Total No. of Questions : 12]

[Total No. of Pages : 3

**P1013**

**[3664]-291**

**B.E. (Chem.)**

**FUEL CELL TECHNOLOGY**

**(409348) (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.*
- 6) All questions are compulsory.*

**SECTION - I**

- Q1)** a) Describe the salient features of proton exchange membrane fuel cell. Draw a figure. [8]
- b) Draw a figure and explain the working principle of SOFC. [8]

OR

- Q2)** a) Explain the basic concepts of fuel cell. [7]
- b) What are the desired properties of materials used for the construction of various components of fuel cells? [9]

- Q3)** At STP condition, Gibbs free energy for the formation of water vapor is  $-55.14$  cal/mole. In the typical SOFC, pure methane is fed at the pressure of 3 atm. Total pressure of gases on anodic side of the fuel cell is observed to be 3.6 atm. Air is supplied at 1.3 atm. Fuel and air is supplied at the same operating temperature of  $850^{\circ}\text{C}$ . Faraday constant is  $96486$  J/V.mol. Calculate
- a) Standard open circuit potential. [9]
- b) Open circuit potential at the operating conditions. [9]

*P.T.O.*



OR

**Q4)** a) In a typical SOFC, current density of  $10 \text{ A/m}^2$  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. Air is supplied at 1.5 atm. The cell is operated at  $1000^\circ\text{C}$ . The diffusivities of hydrogen, oxygen and water vapor are 95, 70 and  $55 \text{ C/s.m}^2 \text{ atm}$ . 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:  $10 \text{ A/m}^2$       Fuel flow rate = 20 mole/h

Active anode surface area:  $0.2 \text{ m}^2$       Air flow rate = 15 mole/h

Fuel composition = hydrogen : 90% , carbon monoxide: 10%

Output potential = 220 V      Lower heating value of fuel = 30,000 kcal/kg.

**Q5)** In a typical SOFC, pure oxygen is used as an oxidiser. Derive Nernst equation to calculate open circuit potential of SOFC for the following conditions: [16]

a) Pure ethane as fuel and

b) Methane and ethane in the proportion of 50% each.

OR

**Q6)** Calculate material balance for SOFC generating 200 kW power at 80% CHP efficiency, using hydrogen as a fuel and 50% theoretical excess air as an oxidiser. [16]

### SECTION - II

**Q7)** a) Explain Kröger-Vink defect structure in solids. [9]

b) Explain the mechanism by which oxygen vacancies are generated in crystal structure. [9]

OR

**Q8)** a) Why internal steam, reforming is preferred over external steam reforming? [9]

b) Explain reaction mechanism and salient features of oxidative reforming of methane. [9]

- Q9)** a) Power density of tubular fuel cell is  $2.2 \text{ kW/m}^2$ . Single tube has a diameter of 18 mm and active length of 1800 mm. In order to obtain 200 kW power, calculate: [8]
- i) total anode surface area required,
  - ii) total number of tubes required.
- b) Calculate mole fraction of defects in a pure crystal at 100 and  $1000^\circ\text{C}$  temperature. Defect energy is 50 kJ/mole. Comment on the significance of result. [8]

OR

- Q10)** a) Explain the mechanism of charge transfer in three phase boundary (TPB). [8]
- b) Derive Butler-Volmer form of the charge transfer rates. [8]

- Q11)** Explain the basic concepts involved in the design of hybrid cycle combining biomass gasification with SOFC for 200 kW power generation capacity. [16]

OR

- Q12)** a) Differentiate between planar and tubular structure of SOFC. [8]
- b) What are the recent advancements in the materials of anode and their advantages and disadvantages? [8]

□□□

Total No. of Questions : 12]

[Total No. of Pages : 3

**P1318**

**[3664]-294**

**B.E. (Polymer)**

**POLYMER PROCESSING OPERATIONS - 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) Explain gear pump or melt pump assisted extrusion process. Discuss volumetric efficiency power requirement and pulsation. [8]
- b) With neat sketch, discuss twin belt coextruder unit to make coextruded plastic sheet. [3]
- c) With schematic sketch, explain different elements in a wire or strand covering line. [5]

OR

- Q2)** a) Draw a neat sketch of tubing extrusion line using vacuum sizing and explain in short? [6]
- b) With a neat sketch, explain caterpillar haul off system for extruded profiles. [6]
- c) What are the different calibration systems used for pipes. Explain any one with a neat sketch. [4]

- Q3)** a) Write in short about draw ratio and secondary draw. [2]
- b) Write short notes on (any four): [16]
- i) Free blowing.
  - ii) Line binding and forming in oven.
  - iii) Reverse draw forming with plug assist.
  - iv) Twin sheet forming.
  - v) Diaphragm forming.

*P.T.O.*

OR

- Q4)** a) Draw a neat cycle time bar chart for cut sheet plug assist vacuum forming. Explain each step of operation in short. [7]
- b) Discuss different types of molds used in thermoforming from design and material for mold construction angle. [7]
- c) Discuss different types of heating modes for thin sheet and thick sheet forming. [4]
- Q5)** a) Draw a neat sketch of any one type of parison die head assembly and explain the function of each part. [8]
- b) Draw a cycle time bar chart for continuous extrusion blow molding for single station and single parison machine. Explain in short different operations involved. [8]

OR

- Q6)** a) Explain the need and benefits of parison programming. [4]
- b) Draw and explain with a neat sketch convergent and divergent type of die-mandrel or cup and pin assembly. [4]
- c) A parison is 0.5m long and is left hanging during parison formation for 3 seconds. The density of the material is  $750 \text{ kg/m}^3$ . Obtain an expression for estimating amount of sagging assuming parison formation time less than the relaxation time for the material. Assume characteristic time for the material to be 10 seconds; elastic modulus  $2 \times 10^4 \text{ N/m}^2$ . Find the amount of sagging. [8]

## **SECTION - II**

- Q7)** a) With neat sketches of the various steps involved, explain gas assisted injection molding. [8]
- b) Explain the breathing techniques used in thermoset injection molding. Draw bar chart for any one type of breathing technique. Explain the process in detail. [8]

OR

- Q8)** a) Discuss shear controlled orientation in injection molding. Draw neat sketches of arrangement of devices. [6]
- b) Write in short about structural foam injection molding. [5]
- c) Explain with neat sketches the torpedo designs and sequences used in double colour injection molding. [5]

- Q9)** a) Define compression molding process. State and explain different stages of compression molding with neat sketch. [8]
- b) List the different types of compression molds. Explain the selection criteria for different types of molds for a given product. Explain semi positive mold with a neat sketch. [8]

OR

- Q10)** a) Write short notes on:
- i) Cooling jigs and fixtures used for compression molded components.
- ii) Deflashing unit. [8]
- b) Explain in brief design consideration in compression mold design. [8]
- Q11)** a) Explain different types of transfer molding processes. Explain any one method with a neat sketch. [8]
- b) Explain the various faults and their remedies for the transfer molding process. [6]
- c) Discuss in brief transfer molding of dough molding compounds. [4]

OR

- Q12)** a) Derive an expression for power dissipated per unit volume of dielectric for high frequency preheating used in transfer molding. [8]
- b) List different types of transfer molding machines. Explain any one with neat sketch. [6]
- c) Compare transfer molding with compression molding. [4]



Total No. of Questions : 12]

[Total No. of Pages : 3

**P1014**

**[3664]-297**

**B.E. (Polymer)**

**POLYMER REACTION ENGINEERING**

**(2003 Course) (Elective - I) (409366)**

*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 the various parameters that affect the properties of any polymeric material. **[6]**
- b) Explain the role of change in viscosity in Polymer reaction Engineering. **[4]**
- c) Polymer A is made up of the following distribution of the chain molecules. Find the number average molecular weight, weight average molecular weight and polydispersity Index. **[6]**

Data:

Weight (in gms)	Molecular weight
5	10,000
10	50,000
10	1,00,000

OR

- Q2)** a) Discuss the role of heat transfer in polymerization process. **[4]**
- b) From the analysis of the given mixture which is composed of 10 molecules of 10,000 monomer lengths and 100 molecules of 10 monomer lengths find the Dispersion Index of the sample. **[4]**
- c) Define at least four quantities used for the characterization of polymers. **[8]**

**P.T.O.**

- Q3)** a) Derive the necessary equation of the rate of Initiation ( $r_i$ ) in terms of Initiator concentration  $[I]$ . [6]
- b) Derive the necessary equation of the total concentration of the free radicals  $\gamma_o (R_j)$  in terms of the rate of Initiation ( $r_i$ ) under free radical polymerization. [12]

OR

- Q4)** a) MMA is to be polymerized at 80°C with Free radical Polymerization in a batch reactor. The initial concentration of monomer is 8.135 gmole/lit, and the concentration of initiator is kept constant at 0.06 gmole/lit. Assume termination takes place only by combination. The rate constant are as  
 $K_0 = 3 \times 10^{-6} \text{ sec}^{-1}$ ,  $k_p = 176 \text{ lit/gmole.sec}$ ,  $k_c = 3.6 \times 10^7 \text{ lit/gmole.sec}$ ,  $f = 0.6$   
 Find the number average molecular weight, weight average molecular weight and MWD for a reaction time of 200 min. [12]
- b) Derive the necessary design equation of Batch Reactor on Instantaneous Number Degree of Polymerization for carrying out Free-radical Polymerization. [6]

- Q5)** a) Discuss the necessary equation for the steady state population balance equation for the particles having 'n' radicals in the Emulsion polymerization. [10]
- b) Write a note on Aqueous Emulsifier solution. [6]

OR

- Q6)** Derive the necessary equation of Overall rate of polymerization in emulsion Polymerization if
- Case 1) Number of the Free radicals per polymer particles small compared with unity.
- Case 2) No transfer of polymer radicals out of the particle through diffusion and high rate of termination. [16]

## **SECTION - II**

- Q7)** a) Describe in detail the synthesis of Polyvinylchloride via suspension polymerization technique. [8]  
b) Discuss Liquid Flow Reactor and Recirculated Coil Reactor for the synthesis of Polystyrene. [10]

OR

- Q8)** With applicable Flow sheet explain in detail about the manufacturing of the followings: [18]  
a) High Impact Polystyrene (HIPS)  
b) Nylon 66

- Q9)** a) Discuss the Auto acceleration effect in Free radical Polymerization and explain its role in Kinetics of vinyl chloride polymerization. [8]  
b) Discuss in detail Kinetics of step growth polymerization. [8]

OR

- Q10)** Discuss in detail the Chiu's Model to explain the effect of diffusion at high conversion on the rate constant in Step Growth polymerization. [16]

- Q11)** a) Write a short note on Reactor Selection for carrying out polymerization reaction. [10]  
b) Explain with neat diagram the effect of different polymerization process variables on end-use properties. [6]

OR

- Q12)** a) Write in detail about the process control strategies in Continuous polymerization process. [8]  
b) Explain the reactor design in terms of following factors Polymerization Mechanism, Stoichiometric Factors, Thermodynamics Factors, and Transport Limitations. [8]

□□□



Total No. of Questions : 6]

[Total No. of Pages : 3

P1376

[3664]-309

**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)** Answer any two questions of the following:

- a) What is a gravimeter? What are the types of gravimeter? Explain the construction of Lactose Romberg Gravimeter. [8]
- b) Calculate the Bouger Anomaly for following data collected during the gravity survey along a line in an area ( $1^\circ$  is a base station). [8]

Given : Tidal Correction : 0.01 mgal, Terrain Correction : 0.031 mgal  
 $\rho = 2.75$  gm/cc constant in a region. The Latitude of a line is  $23^\circ 39' 40''$

Station	Time in hrs	g obs mgal	Elevation in meter
$1^\circ$	9.01	98136891	0
2	9.10	98136903	150
3	9.21	98136925	175
4	9.40	98136950	125
5	9.50	98136930	100
$1^\circ$	10.07	98136899	0

- c) Explain the construction and working of flux gate magnetometer. [8]
- d) Draw and discuss the effects produced by following conditions in gravity and magnetic survey
  - i) A buried sphere of uniform radius 'r' at a depth 'z' with density higher than surrounding.
  - ii) A faulted horizontal sheet with thickness 't', occurring at a depth  $Z_1$  and  $Z_2$ , (where  $Z_1 > Z_2$ ), with density higher than surrounding and angle of faulting  $\theta = 45^\circ$  and also  $\theta = 90^\circ$ . [8]

*P.T.O.*

- Q2)** a) Draw and explain Schlumberger arrangement of electrical resistivity survey. [8]  
b) How is apparent resistivity different from true resistivity? [3]  
c) Explain the “Expanding Spread Traverse” using Schlumberger method. [5]

OR

- a) Explain the working principle of Geiger Muller Counter. [8]  
b) The Nickel isotope  $^{65}_{28}\text{Ni}$  decays by beta decay to the non-radioactive isotope of copper  $^{65}_{29}\text{Cu}$ . The half-life of the nickel isotope is 2.52 h. An initially pure sample of  $^{65}\text{Ni}$  contains  $5.27 \times 10^{20}$  atoms. How much time will pass until  $8.37 \times 10^{19}$  atoms of  $^{65}\text{Cu}$  have been created? [8]

- Q3)** a) How is geochemical method effectively used as an exploration tool in new areas? [8]  
b) Give different modes of transport of hydrocarbons through the seal of the reservoir to the surface. [10]

OR

Write short notes on: [18]

- a) Geochemical Correlation Methods.  
b) Weathering processes of Petroleum Seepages.

## **SECTION - II**

- Q4)** Explain the 2D acquisition of seismic data on land and in offshore. [16]

OR

- a) What is a synthetic seismogram? [8]  
b) How are static and dynamic corrections applied to seismic data? [8]

- Q5)** a) How is seismic method useful in developing a basic geological model? [8]  
b) Write notes on **any one** of the following: [8]  
i) AVO,  
ii) Acoustic impedance,  
iii) Use of GIS in data interpretation.

**Q6) a) Answer the following: [8]**

- i) How is deterministic approach in reserves estimation different than probabilistic approach?
  - ii) What is a play?
  - iii) How is boundary relationship between different units interpreted in mapping reflection seismic images?
  - iv) How does the asymmetry of folding control the area of reservoir during calculation of volumetric reserves?
- b) Explain the steps involved in effective exploration of stratigraphic trap. [10]

OR

- a) What is NELP? What are the likely areas of exploration in India in future? How is risk discussed / addressed while exploring in new areas? [10]
- b) Write a note on 'reserves' nomenclature as recommended by SPE and WPC. [8]



Total No. of Questions : 10]

[Total No. of Pages : 2

**P1202**

**[3664]-31**

**B.E. (E & T/C)**

**VLSI DESIGN (Elective)**

**(1997 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) Answer any three questions from each section.***
- 3) Figures to the right indicate full marks.***
- 4) Assume suitable data where necessary and state your assumptions clearly.***

**SECTION - I**

- Q1)*** a) Design CMOS logic for  $y = ABC + D$ . Calculate area needed on the chip. [8]  
b) Draw the static transfer characteristics of CMOS inverter. Explain the region of operations on this characteristics curve. [8]
- Q2)*** a) What is RTL? What are its advantages while writing VHDL code? Give suitable examples. [8]  
b) What are merits and demerits of synchronous system design. Explain with examples. [8]
- Q3)*** a) What are the signal attributes available in VHDL? Explain each with an example. [8]  
b) Compare Signal and Variable. Give suitable example for each comparison. [8]
- Q4)*** a) Write VHDL code for Decade/binary counter with load, Up/Down, reset, CE and BCD/Binary mode of Operation controls. Write suitable testbench for the same. [12]  
b) What are the constraints in PAR? [4]
- Q5)*** Write short notes on any THREE: [18]  
a) Design flow of VHDL EDA tools.  
b) Technology scaling in CMOS.  
c) JTAG.  
d) Static and Dynamic Hazards.

***P.T.O.***

## **SECTION - II**

- Q6)** Draw the architecture of FPGA. Draw in detail the Tiles, CLB, LC, GRM and IOB of the same. [16]
- Q7)** a) What is the difference between pre-synthesis, post-synthesis and post PAR simulations. [8]  
b) What are the Synthesis issues in VHDL program? Explain them with suitable examples. [8]
- Q8)** a) Explain the following statements with examples: ALIAS, ARRAY TYPE, ENTITY, Guarded signal assignment statement. [10]  
b) Compare FPGA and CPLD. [6]
- Q9)** a) Write VHDL code for a rising edge triggered D flip flop with asynchronous set and reset inputs and Q and Q\_bar outputs. [8]  
b) What is the need of configuration in VHDL? Explain configuration binding with an example. [8]
- Q10)** Write short notes on any THREE: [18]  
a) Overloading in VHDL.  
b) Data objects in VHDL.  
c) Shift operators in VHDL.  
d) Resolution function and multiple drivers.



Total No. of Questions : 6]

[Total No. of Pages : 2

**P1377**

**[3664]-310**

**B.E. (Petroleum Engineering)**

**PETROLEUM 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)*** Answer the following in Brief:

- a) List five petrophysical data sources. [2]
- b) Distinguish between static and dynamic model of a reservoir. [2]
- c) What is mud logging? [2]
- d) What are the data sources in mud logging? [2]
- e) List the information obtained from conventional core analysis for the benefit of (i) petrophysicist (ii) geologist (iii) reservoir engineer (iv) production engineer. [4]
- f) Distinguish between wireline logging and LWD. [2]
- g) List four important applications of cased hole logging. [2]
- h) List the methods to study changes in Petrophysical parameters over time, used for reservoir monitoring. [2]

***Q2)*** Describe borehole environment. What is invasion profile? Explain empirical relationship between different zones and fluids. Which logs are influenced most by the nature of invasion profile. [16]

**OR**

Explain important electrical logging methods with the help of neat sketches.

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

- a) Logs used for evaluation of cementation,
- b) MWD,
- c) Radioactivity logs,
- d) Sonic log.

***P.T.O.***

## **SECTION - II**

**Q4)** Outline the Quick Look Method for determination of oil saturation. [18]

OR

What are clays? Distinguish between clays and clay minerals? Give important properties of clay minerals. How do clay minerals occur in sedimentary rocks? In what way clay minerals influence rock properties? Which logs are affected by clays? How?

**Q5)** Write short notes on *any four* of the following: [16]

- a) Downhole production sampler,
- b) Perforation,
- c) Cross plots,
- d) Recognition of fractured reservoirs,
- e) Geosteering,
- f) Caliper logs.

**Q6)** Answer *any two* of the following: [16]

- a) Explain the importance and procedure of “cuttings analysis”.
- b) What is the origin of “overpressure” in the formation? Explain the methods to detect overpressure.
- c) With the help of neat sketches explain how log patterns could be used to detect different depositional environments and fluid contents in reservoirs.



Total No. of Questions : 8]

[Total No. of Pages : 3

**P1275**

**[3664]-311**

**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) Calculate the reserves in a gas field of 2000 acres, with 10 ft sand thickness, 12% porosity, 15% water saturation, BHP = 3000 psi gauge, BHT = 200 F. The natural gas has the following Mole composition:  $C_1 = 0.85$ ,  $C_2 = 0.05$ ,  $N_2 = 0.1$ . [6]
- b) Find viscosity, molecular weight, specific gravity, pseudo critical properties, Z factor, Bg. Gas data : Pci, Tci are : 668, 708, 493 psia; 343, 550, 227 R.  $\omega_i$  and  $\mu_i$  are 0.01, 0.09, 0.04 and 0.001, 0.002, 0.0015 cp respectively. Explain the charts you use to correct for water? Draw the graph of viscosity and Bg versus pressure. [10]
- Q2)** What is an inflow performance curve for a gas reservoir? What is an outflow performance curve? What is a tubing intake curve? Plot all on the same graph? What is the usefulness of this graph? Explain in detail with equations. [16]
- Q3)** For the well with the following parameters; depth of 5790ft, gas gravity is 0.6, Pts = 2300 psia, and average temperature of the flow string is 117 F. Gas flow rate = 5MMscfd, 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. [18]

*P.T.O.*



**Q4)** Derive the equation for gas metering.

**[16]**

## **SECTION - II**

**Q5) a)** What is the criteria for choosing a H<sub>2</sub>S removal process?

b) Draw a process flow diagram showing the removal of hydrogen sulphide.

**[16]**

**Q6) a)** What is the maximum pressure at which a 10 inch nominal pipe size (OD = 10.75, ID = 10.02) can be operated? Calculate the maximum through put for a 40 mile pipeline of this type. Assume  $e/d = 0.002$ ,  $c = 0.05$ ,  $E = 1.0$ ,  $Y = 0.4$ ,  $S = 35,000$  psi,  $T_{av} = 100$  F, viscosity = 0.01,  $Z = 0.74$ , specific gravity = 0.7, thickness = 0.73 in. Assume 0.0 psia minimum pressure. **[8]**

b) If half the section of the pipeline diameter is doubled, find theoretically what happens to the flow rate. **[10]**

**Q7) a)** Draw a diagram of a centrifugal compressor and name its parts. **[10]**

b) Write a note on reciprocating compressors. **[6]**

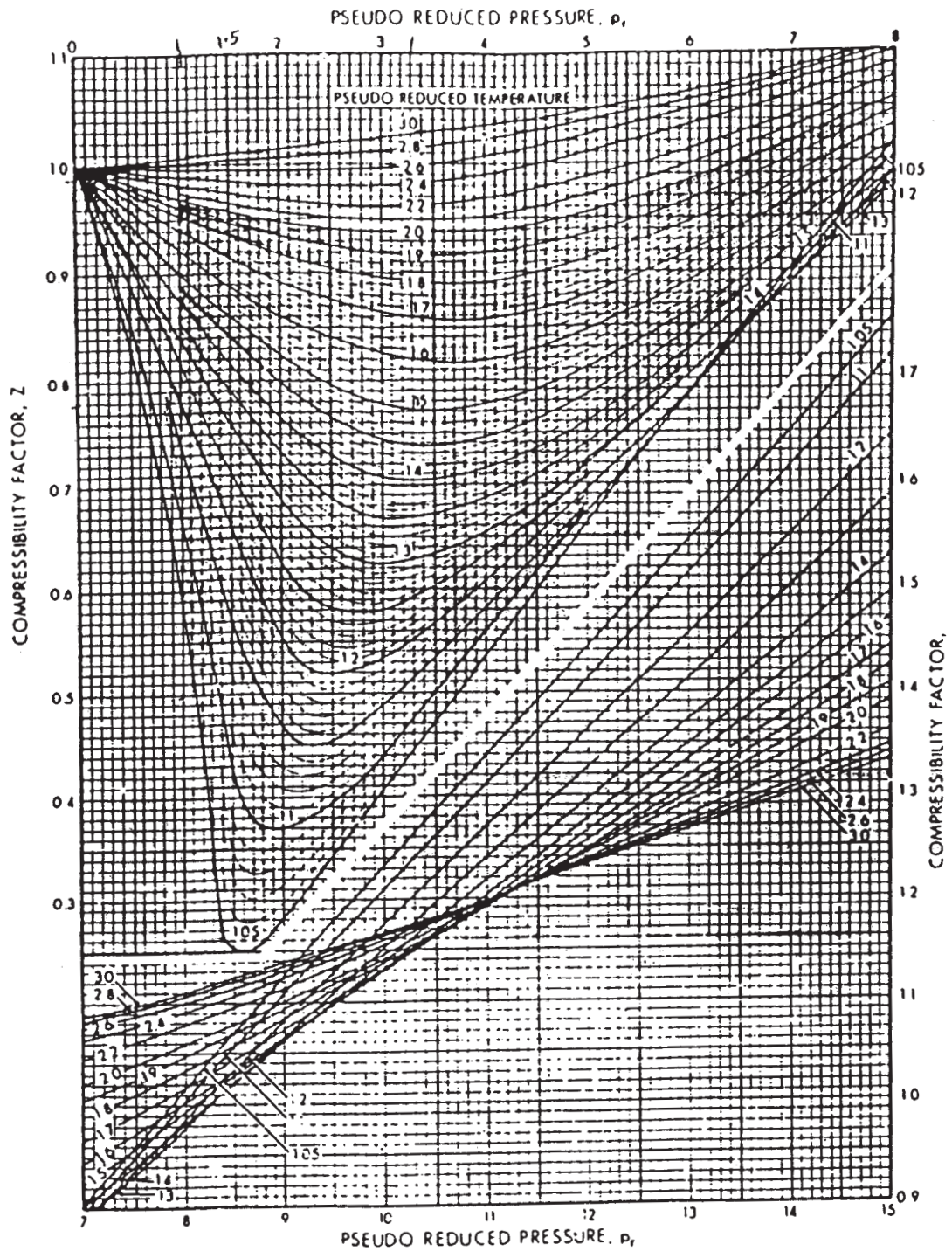
**Q8)** Write short notes on: **[16]**

a) Pipeline efficiency and transmission factor.

b) Compression processes.

c) Gas hydrates.

d) Two phase flow.



Total No. of Questions : 8]

[Total No. of Pages : 2

**P1015**

**[3664]-322**

**B.E. (Petrochemical Engineering)**  
**PETROCHEMICAL PROCESSES**  
**(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.*

**SECTION - I**

- Q1)** a) Describe with flowsheet the hydrodealkylation process for conversion of toluene to benzene. [12]
- b) Mention health and handling precautions and applications of isopropanol. [6]
- Q2)** a) Describe with flowsheet the Nippon Zeon process for separation of butadiene from steam cracked C<sub>5</sub> cut. [12]
- b) Mention end uses of ethylene oxide and Bisphenol-A. [4]
- Q3)** a) Describe with flowsheet the oxidation process for conversion of cumene to acetone. Mention health and handling precautions for acetone. [12]
- b) Mention end uses of formaldehyde and acrylonitrile. [4]
- Q4)** a) Describe with flowsheet the Mitsubishi Gas Chemical Process for direct extraction of m-xylene. [12]
- b) Explain role of steam in steam cracking of naphtha. [4]

*P.T.O.*

## **SECTION - II**

- Q5)** a) Describe the process of steam reforming for production of hydrogen. [10]  
b) Write notes on: [8]  
    i) Xylene isomerisation  
    ii) Utilization of natural gas.
- Q6)** a) Describe with flowsheet the Sohio process for conversion of propylene to acrylonitrile. [12]  
b) Mention health and handling precautions of butadiene. [4]
- Q7)** a) Describe the low pressure Ziegler process with flowsheet for conversion of ethylene to polyethylene. [12]  
b) Mention end uses of ethylene glycol and methanol. [4]
- Q8)** a) Write notes on : [12]  
    i) Toluene disproportionation.  
    ii) Autothermal reactor.  
    iii) Oligomerisation of isobutene.  
b) Mention health and handling precautions for acetic acid. [4]



Total No. of Questions : 10]

[Total No. of Pages : 4

**P1325**

**[3664]-324**

**B.E. (Petrochemical)**

**PROCESS DYNAMICS SIMULATION AND CONTROL**

**(2003 Course)**

**Time : 3 Hours]**

**[Max. Marks : 100**

**Instructions to the candidates :**

- 1) *Answers 3 questions from each section.*
- 2) *Answers to the two sections should be written on separate answer books.*
- 3) *Figures to the right indicate full marks.*
- 4) *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) Discuss the various objectives and benefits of process control. [6]  
b) Dynamics of a system can be represented by following set of equations:

$$\frac{dx_1}{dt} = 2x_1 + 3x_2 + 1 \quad \text{with } x_1(0) = 0$$

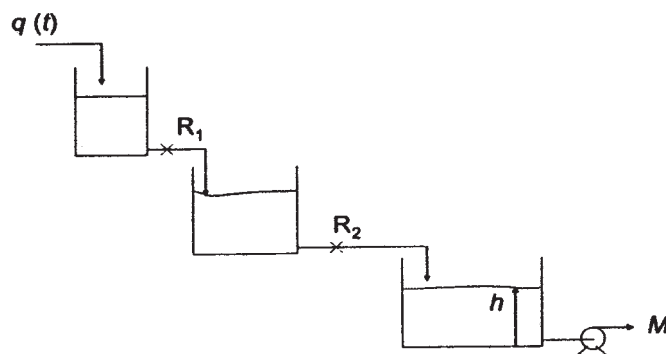
$$\frac{dx_2}{dt} = 2x_1 + x_2 + e^t \quad \text{with } x_2(0) = 0$$

- i) Use Laplace transforms to obtain corresponding algebraic equations.
- ii) Solve obtained algebraic equations using Cramer's rule.
- iii) Use Heaviside expansions for the roots and subsequently report the solutions in time domain. [10]

- Q2)** a) What is damping factor? With help of neat diagram explain its effect on dynamic response of second order system. [4]

- b) Determine the transfer function  $\frac{H(s)}{Q(s)}$  for the liquid level system shown

in the figure. Resistances  $R_1$  and  $R_2$  can be considered to be linear. Flow from tank 3 is maintained constant at a pre-set value  $M$  by means of a pump. All 3 tanks are non-interacting with each other. [8]



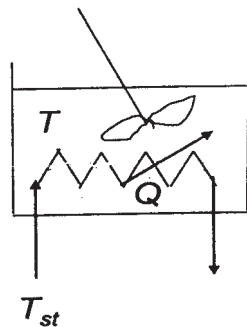
**P.T.O.**

- c) Define : Transportation Lag, Overshoot, Response Time, Time constant. [4]

**Q3) a)** What are Servo and Regulatory control problems?

Derive the overall transfer function of a Feedback loop with a help of block diagram of a Regulatory problem. [8]

- b) Crude oil is being heated by saturated steam flowing through an immersed coil as shown in the figure. Derive the transfer function of this system. Comment on the order of this system and write expression for its parameters. [8]

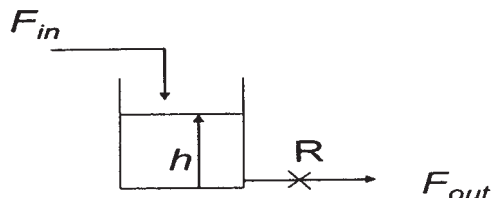


**Q4) a)** Derive the expression for transfer function of a Second order system. [8]

- b) Density of ideal gas is function of pressure and temperature and can be represented by :  $\rho = \frac{M p(t)}{RT(t)}$ , where symbols have their usual significances.

- Derive the overall linearized function for density ( $\rho$ ).
- If  $M = 32$ ,  $T = 500$  K,  $p = 101.3$  kPa and  $R = 8.314$  (kPa.m<sup>3</sup>) / (kmol.K), obtain the density.
- Calculate density of the gas at 154.2 kPa and 432°C temperature with help of derived linearized equation. [8]

**Q5) a)** Derive transfer function for output to input ( $F_{out} / F_{in}$ ) of the following system. Obtain the final response in time domain as well. [6]

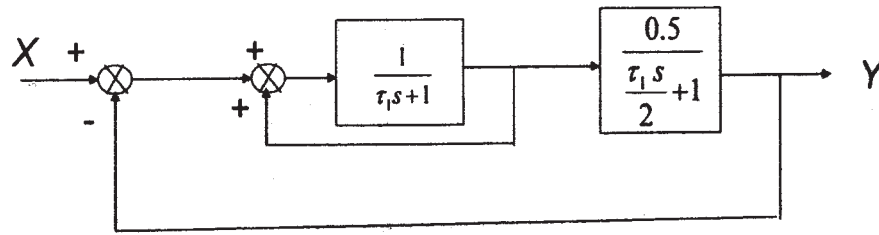


- b) Solve the differential equation with help of Laplace Transform:

$$\frac{d^2 y}{dt^2} + 12.6 \frac{dy}{dt} - 34.7 y = 23t \text{ where } y'(0) = 0 \text{ and } y(0) = 2. \quad [6]$$



- c) Find the overall transfer function of the following system: [6]



## SECTION - II

- Q6) a) Draw Bode plots for an open-loop process, whose dynamics can be represented by : [10]

$$G_{OL} = 100 K_C \left( \frac{1}{0.1s + 1} \right) \left( \frac{1}{2s + 1} \right) \left( \frac{1}{s + 1} \right)$$

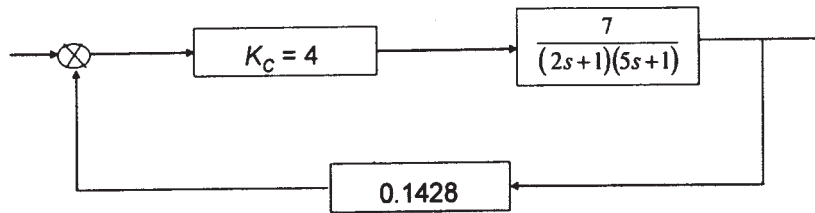
The value of Gain  $K_C$  can be assumed to be 0.6.

- b) “If all roots of characteristic equation lie on LHS of s - plane, system is considered to be stable” - Elaborate and explain your views with help of some suitable example. [6]
- Q7) a) What are the major advantages of Routh - Hurwitz criterion for examining stability of a system? [4]
- b) Consider a feedback control system having the characteristic equation. [8]

$$s^3 + 2s^2 + (2 + K_C) s + \frac{K_C}{\tau_1} = 0$$

- i) Derive condition of stability for the system with help of Routh - Hurwitz Criterion.
- ii) If  $K_C = 45$  and  $\tau_1 = 0.4$ , comment on stability.
- c) With help of diagram explain Gain Margin and Phase Margin. [4]
- Q8) a) What are different time - integral performance criteria generally used for Controller Tuning? Explain in brief. [4]
- b) Justify the selection of control modes of a controller for process parameters such as Temperature, Pressure, flow and Level. [4]

- c) Plot the root locus diagram for the following process: [8]



- Q9)** a) With help of neat diagrams explain transformations of Discrete Signals to Continuous and vice - versa. Comment on applicability of these transformations. [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]

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

- Z - transform and its applications in Process Control.
- Cascade Control strategy for shell & tube heat exchanger.
- Ziegler - Nichols Controller Settings and implementation precautions.
- Feedback - feed-forward Control strategy merits and demerits.





Total No. of Questions : 12]

[Total No. of Pages : 3

**P952**

**[3664]-337**

**B.E. (Computer Engg.)**

**PRINCIPLES OF COMPILER DESIGN**

**(2003 Course) (410444)**

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

**SECTION - I**

- Q1)** a) Write a Lex specification to read a C program and calculate number of new line characters, tabs and white spaces in the program. [8]  
b) Whether lexical analysis detects any errors? Explain with example. [8]

OR

- Q2)** a) Explain with example various Compiler Construction tools. [9]  
b) Why compilation phases are divided into front-end and back-end? What are the advantages? [4]  
c) Explain the following: [3]  
i) token. ii) pattern.  
iii) lexeme.

- Q3)** a) Show that the following grammar is LR(1) but not LALR(1). [10]  
 $S \rightarrow Aa \mid bAc \mid Bc \mid bBa$   
 $A \rightarrow d$   
 $B \rightarrow d$   
b) Explain Recursive Descent parser with an example. [8]

OR

- Q4)** a) Show that following grammar is LL(1) but not SLR(1). [8]  
 $S \rightarrow AaAb \mid BbBa$   
 $A \rightarrow \epsilon$   
 $B \rightarrow \epsilon$

**P.T.O.**

- b) What is Shift-Reduce and Reduce-Reduce conflict? How these can be resolved? With examples explain in which condition S-R and R-R conflict can occur in SLR, canonical LR and LALR parsers. (Make use of LR(0), LR(1) items). [10]

- Q5)** a) Write a translation scheme to generate three address code for assignment sentences with array and pointer references. [8]  
b) Explain concept of back-patching with example. [8]

OR

- Q6)** a) Translate executable sentences of the following C program. [8]

```
main ( )  
{   int i = 1;  
    int a[10];  
    while(i <= 10)  
    {  
        a[i]=0;  
        i = i + 1;  
    }  
}
```

into

- a) syntax tree  
b) postfix notation  
c) three-address code.  
b) What are synthesized and inherited attributes? What are Marker Non-terminal symbols? Give example. [8]

### **SECTION - II**

- Q7)** a) With example explain different parameter passing methods. [8]  
b) Explain Runtime support and Storage organization. [8]

OR

- Q8)** a) What are different storage allocation strategies? Explain anyone in detail. [8]  
b) What is "Display" mechanism? Explain it with example. [8]

- Q9) a)** What is a basic block and flow graph? Generate three address code for the following program. Find the basic blocks in it and write flow graph for the same.

begin

    prod := 0;

    i := 1;

    do

        begin

            prod := prod + a[i] \* b[i];

            i := i + 1;

        end

    while i <= 20

end

[8]

- b) What is next use information explain in detail.

[8]

OR

- Q10)a)** Explain peephole optimization in detail.

[8]

- b) What is a DAG? Explain role of a DAG in code generation phase.

[8]

- Q11)a)** What is the need of code optimization? Discuss principal sources of code optimization.

[10]

- b) Discuss algorithm for live variable analysis.

[8]

OR

- Q12)a)** Enlist and explain with example various transformations on basic blocks.

[8]

- b) With example explain what is Global Common Sub-expression? Write algorithm for Global Common Sub-expression Elimination.

[10]



Total No. of Questions : 12]

[Total No. of Pages : 2

**P955**

**[3664]-344**

**B.E. (Computer)**

**SOFTWARE TESTING & QUALITY ASSURANCE**

**(2003 Course) (410450)**

***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.***

**SECTION - I**

- Q1)*** a) What is good data? How to store & extract the data? [10]  
b) Explain the four principles of investigation. [8]

OR

- Q2)*** a) How to plan formal experiments? Explain with formal experiments examples. [10]  
b) Describe software measurement validation. [8]

- Q3)*** a) Explain the Halstead's software science. [8]  
b) Which are the difficulties with the general complexity measures? [8]

OR

- Q4)*** a) Which are the object - oriented metrics? [8]  
b) Explain the need for internal product attributes measurement. [8]

- Q5)*** a) Write short notes on- [8]  
i) Measurement tools.  
ii) Software defects.  
b) Explain White-Box testing in detail. [8]

OR

- Q6)*** a) Explain equivalence partitioning with example. [8]  
b) Describe user documentation testing. [8]

***P.T.O.***

## **SECTION - II**

**Q7)** Write short notes on - (any three): **[18]**

- a) Integration testing.
- b) Acceptance testing.
- c) Scenario testing.
- d) Regression testing.
- e) Ad-hoc testing.

OR

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

- a) Test plan.
- b) GUI testing.
- c) Usability testing.
- d) Accessibility testing.

**Q9)** a) Explain Ishikawa's seven basic tools. **[8]**

b) Explain the Cause-effect diagram with example. **[8]**

OR

**Q10)** a) Describe the defect removal effectiveness. **[8]**

b) Explain software maintenance & process maturity level. **[8]**

**Q11)** a) How one can make fixation of a problem & test it for any software maintenance? **[8]**

b) How can one choose the method of fix distribution? **[8]**

OR

**Q12)** a) How can we distribute the fixation of the problem, prepare & test shipment unit? **[8]**

b) Which are the logistics & tooling available for problem reporting? Explain with any problem. **[8]**



Total No. of Questions : 12]

[Total No. of Pages : 4

**P1328**

**[3664]-350**

**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 : Q1 or Q2, Q3 or Q4, Q5 or Q6.*
- 5) Section II : Q7 or Q8, Q9 or Q10, Q11 or Q12.*

**SECTION - I**

- Q1)** a) Explain Transaction Server Process Structure. [6]
- b) What factors result in skew when a relation is partitioned on one of its attributes by Hash Partitioning and Rang Partitioning? In each case, what can be done to reduce the skew? [5]
- c) Write a short note on Parallel Hash Join. [5]

OR

- Q2)** a) Describe different approaches to handle cache coherency problem in Parallel Databases. [8]
- b) Evaluate how well partitioning techniques support the following types of data access.
- 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. [8]
- Q3)** a) Define Distributed Databases. Explain types of Distributed Database Management System Architectures. [6]
- b) State different types of failures in distributed systems and explain failure handling in distributed database using 2Phase Commit protocol. [6]
- c) Describe how LDAP can be used to provide multiple hierarchical views of data, without replicating the base level data. [6]

*P.T.O.*

OR

- Q4)** a) Compute semi-join  $r \bowtie s$  for the relations  $r$  and  $s$ . [6]

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) Explain the different approaches to detect distributed deadlock which neither site can detect based solely on its local wait-for-graph. [6]
- c) Explain Optimistic methods for Distributed Concurrency Control. [6]

- Q5)** a) Consider the following nested relational schema.

Emp = (ename, childrenset setoff (children), skillset setoff (skills))

Children = (name, birthday), Birthday = (day, month, year)

Skills = (type, Examset setoff (Exams)), Exams = (year, city).

Answer the following:

- Write DTD and XML file.
  - Write a query in XPath to list all skill types in Emp.
  - Find the names of all the employees who have a child who has a birthday in March.
  - Find the those employees who took an examination for the skill type "typing" in the city "Pune".
  - List all skill types in Emp. [10]
- b) Compare and contrast the two-tier, three-tier and n-tier architecture for Web-DBMS. [6]

OR

- Q6)** a) Write short notes on: [10]

- Axes of XPath.
  - SOAP.
- b) Explain simple type and Complex type of XML Schemas with suitable example. [6]

## SECTION - II

- Q7)** a) Explain different conceptual schemas of Data Warehouse design with suitable example. **[10]**
- b) One of the advantages of Data Warehouse is that we can use it to track how the contents of a relation change over time; in contrast, we have only the current snapshot of a relation in a regular DBMS. Discuss how you would maintain history of a relation R; taking into account that 'old' information must somehow be purged to make space for new information. **[6]**

OR

- Q8)** a) Write short notes on: **[10]**
- i) OLAP ii) Meta Data.
- b) Explain the various options / steps for designing fact table and summary table for Inventory system. **[6]**
- 
- Q9)** a) Write steps of Hunt's Algorithm to construct decision tree. Consider following Data set. **[12]**
- i) Calculate Information gain of Refund, Marital Status and Taxable Income.
- ii) Calculate Gini Index of Refund, Marital Status and Taxable Income.
- iii) Calculate Error Rate of Refund, Marital Status and Taxable Income.
- iv) Draw Decision Tree.

Instance	Refund	Marital Status	Taxable Income	Cheat
1	Yes	Single	125K	No
2	No	Married	100K	No
3	No	Single	70K	No
4	Yes	Married	120K	No
5	No	Divorced	95K	Yes
6	No	Married	60K	No
7	Yes	Divorced	220K	No
8	No	Single	85K	Yes
9	No	Married	75K	No
10	No	Single	90K	Yes



- b) Write a short note on Text Mining. [6]

OR

- Q10)**a) Explain Data Preprocessing in Data Mining. [6]

- b) Write K-means algorithm in details and apply this algorithm on the following items to cluster. Assume  $k = 2$ . [6]

Object	Attribute 1	Attribute 2
Medicine A	1	1
Medicine B	2	1
Medicine C	4	3
Medicine D	5	4

- c) Explain Naïve Bayes Classifier with suitable example. [6]

- Q11)**a) Define Information Retrieval System. Describe how it is differ from database system. [8]

- b) Write a short note on:

- i) Web Search Engine.  
ii) Retrieval Effectiveness. [8]

OR

- Q12)**a) Explain different factors for relevance ranking in information retrieval system. [8]

- b) Explain different Indexing of Documents approaches. [8]



Total No. of Questions : 12]

[Total No. of Pages : 3

**P957**

**[3664]-352**

**B.E. (Information Technology)**

**BIOINFORMATICS**

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

**SECTION - I**

- Q1)*** a) Define bioinformatics. Mention and explain its various applications.[9]  
b) Explain the major types of protein databases with most suitable example for each. [7]

**OR**

- Q2)*** a) Explain how molecular biology is considered as an information science. Also explain central dogma of molecular biology with neat diagram.[8]  
b) What is genomics? Explain the difference between structural & functional genomics. State the tools & techniques included in both. [8]

- Q3)*** a) What is structure visualization? State & explain the various features of representative protein structure rendering programs and compare them.[9]  
b) Explain user interface and information theory. Also explain the four basic components in user interface hierarchy with neat diagram. [8]

**OR**

- Q4)*** a) Describe the working of microarray with spotting technique. What are the sources of variability in spotting? Compare spotting and affimetrix microarray preparation process. [9]  
b) Explain various data mining methods with neat diagrams. [8]

***P.T.O.***

- Q5)** a) Explain centralized and distributed data mining infrastructure in detail.[8]  
b) What are the types of machine learning processes? Explain any three machine learning techniques in detail. [9]

OR

- Q6)** a) What is text mining? Explain the NLP process of text mining with its various phases, in detail. [8]  
b) List different computational methods of sequence alignment. Explain any two of them. [9]

## **SECTION - II**

- Q7)** a) What are the different methods of protein structure prediction? Explain the Ab Initio method of protein structure prediction process with the help of neat diagrams. [7]  
b) What are the components involved in a modelling and simulation system? Explain the basic modelling and simulation process in regards to bioinformatics with neat diagram. [10]

OR

- Q8)** a) Write short notes on:-  
i) Collaboration and communication model. [5]  
ii) Synchronous and asynchronous collaboration. [5]  
b) Explain the comparative modelling process of protein structure prediction. Discuss all its phases in detail. [7]

- Q9)** a) Explain FASTA algorithm. What FASTA programs are available for sequence alignment? [6]  
b) What are the recommended steps for FASTA search? [6]  
c) Compare FASTA and BLAST tools for sequence alignment. [5]

OR

- Q10)** a) Explain BLAST algorithm in detail with neat diagrams. [6]  
b) What is an E ( ) value? Explain its significance giving suitable examples. [4]  
c) Explain gapped - BLAST, alongwith all the major refinements included. What is filtering in BLAST? [7]

- Q11)**a) Explain the process of interchange and transformation of pollutants in atmosphere, hydrosphere and lithosphere. [8]
- b) Define Biotechnology. What is the significance of environmental biotechnology? Discuss various factors responsible for degradation of the ecosystem. [8]

OR

- Q12)**a) Write short notes on:-
- i) Genetic Markers. [5]
- ii) Polymerase Chain Reaction. [5]
- b) Explain various applications of genetic engineering. [6]



Total No. of Questions : 12]

[Total No. of Pages : 3

**P1126**

**[3664]-359**

**B.E. (Information Technology)**  
**ARTIFICIAL INTELLIGENCE (414451)**  
**(Elective-II) (2003 Course)**

*Time : 3 Hours]*

*[Max. Marks : 100*

**Instructions :**

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

**SECTION - I**

- Q1)** a) Define Artificial intelligence. What is Turing Test and what was it intended to accomplish? [8]
- b) Best First search uses both an OPEN list and a CLOSED list. Describe the purpose of each for the Best-First algorithm. Explain with suitable example. [8]

OR

- Q2)** a) Hill climbing is a standard iterative improvement algorithm similar to greedy Best-First search. What are the primary problems with hill climbing? [8]
- b) Describe the essence of a constraint satisfaction problem. What are some of the major applications of constraint satisfaction search? [8]
- Q3)** a) What is predicate logic? Describe the advantages of predicate logic over propositional logic. [8]
- b) Briefly explaining Truth Maintenance system. Explain with suitable example how TMS allows truth values to be changed during reasoning. [8]

OR

- Q4)** a) Represent each of the following sentences in first-order logic and then convert each one of them into Well Formed Formula (WFF). [8]
- i) A whale is a mammal.
  - ii) John knows Jane's father.
  - iii) If it's raining, then the ground is wet.
  - iv) If the switch is on and the light is off then the light-bulb is broken.
  - v) All computers have a processor.

**P.T.O.**

- b) What is resolution? Explain resolution is predicate logic with suitable example. [8]

**Q5) a)** Explain the major modules of a natural language interpretation system and explain their functions. [9]

- b) What is understanding? Explain understanding as constraint satisfaction with suitable example. [9]

OR

**Q6) a)** There are many important relationships that may hold between phrases and parts of their discourse context. Explain the following terms with respect to pragmatic analysis :- [9]

- i) Identical entities
  - ii) Parts of action
  - iii) Elements of sets
  - iv) Causal chains.
- b) Draw and explain types of junction in a line drawing in Waltz algorithm. Also show all permissible labeling at those junctions. [9]

### **SECTION - II**

**Q7) a)** What are the components of a planning system? Explain briefly how these components can be implemented. [8]

- b) Write brief note on i) STRIPS, ii) Least Commitment Strategy. [8]

OR

**Q8) a)** What is planning? How block world problem helps up to study planning? Give suitable example. [8]

- b) Write brief note on i) Hierarchical Planning, ii) Non-Linear planning. [8]

**Q9) a)** What is learning? Explain Failure-driven learning in details with suitable example. [8]

- b) Explain Artificial Neural Networks (ANN). Also explain how ANN mimics the human brain working. [8]

OR

**Q10)a)** What is Supervised Learning and unsupervised Learning? Explain the benefits to Neural Networks. [8]

- b) What is Inductive learning? Also explain Winston's learning program. [8]

**Q11)a)** What is Prolog? How Prolog answer user queries? [9]

- b) Explain architecture of expert system and discuss how expert system technique helps in building an efficient system. [9]

OR

**Q12)a)** Identity and describe two good application areas for expert system within a University environment. [9]

b) Explain how Prolog copes with searching through a number of clauses, matching, unification and resolution. Also consider the following Prolog program code and write the output of the following queries :- [9]

What will be output of the following queries :-

.? proud(shreyash)

.? proud(X)

.? parent(ajay,X)

predicates

proud(symbol).

parent(symbol,symbol).

newborn(symbol).

father(symbol,symbol).

mother(symbol,symbol).

clauses

proud(X):-parent(X,Y),newborn(Y).

parent(X,Y):- father(X,Y).

parent(X,Y):- mother(X,Y).

father (ajay, shreyash).

mother(smita, shreyash).

newborn(shreyash)

□□□

Total No. of Questions : 12]

[Total No. of Pages : 4

**P1172**

**[3664]-363**

**B.E. (Biotechnology)**

**BIO-PROCESS EQUIPMENT DESIGN**

**(416283) (2003 Course)**

**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) Describe the design features of agitated Nutsche filter. [6]  
b) Explain the cake discharge arrangement used in Rotary drum filter. [8]  
c) Explain Recessed plate construction of plate and frame filters. [4]

OR

- Q2)** a) Define following terms: [8]  
i) Partition coefficient. ii) Retention Volume.  
iii) Retention time. iv) Relative retention.  
b) State the advantages of High performance thin layer chromatography. [4]  
c) A chromatographic separation of two component samples on a 40 cm column gave the retention times for two solutes as 4 and 6 min. respectively. Calculate the following: [6]  
i) No. of theoretical plates.  
ii) Plate height.  
iii) Resolution of peaks.

The base width of two chromatographic peaks are 0.2 and 0.4 min.

- Q3)** a) State the need of downstream processing in the biological processes. Explain sublimation drying/Lyophilization. [8]  
b) Describe the general design procedure for Process equipment. [8]

**P.T.O.**



OR

- Q4)** a) Differentiate between Wiped joint and Socket joint. [4]  
b) Draw neat sketches for following pipe fittings- [6]  
Reducing, Tee, Cross, Elbow, Bend, Plug.  
c) Define Utilities. Describe the service fluid codes as per IS-1980 used in process flow diagrams. [6]

- Q5)** a) Describe the design of plain head, shallow dished head, Hemispherical head with neat sketched. [6]  
b) Design pressure vessel from following data: [10]  
Shell Inner dia - 1400 mm.  
Material - Stainless steel.  
Internal pressure -  $1.2 \text{ N/mm}^2$   
Permissible stress -  $130 \text{ N/mm}^2$   
Head Type Flanged and Shallow dished  
Outer dia - 1400 mm  
Crown radius - 1400 mm  
Knuckle radius - 85 mm  
Nozzle Welded to shell  
Max. permissible stress -  $130 \text{ N/mm}^2$   
Inner dia - 220 mm  
Thickness - 3.5 mm  
Bolts - Material - Hot rolled steel

OR

- Q6)** a) Discuss the material used for the construction of High pressure vessels. [6]  
b) Explain Multi-shell construction of High pressure vessel. [4]  
c) Write short note on: [6]  
i) Delta - ring closure. ii) Single Cone joint.

### **SECTION - II**

- Q7)** a) Describe with neat sketch design of Spiral heat exchanger. [6]  
b) Design shell and tube heat exchanger from following data: [12]  
Shell side - No. of passes - 1.  
Material - Carbon steel Corrosion allowance - 3 mm  
Fluid - Water Inlet temp.  $30^\circ\text{C}$ ; Outlet temp.  $65^\circ\text{C}$ .  
Working pressure -  $0.33 \text{ N/mm}^2$ .  
Design pressure -  $0.5 \text{ N/mm}^2$ .  
Nozzles - Inlet & Outlet 90 mm.

Tube side	Material - Stainless steel. No. of tubes - 60 Pitch - square 32 mm. Outer dia - 24 mm. Length - 13 m. Fluid - Nitrous oxide Inlet temp. 98 C Outlet temp. 70 C. Permissible stress - 100 N/mm <sup>2</sup> .
Nozzles	Vent & Drain - 25 mm. Material - Carbon steel. Permissible stress - 90 N/mm <sup>2</sup> .
Shell cover	Dished head. Crown radius 550 mm. Knuckle radius 70 mm.
Channel &	Channel cover Material - Carbon steel. Permissible stress - 95 N/mm <sup>2</sup> .

OR

- Q8)** a) State the material used for construction of shell & tube heat exchanger.[6]  
b) Explain design of Long tube vertical evaporators with neat sketch. [8]  
c) Describe various methods for fixing tubes to tube sheet. [4]

- Q9)** a) Explain different types of jackets used in construction of reaction vessel. [6]

- b) Design vessel shell with half coil jacket from following data:

Vessel shell with inner dia - 2100 mm.

Jacket inner dia - 2200 mm.

Jacket length - 2450 mm.

Dia.of Half coil - 1100 mm.

Internal pressure (shell) 0.70 N/mm<sup>2</sup>.

Internal pressure (jacket) - 0.42 N/mm<sup>2</sup>.

Allowable stress - 98 N/mm<sup>2</sup>.

E at 20 C -  $190 \times 10^3$  N/mm<sup>2</sup>.

Poisson's ration - 0.3.

Flanged and dished head Inner dia - 2100 mm.

Crown radius - 2100 mm

Knuckle radius - 135 mm. [10]

OR

- Q10)**a) Explain shaft design based on Torque and bending moment. [6]

- b) Design shaft & blade of turbine agitator which is running in vessel of 1800 mm dia. using torque and bending moment criteria. [10]

Internal pressure of vessel -  $0.72 \text{ N/mm}^2$

Dia. of agitator - 520 mm

Speed - 250 rpm

Liquid in vessel Specific gravity - 1.15 Viscosity - 580 cP

Overhang of agitator shaft between bearing and agitator - 1250 mm

Agitator blade nos - 6

Width of blade - 78 mm

Thickness of blade - 7 mm

Shaft Material - Rolled steel Permissible stress -  $55 \text{ N/mm}^2$

Tensile stress -  $246 \text{ N/mm}^2$

E -  $19.5 \text{ N/mm}^2$ .

- Q11)**a) Explain the Optimum sieve plate performance diagram. [6]

- b) Discuss various feed arrangements to be considered for distillation column alongwith neat sketches. [8]

- c) Define Percent flooding and weep point. [2]

OR

- Q12)**a) Explain the design of liquid distributors and redistributors. [8]

- b) Calculate stresses developed in fractionating column from following data: [8]

Shell Dia - 2500 mm

Design pressure -  $1.8 \text{ N/mm}^2$

Working temp -  $170^\circ \text{C}$

Design temp -  $220^\circ \text{C}$

Material - Carbon steel

Permissible stress -  $95 \text{ N/mm}^2$

Head - Elliptical welded to shell

Trays Sieve type No - 30

Spacing - 0.7 m

Holes - 4 mm

Thickness - 2.5 mm

Weight of attachment  $1500 \text{ N/mm}^2$

Weight of liquid and tray -  $1240 \text{ N/mm}^2$

Weight of column - 2400 kgs

Wind pressure -  $1428 \text{ N/mm}^2$ .



Total No. of Questions : 10]

[Total No. of Pages : 3

**P1339**

**[3664]-36**

**B.E. (E & TC)**

**FIBER OPTIC COMMUNICATION**

**(1997 Course) (404191)**

*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)** Give reasons for the following: **[16]**

- a) The manufacturer specifies  $R_L$  when characterizing the bandwidth of a photodiode.
- b) Optical fiber cable manufacturer specify bending losses in dB but not in dB/km.
- c) Laser diodes present more problems to the circuit designer than LED's.
- d) Light from usual light sources is in co-herent.

**Q2)** What are the requirements of: **[16]**

- a) Sources for optical communication.
- b) Good connector design.
- c) Detectors for optical communication.
- d) Optical fibers for communication.

**P.T.O.**

- Q3)** a) Prove that  $f_{3dB}(\text{electrical}) = 0.707 f_{3dB}(\text{optical})$ . [8]
- b) A GaAs laser diode has a  $450\ \mu\text{m}$  cavity length, which has an effective absorption coefficient of  $10/\text{cm}$ . For uncoated facets the reflectivities are 0.32 at each end. What is the optical gain at lasing threshold?  
If internal quantum efficiency is 0.60% what is the external quantum efficiency.  
If by addition of a coating the reflectivity is increased, what is the effect on the optical gain at lasing threshold and the external quantum efficiency. [8]
- Q4)** a) Explain the various fundamental structures of confining optical waves in the lateral direction for laser light. [8]
- b) A single mode step index fiber has  $n_1 = 1.447$  and  $n_2 = 1.442$ ; operating wavelength is  $1300\ \text{nm}$ . If the core diameter is  $7200\ \text{nm}$ , confirm that, the fiber will permit single mode operation. Estimate the range of wavelengths over which this will occur.  
If core diameter is doubled will it support single mode operation- Explain. [8]
- Q5)** a) A standard single mode fiber offers per km attenuation of [10]
- |                         |                         |
|-------------------------|-------------------------|
| i) 10 dB at 600 nm      | ii) 3 dB at 800 nm      |
| iii) 1.8 dB at 900 nm   | iv) 0.7 dB at 1100 nm   |
| v) 0.55 dB at 1250 nm   | vi) 0.5 dB at 1300 nm   |
| vii) 0.55 dB at 1350 nm | viii) 1.8 dB at 1400 nm |
| ix) 0.35 dB at 1500 nm  | x) 0.18 dB at 1550 nm   |
| xi) 0.35 dB at 1650 nm  | xii) 2.0 dB at 1800 nm  |
- at wavelength given above.  
Plot the graph and mark the three windows of optical transmission.  
Comment on the attenuation-wavelength relation.  
State the reasons for higher attenuation at wavelengths of  $600\ \text{nm}$ ,  $1400\ \text{nm}$  and  $1800\ \text{nm}$ .
- b) Compute the allowed misalignment for a multimode step index fiber if each type of error is allowed to contribute 0.25 dB of loss. The radius of the cable is  $50\ \mu\text{m}$  and NA is 0.24. [8]

## SECTION - II

- Q6)** Explain in brief: [16]
- a) Operating principle of p-i-n photodiode.
  - b) Optical Directional Coupler.
  - c) EDFA
  - d) Photonic switching.
- Q7)** For a long haul single mode optical fiber system operating at 1300 nm: [16]  
Mean power launched from laser is 500  $\mu$ W.  
Cable fiber loss is 0.4 dB/km.  
Splice loss is 0.1 dB/km.  
Connector loss at transmitter & receiver is 1 dB each.  
Mean power required at APD is -55 dBm when operating at 35 Mbits/sec (BER =  $10^{-9}$ ).  
a) Assuming no dispersion equalization penalty.  
b) Assuming 1.5 dB dispersion equalization penalty.  
Estimate the maximum possible link length without repeaters at 35 Mbits/sec (BER= $10^{-9}$ )
- Q8)** a) Explain the various methods of measurement of attenuation of optical fiber. Comment on the accuracy of the result in each case. [8]  
b) Explain Eye pattern in detail. [8]
- Q9)** a) What is co-herent optical detection? How many kinds of co-herent detection schemes may be designed? Explain the advantages of co-herent detection system over direct detection system. [8]  
b) Discuss briefly the possible sources of noise in optical fiber receivers. [8]
- Q10)** Write short notes on (Any 3): [18]
- a) Splicing Techniques.
  - b) Transimpedance Amplifier.
  - c) WDM.
  - d) Role of cladding in optical fibers.



Total No. of Questions : 12]

[Total No. of Pages : 4

**P929**

**[3664]-102**

**B.E. (Civil)**

**ENVIRONMENTAL ENGINEERING - II**

**(2003 Course) (401003)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Solve all questions.*
- 2) *Answers to the two sections should be written in two separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Your answer will be evaluated as a whole.*
- 6) *Use of non programmable calculator is allowed.*
- 7) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) Differentiate clearly between BOD and COD. How do you determine the BOD and what are the limitations of BOD tests? [4]
- b) Write a short notes on testing of new sewers. [6]
- c) The BOD of a sewage incubated for one day at 30°C has been found to be 110 mg/L. What will be the 5 day 20°C BOD? Assume  $K_1 = 0.1$  at 20°C. [6]

OR

- Q2)** a) State the common laboratory tests conducted on sewage and their importance in the treatment and disposal of sewage. [4]
- b) State whether COD value and BOD value of same sample would be same? Or different? If it is different which will be greater? Why? [6]
- c) Design a sanitary sewer main to discharge a peak flow of 100 L/Sec within a mini velocity of 0.6 m/Sec and maxi of 2 m/sec

Sewer length between two man holes = 100 m

GL at U/S end of sewer = 50.500

GL at D/S end of sewer = 50.200

Depth of soil cover above sewer at U/S end = 1.5 m

q/Q	v/V	N
0.838	1.120	0.013
0.671	1.072	0.013

Workout the invert level at the D/S end of the sewer. [6]

*P.T.O.*

- Q3)** a) Draw a figure showing different zones of stream pollution and discuss in detailed about zone of active decomposition. [4]
- b) Write Streeter - Phelps equation and explain the terms used in the equation. [6]
- c) Explain the factors governing de-oxygenation re-oxygenation. [6]

OR

- Q4)** a) What is the difference between preliminary treatment and primary treatment. [4]
- b) A medium screen is to be designed for the following data.
- i) Screen flow 1 million lit per hour.
  - ii) Inclination of Screen  $45^\circ$
  - iii) free board 0.3 m
  - iv) Bar size 10 mm  $\times$  50 mm at 50 mm clear spacing
- Design Screen chamber, length and numbers of bars [6]
- c) A grit chamber is to be designed to handle a sewage flow from population of 50,000 and per capita daily consumption of water is 135 Lit design grit chamber. [6]
- Q5)** a) Draw a neat flow diagram for a conventional Activated Sludge Process. [6]
- b) Explain the following terms: [6]
- i) Sludge Volume Index.
  - ii) MLVSS.
  - iii) Mean Cell Residence Time.
  - iv) HRT.
- c) Determine the aeration period, BOD loading in Kg/m<sup>3</sup>/day, F/M ratio, total solids, Suspended solids, BOD removal efficiency and recirculation ratio of ASP which is [6]
- operating with the following data.
- i) Waste water flow 35000 m<sup>3</sup>/day.
  - ii) Influent total solids 600 mg/lit.
  - iii) Influent suspended solids 120 mg/ lit.
  - iv) Influent BOD ( $S_0$ ) 175 mg/lit.
  - v) Effluent total solids 495 mg/lit.
  - vi) Effluent suspended solids 22 mg/lit.
  - vii) Effluent BOD 20 mg/lit.
  - viii) MLVSS 2500 mg/lit.
  - ix) Returned Sludge Solids 9800 mg/lit.
  - x) Volume of aeration basin 10000 m<sup>3</sup>.



OR

- Q6)** a) Write about trickling filter: [6]  
i) Construction and operation.  
ii) Filter media.  
iii) Under drainage system.
- b) What are the advantages and disadvantages of trickling filter. [6]
- c) Determine the size of a high rate trickling filter for the following data.[6]  
i) Sewage flow 5 mld.  
ii) Recirculation ratio 1.5  
iii) BOD of raw sewage 230 mg/L.  
iv) BOD removal in PST 30%.  
v) Final effluent BOD Desired 25 mg/L.

### **SECTION - II**

- Q7)** a) Explain the bacterial-Algae symbiosis in oxidation pond. [4]  
b) Distinguish clearly between the working of an oxidation ditch and oxidation pond. [6]  
c) Write in detail design parameters of aerated lagoons and mention the advantages and disadvantages of the same. [6]

OR

- Q8)** a) Discuss with sketch the working of oxidation pond. [4]  
b) What are the advantages and disadvantages of oxidation ditch. [6]  
c) Design a oxidation pond to treat a domestic sewage flow of 3 MLD at a place, the latitude of which is 24°N. The 5 day 20°C BOD of sewage is 250 mg/L, Photosynthetic oxygen yield is 225 kg/ha/day and  $k = 0.23$  per day. Assume necessary data if required. [6]

- Q9)** a) Write a short note on Septic tank. [4]  
b) Design a septic tank to treat sewage from a working women hostel of 2500 residents. Water supply rate 120 lpcd.

Draw a neat sketch giving plan elevation of a septic tank designed above. Also design and draw a soak well for the above septic tank considering percolation capacity of the filter media say 1250 L/m<sup>3</sup>/day. Assume all other required data. [12]

OR

- Q10)** a) Write the design parameters of anaerobic digester. [4]  
b) Draw a neat sketch of dispersion trench plan and section and explain its construction and working in detail. [6]  
c) Draw a simple line diagram of standard rate anaerobic digester showing various space allocations for digested sludge storage, active digestion, supernatant, scum and gas storage in detail. [6]
- Q11)** a) Explain equalization and proportioning. [6]  
b) Discuss in brief various treatment processes adopted for treating industrial waste water. [6]  
c) Explain the following points related to sugar industry. [6]  
i) Manufacturing process and waste water generation.  
ii) Characteristics of waste water and  
iii) Methods of treatments.

OR

- Q12)** a) What is the difference between grab sample and composite sample. [6]  
b) Explain the characteristics of pulp and paper mill waste. [6]  
c) Draw the flow chart for treating dairy waste water. [6]

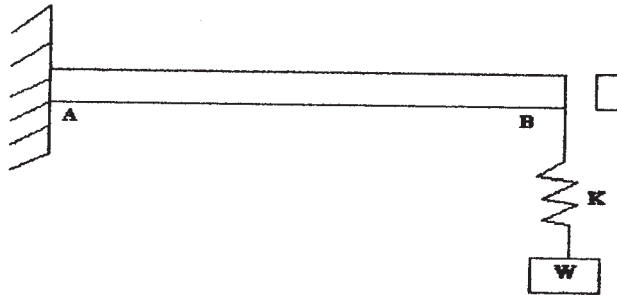


**P931****[3664]-104****B.E. (Civil)****STRUCTURAL DESIGN - III****(2003 Course)***Time : 4 Hours]**[Max. Marks : 100**Instructions to the candidates:*

- 1) Answer Q1 or Q2, Q3 or Q4 in section - I.
- 2) Answer Q5 or Q6, Q7 or Q8 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 10 mm x 50 mm, of length 1.5 m is supporting a load of 120 N through a spring having stiffness  $k = 100\text{N/mm}$  as shown in fig(1). Calculate the natural frequency of the system if modulus of elasticity of mild steel is 200Gpa. **[8]**

**Fig(1)**

- b) A post tensioned prestressed concrete beam section has top flange 480 x 150, web 120 x 380 and bottom flange 350 x 330 mm, is simply supported over a effective span of 18 m and carries a super imposed load of 14 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 80 mm from soffit of the section and are stressed to initial prestress of 930 Mpa. Take loss ratio as 0.82 and unit weight concrete as 25 kN/m<sup>3</sup>. **[17]**

**P.T.O.**

OR

**Q2)** a) Explain in brief with sketches: [8]

- i) Single degree of freedom system.
- ii) Critical damping.

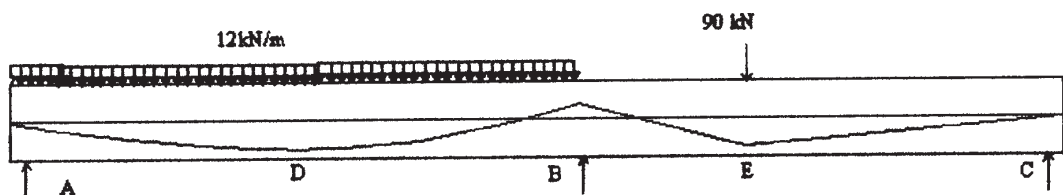
b) A post tensioned prestressed concrete beam section has top flange 500 x 150, web 125 x 600 and bottom flange 280 x 250 mm, is simply supported over a effective span of 16 m. The beam is prestressed with 5 No. of 12/5 Freyssinet parabolic cables with their c.g. at 100 mm from extreme bottom fiber, stressed one at a time from both ends. Calculate total loss of prestress at the age of 100 days, if initial prestress is 1030 Mpa, coefficient friction=0.28,  $k=0.0026/\text{m}$  length of cable, slip of anchorage =1.5mm,  $C_c=2.0$ ,  $E_s=2 \times 10^5$  Mpa, concrete grade = M40, 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 14 kN/m over entire simply supported span of 15.5 m with M45 grade of concrete and Freyssinet cables of 12/5 ( $f_y = 1750$  Mpa) or 12/7 ( $f_y = 1500$  Mpa), including the design of end block. Draw sketches showing cable profiles and end block reinforcement details. Checks for stresses in concrete and shear are required. [25]

OR

**Q4)** a) State and explain the remedies to reduce losses in PSC beams. [8]

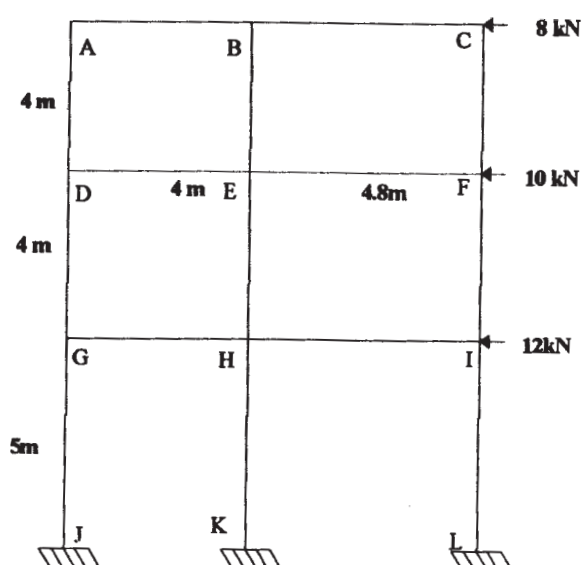
b) A post tensioned prestressed concrete continuous beam ABC as shown in fig(2) is prestressed with initial prestressing force of 1250 kN. The cross section of the beam is 230mm x 800mm. The loads shown are exclusive of dead load. Locate centerline of thrust under prestress plus dead load also & make 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 0.85, AD= DB= 10m and BE= 7m, EC= 13m. The eccentricities at A&C= 0, at D= 240mm (downwards), at B= 150mm (upwards), and at D = 300 mm (downwards). [17]



Fig(2)

## SECTION - II

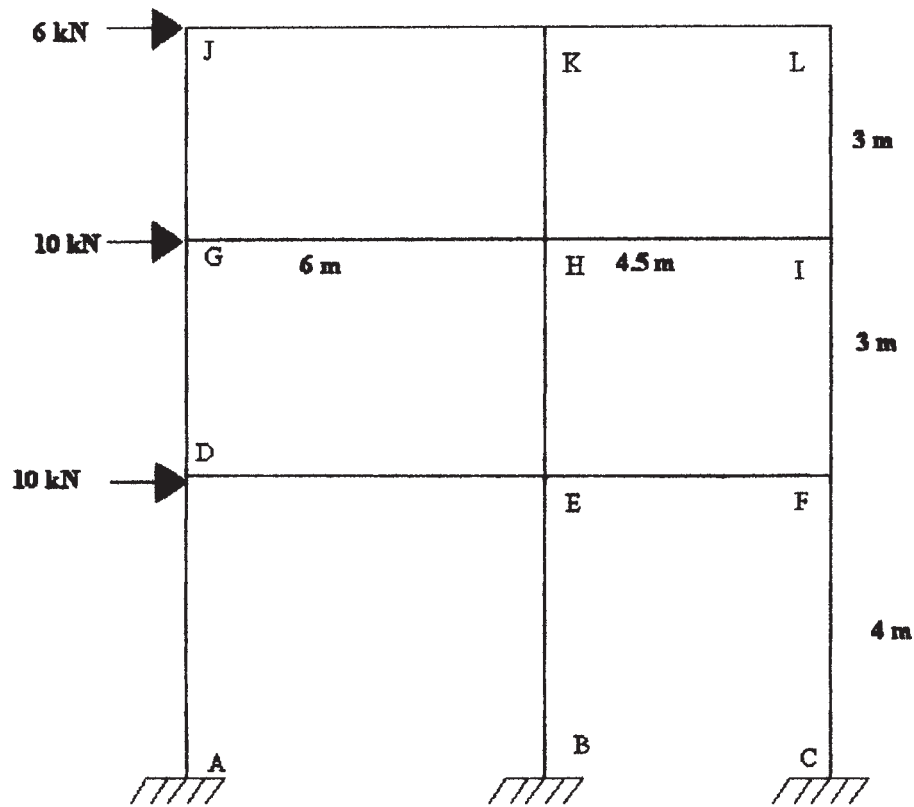
- Q5)** a) Write detailed note on approximate methods of analysis. [8]
- b) Analyze a rigid jointed frame shown in fig(3) by portal method for lateral loads. Flexural rigidity for all members is same. Analyze beam GHI using proper substitute frame, if it is subjected to vertical ultimate live & dead load incl. of its self wt. intensities of 12kN/m & 15kN/m on GH and 13kN/m & 17kN/m on HI respectively. 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 calculations of earthquake forces on RCC 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 20kN/m & 18kN/m on GH and 16kN/m & 15kN/m on HI respectively. 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 wall of circular water tank fixed at base slab showing all details. [5]
- b) Design reinforced concrete combined rectangular footing for two columns A & B carrying working loads 500 kN and 750 kN respectively. Column A is 230mm x 300mm size and Column B is 230mm x 400mm size. Centre to centre distance of columns is 3.2 m. Safe bearing capacity 160 kN/m<sup>2</sup>. Use M20 and TMT steel. Draw all details of reinforcements. [20]

OR

- Q8) Design a L shaped retaining wall for leveled backfill for the following data.  
height = 4.8m,  $\phi = 30^\circ$ ,  $\gamma = 18 \text{ kN/m}^3$ , surcharge = 20 kN/m<sup>2</sup>,  
Safe bearing capacity of the underlying strata = 180 kN/m<sup>2</sup>,  
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 : 8]

[Total No. of Pages : 3

**P932**

**[3664]-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 Q.1 or Q.2; Q.3 or Q.4 and from Section II answer Q.5 or Q.6; Q.7 or Q.8.*
- 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 the loads considered in the design of a highway bridge. **[9]**  
b) Classify bridges on the basis of materials of construction and forms of superstructure. **[8]**  
c) Explain with neat sketches Box Girder Bridge and Skew Bridge. **[8]**

**OR**

- Q2)** a) Classify IRC loadings. Explain IRC Class AA Tracked and Wheeled loadings with neat sketches. **[9]**  
b) Explain Pigeaud's method for the analysis of slabs. **[8]**  
c) Classify bridge bearings and explain the design of elastomeric bearing. **[8]**

- Q3)** An R.C. T-Beam deck slab bridge shown in Fig. 3 has the following details. **[25]**

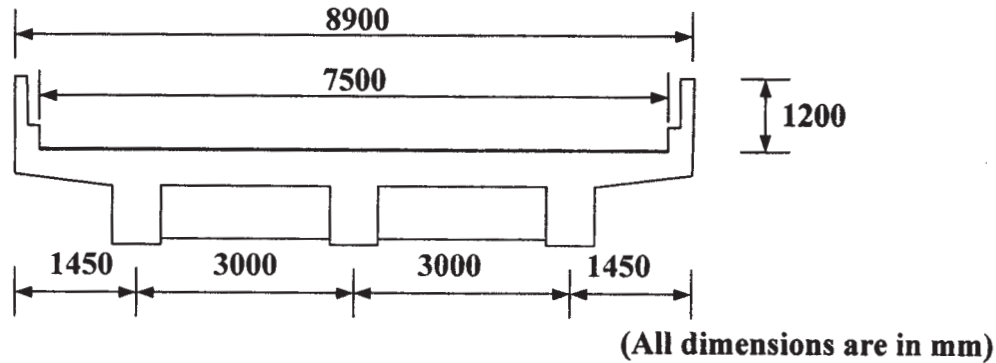
- a) Location of the bridge – On a National Highway
- b) Thickness of railings – 100 mm
- c) Size of kerbs – (600X600) mm
- d) Thickness of wearing coat – 80 mm
- e) Span of main girder – 20.0 m
- f) Spacing of main girders – 3.0 m c/c
- g) Spacing of cross-beams – 4.0 m c/c

**P.T.O.**

- h) Live load – IRC Class AA Tracked Vehicle
- i) Materials – M30 grade of concrete and Fe 415 grade of steel.

Adopt  $m_1 = 0.05$  and  $m_2 = 0.02$

Design the deck slab.



**Fig. 3**

OR

- Q4)** For the R.C. T-Beam deck slab bridge given in Q.3, design the central 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<sup>2</sup>. Use Fe 415 steel for supplementary reinforcement. Consider loss ratio as 0.80. [25]

### SECTION - II

- Q5)** a) Explain structural arrangement for deck and through type truss girder railway steel bridges with neat sketches. [8]
- b) Explain the various loads and forces acting on railway steel bridges. [10]
- c) Classify railway steel bridges on the basis of load carrying elements. [7]

OR

- Q6)** a) Explain portal bracing and sway bracing with neat sketches. [7]
- b) Design a rocker bearing for a 32 m span truss girder railway bridge with the following data.

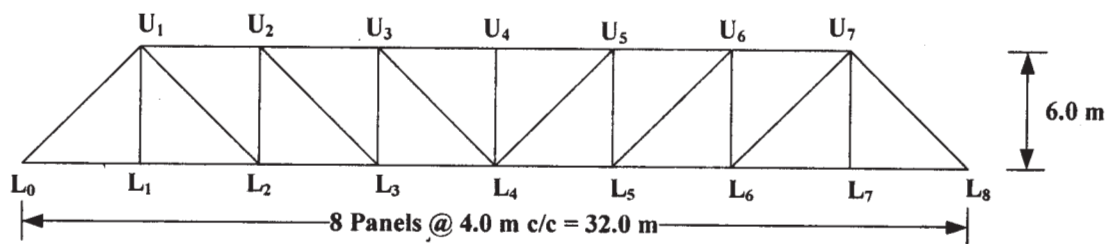
The reaction due to dead load, live load and impact load is 1500 kN. The vertical reaction due to overturning effect of wind at each end of the girder is 120 kN. The lateral load due to wind effect at each bearing is 60 kN. The tractive force and braking force are 981 kN and 686 kN respectively. [18]



**Q7)** The Pratt truss through type railway bridge shown in Fig. 7 has the following details. [25]

- Weight of stock rail – 0.60 kN/m.
- Weight of check rail – 0.40 kN/m.
- Timber sleepers of size – 0.25 m X 0.25 m X 2.5 m @ 0.45 m c/c.
- Unit weight of timber – 7.5 kN/m<sup>3</sup>.
- Spacing of truss – 6.0 m c/c.
- The bridge supports a eudl of 2950 kN.

Design the members  $U_3-U_4$  and  $U_3-U_4$ .



**Fig. 7**

OR

**Q8)** For the Pratt truss through type railway bridge given Q.7, design the top and bottom lateral bracing with the given data. The rails are 800 mm above the c.g. of bottom chord. The chord members are 500 mm deep and 500 mm wide. The end posts are 500 mm deep and 500 mm wide. The web members are 500 mm deep and 240 mm wide. [25]



Total No. of Questions : 12]

[Total No. of Pages : 4

**P1016**

**[3664]-336**

**B.E. (Computer + IT) (Common)**

**OBJECT ORIENTED MODELING AND DESIGN**

**(410443) (2003 Course)**

*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 (Q 1 or Q2) and (Q 3 or Q 4) and (Q5 or Q 6).*
- 4) *From section-II, answer (Q 7 or Q8) and (Q 9 or Q 10) and (Q 11 or Q 12).*
- 5) *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.*

**SECTION - I**

**Q1)** Write short notes on the following : **[18]**

- a) OMG and its role in defining standards.
- b) UML versions.
- c) Object Oriented concept inheritance and how to model it in UML/C++.

OR

**Q2)** a) Write short notes on CORBA. **[18]**  
b) Illustrate the new (only) UML 2.0 features introduced in activity diagrams.  
c) What activities are carried out in construction phase of RUP.

**Q3)** a) What is understood by software architecture, what do you understand by subsystems and components the two important architectural elements and in which diagrams and how are they modeled in UML? Illustrate using diagrams. **[8]**  
b) What are the different type of components in UML 1.3 **[4]**  
c) How does one forward engineer a component? Illustrate. **[4]**

OR

**Q4)** a) With an example system of your choice explain and illustrate full notation of a deployment diagram with examples. **[8]**

**P.T.O.**

- b) Explain the concept of package in package diagram. [4]
  - c) How do you show package generalization in UML, illustrate with appropriate example? [4]
- Q5)**
- a) Why do we need OCL and how does one model a constraint on class attributes in OCL. [6]
  - b) What do you understand by <<bind>>, <<trace>> stereotypes in class diagrams? [6]
  - c) What are TAGS in UML, give examples? [4]

OR

- Q6)**
- a) Consider a LIBRARY PURCHASE system described below. We can use the system to manage library's books purchasing from suppliers. System can also manage member's demand for new titles they wish the library to possess. The system also has to manage suppliers, payments, ordering and cataloguing of books on arrival. 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. [6]
  - b) What do you understand by concepts of stereotypes, meta models? [6]
  - c) What is the need for a state diagram, what aspects does it help model? [4]

### SECTION - II

- Q7)**
- a) Draw a class diagram for a FILE MANAGEMENT SYSTEM (FMS). Make suitable additional assumptions about scope and working of your system (write down the scope too). The FMS has concepts of directories, subdirectories, Files. FMS keeps information on directories as well as files for example of creation date, size of file, entries in a directory etc. One also needs operations to move, delete, create etc. Your classdiagram must show relevant attributes, methods, relationships. [8]
  - b) How do you show an OBJECT in a class diagram, give an appropriate example, and give Notation in UML. [4]
  - c) How do you forward engineer a CLASS in C++. [4]

OR

- Q8)** In context of CLASS/OBJECT diagrams what do you understand and how do you model the given terms/concepts. [16]
- a) Entity class.
  - b) LINK.

- c) Aggregation.
- d) Utility Class.

**Q9)** a) Draw an activity diagram for the business process described below :[12]

A student applies for admission to a college. He can join one of the engineering branches. The student applications are sorted on merit. Top students are offered the admission on merit order. The joining process involves student being shown available branches. Student selects a branch, chooses optionally a hostel seat, in parallel makes payments, selects memberships to gym, and selects elective courses to attend. On successful admission he is enrolled, given a admit card, and is given a copy of academic calendar. The students not admitted can register their interest in waitlist. Make additional assumptions about scope, use advanced activity diagram 2.0 features if relevant.

b) Compare activity diagrams in UML 1.3 and UML 2.0. [4]

OR

**Q10)** a) Draw neat fragments on one of the (/interaction overview/state/activity) diagrams to represent the following. Explain the concept too. [12]

- i) Entry and exit actions of a state.
- ii) Activity with in / out pins.
- iii) Interaction overview diagram.

b) How does one model multidimensional swim lanes in an activity diagram [4]

**Q11)** a) Consider a use case of a banking system for “Adding Interest to all savings accounts” for this draw a SEQUENCE diagram. A brief description is given here. The interaction is triggered at last day of each month 12 noon. The ‘interest rates object’ is checked for latest interest rates, for each account the status of account is checked. If account status is operational, the account balance is obtained. Interest is calculated and the added to account and the resultant sum is updated as balance of account. The entry is also recorded in a ‘log object’. Once all accounts are updated the log entries are printed one after other. The log object is then destroyed. Administrator is notified of completion of operation on his screen. Make additional suitable assumptions about the scope and draw the sequence diagram showing actors, lifelines, objects, messages/parameters, return values, iterations. [14]

b) When is sequence diagram used in software life cycle, Justify. [4]

OR

- Q12)** a) Consider a Use Case “Add an employee to a PROJECT”. The possible actor in the system is HR Manager. The HR manager interacts with the GUI to choose the employee from existing employees list to be added. A list of projects is shown to choose from too. The employee record is also separated updated, as well as the employee is added to the project, and the employee is informed about his addition to project by email. Please make additional assumptions if relevant and appropriate. Identify classes, actors and model a COMMUNICATION diagram for above system with best use of UML Notation. **[8]**
- b) Draw a simple SEQUENCE diagram fragment for a system/example of your own to show good use of a ‘parallel’ fragment. **[6]**
- c) In the context of interaction diagrams with examples explain the concept of controller objects. **[4]**



Total No. of Questions : 12]

[Total No. of Pages : 2

**P1017**

**[3664]-340**

**B.E. (Computer Engineering)  
ARTIFICIAL INTELLIGENCE  
(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) What is the applicability of AI in E-commerce and Medicine? [8]  
b) With appropriate example explain backward reasoning in detail? [4]  
c) What is the future scope of AI field? [4]

OR

- Q2)** a) What are intelligent agents? Detail the architecture of typical intelligent agent. [8]  
b) What is logic programming? [4]  
c) Explain forward and backward chaining. [4]
- Q3)** a) With an example, explain A\* algorithm. What are the drawbacks of it? [10]  
b) Use means ends analysis to solve a problem of transferring a television set kept on wheeled trolley using household robot. Available operators are : [8]

PICKUP, PUTDOWN, PUSH, CARRY, WALK, PLACE.

OR

- Q4)** a) What is constraint satisfaction? Solve the crypt arithmetic problem : [10]  
CROSS + ROADS = DANGER  
b) What is the significance of alpha and beta cutoffs in MINIMAX search? Justify the advantages with example. [8]

**P.T.O.**

- Q5)** a) State all the rules required to convert the given WFF in the clause form. [9]  
b) Explain JTMS with detail example. [7]

OR

- Q6)** a) What is Fuzzy logic? Give an example. [8]  
b) What is resolution? List the drawbacks of the method. [8]

### **SECTION - II**

- Q7)** a) Explain goal stack planning with an example from Block's world. [8]  
b) What is least commitment strategy? Apply it to solve any real world problem. [8]

OR

- Q8)** a) Describe any two methods of learning. [8]  
b) What are the advantages of using hierarchical planning? Justify with example. [8]

- Q9)** a) What is ATN? Build an ATN to satisfy the English Statement like "He has adjusted the speed to move in synchronization with the car". [10]  
b) Give a typical Robot Architecture. [8]

OR

- Q10)** a) Explain the semantic analysis phase of NLP. What is semantic grammar? [10]  
b) Explain Waltz's algorithm in detail. [8]

- Q11)** a) Design an expert system to convert with the patient to counsel in the case of psychological problem. [8]  
b) Design the neuron structure to solve X-OR problem. [8]

OR

- Q12)** a) What are the constituents of a typical expert system? Explain the coordination with neat diagram. [10]  
b) What are the applications of neural network? [6]



Total No. of Questions : 11]

[Total No. of Pages : 2

**P1018**

**[3664]-354**

**B.E. (IT)**

**GIS & REMOTE SENSING**

**(2003 Course) (414445)**

*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, from section-II.*
- 2) *Question 11 from section-II is compulsory.*
- 3) *Answers to the two sections should be written in separate answer books.*
- 4) *Neat diagrams must be drawn wherever necessary.*
- 5) *Figures to the right indicate full marks.*
- 6) *Assume suitable data if necessary.*

**SECTION - I**

- Q1)** a) Explain the features and applications of IKONOS satellite series. [10]  
b) Explain the electromagnetic remote sensing process. [8]

OR

- Q2)** a) Explain in details the parameters of sensors used in remote sensing. [10]  
b) Explain the significance of spectral exitance curves and solar irradiance curves. [8]

- Q3)** a) Explain different geometric correction methods for remotely sensed images. [8]  
b) What are basic elements of image interpretation? [8]

OR

- Q4)** a) Write a note on application of aerial image interpretation. [8]  
b) What are different image enhancement techniques for remotely sensed images? [8]

- Q5)** a) Explain the GIS architecture in details. [8]  
b) Describe the workflow process of GIS. [8]

OR

**P.T.O.**



- Q6)** a) What is the spatial referencing system? [8]  
b) Describe with examples different mapping projections. [8]

**SECTION - II**

- Q7)** a) What are different techniques of graphic representation of spatial data? [10]  
b) Describe Raster GIS Models. [8]

OR

- Q8)** a) Explain different representations of spatio-temporal data. [10]  
b) Explain following terms - LCGU based GIS, layer based GIS, feature based GIS and object oriented GIS. [8]

- Q9)** a) How is spatial and attribute data queried on GIS? [8]  
b) What are the differences between analysis carried out on raster and vector data? [8]

OR

- Q10)** a) Explain the accuracy, precision and resolution as quality factors of GIS data. [8]  
b) What are the sources of errors in GIS? [8]
- Q11)** a) Write a note on Remote Sensing OR GIS software. [8]  
b) Describe different applications of GIS. [8]



Total No. of Questions : 12]

[Total No. of Pages : 3

**P1019**

**[3664]-364**

**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 in detail the characteristics of fermentation broths? [10]  
b) Explain the following terms : [6]  
i) Classical Biotechnology.  
ii) Modern Biotechnology.  
iii) High value low volume products.

OR

- Q2)** a) Explain in detail Physical and Rheological characteristics of fermentation broths? List out the rheological laws applicable to fermentation broths? [10]  
b) Explain different stages involved in downstream processing in bioprocess industries? [6]
- Q3)** a) What do you mean by HPLC? What are the applications of HPLC? [6]  
b) Explain in detail size exclusion chromatography with a neat sketch?[10]

OR

- Q4)** a) Explain the following terms : [10]  
i) Liquid chromatography.  
ii) Ion exchange resins.  
iii) Gel filtration.  
iv) Inorganic molecular sieves.  
v) Stationary supports in chromatography.

**P.T.O.**

- b) Give a brief notes on instrumentation for HPLC with a neat sketch?[6]
- Q5)** a) Explain in detail Piezodialysis? [9]
- b) Explain the following : [9]
- Co coupled transport.
  - Counter coupled transport.

OR

- Q6)** a) What are Membrane Contactors? Explain how the enzyme catalysts are incorporated in various types of membrane contactors? [10]
- b) Define a membrane? [2]
- c) What are the criteria of membrane separation processes? [6]

### SECTION - II

- Q7)** a) Define Spectroscopy? [2]
- b) List out the applications of spectroscopy in various analytical studies? [4]
- c) Explain NMR spectroscopy in detail with a neat sketch? [10]

OR

- Q8)** a) Define AAS? [2]
- b) What are the principles of AAS? [4]
- c) Explain the following : [10]
- Chemical shift.
  - Atomization of sample.
  - Resonance lines.
  - Boltzmann distribution equation.
  - Sensitivity.

- Q9)** a) Define Adsorption? What is the principle behind adsorption? List out the applications of adsorption? [6]
- b) Explain the following : [10]
- Differential heat of adsorption.
  - Integral heat of adsorption.
  - Freundlich Equation.
  - Langmuir isotherm.
  - Gibbs adsorption isotherm.

OR

**Q10)** a) How do you classify adsorption operations? [4]

b) Explain in detail with a neat sketch : [12]

i) Temperature swing adsorption.

ii) Pressure swing adsorption.

**Q11)** a) Explain in detail zone refining? [8]

b) Explain in detail supercritical fluid extraction? [10]

OR

**Q12)** a) Define reactive distillation? Explain in detail the principle behind it?  
What are its applications? [8]

b) Give a short notes on : [10]

i) Molecular Sieves.

ii) Hyphenated techniques.



Total No. of Questions : 8]

[Total No. of Pages : 2

**P1104**

**[3664]-5**

**B.E. (Civil)**

**ARCHITECTURE AND TOWN PLANNING**

**(Elective - I) (1997 Old Course)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) Answer any three questions from each section.*
- 2) Answers to the two sections should be written in separate answer books.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Use of logarithmic tables, non programmable calculator is allowed.*
- 5) Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) What is connectivity matrix? Enlist various activities and their functional inter-relationship for public buildings. [8]  
b) Explain salient features of Gothic Architecture with sketches and examples. [8]
- Q2)** a) Discuss use of lighting and indoor plants as effective elements of interior designing. [8]  
b) Explain various elements of hard landscape and discuss landscape planning on sloping terrain. [9]
- Q3)** a) Enlist different elements of architectural composition. Discuss any two in detail with sketches. [9]  
b) Discuss orientation and planning of building with special reference to climatic factors. [8]
- Q4)** Write short notes on : [16]  
a) Renaissance Architecture.  
b) Building bye laws.  
c) Spatial arrangement of functions in building planning.  
d) 'Shape' and 'texture' as architectural elements.

**P.T.O.**

## **SECTION - II**

- Q5)** a) Discuss the theory of three magnets and explain its relevance in modern town planning. [9]  
b) Write a note on “Role of Neighbourhood in Town Planning”. [8]
- Q6)** a) Explain the statutory procedure in preparation of D.P. in reference with MRTP. [9]  
b) What are the contents of ULC. [8]
- Q7)** a) Write a note on application of GIS and GPS in relation with planning. [8]  
b) Describe the achievements in software techniques in relation with town planning. [8]
- Q8)** Solve any four : [16]  
a) Stages in town development.  
b) Objectives of traffic management.  
c) UDPFI guidelines.  
d) Remote sensing.  
e) Housing.



**P1105**

**[3664]-11-A**

**B.E. (Civil)**

**CONSTRUCTION MANAGEMENT**

**(Elective - II) (1997 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)** a) What are various functions of management? Discuss the function execution. [8]  
b) Explain the role of construction manager on a dam site. [9]
- Q2)** a) Define material management. Explain codification and standardisation in stores management. [9]  
b) Explain the terms : [8]  
i) Lead time.  
ii) Safety stock.  
iii) Inventory control.
- Q3)** a) Explain the steps undertaken while deciding the Technical, Financial and Social feasibility of a new construction project. [8]  
b) Existing four lane road is to be upgraded to eight lane road on BOT basis. Write salient points of feasibility report to be prepared. [8]
- Q4)** a) Write short notes on DPR and TEFR. [8]  
b) Explain the term “Cash Flow”. Draw a cash flow for dam project. [8]
- Q5)** a) Discuss occupational safety & health hazards in construction industry. [8]  
b) What are direct & indirect costs involved in accident? Explain the term IFR and ISR. [8]

**P.T.O.**

## **SECTION - II**

- Q6)** a) What are the points to be considered for site layout for following stages:[9]  
i) Concreting work for National Highway.  
ii) Blasting of a tunnel.  
iii) Multistoreyed construction.  
b) Draw a site layout for a project you have visited. Label various parts.[8]
- Q7)** a) Discuss importance of following act w.r.t. construction site : [9]  
i) Works contract act.  
ii) Workman's compensation act.  
iii) Child labour act.  
b) What are different types of risks? How are those managed by a construction manager? [8]
- Q8)** a) What is the role of Risk Manager? Explain in detail. [8]  
b) How would you design training programme for construction manager on mega project? [8]
- Q9)** a) Explain role of MIS in construction sector. [8]  
b) What is DBM? Explain the methods of data communication. [8]
- Q10)** Write short notes on any 4 of following : [16]  
a) Payment of bonus act.  
b) Risk mitigation.  
c) Labour insurance.  
d) Labour on contract.  
e) Impact of globalisation on construction industry.





**P1106**

**[3664]-17**

**B.E. (Mech. S/W)**

**MANUFACTURING MANAGEMENT**

**(Elective - II) (1997 Course)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:-*

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

**SECTION - I**

- Q1)** a) Explain the principle of scientific management. [8]  
b) What is meant by motivation? Explain Maslow theory for motivation. [8]
- Q2)** a) Define work study, productivity, method study, time study? Explain procedure to carry out time study. [12]  
b) What is meant by group dynamic? How group are to be formed explain. [4]
- Q3)** a) What is forecasting? Explain in brief different methods of forecasting. [10]  
b) State the factors affecting on systematic plant layout. [6]
- Q4)** Write note on following any 3 : [18]  
a) Leader ship style.  
b) Routing & scheduling.  
c) Process layout.  
d) Motion economy.

**P.T.O.**

## **SECTION - II**

- Q5)** a) Explain the function of material management. [8]  
b) Explain different cost associated with inventory. [8]
- Q6)** a) With neat sketch explain OC curve. [8]  
b) Define cost, costing, marginal cost? How will you calculate total cost of a product. [8]
- Q7)** a) Define CPM, PERT, critical path, forward & backward pass, slack, float, crashing slope. [8]  
b) Explain JIT & their implementation. [8]
- Q8)** Write note on following any 3 : [18]  
a) ERP.  
b) Isogoor.  
c) MRP.  
d) Crashing of a network.



**P1108**

**[3664]-25**

**B.E. (E & TC)**

**COMPUTER ARCHITECTURE**

**(1997 Course) (404181)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) Answer any 3 questions from each section.*
- 2) Answer three questions from Section - I and three questions from Section - II.*
- 3) Attempt not more than six questions of which at least three questions must be from each section.*
- 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) You are advised to attempt not more than six questions.*
- 8) Your answers will be valued as a whole.*
- 9) Assume suitable data, if necessary.*

**SECTION - I**

**Q1)** Answer the following questions in brief (any six) : **[18]**

- a) What is 'parallel processing'? How it is related to distributed processing?
- b) List only the Flynn's machine organizations.
- c) State only the major steps of executing an instruction in a digital computer.
- d) Explain the basic use of vectorizing compiler.
- e) What is the use of functional pipeline structure in the second-generation vector processors?
- f) State how memory can be classified according the accessing method.
- g) Define 'through put' related to linear pipeline.

**Q2)** a) Distinguish among computer terminologies in each of the following groups : **[8]**

- i) Uniprocessor and Multiprocessor systems.
- ii) Control flow and data flow computers.
- b) With the help of block schematic explain the basic principle of MISD computer. **[8]**

**P.T.O.**

- Q3)** a) Explain in brief the operation of cache memory. [8]  
b) What are the placement policies of cache memory? Explain one policy in brief. [8]
- Q4)** a) With the help of block schematic explain the pipelined structure of a typical CPU. [8]  
b) Compare the following pipeline structures : [8]  
i) Static Pipelines and Dynamic Pipelines.  
ii) Scalar Pipelines and Vector Pipelines.
- Q5)** a) State vector processing significance; hence explain the characteristics of vector processing. [8]  
b) State and explain the requirements of scalar and super scalar processor. [8]

## **SECTION - II**

- Q6)** a) Explain with proper example the concept of virtual memory. [8]  
b) Explain how virtual to real page address translation takes place. [8]
- Q7)** a) Explain the following related to segment memory system : [8]  
i) Segment table (ST).  
ii) STBR.  
iii) STE.  
iv) AST.  
b) Distinguish 'parallel processing' at job level, task level, the instruction level and the intrainstruction level. [8]
- Q8)** a) Describe at least four characteristics of MIMD multiprocessors. [8]  
b) Prove that a K-stage linear pipeline can be at most 'K' times faster than that of non pipelined serial processor. [8]
- Q9)** a) Explain the following related to Memory with page segments : [8]  
i) Linear segmentation.  
ii) Segmented name space.  
iii) Page-fault.  
iv) Page size.

- b) State different Hazard detection methods in pipeline process and explain one method in brief. [8]

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

- a) CISC processor.
- b) RISC processor.
- c) TLB.
- d) Multithread.



**P1109**

**[3664]-35**

**B.E. (E & TC)**

**CONSUMER ELECTRONICS**

**(1997 Course) (404189)**

*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 block diagram of disc recording Explain each block in brief.  
How mass production of disc is done? [10]
- b) Explain basic principle of magnetic recording. How you will relate  
tape speed, headgap and frequency to be record. [6]
- Q2)** a) With the help of suitable diagram explain magnetic tape recording &  
reproduction. [10]
- b) Explain the following terms : [8]
- i) WOW.
  - ii) Flutter.
  - iii) Rumble.
  - iv) Hissing noise.
- Q3)** a) What do you mean by scanning? Explain any one method of scanning. [8]
- b) Bandwidth required to transmitt video signal is 5MHz. Justify. [8]
- Q4)** a) Compare American and European television standards. [6]
- b) With the help of working principle, construction details explain vidicon  
camera tube. [10]

**P.T.O.**

- Q5)** Explain the following terms : **[16]**
- a) SAW filter.
  - b) Colour burst.
  - c) Frequency interleaving.
  - d) Picture tube.

### **SECTION - II**

- Q6)** a) Compare Betamax and VHS systems for video recording. **[8]**  
b) How luminance and chrominance signals are transmitted. **[10]**
- Q7)** a) Explain basic product development process. **[8]**  
b) With the help of suitable diagram explain JPEG standard. **[8]**
- Q8)** a) Enlist the advantages and disadvantages of solar panel. State its applications. **[6]**  
b) Draw and explain diplexer in detail. **[10]**
- Q9)** a) Draw block diagram and explain each block of following home appliances. **[10]**  
i) Microwave oven.  
ii) Washing machine.  
b) What are HDTV system considerations? **[6]**
- Q10)** Write short notes on : **[16]**
- a) FTP.
  - b) Camcoder.
  - c) ENG.
  - d) Cordless phone.



**P1110****[3664]-42****B.E. (Electronics)****COMPUTER BASED SIMULATION & MODELING  
(1997 Course)****Time : 3 Hours]****[Max. Marks : 100****Instructions to the candidates:-**

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

**SECTION - I**

- Q1)** a) Explain the system classification with methodology to study it. [8]  
 b) Explain the principles used for the classification of models of systems. [8]
- Q2)** a) Explain the flow-chart for simulation of system. Also give the significance of the simulation. [10]  
 b) Explain the limitations of simulators. [8]
- Q3)** a) Explain : [6]  
 i) Compiled simulators.  
 ii) Distributed simulators.  
 iii) Mixed simulators.  
 b) Draw the flow chart for the 1 - server system given below.

Samples	Arrival time	Service time
1	0	25
2	15	20
3	20	15
4	40	10
5	35	15
6	15	20
7	10	15

and determine the queue status, wait time, service time.

[10]

**P.T.O.**



- Q4) a)** Explain the terms mathematically : [8]
- i) Mean
  - ii) Probability density function.
  - iii) Probability distribution function.
  - iv) Median of digital and analog system.
- b)** Explain the distribution : [8]
- i) Normal distribution.
  - ii) Poisson's distribution.

- Q5)** Write short notes on : [16]
- a) Simulation of R.L.C. (series) analogies to Auto-pilot system simulation.
  - b) Factors affecting behavior of queue.

### **SECTION - II**

- Q6) a)** Define the terms : [6]
- i) Utilization factor.
  - ii) Co-efficient of variation.
- b)** For the Poisson Arrival Pattern show [10]

$$q_n(t) = \left( \frac{1}{\alpha} \right)^n \frac{1}{k!} f(t).$$

Where

$\alpha$  : Mean Arrival time

$q_n(t)$  : Probability of Arrival at time 't'

k : Sample

- Q7) a)** What do you mean by system dynamics? Explain the system dynamics for system simulation. [8]
- b)** Simulate  $y = x_1 * x_2$

Where

$$x_1(t) = 1 \quad 0 \leq x_1 \leq 2$$

$$x_2(t) = 1 \quad 3 \leq x_2 \leq 6$$

[10]

- Q8)** a) What is the need for  $\chi^2$  test? What are its pre-requisite. [6]  
b) What is the need for random numbers? How these are generated on computer. [6]  
c) A dairy firm with random variation in daily yielding  $\pm 40$  liters with confidence level 95%. Determine the variation for 96-day  $\left[ \frac{1}{1 - \alpha/2} = 1.96 \right]$ . [4]
- Q9)** a) Draw the flow-chart for digital system simulation on EDA tool and explain the blocks. [8]  
b) Explain the optimization of digital system based on various operational parameters and modeling used. [8]
- Q10)** Write notes on : [16]  
a) Generation and test of random numbers.  
b) Validation of model.



**P1111**

**[3664]-47**

**B.E. (Electronics)**

**ADVANCED COMPUTER PROGRAMMING**

**(1997 Course) (404210)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

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

**SECTION - I**

- Q1)** a) Discuss the spiral model and it's advantages over waterfall model. [10]  
b) Discuss unit testing with example. [8]
- Q2)** a) What is type conversion and casting in java? [4]  
b) Explain data types of java. [6]  
c) Explain the control statements of java. [6]
- Q3)** a) With an example explain parameterized constructors. [8]  
b) Write a note on overloading of methods and overridden methods. [8]
- Q4)** a) Write a java program to copy a file with command line arguments. [8]  
b) Explain the use of following methods. [8]  
i) `isAlive ( )`  
ii) `join ( )`
- Q5)** a) Explain the exception handling in java. [8]  
b) Explain the importance of thread priority. [8]

**SECTION - II**

- Q6)** a) Discuss the order by and group by clauses of select statement. [10]  
b) With an example explain calculated column. [8]

*P.T.O.*

- Q7)** a) Write an embedded SQL program (Dynamic) to delete rows from a table. [8]  
 b) Explain the terms : [8]  
     i) Assertion.  
     ii) Trigger.
- Q8)** a) What is a view? Explain the advantages. [6]  
 b) Explain the different search conditions used in select statement. [10]
- Q9)** a) Explain the multitable joins in SQL with suitable example. [8]  
 b) Explain the GRANT and REVOKE statements. [8]
- Q10)** a) Write HTML tags to display following lines of text in the specified manner. [8]
- | Line No. | Text               | Font          | Alignment |
|----------|--------------------|---------------|-----------|
| 1        | University of Pune | 20/Bold/Green | Right     |
- b) Explain different tags used to form tables in HTML. [8]



**P1114**

**[3664]-70**

**B.E. (Industrial Electronics)  
SOFTWARE ENGINEERING  
(1997 Course)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) Answer any 3 questions from each section.*
- 2) Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) What are different categorization of application domains for computer software? What myths about software still exist? Explain them. [8]  
b) Explain software process and explain any one process model. [8]
- Q2)** a) What are software metrics and how can they be used to manage a software project and the software process? [8]  
b) What is software quality assurance? and Explain. [8]
- Q3)** a) You have been asked to develop a small application that analyzes each course offered by a university and reports the average grade obtained in the course (for a given term). Write a statement of scope that bounds this problem. [9]  
b) Team A found 342 errors during the software engineering process prior to release. Team B found 184 errors. What additional measures would have to be made for projects A and B to determine which of the teams eliminated errors more efficiently? What metrics would you propose to help in making the determination? [9]
- Q4)** a) The software used to control a photocopier requires 32,000 of C and 4,200 lines of Smalltalk. Estimate the number of function points for the software inside the photocopier. [8]  
b) What is CASE? Describe taxonomy of CASE tools. [8]

- Q5)** a) How can S/W quality be measured? How it can be assured? [8]  
b) Describe in details about S/W risk. And how can they be mitigated? [8]

## **SECTION - II**

- Q6)** a) What are the reasons for project getting late? What are the remedies?[8]  
b) What is the purpose of FTR? What are guidelines for conducting it?[8]
- Q7)** a) Describe design principles. [8]  
b) What are different rules for user interface design? [8]
- Q8)** a) What is testability? [8]  
b) Explain white box testing and any two types eg. Cyclomatic Complexity, control structure testing. [8]
- Q9)** a) Differentiate between Reengineering, forward engineering and reverse engineering. [8]  
b) Explain any one : Formal methods, client/server software Engineering, OO software engg. [8]
- Q10)** Write notes on (any two) : [18]  
a) Web engineering.  
b) Integration testing.  
c) System testing.



**P1115**

**[3664]-82**

**B.E. (Chem.)**

**PLANT DESIGN AND PROJECT ENGINEERING**

**(1997 Course)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

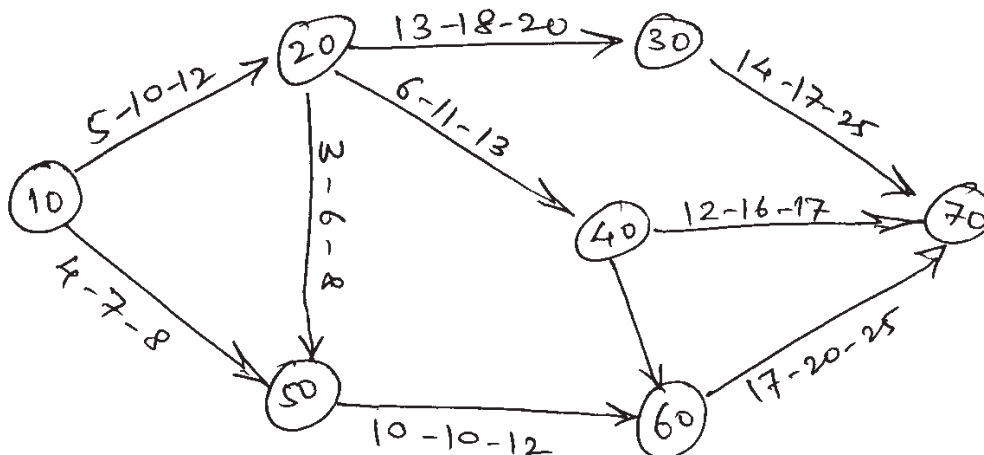
- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Draw neat sketches wherever necessary.*
- 4) *Use of logarithmic tables, slide rule, Mollier charts, calculator and steam table is permitted.*
- 5) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) Discuss in detail the techno-economic feasibility of report of a project. [10]  
b) Explain significance of laboratory data in process development. [8]
- Q2)** a) Discuss various function of pilot plant. [8]  
b) Explain the importance of flow sheeting in chemical industry. [8]
- Q3)** a) Discuss the various types of valves and their importance in chemical process industry. [6]  
b) Explain the characteristic of single acting and doubling acting reciprocating pumps. [10]
- Q4)** a) What factors are to be considered for pipe design? [8]  
b) Explain Normal Pipe Size (NPS). [4]  
c) What factors govern the selection of piping and insulation? [4]
- Q5)** Write short note on : [16]  
a) Waste Water Treatment.  
b) Material Selection for Equipment.  
c) Capacity utilization and debottle process.  
d) Process Instrumentation.

## SECTION - II

- Q6)** a) A Project Engineer would like to choose a plant either near market or near source of raw materials for following manufacturing facilities like any other. Please help him during selection of proper site, giving justification. [10]
- i) Polystyrene Plant.
  - ii) Sulphuric Acid Plant.
- b) Explain the primary and secondary process utilities required for process plant. [8]
- Q7)** a) Write the specification sheet and design needs for a calandria type evaporator. [8]
- b) Explain the following terms : [4]
- i) Intrinsically safe process.
  - ii) HAZOP.
- c) List factors to be considered for plant layout and plant design. [4]
- Q8)** Write short note on : [16]
- a) NPSH and cavitations.
  - b) Scale up methods.
  - c) Factories Act.
  - d) Indian Boiler Regulation.
- Q9)** Consider the network shown in the figure. Determine the standard deviation and expected time for each activity. For each activity the three estimates  $t_0 - t_m - t_p$  are given along the arrow. [16]



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**P1116**

**[3664]-92**

**B.E. (Computer)**

**OBJECT ORIENTED COMPONENTS AND SYSTEMS**

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

**SECTION - I**

- Q1)** a) Every application has presentation, logic, data. Draw a neat diagram to explain how one can partition this into client and server side. [6]  
b) Explain N-tier model in client/server architecture. State its advantage and disadvantages. [6]  
c) What are Java Beans? How are they useful? [4]
- Q2)** a) Discuss any four desired characteristics of a super component. [6]  
b) What are object wrappers, explain with examples. [4]  
c) How IDL helps to generate stubs, skeletons and proxies? Explain with labelled diagram. [6]
- Q3)** a) Explain the architecture of CORBA with neat diagram. [8]  
b) What are CORBA services and CORBA facilities. [8]
- Q4)** a) Discuss the concept of TPmonitor, CORBA OTS. [8]  
b) With the help of suitable diagram explain three tier client/server architecture with an ORB middleware. [8]
- Q5)** Write short notes on any three : [18]  
a) RMI.  
b) XML.  
c) IIOP/GIOP.  
d) Apartments in COM/DCOM.  
e) Web & distributed objects.

**P.T.O.**

## **SECTION - II**

- Q6)** a) In context of components explain : **[6]**  
i) Need for binary standard.  
ii) Licensing.
- b) In banking domain for a loan application identify any two suitable components and the interfaces and give their descriptions. **[6]**
- c) How do components and interfaces encourage reusability? **[4]**
- Q7)** a) Compare C++ and Java as OOPL and a web development languages. **[8]**  
b) In J2EE architecture discuss need for technologies like RMI and JDBC. **[8]**
- Q8)** Explain the concept and need for the following : **[16]**  
a) Thread.  
b) Naming services.  
c) GUID.  
d) Class factories.
- Q9)** a) Explain the following standard marshalling architecture : **[16]**  
i) Stub architecture.  
ii) Proxy architecture.
- b) Explain the given terms & concepts : **[16]**  
i) Polymorphism.  
ii) JDBC-ODBC.
- Q10)** Write short notes on any three : **[18]**  
a) MVC architecture.  
b) Security in distributed systems.  
c) Active-X, OLE and COM.  
d) Window Registry.



Total No. of Questions : 6]

[Total No. of Pages : 3

**P1117**

**[3664]-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 metamorphic rocks older than Deccan Trap, occurring in Maharashtra state. **[9]**
- b) Field characters of fractures. **[5]**
- c) Branches and offshoots of dykes. **[4]**

OR

- a) Field characters of dykes in Deccan Trap area. **[4]**
- b) Engineering significance of older sedimentary rocks occurring in Deccan Trap area of Maharashtra state. **[9]**
- c) Types of Volcanic Breccias. **[5]**

- Q2)**
- a) Explain in detail the origin of Tachylytic Basalts. **[6]**
  - b) Discuss with suitable examples, suitability of Amygdaloidal Basalt and Volcanic Breccia from dam foundation point of view. Give case histories. **[10]**

OR

- a) Explain with suitable examples, engineering significance of dykes from dam foundation point of view. **[7]**
- b) Discuss in detail, the geological conditions leading to Tail Channel Erosion in Deccan Trap area. Mention the case histories due to
  - i) Columnar Basalt.
  - ii) Volcanic Breccia. **[9]**

**P.T.O.**

- Q3)** a) Explain in detail, the concept of RMR system of classification of rock masses. [9]  
b) Discuss compressive strength of a rock mass. [4]  
c) What is R.Q.D? How to calculate it? [3]

OR

- a) Explain in detail the concept of Wickham et.al. classification of rock masses. [12]  
b) List only various geophysical methods of rock exploration. [4]

### **SECTION - II**

- Q4)** Discuss with suitable examples, suitability of compact basalt, amygdaloidal basalt and volcanic breccias from tunnelling point of view. [18]

OR

- a) Rating of ground water conditions in tunnelling in R.M.R. classification. [6]  
b) Can we locate a pier of a bridge partly on dyke and partly on weathered basalt? [6]  
c) The parameters deciding safe bearing capacity (S.B.C) for bridge foundation. [6]

- Q5)** Write notes on the following :

- a) Zone of weathering and ground water. [4]  
b) Waterbearing character of tachylytic basalts. [4]  
c) Waterbearing character of intertrappean beds. [4]  
d) Block disintegration. [4]

OR

Write notes on the following :

- a) Engineering significance of transported soils derived from Deccan Trap basalts. Give case histories. [8]  
b) Scarcity of natural sands in the Deccan Trap area. [4]  
c) Chances of getting ground water along fractures. [4]

- Q6)** Write notes on the following :

- a) Compact basalt as construction material. [4]  
b) Occurrence of zeolites in natural sands. [4]

c) Problems with 'open excavations' in city areas. [4]

d) Engineering significance of active faults. [4]

OR

Write notes on the following :

a) Dam building activity and earthquakes in Deccan Trap Area. [8]

b) Problems with 'made grounds' in city areas. [4]

c) Treatment to be given to a fault zone crossing dam alignment. Give example. [4]



**P1118****[3664]-132**

**B.E. (Mechanical and Mechanical S/W)  
CAD/CAM AND AUTOMATION**

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

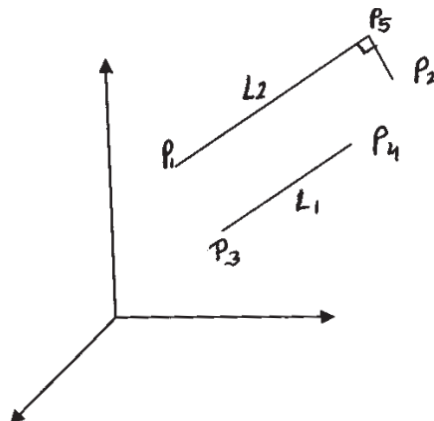
- 1) *Answers to the two sections should be written in separate books.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 5)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

**SECTION - I**

- Q1)** a) Find the co-ordinates of triangle ABC with vertices A(3, 3), B(9, 3) and C(3, 7) when it is scaled by  $S_x = 2$  and  $S_y = 2$  about point P(5, 4). [6]  
 b) What do you understand by “Mapping of Geometric Model”? [5]  
 c) Write a short note on Inverse Transformation. [5]

OR

- Q2)** a) A triangle PQR represented as P(14, 15), Q(66, 15) and R(40, 60). It is mirrored about line  $y = 30$ . Determine the new coordinates of the triangle. [6]  
 b) Write a short note on transformation matrix for perspective projections. [5]  
 c) Determine the concatenated transformation matrix for reflecting any entity about any given line. [5]
- Q3)** a) Formulate the equation and end point of a line which passes through a point P<sub>1</sub> and is trimmed by a point P<sub>t</sub> as shown in the fig. The line is to be parallel to an existing line passing through points P<sub>3</sub> and P<sub>4</sub>. [8]

**P.T.O.**

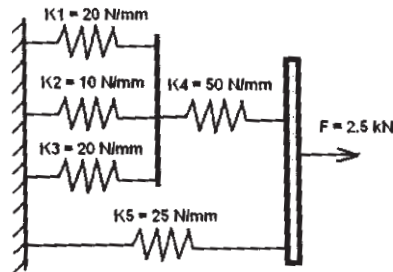
- b) Write a short note on B-Spline Curve. [4]
- c) What are the advantages of parametric representation of curve in CAD system. [4]

OR

- Q4)** a) Plot the Bezier curve having end points  $P_0(1, 3)$  and  $P_3(7, 2)$ . The other control points are  $P_1(5, 6)$  and  $P_2(6, 0)$ . Plot for values of  $u = 0, .2, .4, .6, .8$  and  $1$ , if the charecteristic polygon is drawn in the sequence  $P_0 - P_1 - P_2 - P_3$ . [8]

- b) Explain different solid manipulations and its importance. [8]

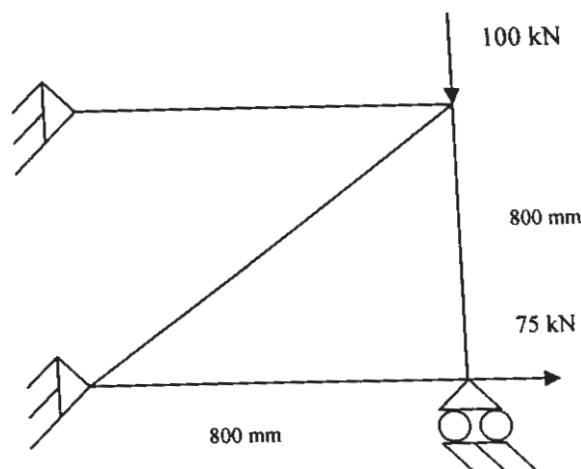
- Q5)** a) A system of spring is shown in the fig. Determine the overall stiffness matrix and deflection of each spring. [8]



- b) Derive an expression for the element stiffness matrix of the two noded truss elements. [6]
- c) Explain, with suitable examples, the plane stress and plane strain condition. [4]

OR

- Q6)** a) A four bar truss is as shown in the fig. Assuming that for each element the cross sectional area is  $400\text{mm}^2$  and  $E = 200\text{ GPa}$ , determine the deflection, reaction forces and stresses in each element. [10]



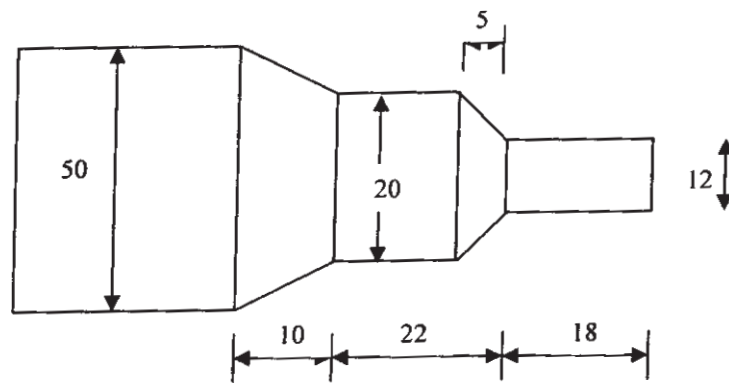
- b) What is the significance of shape functions? Explain shape function in terms of natural coordinates, for the three noded 1-D elements. [4]
- c) Obtain the stress-nodal displacement relationship for the one-dimensional element. [4]

### SECTION - II

- Q7)** a) A CST element is defined by nodes at I(24, 30), J(60, 20), and K(90, 50) and the stress at these nodes are 90, 120 and 160 MPa respectively. Determine the stress at point P(60, 30). [6]
- b) Derive a relation to determine the Jacobian function for CST element. [6]
- c) Explain higher order 2D element. [4]

OR

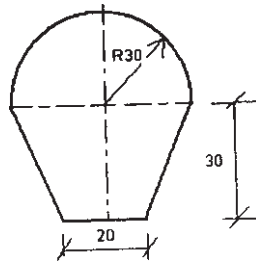
- Q8)** a) Explain how symmetry is used in FEA with applications. [8]
- b) Explain shape function of CST element. Also explain the physical representation by area coordinates. [8]
- Q9)** a) What do you understand by machine zero and job zero? Explain the significance of using job zero method. [6]
- b) 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 400 rpm and 0.35mm/rev. assume 1 mm material is to be removed radially from external diameter. [10]



OR

- Q10)** a) Write a note on new trends developing in CNC / DNC technology. [6]
- b) Write an APT part program to machine the outline of the geometry shown in fig. Assume the component to be 5 mm thick. The post processor cell statement is MACHINE/ABM, 1. The end mill is used is 10 mm in diameter. Assume spindle speed as 1000 rpm and feed as 0.3 mm/rev. [10]





- Q11)** a) What are the elements of FMS? [6]  
 b) Write a short note on Vacuum Grippers used for robot. [6]  
 c) What are the different strategies adopted in automation? [6]

OR

- Q12)** a) What is machining centre? What are its advantages? [6]  
 b) What are different types of joints used in Robot? [6]  
 c) Write a short note on Robot sensors. [6]



**P1119**

**[3664]-147**

**B.E. (Mechanical S/W Engineering)  
COMPUTATIONAL FLUID DYNAMICS  
(2003 Course) (Elective - II) (402063)**

*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.*

**SECTION - I**

- Q1)** a) Explain role of Computational Fluid Dynamics in this Modern Era. [6]  
b) Explain impact of CFD in following fields. [6]  
i) Automobiles.  
ii) Industrial Manufacturing.  
c) Explain Flow Modelling using finite control volume and infinitesimal control volume. [6]

OR

- Q2)** a) Explain what do you understand by the term substantial derivative and derive its eq<sup>n</sup>. [10]  
b) Explain importance of divergence of the velocity (its physical meaning) and derive its eq<sup>n</sup>. [8]
- Q3)** a) Explain Adaptive step size control. [4]  
b) Using R.K. Method solve [12]

$$\frac{d^2y}{dx^2} - 64y + 10 = 0$$

Subject to conditions  $y(0) = y'(0) = 1$   
 $h = 1/3$ . Find out  $y(1/3) + y'(1/3) = ?$

OR

**Q4)** a) Explain Milnes Predictor Corrector Method. [4]

b) Solve the eq<sup>n</sup>  $\frac{dy}{dx} = 1 + y$  using Milnes Predictor Corrector Method. [12]  
 $y(0) = 0$   $h = 0.1$ . Find  $y(0.5)$ .

**Q5)** a) What do you understand by the word 'Descritization' in reference to finite difference approach? [4]

b) Explain explicit method. [6]

c) Use explicit method to solve for the temperature distribution of a long thin rod of 10 cm and conductivity  $K = 0.49 \text{ cal/s. cm}^\circ\text{C}$   $\Delta x = 2 \text{ cm}$  and  $\Delta t = 0.1 \text{ s}$ . At  $t = 0$  the temperature of the rod is zero and boundary conditions are fixed for all times at  $T(0) = 100^\circ\text{C}$  and  $T(10) = 50^\circ\text{C}$ . Note that the rod is aluminium with  $C = 0.2174 \text{ cal/g}^\circ\text{C}$  and  $\rho = 2.7 \text{ g/cm}^3$ . Thermal diffusivity  $\sigma = \frac{K}{\rho c} = 0.835 \text{ cm}^2/\text{s}$

$$\sigma = \frac{K}{\rho c} = 0.835 \text{ cm}^2/\text{s}$$

$$\lambda = \frac{K \Delta t}{(\Delta x)^2} = 0.020875 \quad [6]$$

OR

**Q6)** a) Explain Implicit Method. [6]

b) Explain difference in Implicit and Explicit Method. [6]

c) Write short note on : [4]

i) Round off Error.

ii) Descritization Error.

### SECTION - II

**Q7)** a) Write down the transient and steady state Heat conduction equations for 1D and 2D problems. Discuss the explicit formulation for 1D transient problem. Illustrate by suitable example the solution procedure for a practical problem. [10]

b) Discuss the problem of thermally developing flow inside a two dimensional channel. [6]

OR

- Q8)** Write notes on : **[16]**
- a) Practical examples of 1D – 2D transient and steady state Heat conduction problems.
  - b) Finite difference formulation of convective heat transfer problem.
  - c) Semi-implicit scheme algorithm.

- Q9)** a) Discuss in detail the Mac Cormack's Technique. Explain the Predictor Step and the Corrector Step. **[10]**
- b) Illustrate Mac Cormack method by a suitable example. **[6]**

OR

- Q10)** Explain the CFD solution Algorithm for Subsonic-Supersonic isentropic nozzle flow. **[16]**

- Q11)** a) Write down the Navier-Stokes equations for Incompressible flow. **[4]**
- b) Develop the solution algorithm using MAC formulation. **[10]**
- c) Explain the use of staggered grid. **[4]**

OR

- Q12)** Write notes on : **[18]**
- a) SIMPLE algorithm.
  - b) Finite volume method.
  - c) Stability considerations.



**P1147**

**[3664]-37**

**B.E. (E & TC)**

**AGRICULTURE ELECTRONICS (Elective - II)**

**(1997 Course)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answers of the two sections should be written in separate answer books.*
- 3) *Figures to the right indicate full marks.*
- 4) *Neat diagrams must be drawn wherever necessary.*
- 5) *Use of log tables, slide rule, Mollier charts, steam tables is allowed.*
- 6) *Use of non programmable scientific calculator is allowed.*
- 7) *Use of electronic gazettes like mobile phone, diary etc. not allowed.*
- 8) *Assume suitable data if necessary.*
- 9) *Figures to right indicate full marks.*

**SECTION - I**

- Q1)** a) Explain concept of absolute and relative humidity, how humidity of the soil can be tested? [8]
- b) How pH of a liquid material is measured in a laboratory? What is necessity of pH measurement for food in process industry. [8]
- Q2)** a) Give details and specifications of transducer used for soil conductivity measurement, explain instrument used with help of simple block diagram. [8]
- b) How turbidity is measured in a laboratory? What is necessity of turbidity measurement of a water used for irrigation through suitable watering system? [8]
- Q3)** a) Prepare a flow chart for milk processing in a dairy for distribution of milk in urban area. [8]
- b) Explain the layout of milk processing plant, with special reference to inwards inventory. [8]
- Q4)** a) Give the details of various methods to measure the wind speed which may affect the green house environment. [8]
- b) Explain systems developed related to transport of processed milk or products of green house to the distribution or air lift centers. [8]

**P.T.O.**

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

- a) Soil testing in laboratory, explain instruments used for soil testing.
- b) Explain scheme of oil/milk packing in a plastic bags with automation.
- c) Conventional and advance techniques for drying agriculture products.
- d) Need of pipeline milking machine for a milkman.
- e) Use of wind speed record for wind mills.

**SECTION - II**

**Q6)** a) Explain selection process of pump motors for water irrigation of fields. **[8]**

- b) Give details of protection systems for a single phase and motors used in drip irrigation. **[8]**

**Q7)** a) Explain, how electronics systems can be adopted for control drip water irrigation and related pipeline issues. **[8]**

- b) Explain power generation with the help of roof top wind mill based systems features and drawbacks. **[8]**

**Q8)** a) Explain the wireless system features of Rain Fall measurement in water catchments area of a water Dam. **[8]**

- b) Explain need of a tissue culture labs. **[8]**

**Q9)** a) Explain methods of water flow measurement in water cannels to agriculture fields. **[8]**

- b) Give details of green house gases and their effect on agriculture farming. **[8]**

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

- a) Export oriented flora base for rose cultivation and export.
- b) Light intensity measurement on agriculture fields and its necessity.
- c) Wind mill power and solar cell generated power.
- d) Water pump control and protection needs in remote field irrigation.
- e) Give details water irrigation system for a fields through microcontroller based system.



**P1148**

**[3664]-58**

**B.E. (Industrial Electronics)**

**POWER ELECTRONICS DRIVES AND APPLICATIONS**

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

**SECTION - I**

**Q1)** a) Draw the neat circuit diagram of 1  $\phi$  full-converter drive for separately excited dc motor. Explain its operation with the help of wave forms for continuous armature current. **[12]**

b) State and define different dc motor performance parameters. **[6]**

**Q2)** a) Draw a neat circuit diagram of 3  $\phi$  semiconverter drive for separately excited dc motor. Sketch the following waveforms for continuous armature current. **[8]**

- i) Phase supply voltages (R, Y and B).
- ii) Armature voltage.
- iii) Armature current.

b) The speed of 20 HP, 300 V, 1800 rpm separately excited dc motor is controlled by 3  $\phi$  full converter drive. The field current is also controlled by 3  $\phi$  full-converter and is set to the maximum possible value. The ac input is 3  $\phi$ , star connected, 208 V, 50 Hz,  $R_f = 250 \Omega$ ,  $R_a = 0.35 \Omega$ . The motor voltage constant  $K_v = 1.15 \text{ V/A} - \text{rad/sec}$ . The armature and field current continuous and ripplefree. Determine the following **[8]**

The delay angle of armature converter ( $\alpha_a$ ), if the motor supplies the rated power at rated speed.

**Q3)** a) Compare HVDC and HVAC transmission. **[6]**

b) Explain circulating and non-circulating mode of dual converter dc motor drive. **[10]**

**P.T.O.**

- Q4)** a) Explain a bipolar drive for stepper motor. Which stepper motors needs bipolar drive? [8]  
b) Explain principle of dielectric heating. State the applications of dielectric heating. [8]
- Q5)** Write short notes : [16]  
a) Traction drive.  
b) Electronic Ballast.  
c) Requirements of stepper motor drive.

### **SECTION - II**

- Q6)** a) Draw a neat circuit diagram of slip power recovery system using solid state scherbuis system. Explain its operation. [10]  
b) Explain the need of softstart for induction motor. How will you achieve it for different loads? [8]
- Q7)** a) Explain true synchronous mode operation of synchronous motor. [8]  
b) Compare synchronous motor drive with induction motor drive. [4]  
c) Explain why the v/f ratio is kept constant for synchronous motor. [4]
- Q8)** a) Explain the operation of 3  $\phi$  brushless dc motor drive with the help of necessary waveforms. [8]  
b) Explain vector control system of induction motor. [8]
- Q9)** a) Draw block diagram of microprocessor based dc motor control system. State the various functions to be performed by microprocessor in this system. [10]  
b) Compare dedicated hardware system with microprocessor based control for variable speed drives. [6]
- Q10)** Write short note : [16]  
a) Electric drives used in steel industry.  
b) Transistor inverter fed induction motor drive.  
c) Microstepping in stepper motor.





**P1149****[3664]-106****B.E. (Civil)**

**SYSTEMS APPROACH IN CIVIL ENGINEERING**  
**(2003 Course & 1997 Course) (Elective - I)**

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

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

**SECTION - I**

**Q1)** a) Minimize  $Z = x_1 + 2x_2 + 3x_3$  **[12]**

Subject to

$$x_1 - x_2 + x_3 \geq 4$$

$$x_1 + x_2 + 2x_3 \leq 8$$

$$x_2 - x_3 \geq 2$$

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

Use Big M Method.

- b) Explain the principle of Big M Method. How does it affect the value of the objective function? **[4]**

OR

**Q2)** a) Solve the problem in Q1 (a) above by Two Phase Method. **[12]**

b) Explain with suitable sketches. **[4]**

i) Unbounded solution in L.P.

ii) Infeasible solution in L.P.

**Q3)** In a regional rural water supply scheme, water is to be supplied from three sources to four different villages. The quantity of water available at each source and that required by each village and the unit cost of transport are given in the following table **[18]**

a) Find the Initial Feasible solution by

i) N-W Corner Method.

ii) VAM.

**P.T.O.**

- b) Using the solution obtained by VAM, find the distribution policy which will minimize the cost of transportation.

Sources	Villages				Supply
	1	2	3	4	
A	5	5	9	12	40
B	11	8	13	13	30
C	15	18	16	21	30
Demand	5	15	35	45	

OR

- Q4)** a) Five civil contractors have submitted their bids for 4 projects. One project will be awarded to one contractor only, who has submitted the minimum bid. Find the optimal assignment if the cost bid by each contractor for the projects is given below (unit in lakh rupees), so that the total cost of the assignment is minimum. Contractor D is unable to execute project No.3. Which one of the contractors does not get a project? [10]

Contractors	Projects			
	1	2	3	4
A	18	26	28	26
B	25	29	31	28
C	22	26	30	27
D	26	27	–	26
E	25	24	31	29

- b) How will you solve an Assignment Model for maximization? [2]  
 c) Write the dual of the problem in Q1(a). [6]
- Q5)** a) Use Fibonacci Method to maximize  $Z = 75x - x^3$  in the range 0 to 15 to an accuracy of 1%. Carry out the first four iterations only. [10]  
 b) Explain the Dichotomous Search Technique. [6]

OR

- Q6)** a) Use Newton's Method to minimize [12]  

$$f(x) = 2x_1^2 + 2x_2^2 + 2x_1x_2 - 3x_1 - 2x_2$$
 Take the starting point as (0, 0)
- b) What is a Hessian Matrix? Explain its significance. [4]

## SECTION - II

- Q7)** a) Use Lagrange Multiplier Technique to optimise **[10]**

$$Z = 3x_1^2 + 4x_1x_2 + 6x_2^2$$

Subject to  $4x_1 + 5x_2 = 26$ .

- b) What is Bellman's principle of optimality? Give any 4 applications of Dynamic programming to Civil Engineering. **[6]**

OR

- Q8)** Six units of power are to be distributed among three regions designated as A, B & C. The expected returns from each region depending upon the number of units of power supplied are given below. Use Dynamic Programming to determine an optimum power allocation so as to maximize the returns. Write the recursive equation for each stage. **[16]**

Power supplied (in units)	Returns from Regions (in money units)		
	A	B	C
0	0	0	0
1	10	30	24
2	20	40	48
3	60	44	50
4	62	46	52
5	64	48	54
6	66	50	56

- Q9)** a) There are 10 jobs which are to be processed on two machines A and B, first on machine A and then on machine B. The processing times in minutes, of these jobs are given below. Determine the sequence for the 10 jobs so as to minimize the total elapsed time. Also find the idle times of the machines. **[9]**

	Processing Times in minutes									
Job No.	1	2	3	4	5	6	7	8	9	10
Machine A	40	20	6	20	10	4	16	14	6	8
Machine B	8	24	10	16	12	24	8	20	12	2

- b) What are the various components of a queueing system? **[3]**

- c) Customers arrive at an airport ticket booking counter according to Poisson distribution at the rate of 2 every 5 minutes. It takes 1.5 minutes on an average to serve a customer and the service time follows exponential distribution. [6]

Find :

- The proportion of time the facility remains idle.
- The expected number of customers waiting but currently not being served at a particular point of time.
- The expected time a customer spends in the system.

OR

**Q10)** The interarrival time and the service time in a waiting line problem have the following frequency distribution based on 100 such arrivals. [18]

Interarrival Time in minutes	3	6	9	12	15	18
Frequency	6	9	25	37	16	7

Service Time in minutes	4	6	8	10	12
Frequency	4	10	18	44	24

Calculate :

- The average waiting time and percentage waiting time of an arrival.
- The average idle time and percentage idle time of the server.
- Mean queue length.

Simulate 10 arrivals and use the following random numbers.

Arrivals	15	19	61	49	54	73	85	96	31	22
Service	9	11	90	64	37	29	43	78	87	56

- Q11)** a) Explain the assumptions in a Two-Person-Zero Sum Game. [4]  
 b) Define saddle point and Fair Game. [4]  
 c) The pay off 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. [8]

	B <sub>1</sub>	B <sub>2</sub>	B <sub>3</sub>	B <sub>4</sub>
A <sub>1</sub>	6	-9	10	1
A <sub>2</sub>	7	8	9	2
A <sub>3</sub>	9	8	16	2
A <sub>4</sub>	4	5	0	4

OR

**Q12) a)** What is an Annuity? What are the different types of Annuities? [8]

b) A company is interested in investing in any one of the following two projects. The relevant data pertaining to the two projects is given below. Rank the projects according to the B/C ratio and state which option would be the best. [8]

Particulars	Project A	Project B
1. Initial Investment (lakh Rupees)	37	45
2. Net Annual Benefits (lakh Rupees)	5	7
3. Useful Life (Years)	15	10
4. Salvage Value (in lakh Rupees)	1	2
5. Discount Rate	10%	10%

\*\*\*

**P1150****[3664]-141****B.E. (Mech. 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)** A pair of straight bevel gears mounted on shafts, which are intersecting at right angle consists of 24 teeth pinion meshing with 32 teeth gear. The pinion is connected to 7.5 kW, 1000 rpm electric motor. The starting torque of the motor is 125% of the rated torque. The load distribution factor is 1.2. The gear is made of gray cast iron FG 350, while the pinion is made of case hardened 40 C8 ( $S_{ut} = 580 \text{ N/mm}^2$ ). The gears are generated. Tooth system is  $20^\circ$  full depth involute.
- i) If the factor of safety required against bending failure is 3.0, design the gear pair by using velocity factor.
  - ii) If the factor of safety required against pitting failure is 2.0, specify the surface hardness required on the gears.

$$\text{Velocity factor} = \frac{5.6}{5.6 + \sqrt{v}}$$

$$\text{Lewis form factor} = 0.484 - \frac{2.87}{Z'}$$

Std module (mm) : 1, 2, 3, 4, 6, 8, 10, 12, 15

**[12]****P.T.O.**

- b) A worm transmits 3kW at 1440 rpm and drives a gear having 60 teeth. The pitch circle diameter of worm is 90 mm and is triple threaded. The module of the worm gear is 4 mm. Calculate [6]
- Tangential force on the worm and gear.
  - Separating force.
  - Efficiency of the drive.
- Assume coefficient of friction to be 0.1 and wheel to have a normal pressure angle of  $20^\circ$ .

OR

- Q2)** a) A worm gear pair is used to transmit 3.7 kW power from an electric motor running at 1000 rpm to a machine. The worm is quadruple threaded, while the worm gear has 52 teeth. The module is 8 mm and the diametral quotient of the worm is 10. The face width of the gear is 58 mm. The worm is made of 10C4, while the gear is made of phosphor bronze having permissible bending stress of  $80 \text{ N/mm}^2$ . The wear load factor for worm gear is  $0.6 \text{ N/mm}^2$ . The transverse pressure angle is  $21.4^\circ$ . The coefficient of friction between the worm and worm gear teeth is 0.035. The application factor is 1.25. The external surface area of the housing is  $1.35 \text{ m}^2$ . The overall heat transfer coefficient is  $18 \text{ W/m}^2 \text{ }^\circ\text{C}$ . Determine :
- Factor of safety against bending, & pitting failure.
  - Temperature rise of lubricating oil.

$$\text{Lewis form factor, } y = 0.484 - \frac{2.87}{Z_g}. \quad [12]$$

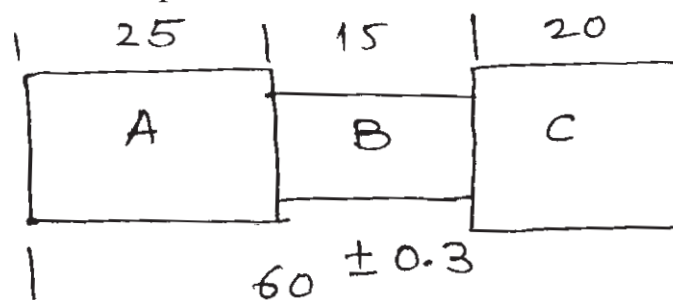
- b) A 21 teeth straight bevel pinion rotating at 720 rpm transmits 10 kW power to a 40 teeth bevel gear. The module is 6mm and the pressure angle is  $20^\circ$  face width is 45 mm. If the shaft angle is  $90^\circ$ , determine the components of force acting on meshing teeth. [6]

- Q3)** a) A tube of inner and outer diameters 20 mm and 40 mm respectively is reinforced by shrink fitting another tube of diameter 60 mm. This assembly is to withstand an internal pressure of 10MPa. The shrinkage is such that the maximum tangential stress in both the tubes is same. Calculate the contact pressure and the dimensions of the tube. Also plot the important values of resultant stresses. [12]
- b) Describe various supports used for vertical pressure vessel. [4]

OR

- Q4) a)** A class 2 cylindrical pressure vessel of 1220 mm inner 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 of vessel are 30 mm and 15 mm respectively. The corrosion allowance is 1.5 mm. Double welded butt joints which are spot radiographed are used for fabrication. Nozzle is made of seamless tube. The pressure inside the vessel is 2 MPa. Allowable stresses for shell and nozzle are 120 MPa and 100 MPa respectively. A reinforcing pad of 6 mm thickness and 350 mm outside diameter is used. Find whether reinforcement is required and if not suggest necessary action. [12]
- b)** Explain different types of welded joints used in pressure vessels. [4]

- Q5) a)** An assembly comprises of three components A, B and C as shown in figure. The mean dimensions of components A, B and C are 25, 15 and 20 respectively. Component C has three times and B has two times the standard deviation of component A. The overall dimensions and the individual dimensions are normally distributed. The natural tolerance and design tolerance are equal. Specify the tolerances for individual components. [10]



- b)** Explain various junction designs with relation to castings. [6]

OR

- Q6) a)** Explain design principles in welding. [6]
- b)** A machine member made of plain carbon steel has a mean yield strength of 250 MPa and deviation of 30 MPa. This member is subjected to a bending stress with a mean of 160 MPa and a standard deviation of 15 MPa. Determine [10]
- Probability of failure and reliability of the machine member.
  - Minimum factor of safety available.
  - Average factor of safety available.

Assume normal distribution.

Standardised variable Z and area under the graph is

Z	1.0	2.0	2.5	3.0
A	0.3413	0.4772	0.4938	0.4987



## SECTION - II

- Q7) a)** A cantilever beam of circular cross section is fixed at one end and subjected to completely reversed force of 10 kN at the free end. The force is perpendicular to the axis of the beam. The distance between free and fixed ends is 100 mm. The beam is made of steel with ultimate tensile strength of 540 N/mm<sup>2</sup> and tensile yield strength of 320 N/mm<sup>2</sup>. Neglect the effect of stress concentration. The size factor, surface finish factor and reliability factors are 0.85, 0.8 and 0.868 respectively. Temperature factor is 1.010. If the diameter of the beam is 35 mm, find the life of the beam. [12]
- b)** Explain Miner's equation. [6]

OR

- Q8) a)** Explain different endurance limit modifying factors. [6]
- b)** A transmission shaft made of steel having ultimate tensile strength of 630 MPa and yield point strength of 360 MPa respectively is subjected to a fluctuating torque which varies from 600 Nm clockwise to 100 Nm anticlockwise direction. The surface finish factor and size factor are 0.8 and 0.85 respectively. Reliability factor is 0.897. If the factor of safety is 2 find the diameter of the shaft. Use distortion energy theory of failure. Use modified Goodman diagram. [12]
- Q9) a)** In a light weight equipment, a shaft is transmitting a torque of 900 Nm is to have a rigidity of 90 Nm/degree. Assume a factor of safety of 1.5 based on yield strength. Design the shaft with minimum weight. What will be the change in design for minimum cost. Assume maximum shear stress theory of failure. Use the following data for the materials.[12]
- | Material       | Mass density<br>(kg/m <sup>3</sup> ) | Material cost<br>(Rs./N) | Yield strength<br>(MPa) | Shear modulus<br>(GPa) |
|----------------|--------------------------------------|--------------------------|-------------------------|------------------------|
| M <sub>1</sub> | 8500                                 | 16                       | 130                     | 80                     |
| M <sub>2</sub> | 3000                                 | 32                       | 50                      | 26.7                   |
| M <sub>3</sub> | 4800                                 | 480                      | 90                      | 40                     |
| M <sub>4</sub> | 2100                                 | 32                       | 20                      | 16                     |
- b)** Explain Johnson's method of optimum design. [4]

OR

**Q10)** A cantilever beam of length 200 mm and rectangular cross section is to function in a device as a spring member. The width is five times its depth. It is subjected to a vertical force which varies from +500 N to –500 N at its free end. The maximum deflection at the free end is limited to 1 mm. The factor of safety is 2. Design the beam for minimum material cost out of the following materials. [16]

Material	Mass density (kg/m <sup>3</sup> )	Material cost (Rs./kg)	Endurance limit (MPa)	Modulus of elasticity (MPa)
M <sub>1</sub>	7800	20	130	207 × 10 <sup>3</sup>
M <sub>2</sub>	2800	70	50	72 × 10 <sup>3</sup>
M <sub>3</sub>	4500	800	260	114 × 10 <sup>3</sup>

**Q11)a)** An inclined conveyor handles an ore having density of 1.5 t/m<sup>3</sup>. The material has to be conveyed over a distance of 2 kms and height of 450 m. If the belt speed is to be 120 m/min, then find the standard width of four ply belt so that the material can be conveyed at a rate of 3 tonnes/hr. for the inclined belt use following data.

Conveyor inclination	10° – 15°	16° – 20°	21° – 25°
Flowability factor	2.65 × 10 <sup>-4</sup>	2.5 × 10 <sup>-4</sup>	2.35 × 10 <sup>-4</sup>

Standard belt widths are 300, 500, 600, 800, 1000, 1200, 1400, 1600, 1800 mm. Also determine the diameter and width of the drive pulley and the gear reduction ratio for the motor if the motor speed is 1440 rpm. Assume the material for the ply of belt has material factor = 2.5 and belt tension & arc of contact factor = 80. [12]

b) Explain advantages of belt conveyors over other conveyors. [4]

OR

**Q12)a)** Explain different types of belt conveyor layouts. [6]

b) Determine the resistance offered by a single carrying & return idler for the conveyor having following data.

Capacity of the conveyor = 400 tph.

Belt speed = 2 m/s

Mass of belt = 16 kg/m

Carrying side pitch = 1m

Return side pitch = 2m

Coefficient of friction between idler & pulley = 0.02

Coefficient of friction between roller pin and idler = 0.04

Belt inclination = 15°.

[10]



Total No. of Questions : 12]

[Total No. of Pages : 2

**P1151**

**[3664]-153**

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

**SECTION - I**

**Unit - I**

- Q1)** a) Explain history and development of production/operation management in brief. [8]
- b) Explain what makes industry to think for new product design? [8]

OR

- Q2)** a) Explain how production interface with other functional areas of the business. [8]
- b) Explain the concept of product design and product cost. [8]

**Unit - II**

- Q3)** a) What are the factors considered while selecting location for a foundry -manufacturing costings? [9]
- b) What are the different types of layout? Explain each with their characteristics, merits and demerits. [9]

OR

- Q4)** a) Enumerate eight major factors influencing plant layout and explain any two in detail. [9]
- b) What are the different quantitative/models used to solve facility layout problem? And explain gravity location problem in detail. [9]

***P.T.O.***

### **Unit - III**

- Q5)** a) Enumerate different manpower forecasting techniques. Explain any two in brief. [8]  
b) What are the different productivity ratios? Explain in detail. [8]

OR

- Q6)** a) Explain the concept of capacity in industry. [8]  
b) Explain the process of capacity planning. [8]

### **SECTION - II**

#### **Unit - IV**

- Q7)** a) Which framework is suitable for “Value Added Engineering”? Explain this in brief. [9]  
b) What is the contribution of Schonberger in WCM? [9]

OR

- Q8)** a) Explain the concept of World Class Manufacturing (WCM). [9]  
b) What are the ways to eliminate seven wastes as suggested by Shigeo (1981)? [9]

#### **Unit - V**

- Q9)** a) What are the different types of maintenance? Explain. [8]  
b) Explain different functions of maintenance engineering in industry. [8]

OR

- Q10)** a) What are the operating policies in maintenance? Explain policies with respect to work allocation in brief. [8]  
b) What is work authorization and control? Explain. [8]

#### **Unit - VI**

- Q11)** a) What are the different solutions to minimize the environmental changes in clean production? [8]  
b) What is green manufacturing (Production)? [8]

OR

- Q12)** a) Write short note on “Environmental Pollution”. [8]  
b) Explain the standards used to control pollution. [8]



**P1152**

**[3664]-170**

**B.E. (Production S/W)**

**ERGONOMICS AND HUMAN FACTORS IN ENGINEERING  
(2003 Course) (411090)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) Answer three questions from 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 is cumulative trauma disorder? What are the causative factors of CTD? [8]

b) Explain the basis of ergonomic problem identification. [8]

OR

**Q2)** a) Explain various characteristics of human machine systems. [8]

b) What are requirements for designing a reasonably safe product. [8]

**Q3)** a) Explain science of seating and various principles used in design of seats. [8]

b) What are the important anthropometric dimensions useful for design of interiors of a passenger car? [8]

OR

**Q4)** a) Explain in detail design of MMH Task. [8]

b) Differentiate between Static dimensions and Dynamic Dimensions. [4]

c) Write a note on mirror image arrangements. [4]

**Q5)** a) Write short note on (Any Three) : [12]

i) Lux and Lumen.

ii) Glare and its types.

iii) Control of Noise.

iv) Lighting and elderly.

b) Explain various operative temperatures. [6]

*P.T.O.*

OR

- Q6)** a) Explain in detail physiological effects of heat stress. [6]  
b) Explain the various effects of cold stress on performance. [6]  
c) Write a short note on special purpose lighting for illumination. [6]

**SECTION - II**

- Q7)** a) What is Maximum aerobic power? Explain various factors affecting MAP. [8]  
b) What is energy consumption? What are various factors affecting energy consumption? [8]

OR

- Q8)** a) Explain in brief the concept of learning curves. [4]  
b) Explain in brief various stages in systems design process. [8]  
c) Explain the working of Actin and Myosin. [4]
- Q9)** a) What is C/R Ratio? How to decide optimum C/R ratio? [8]  
b) Write a note on design for shift work. [4]  
c) What are the design considerations for foot pedals. [4]

OR

- Q10)** a) Explain in brief multifunction hand controls. [6]  
b) Explain various principles used in the design of hand tools. [10]
- Q11)** a) What is PMTS? What are the different classifications of PMTS? [10]  
b) Explain MOST and its types. [8]

OR

- Q12)** a) Explain Method Time Analysis. [8]  
b) Explain MTM and various types of MTM. Also explain where they are used? [10]

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**P1154**

**[3664]-169**

**B.E. (Production Sandwich)  
MECHATRONICS & ROBOTICS  
(2003 Course) (411121)**

*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**

**Unit - I**

- Q1)** a) Explain the following with an example : **[8]**
- i) Measurement System.
  - ii) Display System.
  - iii) Sequential Controller.
  - iv) Comparison element of a closed system.
- b) Discuss the functioning of an Engine Management System and draw a block diagram representing the basic elements of the control system for it. **[10]**

OR

- Q2)** a) Explain the basic building blocks of models used to represent Mechanical systems. **[4]**
- b) State and explain the signal conditioning processes. **[5]**
- c) Discuss the following with neat sketches : **[9]**
- i) Inverting amplifier.
  - ii) Summing amplifier.
  - iii) Integrating amplifier.

**Unit - II**

- Q3)** a) Explain the following for a Microprocessor. **[9]**
- i) Assembler.
  - ii) Memory address
  - iii) Bus

**P.T.O.**

- b) Explain the use of Stack with suitable examples. Illustrate the various operations used with a stack pointer. [7]

OR

- Q4)** a) Explain what Logic gates might be used to compare two digital words to determine if they are exactly equal. [6]
- b) Select proper kind of flip-flop and Design a circuit for the following:[10]
- i) Safety alert system in which an alarm is to sound when a beam of light is interrupted and remain sounding even when the beam is no longer interrupted.
  - ii) A system that could be used to show a green light when the sensor input is low and a red light when it goes high and sound an alarm.

### **Unit - III**

- Q5)** a) Explain the following instructions : [8]
- i) MOV.
  - ii) ADC.
  - iii) RAL.
  - iv) LHLD.
- b) Explain block of microcomputer with all interfacing devices. [8]

OR

- Q6)** a) Explain the following pins of Microprocessor. [8]
- i) RESETIN.
  - ii) INTR.
  - iii) READY.
  - iv) HOLD.
- b) What are the different categories of instructions in 8085. [8]

### **SECTION - II**

#### **Unit - IV**

- Q7)** a) Discuss the following with respect to PLCs. [8]
- i) Multi tasking.
  - ii) Classification.
  - iii) Task of Input/Output section.
  - iv) Scan time.
- b) Explain the following : [8]
- i) How the direction of the core displacement is sensed in LVDT?
  - ii) How the direction of rotation is determined in rotary encoder?



OR

- Q8)** a) To run an Automatic Injection Moulding machine, list the various activities to be performed in sequence and draw a ladder diagram for it. [10]  
b) Define the following and state which physical parameters they can sense. [6]  
i) Pyroelectric transducers.  
ii) Piezoelectric transducers.

**Unit - V**

- Q9)** a) Explain the following pneumatic actuators with neat diagram. [9]  
i) Linear Single rod Single acting.  
ii) Linear Single rod Double acting.  
iii) Linear Double rod Double acting.  
b) In what way the stepper motor is advantageous than the DC and AC motors? [7]

OR

- Q10)** State and explain various types of : [16]  
a) Valve bodies.  
b) Plugs.  
c) Ball and Roller bearing.  
d) Solid state devices.

**Unit - VI**

- Q11)** a) State and explain various types of automations. [6]  
b) Discuss the role of Robot in following applications : [12]  
i) Surgery.  
ii) Machine Loading and Unloading.  
iii) Profile Welding.

OR

- Q12)** a) Discuss some of the applications which demand the use of Robots. [6]  
b) Discuss the various coordinates of Robot with specific application of each. [12]



Total No. of Questions : 12]

[Total No. of Pages : 3

**P1155**

**[3664]-172**

**B.E. (Production & Industrial Engineering)**

**DIE AND MOULD DESIGN**

**(Elective - I) (2003 Course) (411122)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

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

**SECTION - I**

- Q1)** a) What is yield criteria? Explain any two yield criteria. [8]  
b) What are the problems in rolling? Explain it with neat sketch. [8]

OR

- Q2)** a) Explain the following terms in extrusion : [8]  
i) CCD.  
ii) Shape Factor.  
iii) Form Factor.  
iv) Extrusion ratio.  
v) Breakthrough pressure.  
vi) Discard pressure.  
b) Explain various types of wire drawing machines state their advantages & limitation. [8]

- Q3)** a) Explain with neat sketch the different types of presses based on method of actuation of slide with their specific application. [12]  
b) Draw neat sketch of compound die for manufacturing of washer. [4]

OR

**P.T.O.**

- Q4)** a) What is OBI? State its application with advantages & disadvantages. [8]  
 b) What are the different types of die set? Explain with neat sketch. [8]

**Q5)** Design simple die for the component shown in fig. 1. [18]

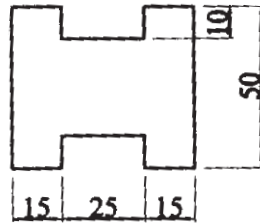


Fig:- 1

OR

- Q6)** a) Sketch assembly drawing of a progressive die for the component shown in fig. 2

Given : Stock thickness = 1.0 mm

Shear strength = 260 MPa

[6]

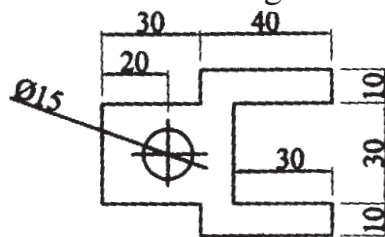


Fig:- 2

- b) Draw strip layout & find out material utilization (strip length = 2500 mm). [6]  
 c) Find out press tonnage with staggering. [2]  
 d) If full shear is given, what is press capacity. [2]  
 e) What size of dowels & allen screws are required for fastening? [2]

## SECTION - II

- Q7)** a) Explain important design factor to be considered while designing a forging die. [8]  
 b) Explain the following with neat sketch : [8]  
 i) Shot blasting & tumbling process for cleaning forging.  
 ii) Isothermal forging.

OR

- Q8)** a) Explain edging, bending, drawing out (swaging) & trimming operations of forging with neat sketch. [8]  
b) Write note on forging equipment : [8]  
a) Board drop hammer.  
b) Screw press.
- Q9)** Write short note on : [16]  
a) Transfer moulding.  
b) Injection moulding for thermoplast.  
c) Blow moulding.

OR

- Q10)** a) What are the types of plastic? Explain the difference between them. [4]  
b) How injection moulding machines are specified? Compare vertical & horizontal injection moulding machine. [6]  
c) Explain basic terminology of Injection mould. [6]
- Q11)** Design a two plate injection mould for component shown in figure 3 [18]

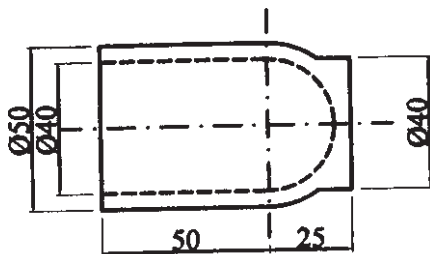


Fig:- 3

OR

- Q12)** a) Explain different methods of ejection in injection moulding. [10]  
b) What is gate? What factor should be considered in designing gate? And explain any two types of gate used in injection moulding. [8]



**P1156**

**[3664]-178**

**B.E. (Electrical)**

**POWER SYSTEM OPERATION AND CONTROL**

**(2003 Course) (403141)**

*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.*

**SECTION - I**

- Q1)** a) Explain equal area criterion for power system stability. [9]  
b) Discuss the importance of critical clearing angle and critical clearing time for power system stability. Derive the expression for critical clearing time in terms of critical clearing angle. [9]

OR

- Q2)** a) Explain the solution of swing equation by point by point method. [9]  
b) A 150 MVA, 13.8 kV, 50Hz, 4 pole turbogenerator has an inertia constant of 8 MJ / MVA. [9]  
i) Find the stored energy in the rotor at synchronous speed.  
ii) The machine is operating at a load of 80 MW and the load suddenly increases to 100 MW. Find the rotor retardation. Neglect losses.  
iii) The retardation calculated above is maintained for 5 cycles. Find the change in the power angle and rotor speed in rpm at the end of this period.

- Q3)** a) What is unit commitment? Explain priority list method of unit commitment. [10]  
b) Explain the concept of spinning reserve and thermal units constraints used for commitment. [6]

**P.T.O.**

OR

- Q4)** a) Explain dynamic programming method used for unit commitment.[10]  
b) Discuss hydro constraints and nonconventional energy sources constraints used for unit commitment. [6]
- Q5)** a) Draw complete block diagram representation of load frequency control and discuss the concept of Automatic generation and control. [8]  
b) With complete block diagram explain proportional plus integral load frequency control along with dynamic response of the system. [8]

OR

- Q6)** Discuss the following :
- a) Load frequency control with generation rate constraints. [6]  
b) Effect of speed governor dead band on automatic generation and control. [5]  
c) Digital load frequency controller. [5]

### **SECTION - II**

- Q7)** a) Explain the need of real time control of power system. Discuss basic components used for real time computer control of power system.[10]  
b) Draw functional block diagram and discuss real time monitoring of power system. [8]

OR

- Q8)** a) Draw a neat schematic / block diagram for supervisory control and data acquisition system (SCADA) and explain principle of operation of SCADA system. [10]  
b) Write short notes on : [8]  
i) Telemetry.  
ii) Remote terminal unit.  
iii) Display monitoring and data logging.  
iv) Centralized and decentralized control.

- Q9)** a) Draw the loading capability curve of a synchronous generator. With the help of this curve, explain reactive power generation and absorption from a synchronous generator. [8]
- b) What is series compensation of a transmission line? Explain sub-synchronous resonance associated with series compensation. [8]

OR

- Q10)** a) What is static VAR compensator? Explain with neat diagrams, various types of static VAR compensators. [8]
- b) Explain various types of FACTS controllers used for reactive power control. [8]
- Q11)** a) Why interchange of power between interconnected utilities is beneficial? Explain economy interchange evaluation between interconnected utilities. [8]
- b) Explain interchange evaluation with unit commitment. [8]

OR

- Q12)** Explain the following : [16]
- a) Power pools.
  - b) Inadvertent power exchange.
  - c) Emergency power interchange.
  - d) Energy banking.



**P1158**

**[3664]-183**

**B.E. (Electrical)**

**POWER QUALITY**

**(Elective - I) (2003 Course) (403143)**

*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.*
- 6) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 7) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) Explain why power quality issues are gaining importance in today's context. [8]
- b) Explain various definition of power quality with reference to each stake holder of power quality. Explain the EMC term. [8]

OR

- Q2)** a) Define with graphical representation various RMS voltage Variations as per IEEE Std 1159-1995. [10]
- b) Explain grounding, its purpose and good practices to avoid failure or malfunction of equipments. [6]

- Q3)** a) Explain various causes, effects and solutions of over voltage and under voltage. [10]
- b) Explain impact of reactive power management on voltage profile. [6]

OR

- Q4)** a) Explain voltage flicker, various causes of flicker and techniques for flicker mitigation. [12]
- b) Explain complex power. [4]



- Q5)** a) Explain various sources of voltage sag. [12]  
b) Explain various characteristics of voltage sag. [6]

OR

- Q6)** a) Explain influence of fault location, fault level on voltage sag. Explain area of vulnerability and critical distance. [9]  
b) Explain following voltage sag mitigation devices. [9]  
i) DVR.  
ii) CVT.  
iii) DPI.

### **SECTION - II**

- Q7)** a) Explain relation of various a.c. quantities under nonsinusoidal conditions. [10]  
b) Explain various sources of harmonics. [8]

OR

- Q8)** a) Explain harmonic series and parallel resonance and various consequences of resonance. [8]  
b) Explain various harmonic mitigation techniques. [10]
- Q9)** a) Define impulsive and oscillatory transients and their sources. [10]  
b) Explain how voltage magnification takes place due to capacitor switching. [6]

OR

- Q10)** a) Explain various solutions for controlling impulsive transients. [8]  
b) Explain various techniques to control capacitor switching transient. [8]
- Q11)** a) Explain the various objectives of power quality monitoring. [8]  
b) Explain requirement of power quality monitor to monitor various power quality parameters. [8]

OR

- Q12)** a) Explain various voltage and current transducer used for power quality monitoring. [10]  
b) Explain Reactive and Proactive approach of power quality monitoring with advantages and disadvantages. [6]



**P1160**

**[3664]-191**

**B.E. (Electrical)**

**HIGH VOLTAGE ENGINEERING  
(Elective - II) (2003 Course) (403150)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

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

**SECTION - I**

- Q1)** a) Discuss effects of corona discharges. [8]  
b) Explain time lag for breakdown in gases. [8]

OR

- Q2)** a) Discuss Townsend's law for breakdown in gases. [8]  
b) Explain streamer mechanism for breakdown in gases. [8]
- Q3)** a) Discuss various factors that influence conduction in pure liquid dielectrics and in commercial liquid dielectrics. [10]  
b) Discuss process of breakdown in composite insulation system. [8]

OR

- Q4)** With reference to breakdown in solid dielectrics discuss -  
a) Intrinsic breakdown. [6]  
b) Electromechanical breakdown. [6]  
c) Thermal breakdown. [6]

- Q5)** Write short notes on :  
a) Lightning phenomenon and development of overvoltages in power system. [6]  
b) Overvoltages due to switching surges. [5]  
c) Overvoltages due to system faults and abnormal conditions. [5]

OR

- Q6)** a) Discuss principles of insulation coordinations on high voltage and extra high voltage power system and substation. [12]

*P.T.O.*

- b) How are the protective devices chosen for optimal insulation level in a power system. [4]

## SECTION - II

- Q7)** a) What is the principle of operation of a resonant transformers? How is it advantageous over the cascade connected transformers. [9]  
b) Draw a neat sketch of Marx circuit arrangement used for multistage impulse generator. Discuss basic principle of operation of Marx circuit. [9]

OR

- Q8)** a) Discuss basic principle of impulse current generator used for generation of impulse currents in laboratory. [9]  
b) Explain with neat sketches the principle of operation used for tripping and control of impulse generators. [9]
- Q9)** a) Draw neat sketch of capacitance voltage divider. Explain basic principle of operation of capacitance divider used for the measurement of high ac voltages. [8]  
b) Discuss use of sphere gap unit for measurement of high DC, AC and impulse voltages. Explain various parameters that influence voltage measurement. [8]

OR

- Q10)** a) Draw the schematic arrangement of an impulse potential divider with an oscilloscope connected for measuring impulse voltages. Explain the arrangement used to minimize errors. [8]  
b) Explain with neat schematic diagram the basic principle used for high voltage schering bridge for the dissipation factor and capacitance measurement of insulators. [8]
- Q11)** a) Discuss method of high voltage testing of insulators. [8]  
b) Explain with a schematic diagram one method of radio interference measurements of transmission line hardware. [8]

OR

**Q12)** Write short notes on :

- a) Testing of cables. [5]  
b) Testing of power transformers. [5]  
c) Operating duty cycle test on a surge arrester. [6]



**P1161**

**[3664]-216**

**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) Draw the block diagram of a SMART TRANSMITTER with RTD as the input sensor. Explain the function of each block. **[8]**
- b) Using an RTD with temperature coefficient of resistance  $0.0034/^{\circ}\text{C}$  and  $R = 100 \text{ Ohms}$  at  $20^{\circ}\text{C}$ , design a signal conditioning with bridge and Instrumentation amplifier to provide 0-5 V output for  $20^{\circ}\text{C} - 100^{\circ}\text{C}$  temperature variation. The RTD dissipation constant is  $28\text{mW}/^{\circ}\text{C}$ . **[8]**

**OR**

- Q2)** a) Write the specifications of a digital conductivity meter. **[6]**
- b) Temperature is to be measured in the range of  $250^{\circ}\text{C} - 450^{\circ}\text{C}$  with an accuracy of  $\pm 2^{\circ}\text{C}$ . The sensor is a resistance that varies linearly from 280 ohm to 1060 ohm for this temperature. Power dissipation in the sensor must be kept below 5 mW. Design a signal conditioning circuit that provides an voltage output of -5V to +5V for this temperature range. **[10]**
- Q3)** a) Sketch the following types of control valve actuators. **[10]**
- i) Spring diaphragm actuator with positioner.
  - ii) Electropneumatic actuator.
- b) Explain "Rate Before Reset" PID controller. Where it is used? **[6]**

**P.T.O.**

OR

- Q4)** a) Explain open loop transient response method for controller tuning. [6]  
b) A liquid level system converts a 4 – 10m level into 4 – 20 mA current. Design a three mode controller that outputs 0 – 5 V with a 50% proportional band, 0.03 minute reset time and 0.05 minute derivative time. Fastest expected change time is 0.8 minute. [10]

**Q5)** Draw the P & I diagram and explain the following control schemes. Write the specifications of the instruments used in each scheme :

- a) Three element control of boiler drum level.  
b) Cascade control of a multiple effect evaporator. [18]

OR

- Q6)** a) With a block diagram explain “Self tuning controller”. [6]  
b) What is “Statistical Process Control”? How it differs from conventional process control strategies? [6]  
c) Draw the P & I diagram and write the specifications of the instruments used in the cascade control of a jacketed CSTR (Continuously Stirred Tank Reactor) [6]

## **SECTION - II**

- Q7)** a) Explain the mathematical dynamic model of any temperature process. [10]  
b) Explain the term “Feedforward optimizing control”. [6]

OR

- Q8)** a) With suitable examples, explain the following terms : [10]  
i) Model Predictive Control (MPC).  
ii) Internal Model Control.  
b) Explain different optimizing tools in process control. [6]

- Q9)** a) Write the sample specifications of a PLC having both analog and digital inputs as well as outputs. [6]
- b) Explain the following terms w.r.t. a PLC : [4]
- i) I/O scan mode.
  - ii) Execution mode.
- c) Draw the physical ladder diagram for a motor with NO start switch, NC stop switch, thermal overload limit switch opening at high temperature, Green light when running and Red light for thermal overload. Convert it into a Programmed Ladder Diagram. [6]

OR

- Q10)**a) How the interpretation of NO and NC symbols differ in Relay ladder logic and PLC ladder logic. [4]
- b) Draw the event sequence and ladder diagram for a PLC system for a “Conveyor System for Bottle Filling”. Consider all sensors as direct inputs to PLC. [12]
- Q11)**a) Draw the block diagram of a SCADA system and explain the function of each block. [10]
- b) Explain following terms w.r.t. a Distributed Control System (DCS):[8]
- i) Data highway configuration.
  - ii) Star type configuration.
  - iii) Ring type configuration.
  - iv) Mesh type configuration.

OR

- Q12)**Write short notes on the following : [18]
- a) Square root extractor.
  - b) Control panel classification.
  - c) Flow totaliser.



**P1163**

**[3664]-243**

**B.E. (Instrumentation & Control)  
PROCESS INSTRUMENTATION - 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 books.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Figures to the right indicate full marks.*
- 5) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 6) Assume suitable data, if necessary.*

**SECTION - I**

**Q1)** a) State various factors considered in ISA 75.02 for testing capacity of a control valve. Explain any two factors in detail. **[8]**

b) A control valve regulates liquid flow from a tank. The water level is to be controlled in this tank at a level of 25 feet by regulating the outflow. The measured inflow varies from 0 to 120 gallons per minute. Calculate  $C_v$  and suggest a suitable valve for this application.

Instead of the valve discharging to atmosphere, if it discharges into a second tank with head of 15 feet. The maximum flow through is 120 gpm.

Calculate  $C_v$  and suggest a suitable valve for this application. **[8]**

OR

**Q2)** a) Describe the terms 'Cavitation' and 'Flashing' w.r.t. control valves. State giving reasons whether the following statement is true or otherwise. 'Flashing is more hazardous than Cavitation'. **[8]**

b) Comment on valves used for high temperature and high pressure applications. **[8]**

**Q3)** a) For the following processes select the PID settings with justification. **[10]**

- i) A process with dead time and multiple capacity.
- ii) A gas pressure control process with single capacity.

**P.T.O.**

- b) In a flow control system consider a 200 ft. length of 1- in schedule 40 pipe, containing water flowing at 10 gal/min with a drop of 20 lb/in<sup>2</sup>.  
 $\rho = 62.4 \text{ lb/ft}^3$ ,  $g = 32.2 \text{ ft/s}^2$ ,  $A = 0.06 \text{ ft}^2$ .

Calculate time constant of the process. [6]

OR

- Q4)** a) Derive the first order differential equation for self-regulating process. [8]  
 b) List all dynamic elements in a control loop and explain the effect of any two on a control loop. [8]

- Q5)** a) What is 'Multivariable Control'? Compare its performance with 'Single variable Control'. [10]  
 b) Explain the difference between 'Cascade Control' and 'Feed back + Feed forward Control'. [8]

OR

- Q6)** a) What is 'Dual Mode Concept' for attaining better control? How the selection of two controllers is done? [10]  
 b) With suitable example justify the use of selective control in process equipment protection. [8]

### SECTION - II

- Q7)** a) List the various function blocks available in SLPC. Explain the utility of any two function blocks with suitable application. [8]  
 b) In a heat exchanger process following data is available  
 i) Flow of cold water (F) : 0-100 gpm.  
     Normal reading : 60 gpm.  
 ii) Output temperature range : 25-75°F  
     Normal reading : 50°F  
 iii) Temperature of coldwater input range : 0-50°F  
     Normal reading : 30°F  
 iv) Rate of heat transfer (Q) range : 0-60,000 BTU/hr  
     Normal reading : 48000 BTU/hr.

Considering equation,  $Q = F \cdot K (T_2 - T_1)$  for the heat exchanger, apply scaling and convert to normalized form. Also draw the instrumentation scheme. [10]

OR



- Q8)** Explain in brief with proper examples the steps involved in analysing
- i) Flow control system.
  - ii) Temperature control system. **[18]**

- Q9)** a) Draw the block diagram of the 'Predictive Controller' and explain its working. **[8]**
- b) What is self tuning controller? Explain the working using block schematic. What are various limitations of this controller. **[8]**

OR

- Q10)** a) "Function charts of model based controllers are to be prepared before implementing it" explain. **[8]**
- b) Compare Intelligent controllers with conventional controllers. **[8]**
- Q11)** a) Explain the terms 'Fuzzifier' and 'Defuzzifier' w.r.t. fuzzy controller. **[8]**
- b) What is SPC? Explain its importance in process industry. In a process control application specify when not to use SPC. **[8]**

OR

- Q12)** a) Explain the techniques for analysis of process control performance using ANN. **[8]**
- b) With the help of block schematic explain the working of 'Model Predictive Controller'. **[8]**



**P1165**

**[3664]-253**

**B.E. (Instrumentation & Control)**

**ADVANCED BIOMEDICAL INSTRUMENTATION  
(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) What are different electrode configurations used in cutting and coagulation mode. [4]  
b) With the help of neat diagram, explain the working of R wave inhibited pacemaker. [8]  
Mention the advantages and disadvantages of the same. [4]

OR

- Q2)** a) What is the function of cardiometer? [1]  
Draw the block diagram. [3]  
Discuss the working of an integrating cardiometer. [4]  
b) Draw four different types of waveforms used in defibrillator. [4]  
Explain each waveform with its specifications. [4]

- Q3)** a) What is Electrophoresis? [2]  
Explain its applications in biomedical field? [6]  
b) State and explain different methods of modulation used in telemetry. [8]

OR

- Q4)** a) Explain coulter counter used for blood cell counting. [8]  
What are the problems associated with it? [2]  
b) A cardiac patient in rural area is being treated from distant location. What is the essential data that must be transmitted during telemedicine. [6]

*P.T.O.*

- Q5)** a) Explain the principle of X ray generation with the help of neat diagram. [6]  
b) What are image artifacts? [4]  
c) What is Hounsfield number? [3]  
Specify Hounsfield number for water, muscle, bone, fat and air? [5]

OR

- Q6)** a) Draw the block diagram of basic CT scanner. [4]  
Explain its working. [5]  
b) What are different front panel controls for X ray machine. [3]  
Explain their function in detail. [6]

### **SECTION - II**

- Q7)** a) Draw the diagram of Rectilinear Scanner. [3]  
Describe the instrumentation in rectilinear scanner. [5]  
b) What is A scan display in Ultrasound imaging? [5]  
State the applications of A scan in biomedical field. [5]

OR

- Q8)** a) Explain the terms gyromagnetic ratio, T1, T2 in respect to MRI. [8]  
b) Write a note on Positron Emission Tomography. [10]
- Q9)** a) What is the thermal and nonthermal interaction of laser with tissue. [6]  
List one application of each. [2]  
b) Describe the instrumentation in microwave diathermy. [8]

OR

- Q10)** a) Explain the working of gastro-endoscope with the help of a suitable diagram. [8]  
b) List various applications of lasers in Dermatology and explain any one of them in detail. [8]
- Q11)** a) With the help of neat diagram explain how the natural kidney works. [6]  
List different tests to be performed to check kidney functioning. [4]  
b) Which materials are used for Wheelchair and why? [6]

OR

- Q12)** a) What is Lithotripsy? [2]  
Draw the waveform showing important parameters used in lithotripsy. [4]  
What is the role of X ray imaging in lithotripsy? [4]  
b) Compare Coil Type Dialyzer and Parallel Plate Dialyzer. [6]



**P1166****[3664]-256**

**B.E. (Instrumentation & Control)**  
**PROCESS MODELING AND OPTIMIZATION**  
**(1997 & 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.*
- 7) *All questions are compulsory.*

**SECTION - I**

- Q1)** a) Obtain the model for armature controlled D.C. shunt motor. [8]  
 b) Fit the given data to the model  $y = mx + c$  using least square method. [8]

$x$	$y$
200	0.846
400	0.573
600	0.401
800	0.288
1000	0.199
1200	0.153
1400	0.111
1600	0.078

OR

- Q2)** a) Obtain the model for field controlled D.C. shunt motor. [8]  
 b) Obtain the model for gravity flow tank. [8]
- Q3)** a) Obtain the model for non isothermal C.S.T.R. [8]  
 b) Obtain the model for ideal binary distillation column. [8]

OR

**P.T.O.**

**Q4)** Obtain the model of heat exchanger. [16]

**Q5)** Explain the sine wave test and pulse test of system identification in detail. [18]

OR

**Q6)** Explain ATV identification and its models in detail. [18]

### **SECTION - II**

**Q7)** List various methods of stability analysis of multivariable systems. Explain Niederlinsky index. Find Niederlinsky index of the system, [16]

$$\begin{bmatrix} X_D \\ X_B \end{bmatrix} = \begin{bmatrix} \frac{12.8e^{-s}}{1 + 16.7s} & \frac{-18.9e^{-3s}}{1 + 21s} \\ \frac{6.6e^{-7s}}{1 + 10.9s} & \frac{-19.4e^{-3s}}{1 + 14.4s} \end{bmatrix} \begin{bmatrix} R \\ V \end{bmatrix}$$

and comment on stability. Repeat the procedure for  $X_D - V$  and  $X_B - R$  pairing.

OR

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

- a) Relative gain array.
- b) Inverse Nyquist array.

**Q9)** a) Define and explain the following : [12]

- i) Continuity of a function.
- ii) Convexity of a function.
- iii) Concavity of a function.

b) Determine the optimum values of  $x_1$  and  $x_2$  for the function [6]

$$y = \frac{x_1^2}{4} + \frac{2}{x_1 x_2} + 4x_2.$$

OR

**Q10)** a) Find the optimum values of  $f(x) = 12x^5 - 45x^4 + 40x^3 + 5$  [6]

b) Find the minimum value of  $y$  if, [12]

$$y = \frac{x_1}{x_2} + \frac{1}{x_1 x_3} + \frac{1}{2} x_2^2 + \frac{x_3}{16}.$$

**Q11)** Explain the procedure of scanning and bracketing for single variable optimization in detail. [16]

OR

**Q12)** a) Minimize  $f(x_1, x_2) = x_1 - x_2 + 2x_1^2 + 2x_1x_2 + x_2^2$  using Newton's method if starting point is  $x = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$ . [8]

b) Explain conjugate gradient method for multivariable optimization with the help of algorithm and flow chart. [8]

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Total No. of Questions : 12]

[Total No. of Pages : 3

**P1168**

**[3664]-279**

**B.E. (Chemical)**

**POLYMER TECHNOLOGY**

**(Elective - I) (2003 Course) (409341)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

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

**SECTION - I**

**Q1)** Classify different polymers based on structure, method of synthesis, Geometry, thermoset and Thermoplastics. Discuss the effect different factors that influences polymer properties. **[16]**

OR

**Q2)** Differentiate the natural polymer and synthetic polymers classify the polymer based on tacticity, (Atactic, Syndiotactic, isotactic). Classify and discuss different polymers based on linear and cross linked polymers. **[16]**

**Q3)** What are different polymerization techniques are available. Explain different physical aspects which need to consider during selection of technique. Explain in detail suspension polymerization technique along with engineering aspects of suspension polymerization. **[16]**

OR

**Q4) a)** Differentiate addition polymerization and condensation polymerization alongwith suitable example. **[6]**

**b)** What is difference between suspension polymerization and emulsion polymerization? Explain “Smith and Ewart Kinetics” used for predicting rate of Emulsion polymerization. Discuss in detail Emulsion polymerization technique and its applications. **[10]**

**P.T.O.**

**Q5)** What are different methods for determination of molecular wt? Explain vapour phase osmometric method for determination of mol.wt in detail. Write a note on molecular wt control and effect of parameters affecting molecular wt. [18]

OR

**Q6)** Explain number average molecular wt ( $\overline{M}_n$ ), Viscosity avg mol. wt( $\overline{M}_v$ ). Explain how dispersity index and degree of polymerization are important for application of polymer. Write a note on Gel Permeation Chromatography for determination of molecular wt of polymers. Explain working principle and role of stationary phase for determination of mol. wt. [18]

## **SECTION - II**

**Q7)** Which initiators are used during polymerization process? Explain and derive rate of polymerization (propagation rate)  $R_p$ , for free radical polymerization. Write down the different steps such as initiation, propagation and termination during polymerization process? [16]

OR

**Q8)** Write a note on :

- a) Kinetics of step growth polymerization. [8]
- b) Copolymers and effect of reactivity ratios on copolymerization. [4]
- c) Coordination polymerization. [4]

**Q9)** What is compounding? Draw and explain extrusion compounding process alongwith different zones present in barrel, screw etc. Explain dry compounding method and equipments used for same. [16]

OR

**Q10)** Write a note on : [16]

- a) Different types of polymer additives, colourants, UV stabilizers.
- b) Relationship between fillers and mechanical properties.
- c) Flame retardant additives and its mechanism.
- d) Injection moulding machine.



***Q11)*** Along with process flowsheet explain synthesis process of polypropylene?  
Explain its application and properties. **[18]**

OR

***Q12)*** Write a note on : **[18]**

- a) Polystyrene, HIPS and it's properties and application.
- b) Natural rubber and thermoplastic elastomers.
- c) Manufacturing of condensation polymer Nylon 6.



**P1169**

**[3664] - 282**  
**B.E. (Chemical)**  
**PETROLEUM REFINING**  
**(2003 Course) (409341)**

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

**SECTION - I**

- Q1)** a) Explain specifications of kerosene and engine oil. [8]  
b) What are worldwide opportunities in Petroleum Refining? [8]

OR

- Q2)** For the following petroleum products, discuss in details the specifications.[16]  
a) LPG.  
b) Gasoline.

- Q3)** Discuss in details : Vacuum distillation. [16]

OR

- Q4)** Explain in details : Atmospheric distillation. [16]

- Q5)** Discuss with neat sketches : Hydrocracking. [18]

OR

- Q6)** Explain with neat diagrams : Reforming. [18]

**P.T.O.**

## **SECTION - II**

- Q7)** a) Explain Hydro-desulphurization. [8]  
b) Discuss in details : HDM. [8]

OR

- Q8)** a) Discuss about Acid refining. [8]  
b) Explain various types of refining. [8]

- Q9)** a) Note various additives in petroleum processes. [8]  
b) Write down safety norms in refining. [8]

OR

- Q10)** a) Explain strategies of marketing of petroleum products. [10]  
b) Discuss transportation methodologies of petroleum products. [6]

- Q11)** Write short notes on : [18]  
a) Catalysts used in petroleum refining.  
b) Packing materials for petroleum products.

OR

- Q12)** a) Explain settling and moisture removal in pre-refining. [10]  
b) Discuss various recent trends in petroleum distillation. [8]



Total No. of Questions : 12]

[Total No. of Pages : 3

**P1171**

**[3664]-348**

**B.E. (Computer)**

**HIGH PERFORMANCE NETWORKS**

**(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) Discuss in short about 1000 BASE - X Family with suitable applications. **[8]**

b) Explain why half duplex operation of Gigabit Ethernet incorporates Carrier Extension. What are its drawbacks. **[8]**

OR

**Q2)** a) What is medium independent interfacing? Differentiate among all 3 interfaces used in 10,100 and 1000 mbps Ethernet (At least 4 points). **[8]**

b) Explain in short the need of flow control in gigabit Ethernet? How it is supported? **[8]**

**Q3)** a) Draw the LAPF Protocol Frame Format. What is the significance of DLCI? **[6]**

b) Explain the need and significance of TE1, NT2 and TA functional groups specify suitable example which represents TE1 and TE2. **[8]**

c) Explain the terms FECN and BECN. What is their significance in a frame relay network. **[4]**

OR

**Q4)** a) A company has H.O in Pune and two branch offices in Mumbai and Bangalore. Draw a logical diagram of full mesh frame relay network with suitable IP addresses, which would facilitate the communication among these sites. **[4]**

**P.T.O.**

- b) What is common channel signaling? Explain in short the SS7 protocol? [6]
- c) Describe the importance of CIR, Bc and Be In Frame relay Congestion Control. [8]
- Q5)** a) What is Virtual Path and Virtual Channel? Explain the advantages of Virtual Path in ATM Network. [8]
- b) Draw and Explain B-ISDN protocol architecture. Which layers are related to ATM. [8]

OR

- Q6)** a) Which AAL will you choose for supporting the following applications? [6]
  - i) Uncompressed Video.
  - ii) Compressed Video.
  - iii) File Transfer.
- b) What is cell rate decoupling? How it is provided? [6]
- c) Draw the ATM Cell Structure at User-Network Interface. Explain the Function of CLP Field. [4]

### **SECTION - II**

- Q7)** a) Explain why are some variations of xDSL Asymmetric. [8]
- b) Explain the operation of ADSL using DMT (Discrete Multitone). [8]

OR

- Q8)** a) Draw and explain A typical ADSL equipment configuration. [8]
- b) Describe in short VDSL2. What are its advantages over VDSL standard. [8]
- Q9)** a) Describe in short the significance of following terms : [8]
  - i) Differentiated Services.
  - ii) Integrated Services.
- b) Describe in short the working of RSVP protocol. What are its key features. [8]

OR

- Q10)** a) Draw and explain the structure of label used in MPLS. [4]
- b) Differentiate between ATM and MPLS. [4]

- c) Describe the following terms related to MPLS operation [8]
- i) Label Edge Router (LER).
  - ii) Label Switch Router (LSR).
  - iii) Label Distribution Protocol (LDP).
  - iv) Label Switched Path (LSP).

- Q11)** a) Explain the various security measures that can be applied to secure A WiFi network. [6]
- b) Differentiate between 802.11a and 802.11g standards. [6]
- c) Describe in short the various parameters that can be configured during Access Point installation. [6]

OR

- Q12)** a) Discuss in short about 802.16 physical layer. [6]
- b) Comment on MAC layer operations of WiMAX. [6]
- c) Differentiate between WiFi and WiMax technology highlighting key points. [6]



**P1182**

**[3664]-53**

**B.E. (Electronics)**  
**MICROWAVE TECHNIQUES**  
**(1997 Course) (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.*

**SECTION - I**

- Q1)** a) With the help of voltage and current waveforms explain the principle of Operation of TRAPATT diodes. [8]  
b) State the characteristics of IMPATT diodes. Explain the negative resistance. [8]
- Q2)** a) Draw a neat sketch of E-plane tee, H-plane tee and magic tee. Write 'S' parameter matrix of each. [8]  
b) Draw a neat sketch of 'Directional Coupler'. State the spacing between the Centres of two holes of two hole directional coupler. Explain how the wave Energy is propagating through it. [8]
- Q3)** a) State and explain the principle of operation of two-cavity klystron amplifier. [8]  
b) What is 'GUNN EFFECT'? State the microwave generation and amplification using Gunn diode. [8]
- Q4)** a) State and explain the principle of operation of helix traveling wave tubes. [8]  
b) State the physical structures and principle of operation of microwave Transistors. [8]

- Q5)** Write short notes on any three of the following : **[18]**
- a) PULSED RADAR SYSTEM.
  - b) PLAN\_POSITION INDICATOR.
  - c) TV RELAY.
  - d) LENS ANTENNA.
  - e) CASSEGREIN FEED.

### **SECTION - II**

- Q6)** a) With the help of block diagram explain the working of CW Radar. **[8]**  
b) What is DOPPLER EFFECT? Where and how is it used? **[8]**
- Q7)** a) Explain use of Microwave in health care. **[8]**  
b) Explain the terms 'Synchronous Orbit', 'Polar Orbit', Inclined Orbit'. **[8]**
- Q8)** a) State and define any three antenna parameters. **[8]**  
b) State the principle of operation of reflector antenna. **[8]**
- Q9)** a) State the difference between Aperture antenna and Horn antenna. **[8]**  
b) Draw a block diagram of experimental setup of measurement of microwave. **[8]**
- Q10)** Write short notes on any three of the following : **[18]**
- a) MASERS.
  - b) MAGNETRON.
  - c) CAVITY RESONATORS.
  - d) REFLEX KLYSTRON.
  - e) MODES IN RECTANGULAR WAVEGUIDE.





**P1183****[3664]-57**

**B.E. (Industrial Electronics)**  
**DIGITAL SIGNAL PROCESSING**  
**(1997 Course) (404221)**

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

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

**SECTION - I**

- Q1)** a) Define stability. State & derive the condition for system to be stable in terms of impulse response. Test stability of the system whose impulse response is  $h(n) = (1/2)^n u(n)$  [6]
- b) An analog signal  $x_a(t) = 15 \cos(1250\pi t) + 17 \cos(2170\pi t) + 33 \cos(4750\pi t)$  is converted into discrete time signal. Determine Nyquist sampling rate, folding frequency, resulting discrete time signal  $x(n)$ , if sampling frequency is 625 Hz. Also write the discrete time frequencies in radians. [6]
- c) Compute & sketch convolution  $y(n)$  of following signals  $x(n) = 0.5^n$  ( $0 \leq n \leq 5$ ) &  $h(n) = 1$  ( $-3 < n < +3$ ). [6]
- Q2)** a) An LTI system is defined by difference equation  $y(n) = y(n-1) + y(n-2) + x(n-1)$ . Find system function  $H(z)$ . Draw pole-zero diagram. Find out  $h(n)$  for causal, non-causal system. Is the system stable in both cases? If not what should be  $h(n)$ ? [8]
- b) Find convolution of following two signals using Z-transform.  
 $x_1(n) = a^n u(n)$  &  $x_2(n) = u(n)$  (Note :  $a < 1$ ). [8]
- Q3)** a) Find the causal sequence  $x(n)$  for [8]

i) 
$$X(z) = \frac{1 + 3z^{-1}}{(1 + 3z^{-1} + 2z^{-2})}$$

$$\text{ii) } X(z) = \frac{(6 + z^{-1})}{(1 + 0.25z^{-1})(1 + 0.5z^{-1})}$$

- b) Define Fourier Transform (FT), Discrete Time Fourier Transform (DTFT) and Discrete Fourier Transform (DFT). Find DFT of sequence

$$x(n) = 1 \text{ for } 0 \leq n \leq 2 \\ = 0 \text{ otherwise}$$

For  $N = 4$ . Plot  $|X(k)|$  &  $\angle X(k)$ . [8]

- Q4)** a) Compare circular & linear convolution and find circular convolution of two finite duration sequences  $x_1(n) = \{1, -1, -2, 3, -1\}$  and  $x_2(n) = \{1, 2, 3\}$  using concentric circle method. [8]

- b) What is FFT? Give classification of FFT. Explain Bit reversal and In Place computation concepts in FFT algorithm. Show 3-bit bit reversed sequence. [8]

- Q5)** a) Obtain Direct form-II realization. [8]

$$\text{i) } H(z) = \frac{2 + z^{-1} + z^{-2}}{(1 + 0.5z^{-1})(1 - \frac{1}{4}z^{-1})(1 + \frac{1}{8}z^{-1})}$$

$$\text{ii) } y(n) + \frac{3}{4}y(n-1) + \frac{1}{8}y(n-2) = x(n) + x(n-1)$$

- b) Obtain IDFT for the DFT sequence given below. [8]

$$\text{i) } X(k) = \{0, 0, 2, 0\}$$

$$\text{ii) } X(k) = \{4, -5, 3, -5\}$$

## SECTION - II

- Q6)** a) Explain following features and typical registers associated with following units of DSP Processor. [8]

i) ALU.

ii) MAC.

iii) Barrel shifter.

iv) Program sequencer.

- b) Explain frequency sampling technique of FIR filter design. [6]

- c) Draw block diagram of typical ADSP 21XX series Processor. [4]

- Q7)** a) A first order low pass Butterworth transfer function with 3 dB cut off frequency at  $\Omega_c$  is given by  $H_a(s) = \Omega_c / (s + \Omega_c)$ . Design a single pole low pass digital filter with 3 dB bandwidth of  $0.2\pi$  rad using BLT. Hence obtain  $H(w)$  and find values of  $H(w)$  at  $w = 0$  and  $w = 0.2\pi$ . [8]

- b) Explain Impulse Invariance Transformation and its drawback. Hence obtain the system function  $H(z)$  for the transfer function given below using Impulse Invariance Technique for  $T = 0.2$  sec. [8]

$$H(s) = \frac{10}{(s^2 + 7s + 10)}.$$

- Q8)** a) Design a FIR filter with

$$H_d(w) = e^{-jzw} \quad |w| \leq \pi/4$$

$$= 0 \quad \text{otherwise}$$

Use Hanning window with  $N = 7$ . [8]

- b) Explain Gibb's phenomenon and compare performance of different window function. [8]

- Q9)** a) Explain Goertzel Algorithm in detail. [6]

- b) Compare FIR & IIR filters. Explain selection of a filter for a particular application. [6]

- c) Draw Butterfly diagram for 8 point DIF FFT complete in all respect. [4]

- Q10)** a) Determine the step response for the LTI systems represented by following Impulse response. [8]

i)  $h(n) = \delta(n) - \delta(n-1)$

ii)  $h(n) = (1/2)^n u(n)$

- b) Explain in detail application of DSP in echo canceller or Speech Analysis. [8]



**P1184**

**[3664]-93**

**B.E. (Information Technology)**

**OBJECT ORIENTED COMPONENT SYSTEMS**

**(1997 Course) (410452) (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) Draw neat diagrams wherever necessary.*
- 4) Marks on the right indicate full marks.*
- 5) Make suitable assumptions wherever necessary and relevant.*

**SECTION - I**

- Q1)** a) What do you understand by components, interfaces and why are components, interfaces important in distributed systems. [8]  
b) What is the growing importance of network and internet. What are the advantages and disadvantages of distributed systems as compared to centralized systems. [8]
- Q2)** Explain in brief, terms and concepts : [16]  
a) Databases for persistent storage.  
b) Interface definition language.  
c) Objects and classes.  
d) Inheritance.
- Q3)** a) Describe in detail with explanations what do you understand by concept of client, server, tiers in software in context of client server systems and concept of Glue(middleware) in 3 tier client server systems. [10]  
b) Write short notes on COM/DCOM. [6]
- Q4)** Briefly discuss : [16]  
a) Object oriented databases.  
b) XML.  
c) Performance of software systems.  
d) HTML.

**P.T.O.**

- Q5)** Write short notes on any three : **[18]**
- a) Neat diagram for CORBA.
  - b) Web browsers as clients.
  - c) Userfriendly Graphical User Interfaces (GUI) for desktop applications.
  - d) CORBA.

## **SECTION - II**

- Q6)** How has Internet impacted our communication with each other as well as the way we do business, illustrate with examples of popular websites and few example web based activities one does. **[16]**
- Q7)** Write on java language and its features with examples, suitability of java for web applications, features of advanced java like J2EE. **[16]**
- Q8)** Discuss the following concepts in brief : **[16]**
- a) Features in a good user-friendly website.
  - b) Static websites.
  - c) Transactions properties : to recover from failure.
  - d) Authentication of users using login, pros and cons.
- Q9)** Explain in detail the need for the following, giving appropriate EXAMPLES : **[16]**
- a) Software Components.
  - b) How security is important in today's internet world.
- Q10)** Write short notes on any three : **[18]**
- a) Advantage of components in assembling a car (like engine, tire ...).
  - b) Interactive, dynamic web pages (with java applets...).
  - c) Performance and response time of a website.
  - d) HTML, DHTML, HTTP.



**P1185**

**[3664]-143**

**B.E. (Mech. SW)**

**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) 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 Steam Jet refrigeration system with neat sketch. [8]  
b) Explain Reduced ambient air-refrigeration cycle. Why it is called reduced ambient? [8]

OR

- Q2)** a) Define the terms COP, EER, SEER, IPLV. [8]  
b) A reversed cycle has refrigerating COP of 4, [8]  
i) Determine the ratio  $T_1/T_2$ .  
ii) If the work done on the cycle is 10 kW, determine the maximum refrigerating effect in TR.  
iii) If this cycle is used as heat pump, determine the COP and heat delivered.

- Q3)** a) Define the following : [4]  
i) ODP  
ii) GWP.  
iii) TEWI.  
b) What is difference between retrofitting and drop in. What are the modifications made in R-12 system to make it suitable for HFC-134a refrigerant? [4]

**P.T.O.**

- c) 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]

OR

- Q4)** a) Discuss various losses occurred in actual vapour compression cycle. [8]  
 b) A vapour compression refrigerator works between the pressures of 5.3 bar and 2.1 bar. The vapour is superheated at the end of compression; its temperature being 37°C. The vapour is superheated by 5°C before entering the compressor. The specific heat at constant pressure for superheated vapour is 0.63 kJ/kgK. Find the COP of the plant. Use the data given below. [8]

Pressure (bar)	Temp. °C	$h_f$ (kJ/kg)	$h_{fg}$ (kJ/kg)
5.3	15.5	56.15	144.9
2.1	-14.0	25.12	158.7

- Q5)** a) What is necessity of multi staging? Explain the analysis of two stage compression system with flash gas chamber as a gas removal. [8]  
 b) A refrigeration system using R-12 as refrigerant has three evaporators of capacities 30TR at -10°C, 20 TR at 5°C and 10 TR at 10°C. The refrigerant leaving the evaporator is dry and saturated. The system is provided with compound compression, individual expansion valves and flash intercoolers. The condenser temperature is 40°C. Assuming isentropic compression in each compressor, find the power required to run the system and COP of the system when the liquid refrigerant leaving the refrigerant is saturated. [10]

OR

- Q6)** a) Compare VAC and VCC. [4]  
 b) Explain construction and working of Electrolux refrigerator system. [8]  
 c) Explain with neat sketch Cascade refrigeration system. Why CO<sub>2</sub> is a suitable refrigerant for this system. [6]

## SECTION - II

- Q7)** a) Prove “Enthalpy of moist air ( $h$ ) =  $c_{pm} \times T_d + w \times (h_{fg})$  at 0°C”. Where  $c_{pm}$  = humid specific heat,  $T_d$  = DBT,  $w$  = humidity ratio,  $h_{fg}$  is enthalpy of evaporation. [4]  
 b) Sketch ‘comfort chart’ and show on it the comfort zone’. [6]

- c) The sling –psychrometer reads 40°C DBT and 28°C WBT. Calculate the following : [6]
- i) Specific humidity.
  - ii) Relative humidity.
  - iii) Vapour density of air.
  - iv) Dew-point temperature.
  - v) Enthalpy of the mixture per kg of dry air.
- Assume atmospheric pressure to be 0.95 bar.

OR

- Q8)** a) State and explain the factors affecting human comfort. [4]
- b) Explain the different psychometric processes with the help of Air washer. [4]
- c) Room air at 20°C DBT and 50% RH is mixed with outdoor air at 40°C DBT and 30% RH in the ratio of 4 : 1. The mixture is passed through a cooling coil whose temperature is maintained constant at 10°C whose by pass factor is 0.2. Determine the following : [8]
- i) Condition of air before entering the cooling coil,
  - ii) Condition of air leaving the coil and
  - iii) Refrigeration load on cooling coil when 250m<sup>3</sup>/min of air is supplied to the room.
- Q9)** a) Describe the procedure to estimate load on air-conditioning system with the help of psychometric chart and block diagram. Explain both cases, mixing of air before and after cooling coil. [10]
- b) Explain air-water air-conditioning system with neat sketch. [6]

OR

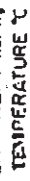
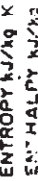
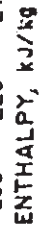
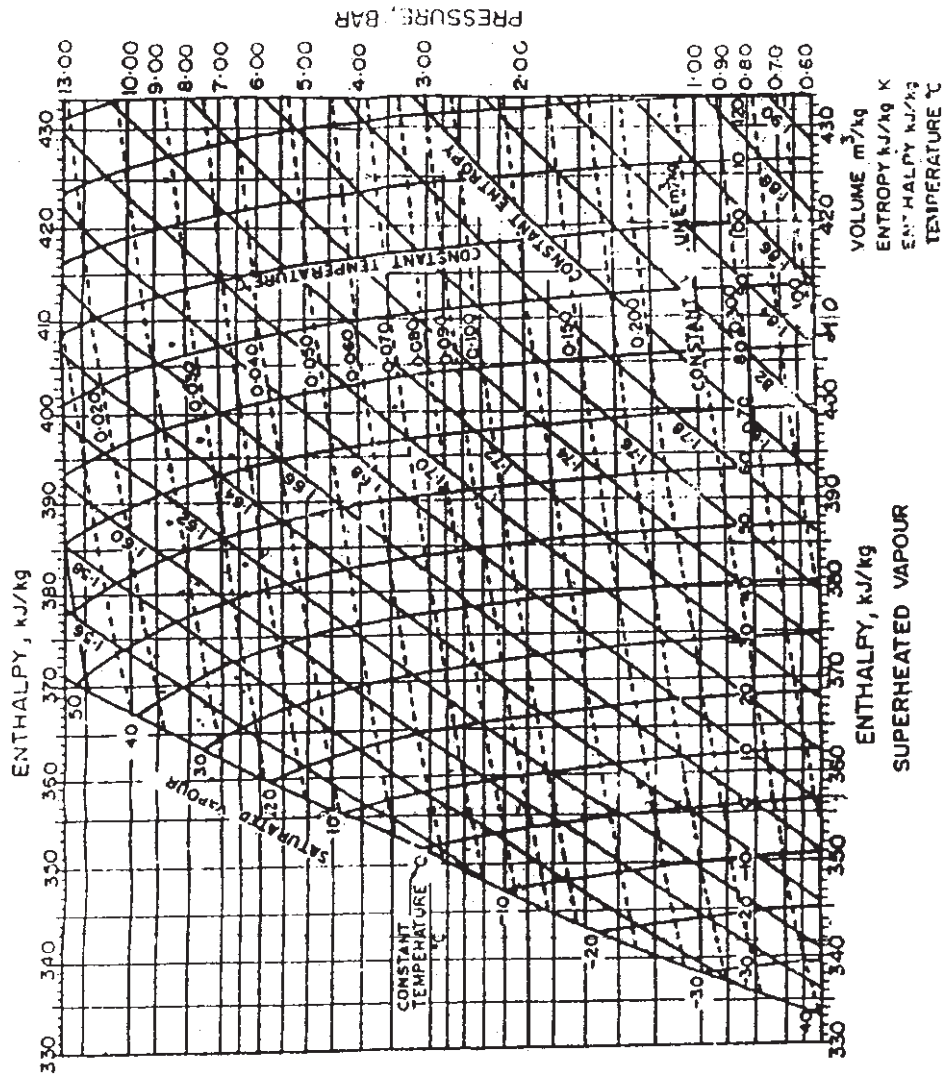
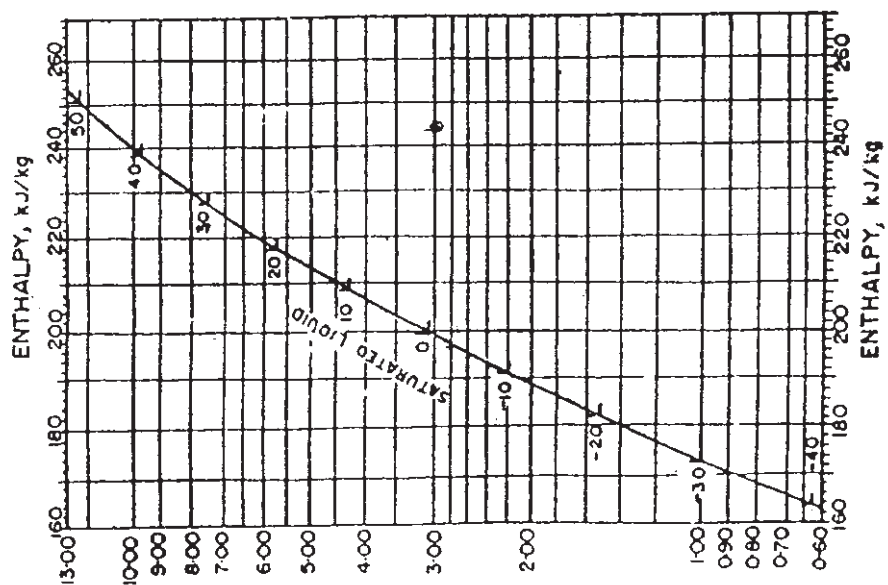
- Q10)** a) Enumerate main types of condensers in use with specific application of each type. [6]
- b) Compare D-X and flooded type evaporators and explain construction and working of any one flooded type evaporator. [6]
- c) Explain the procedure of charging of refrigerant in the system. [4]
- Q11)** a) Explain “pressure losses” in duct. [6]
- b) Why the ducts are used in an air-conditioning system. Classify ducts. [4]



- c) A rectangular duct section  $500 \text{ mm} \times 350 \text{ mm}$  size carries  $1.25 \text{ m}^3/\text{s}$  of air having density of  $1.15 \text{ kg/m}^3$ . Determine the equivalent diameter of a circular duct if [8]
- i) the quantity of air carries in both cases is same.
  - ii) and velocity of air in both cases is same. If  $f = 0.001$  for sheet metal, find the pressure loss per 100m length of duct.

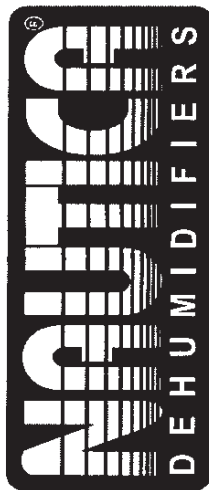
OR

- Q12)** a) Discuss various applications of cryogenics. [8]
- b) Explain construction and working of linde system liquefaction of gas. [10]



12  
PRESSURE-ENTHALPY DIAGRAM, REFRIGERANT

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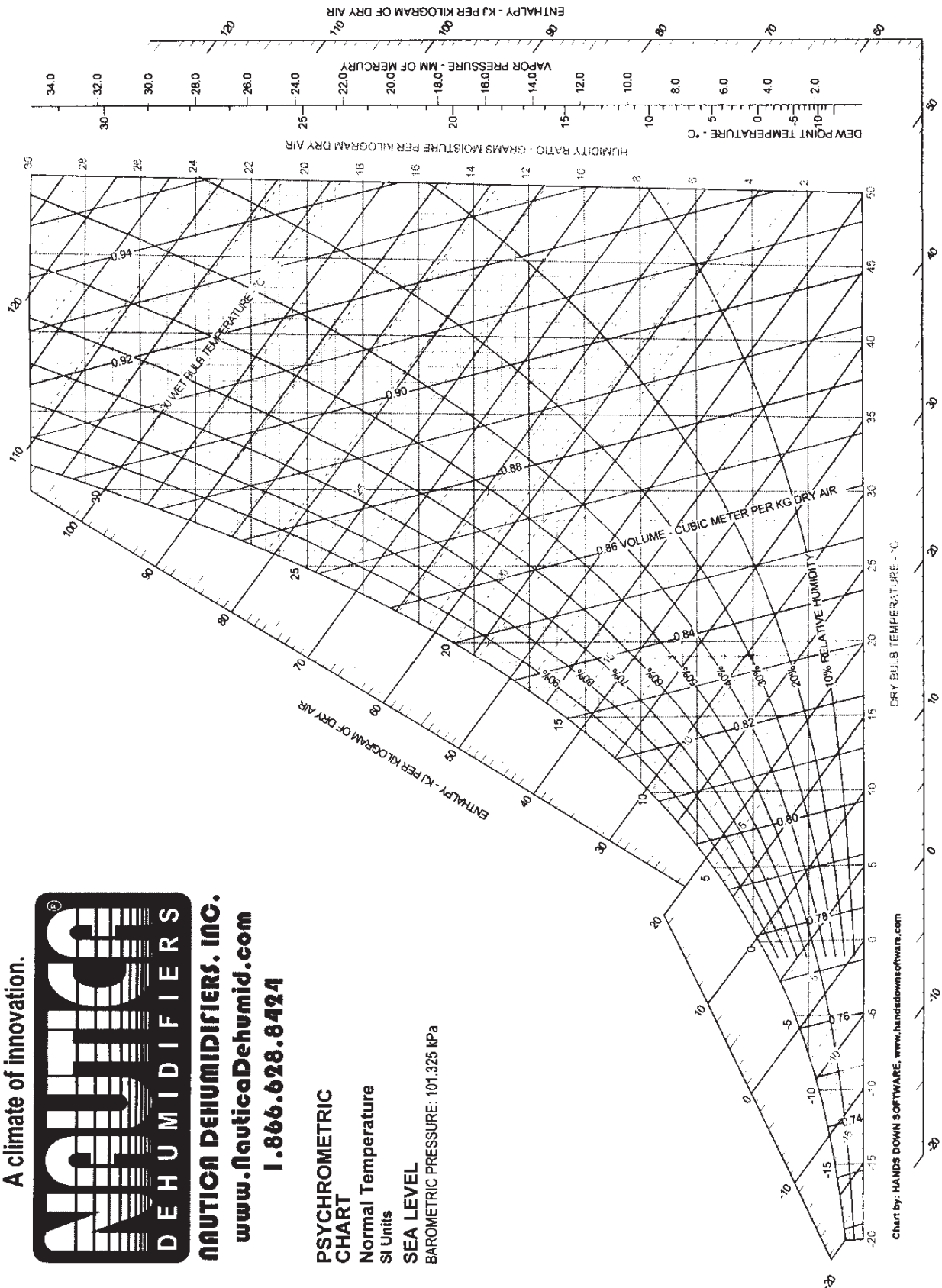


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**P1186**

**[3664]-145**

**B.E. (Mechanical S/W)**

**TRIBOLOGY**

**(2003 Course) (402063)**

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

**SECTION - I**

**Unit - I**

- Q1)** a) Explain tribological problems in industry. [8]  
b) State desirable properties of lubricant. [6]  
c) Explain API classification of lubricating oil. [2]

OR

- Q2)** a) Write a short note on Viscosity Index. [5]  
b) Compare Rolling contact bearings with Hydrodynamic bearings based on following points : [8]  
i) Starting Friction,  
ii) Load Carrying Capacity,  
iii) Speed and  
iv) Life.  
c) Determine the viscosity of the lubricant in centipoises having viscosity 160SUS and specific gravity 0.86. [3]

**Unit - II**

- Q3)** a) Using deformation theory prove that coefficient of friction due to deformation is directly proportional to semi-cone angle for conical asperity. [6]  
b) Explain Fretting and Percussion wear in detail. [6]  
c) Enumerate the factors affecting wear. [4]

**P.T.O.**

OR

- Q4)** a) Assuming theory of ploughing of a soft surface by a hard conical shaped asperity, show that volume of wear is given by – [8]

$$Q = \frac{2W \cot \theta}{\pi P_0}$$

where,

W- Load,  $\theta$  - semi cone angle of the asperity and  $P_0$  – yield pressure of the softer material.

- b) Write short note on following : [8]
- i) Stick-Slip Friction.
  - ii) Tomlinson's theory of molecular attraction.

### Unit - III

- Q5)** a) Show that the oil film thickness in case of hydrodynamic journal bearing is given by  $h = c(1 + \epsilon \cos \theta)$  with usual notations. [8]
- b) Explain Boyd-Raimondi's method for analysis of Hydrodynamic Journal Bearing. [10]

OR

- Q6)** a) Derive an expression for pressure ' $p$ ' around a short journal bearing of

length L as –  $p = \frac{3U\eta C \epsilon \sin \theta}{RC^3(1 + \epsilon \cos \theta)^3} \left[ \frac{L^2}{4} - y^2 \right]$  with usual notations. [8]

- b) Following data is given for a 360° Hydrodynamic journal bearing : [10]

Radial Load	=	10 kN
L/D ratio	=	1
Bearing Length	=	50 mm
Journal Speed	=	1450 rpm
Radial Clearance	=	20 microns
Specific gravity of Lubricant	=	0.86
Specific heat of lubricant	=	2.09 kJ/kg°C

Calculate –

- i) minimum oil film thickness.
- ii) the coefficient of friction.
- iii) power lost in friction.
- iv) viscosity of lubricant in cP and
- v) total flow rate of lubricant in l/min.

$\left(\frac{l}{d}\right)$	$\varepsilon$	$\left(\frac{h_o}{c}\right)$	S	$\phi$	$\left(\frac{r}{c}\right)^f$	$\left(\frac{Q}{rcn_s l}\right)$	$\left(\frac{Q_s}{Q}\right)$	$\left(\frac{P}{P_{\max}}\right)$
1	0	1.0	$\infty$	(85)	$\infty$	$\pi$	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	1.0	—

**Table 1 : Dimensionless Performance Parameters for full journal bearings with side flow.**

## SECTION - II

### Unit - IV

- Q7)** a) Derive the equation for flow rate of lubricating oil through rectangular slot with neat sketch. State its applications. [8]  
b) Explain the working of hydrostatic bearing with neat sketch. [8]

OR

- Q8)** a) Derive the equation for stiffness of hydrostatic step bearing. [6]  
b) Following data is relates to a hydrostatic thrust bearing : [10]

Shaft diameter	= 500 mm
Recess diameter	= 300 mm
Shaft Speed	= 720 rpm
Viscosity of oil	= 160 SUS
Film thickness	= 0.15 mm
Specific gravity of oil	= 0.86
Specific heat of oil	= 1.76 kJ/kg°C
Thrust Load	= 500 kN.

Calculate :-

- i) The supply pressure;
- ii) Flow requirement in l/ min;
- iii) Power loss in pumping;
- iv) Frictional power loss and
- v) Temperature rise assuming the total power loss in bearing is converted into the frictional heat.

### Unit - V

- Q9)** a) Derive equations for pressure distribution, load carrying capacity and time of approach for squeeze film lubrication between parallel rectangular plates. [10]
- b) Explain merits, demerits and applications of Gas bearings. [6]

OR

- Q10)** a) Derive an expression for average pressure, load carrying capacity and time of approach for squeeze film lubrication between parallel square plates. [8]
- b) A circular plate of 60 mm radius is approaching the base plane at a velocity of 150 mm/sec at the instant when the oil film thickness is 0.2 mm. If the absolute viscosity of the oil is 0.025 Pa-sec, calculate :
- i) The load carrying capacity of the oil film at the given instant;
  - ii) The maximum pressure and
  - iii) The average pressure.
- [6]
- c) What are essential operating conditions for gas lubricated bearings. [2]

### Unit - VI

- Q11)** a) A fixed pad hydrodynamic thrust bearing of length 'L' and width 'B' has a fluid film shape given by relation :

$$h = h_0 e^{-ax}$$

Where  $h_0$  = minimum film thickness and  $a$  = constant. Assuming side leakage as zero, derive an expression for pressure distribution. [10]

- b) The following data refers to the hydrodynamic tapered-pad bearing :

Length of the pad	= 200 mm
Width of the pad	= 850 mm
Maximum oil film thickness	= 150 microns
Minimum oil film thickness	= 75 microns
Viscosity of the lubricant	= 0.05 Pa-sec.
Sliding velocity	= 5 m/sec.

Calculate :

- i) The load carrying capacity of bearing.
- ii) The pressure at a distance of 100 mm from leading edge.
- iii) Coefficient of friction.
- iv) Power lost in bearing.

[8]

OR

- Q12)** a) Write short notes on the following (any two) : **[8]**
- i) Elastohydrodynamic lubrication.
  - ii) Gaskets.
  - iii) Dynamic Seals.
  - iv) Sintered Metal Bearings
- b) Explain different types of oil groove arrangements in journal bearing. **[6]**
- c) Enlist desirable properties of bearing materials. **[4]**





Total No. of Questions : 6]

[Total No. of Pages : 2

**P1188**

**[3664]-264**

**B.E. (Printing)**

**SECURITY PRINTING**

**(2003 Course)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Questions 1, 2, 4 & 5 have 16 marks and questions 3 & 6 have 18 marks.*
- 4) *Answers to the two sections should be written in separate books.*

**SECTION - I**

**Q1)** a) Overview of Security Printing.

OR

b) Importance of Brand security.

**Q2)** a) Various consideration when designing a security documents, such as Degree Certificates.

OR

b) The importance of Substrates used in Security Printing.

**Q3)** a) What is RFID technology. When did it start and what is the present scenario of the same.

OR

b) Security Printing Devices.

**SECTION - II**

**Q4)** a) What does MICR stand for? How many types are in use today? Since when did it start in India and for what type of document?

OR

b) What are the tolerances for a MICR Font E13B. How many characters are there in a MICR Font.

**P.T.O.**

**Q5)** a) Special inks used in Security Printing. Explain the functioning of any one in detail.

OR

b) Explain the various testing methods used for Security documents. Explain any one in detail.

**Q6)** a) Importance of Brand security.

OR

b) Effect of Piracy/Counterfeiting on the original product and loss to the company.



Total No. of Questions : 6]

[Total No. of Pages : 3

**P1189**

**[3664]-266**

**B.E. (Printing)**

**ASSEMBLY AND MAINTENANCE OF PRINTING MACHINES**

**(2003 Course)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) All questions are compulsory. Answer any one of each question a or b.*
- 2) Questions 1, 2, 4 and 5 have 16 marks and Questions 3 and 6 have 18 marks.*
- 3) Appropriate drawings are expected with the answers. Coloured Pencils may be used.*
- 4) For the Layout Graph Paper will be provided (A 3 size).*
- 5) Start answering each question on a new page.*

**SECTION - I**

- Q1)** a) i) What are the mechanical drives used in printing machines?  
ii) Bevel Gears are often found in printing machines. Where and why?  
iii) What is the function of a toggle lever drive. Where is it used in the printing industry name at least 1 instance.  
iv) What mechanical parts do air cylinders replace and why?
- b) i) In printing industry various types of speed control systems are used. List the same. Explain a thyristor variable speed drive?  
ii) What are the different types of bearing used in printing machines? List.  
iii) What are various types of coupling used in printing industry? Name at least 3.  
iv) Where are pneumatic systems used in printing industry?
- Q2)** a) i) What are the various mechanical groups of a printing machine?  
ii) Undercuts on cylinders. If you do not know the undercut of a machine how would you find out the same?  
iii) How is the motion on the feeder mechanism on a printing machine changed from vertical to horizontal?  
iv) Where are quick action clamps used on printing machines? Explain their function.

**P.T.O.**

- b) i) What is the type of Inking system of an sheet-fed offset printing machine? Explain any one with diagram.
  - ii) What are the different types of feeding systems used in printing industry?
  - iii) Explain the function of a stream feeder in brief.
  - iv) How is the blanket clamped to the cylinder?
- Q3)** a) What is daily/routine inspection of a machine. Its role in keeping the equipment running with minimum breakdowns?
- b) What is understood under the term Proactive Maintenance? How can it reduce the incidence of machine failures?

### **SECTION - II**

- Q4)** a) What do you understand under maintenance? Explain in detail.
- b) What is the role of a Maintenance Engineer?
- Q5)** a) i) When installing a machine what is necessary with relation to foundation?
- ii) Importance of proper lubrication and types of lubrication systems?
- b) i) What is the advantage of a ball bearing over a bush (sliding) bearing.
- ii) In modern machines often the entire gear and other drive components lubricated with fluid grease. Explain reasons for the same.
- Q6)** a) i) What are the essential tools required by a Maintenance Engineer? List at least 10.
- ii) The cutting action of a paper cutting machine is ———? Explain the reason for the same.
- b) What are the principles of plant layout? Explain in detail.
- Prepare a layout for a printing press room with following equipment :  
Explain the work flow.
1. 4 colour offset machine                      19 × 25 inches.  
Area of the machine is                      22 feet by 7.5 feet.  
CPC unit requires an area of              5 feet × 7 feet.  
Ancillary equipment such as compressor, chilling unit etc occupies  
an area of 6 feet × 8 feet.

- |    |  |                    |
|----|--|--------------------|
| 2. | 2 colour offset machine                  | 25 × 38 inches     |
|    | Area required for the machine is         | 8 feet × 14 feet   |
| 3. | Single colour offset machines            | 20 × 30 inches     |
|    | Area required by the machines            | 6 × 10 feet        |
| 4. | 1 die cutting cylinder machine           | 25 × 38 inches     |
|    | Area required by the machine is          | 12 feet × 6.5 feet |
|    | Supervisor cabin                         | 8 × 10 feet        |
|    | Test equipment table                     | 6 feet × 4 feet    |
|    | Storage area for consumeables and spares | 12 × 15 feet       |
- Prepare the layout taking into consideration the above equipment providing space for working area and work in process.



**P1190**

**[3664] - 298**  
**B.E. (Polymer)**  
**RUBBER TECHNOLOGY**  
**(2003 Course) (Elective)**

*Time : 3 Hours]*

*[Max. Marks:100*

*Instructions to the candidates:*

- 1) Question Nos. 1 and 4 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) Figures to the right indicate full marks.*
- 4) Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) What are the molecular-structure requirements for a material to act as a rubber? [8]
- b) Explain the various stages involved in the raw rubber technology. [8]

OR

- a) Explain the various stages involved in latex technology. [8]
- b) Write a short note on swelling of rubbers by liquids. What influence does fillers have on the swelling of rubbers. [8]
- Q2)** a) What are the different types of C-blocks? Differentiate between them. [6]
- b) Explain the properties of C-block. w.r.t. [8]
- i) Particle size or surface area.
  - ii) Structure.
  - iii) Physical and chemical nature of the surface and
  - iv) Particle Porosity.
- c) Write a short note on "Peptisers". [3]

OR

- a) Explain the effect of C-block on the properties of rubber. [6]

**P.T.O.**

- b) Explain the need for addition, mechanism of functioning giving 2 examples of each of the following additives. [8]
- i) Antioxidants.
  - ii) Vulcanising Agents &
  - iii) Accelerators & Activators.
- c) Write a short note on “Tackifiers” used with rubbers. [3]
- Q3)** a) Discuss the following elastomers w.r.t their structure, properties, vulcanising systems used and applications. [9]
- i) Natural rubber.
  - ii) Nitrile rubber and
  - iii) Silicone rubber.
- b) List the various ingredients added a typical rubber formulation. State the different types of machinery used for compounding of rubbers. Explain in detail the design of a Banbury mixer. [8]

OR

- a) What is vulcanisation? What are the factors affecting the rate of vulcanisation? [4]
- b) Draw and compare the cure curve for NR and SBR. [4]
- c) Which are the vulcanising systems used with the following rubbers. Write a reaction showing the same. [9]
- i) Polychloroprene Rubber.
  - ii) Silicone Rubber.
  - iii) Polyacrylic rubbers.
  - iv) Ethylene-Propylene copolymer.

### **SECTION - II**

- Q4)** a) Explain the process of Injection molding of rubbers. State its advantages and disadvantages. [8]
- b) List the different types of compression process used with rubbers. [5]
- c) What is “Flashless Method” for manufacture of rubber articles? [3]

OR

- a) Explain the different types of roll arrangements used in a calendar. What is “roll bending in case of calendaring”? [8]
  - b) How is vulcanisation of the extrudates carried out? [5]
  - c) Explain “ram extruders” used w.r.t rubbers. [3]
- Q5)**
- a) Explain the process for manufacturing of rubber hoses. Which rubbers are used in the manufacture of hoses. Also list the various types of reinforcement used. [9]
  - b) List the 3 types of tyre constructions and explain. [5]
  - c) What are the different applications of rubber latex? [3]

OR

- a) Define “Cellular rubbers”. Classify cellular rubbers and explain. [5]
  - b) Explain a standard formulation for a rubber compound to be used in making of conveyor belts. Explain the construction of a conveyor belt what are its applications? [9]
  - c) With the help of a neat sketch explain the major components of a cable.[3]
- Q6)**
- a) What is the need for testing of rubbers? How are the test specimens prepared. [6]
  - b) List the tests carried out on unvulcanised rubbers. Explain any one of them. [6]
  - c) What is ‘rebound resilience’? How is the test carried out? What is the effect of compounding on rebound resilience? [5]

OR

- a) Why is the test “Permanent set” carried out? Give one application where it is carried out. Explain the procedure to carry out permanent set in compression. [6]
- b) State 2 applications in which the rubber product is tested for abrasion. Explain the procedure to carry out the test. [6]
- c) List the electrical tests carried out on rubbers. Explain surface resistivity or volume resistivity w.r.t rubbers. [5]





**P1191**

**[3664]-301**

**B.E. (Polymer)**

**PRODUCT DESIGN AND COMPUTER APPLICATIONS**

**(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) 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 isochronous and isometric graphs. How are they used in plastic product design? **[4]**
- b) Viscoelastic behaviour of a plastic is represented by a spring and dash pot elements with constants of  $4\text{GN/m}^2$  and  $100\text{ GN/m}^2$  respectively. If a stress of  $14\text{ MPa}$  is applied for 100 seconds and then completely removed, compare values of strain predicted by Maxwell model and Kelvin-Voight model after **[6]**
- i) 55 seconds.
  - ii) 130 seconds.
- c) Illustrate Maxwell model for relaxation and creep. **[6]**

**OR**

- Q2)** a) Write short notes on any 2 : **[6]**
- i) Different types of mesh used in FEA.
  - ii) Concurrent engineering approach in product design.
  - iii) Steps followed in product design.
- b) Explain stress relaxation behaviour and creep behaviour in plastics using Kelvin-Voight model. **[6]**

**P.T.O.**

- c) A small PP flange is 4 mm thick; It is clamped using tightening screms. This reduces its thickness by 0.08 mm. Estimate initial stress and stress after a week. Use curves supplied in Fig. 1. [4]

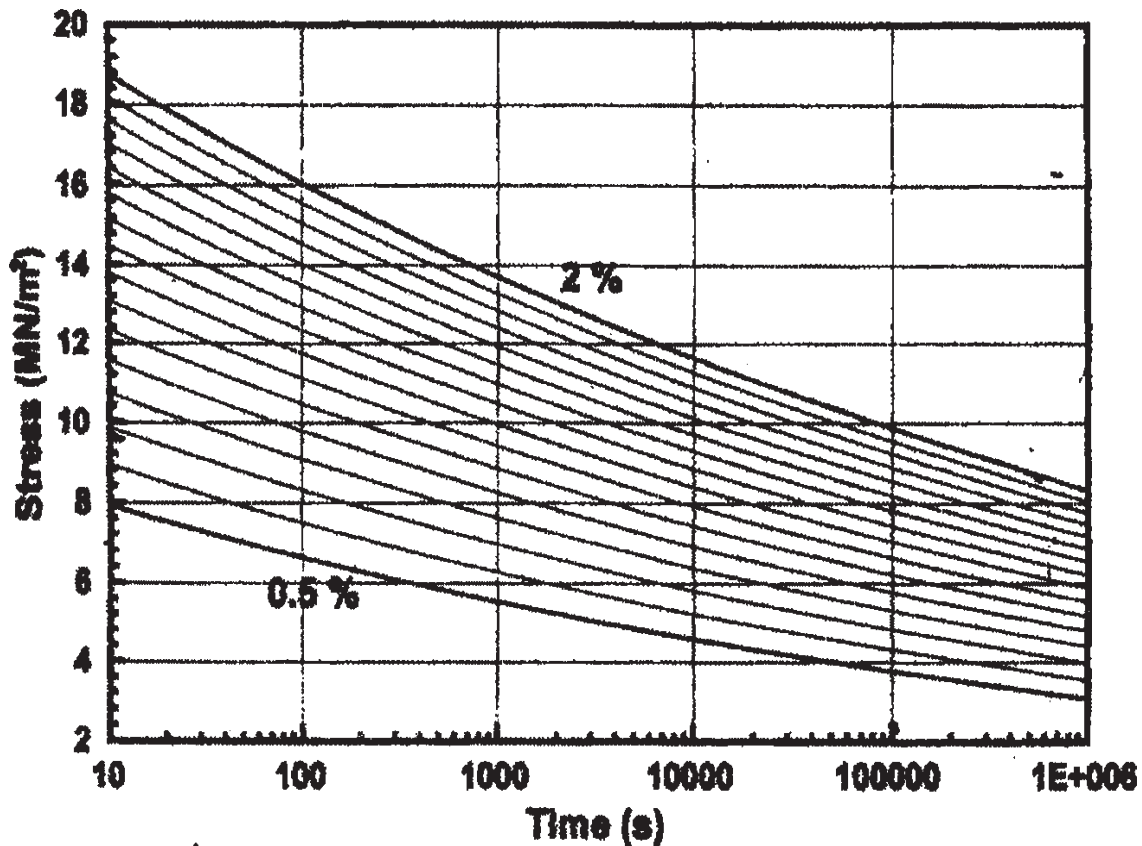
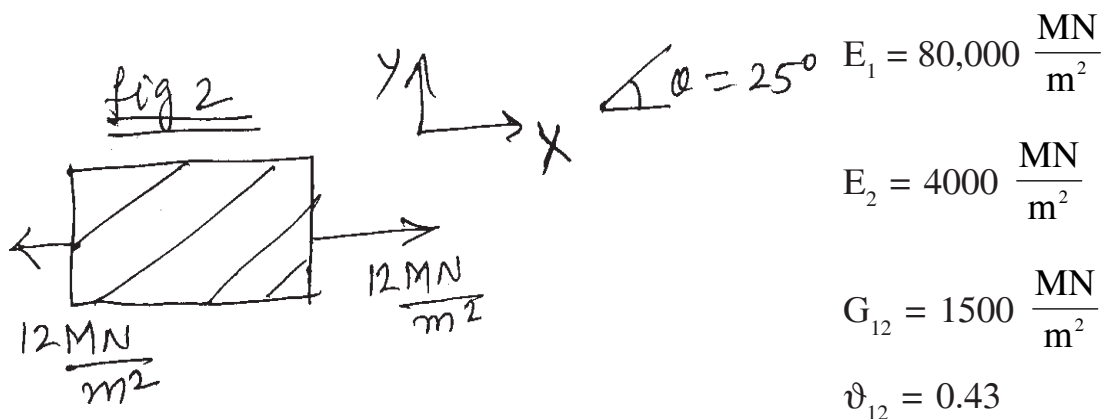


Fig 1: Stress - time curves for PP.

- Q3) a) Write a note on any one type of shap fit assembly used in plastic product design. [6]  
 b) An orthotropic lamina of 1 mm thickness is subjected to loading conditions as shown in the figure below (fig 2). Find strains in the global direction. [6]



- c) Give any one example of non-symmetric laminate and comment on its extensional stiffness [A], coupling stiffness [B] and bending stiffness [D] matrices. [6]

OR

- Q4)** a) Explain Tsai Hill failure theory in details. [6]
- b) Write a note on press fit assemblies in plastic product design. [6]
- c) Define load transfer length and critical fibre length for short fibre reinforced composites. Derive an expression for stress induced in the fibre for fibre length equal to the load transfer length. [6]

- Q5)** a) Discuss Eyring-Prandtl viscosity model in details. [4]
- b) Write a note on packing phase analysis in injection molding. [6]
- c) Explain various reasons for shrinkage in injection molded components. Explain the various measures used to reduce shrinkage. [6]

OR

- Q6)** a) Write a note on flow hesitation and flow leaders in injection mold design. [4]
- b) Discuss different types of weld lines and explain methods of eliminating the weld lines. [8]
- c) Discuss the Ellis viscosity model in details with its merits & demerits. [4]

## SECTION - II

- Q7) a) Design and draw a multi impression mold for component in Fig. 3. Draw at least two views including one sectional view showing details of feed, ejection and cooling system. [40]

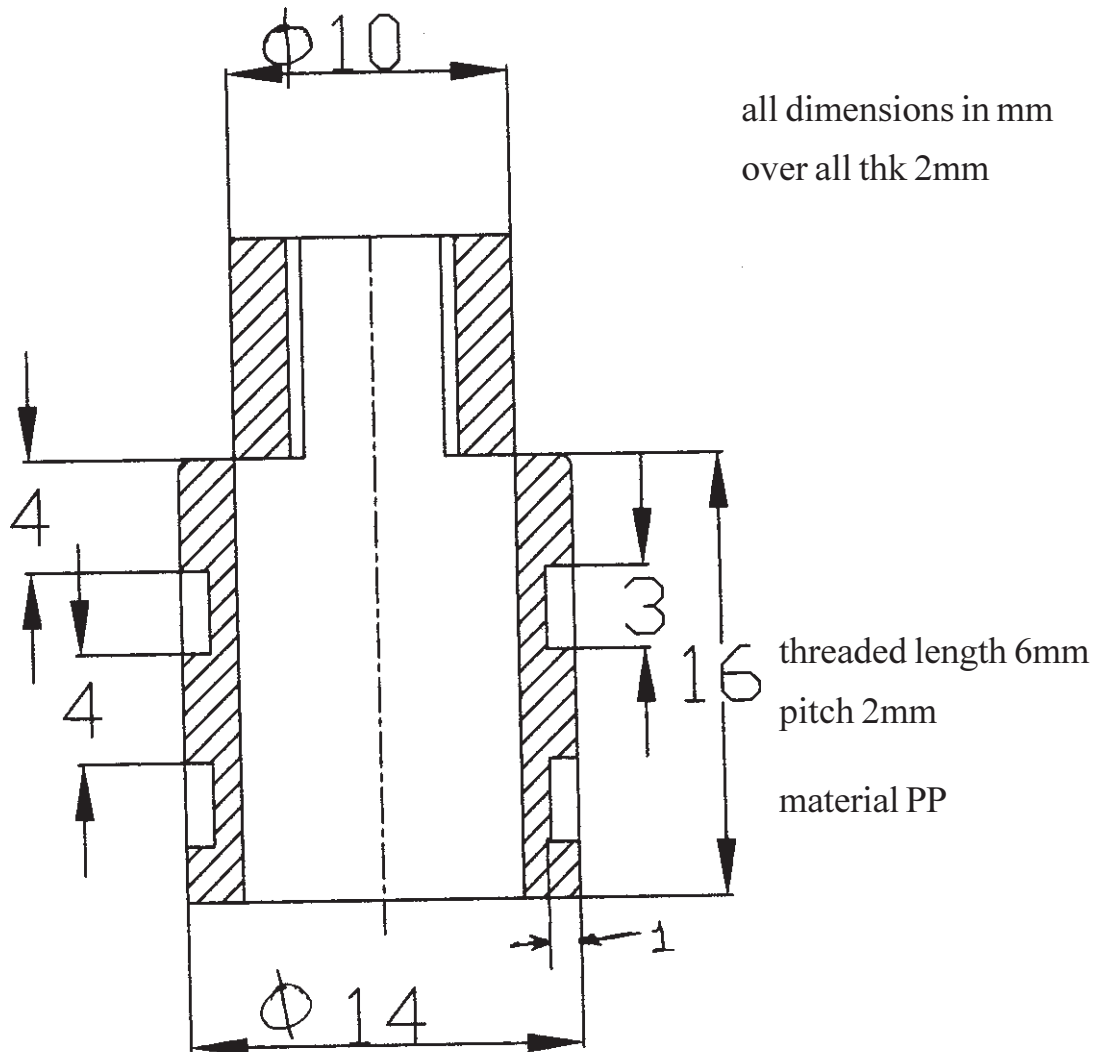


Fig 3

- b) Explain the design calculations for cams, gears if used. Give overall dimensions. [10]



**P1193**

**[3664]-347**

**B.E. (Computer Engineering & I.T.)  
EMBEDDED SYSTEMS  
(2003 Course) (410451)**

*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.No.1 or Q.No.2, Q.No.3 or Q.No.4, Q.No.5 or Q.No.6.  
In section II attempt: Q.No.7 or Q.No.8, Q.No.9 or Q.No.10, Q.No.11 or Q.No.12.*
- 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 characteristics of embedded systems? Explain. [8]  
b) Explain interrupt handling in ARM7. [8]

OR

- Q2)** a) With the help of neat diagram, describe different components of embedded systems. [6]  
b) What are the features of ARM7 architecture? [6]  
c) Differentiate between CISC and RISC. [4]

- Q3)** a) Explain the process of converting the following using block diagram.[12]  
i) C program into a file for ROM image.  
ii) Assembly program into a file for ROM image.  
b) What are the types of memory that can be integrated in a processor? [6]

OR

- Q4)** a) What is Watchdog timer? What is its importance in embedded systems?[6]  
b) How does clock unit can affect the performance of an embedded system? [6]  
c) What is DMA? What is its role in an embedded system? [6]

- Q5)** a) What are the different standards available for serial & parallel I/O? What are the applications of these I/O methods? [6]  
b) Explain with neat diagrams, the data transfer mechanism on I<sup>2</sup>C bus.[10]

OR

*P.T.O.*

- Q6)** a) What do you mean by Context, Interrupt Latency and Deadline? [8]  
b) Define a task, a thread & a process. What are the different IPCs used in multiprocessor systems? [8]

### **SECTION - II**

- Q7)** a) What are the different phases of software development cycle for a typical embedded system? [8]  
b) Explain the use of Java language for embedded system? What are the disadvantages of Java? [6]  
c) When do you use high level language instead of assembly language for embedded system programming? [4]

OR

- Q8)** a) Explain the use of C++ in embedded system programming? [6]  
b) What is cross compiler? How it is different than generic compiler? [6]  
c) What are the different ways to debug the embedded system software? [6]

- Q9)** a) With the help of neat diagram, explain cyclic scheduling with time slicing model for RTOS. [8]  
b) List the different features of embedded OS? How it is different than RTOS? [8]

OR

- Q10)** a) When RTOS is necessary in an embedded system? Explain. [8]  
b) What are the OS security issues? [8]

- Q11)** a) Differentiate MicroC/OS-II and VxWorks based on features and their area of application. [6]  
b) With the help of neat system block diagram, explain the system requirements and tasks for chocolate vending machine. [10]

OR

- Q12)** a) How tasks are managed in MicroC/OS-II? Explain in detail. [8]  
b) With help of neat diagram, explain synchronization of tasks and IPCs for chocolate vending machine. [8]



**P1203**

**[3664] - 32**  
**B.E. (E & TC)**  
**ROBOTICS**  
**(1997 Course) (404185) (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) Use of electronic pocket calculator is allowed.*
- 6) Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) How robots are classified by control method? Give applications of each type. **[10]**
- b) Define the terms :
- |                        |                 |
|------------------------|-----------------|
| i) Tip speed           | ii) Pay load    |
| iii) Degree of freedom | iv) Work space. |
- [8]**
- Q2)** a) Explain rotary to nonlinear motion conversion technique. **[8]**
- b) What is the function of gears in a robot? What are the different types of gears used in robotics? **[8]**
- Q3)** a) Discuss the E-L formulation and its significance for a robotic manipulator. **[8]**
- b) Draw a neat sketch showing basic components of a robot system and explain. **[8]**
- Q4)** a) Discuss homogeneous transformation in detail. **[8]**
- b) What is symbolic T matrix & Numeric T matrix. Discuss their significance in robotics. **[8]**

**P.T.O.**

- Q5)** a) Give D-H algorithm. Discuss its use in robotics. [8]  
b) Describe the Geometric approach for obtaining Inverse solution. [8]

## **SECTION - II**

- Q6)** a) Explain the working stepper motor in full step and half step mode of operation. [8]  
b) Explain the principle of working of pneumatically controlled prismatic joint. [8]

- Q7)** a) What types of motion are used in motion planning?  
R - R manipulator is at initial position (50 - 50) degrees. It is required to move to (100, 50) degrees. Joints have maximum acceleration / deceleration of (40, 80) degree / S<sup>2</sup> respectively. Maximum velocity of joints is (30, 60) deg / sec. If the robot follows trapezoidal velocity pattern using joint interpolated motion, find the travel time and velocity of each joint. [10]  
b) What is need for external state sensors? Discuss one contact & Non contact proximity sensor. [8]

- Q8)** a) Explain how potentiometer can be used to monitor joint position. [8]  
b) Explain how synchros are useful in robot. [8]

- Q9)** a) Discuss typical specifications of a robot of any type. [8]  
b) Explain the palletizing operation using a robot. [8]

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

- a) Harmonic Drive.
- b) Link and Joint parameters.
- c) Perspective Transformation.
- d) Grippers.





Total No. of Questions : 10]

[Total No. of Pages : 2

**P1204**

**[3664]-95**

**B.E. (I.T.)**

**MANAGERIAL ECONOMICS**

**(1997 Course) (410445) (Elective - I)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) Both the sections should be answered in separate answer books.*
- 2) Q. No. 5 and Q. No. 10 are compulsory.*
- 3) Out of the remaining solve any two questions from each section.*
- 4) Figures to the right indicate full marks.*

**SECTION - I**

- Q1)** Explain the Law of Demand with diagrammatic representation. Elaborate the different types of elasticity of demand. **[16]**
- Q2)** Define “Joint Stock Company”. Explain its features, advantages and disadvantages. **[16]**
- Q3)** What do you understand by the term “Managerial Economics”? Distinguish between macro and micro economics. **[16]**
- Q4)** Elaborate the concept of ‘cost’ with its determinants. In what way does cost have an impact on decision-making? **[16]**
- Q5)** What short notes on (any three) : **[18]**
- a) Profit Maximisation.
  - b) Determinants of Market.
  - c) Law of Supply.
  - d) Co-operative Society.
  - e) Cost Forecasting.

**SECTION - II**

- Q6)** Define ‘Market’. What do you mean by the term perfect competition? Explain its characteristics. **[16]**
- Q7)** What is cost benefit analysis? Explain its steps, in detail. **[16]**

***P.T.O.***

**Q8)** Define “Demand Forecasting”. Elaborate the different techniques of demand forecasting. [16]

**Q9)** What is price control? Distinguish between support prices and administered prices. [16]

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

- a) Private Goods Vs Public Goods.
- b) Oligopoly.
- c) Non-Profit Organisation.
- d) Break-Even Analysis.
- e) Protection of consumers interest.



**P1206**

**[3664]-136**

**B.E. (Mech.) (Part - II)**

**COMPUTATIONAL FLUID DYNAMICS**

*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**

**Unit - I**

- Q1)** a) For model of infinitesimally small element fixed in space, obtain continuity equation and state whether it is conservation or non conservation form. [10]
- b) Write the equation of divergence of velocity with its significance. [6]

OR

- Q2)** Derive an expression for momentum equation in conservation form. [16]

**Unit - II**

- Q3)** For the matrix equation  $Ax = b$ , Write down the conjugate gradient algorithm for A being symmetric and positive definite. What is the strategy of using preconditioning? [16]

OR

- Q4)** For the set of following equations : [16]

$$a_{11}x_1 + a_{12}x_2 + a_{13}x_3 = b_1$$

$$a_{21}x_1 + a_{22}x_2 + a_{23}x_3 = b_2$$

$$a_{31}x_1 + a_{32}x_2 + a_{33}x_3 = b_3$$

explain various methods to solve it.

**P.T.O.**

### **Unit - III**

**Q5)** For large rectangular slab, initially at temperature  $T_i$  is suddenly dropped in liquid both at temperature  $T_o$  ( $T_i > T_o$ ) write down - **[18]**

- a) Governing equation with boundary conditions.
- b) Present in discretised form.
- c) Methods to solve these equations.

OR

**Q6)** Consider first order wave equation -

$$\frac{\partial u}{\partial t} + C \frac{\partial u}{\partial x} = 0$$

Present above equation in discretised form and obtain condition for stability of its numerical solution. **[18]**

### **SECTION - II**

### **Unit - IV**

**Q7)** For one dimensional steady state heat conduction equation obtain solution by - **[16]**

- a) Explicit method.
- b) Semi-Implicit.
- c) Implicit method.

OR

**Q8)** For thermally developing flow and hydrodynamically fully developed flow inside circular pipe, obtain - **[16]**

- a) Governing equation with boundary condition.
- b) Discretised form with probable solution method.

### **Unit - V**

**Q9)** Describe the Lax-Wendroff technique for evaluating x-component of velocity at node  $(i, j)$  at a time step of  $t + \Delta t$ . **[16]**

OR

**Q10)** Explain predictor and corrector step used in Mac Cormak's method to find energy at time step  $t + \Delta t$  for node  $(i, j)$  [16]

**Unit - VI**

**Q11)** Outline the MAC algorithm and show how the incompressible flow field is obtained. [18]

OR

**Q12)** Obtain an expression for continuity equation, momentum equation and energy equation for converging-diverging nozzle for one dimensional compressible flow. [18]



Total No. of Questions : 6]

[Total No. of Pages : 3

**P1207**

**[3664]-148**

**B.E. (Mech./SW)**

**INDUSTRIAL ENGINEERING (Elective - III)**

**(2003 Course) (402065)**

*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) Explain with suitable examples how the different tools in Industrial Engineering helps in the modern organisation to improve their performance. [8]
- b) What do you understand by standard performance? How it is considered in standard time calculations? [4]
- c) Which are different charting techniques used in method study? Explain two handed chart with suitable example. [6]

OR

- a) What is method study? Discuss in brief the various steps involved in method study. [9]
- b) What are therbligs? Mention any eight therbligs with symbols and meaning. [9]
- Q2)** a) Distinguish between time study and work sampling. [5]
- b) Explain the limitations of time study. [3]
- c) Following data pertains about time study of an industrial operation. If total allowances are 20%, calculate standard time of the operation. [8]

Activity	1	2	3	4	5
Observed time min. (cumulative)	0.20	0.35	0.50	0.75	1.75
Performance Rating %	90	80	80	100	110

**P.T.O.**

OR

- a) Define work measurement. Mention any four uses of it. [5]
- b) Write short notes on : [6]
  - i) Synthetic data.
  - ii) PMTS.
- c) Explain in brief Work sampling technique used to decide the standard time for the job. [5]

- Q3)**
- a) Explain the scope of ergonomics in industrial engineering. [8]
  - b) Explain the concept of 'Work place design'. What are the factors affecting the process of design. [8]

OR

- a) Explain the man-machine system with its characteristics. [8]
- b) Explain the difference between ergonomics and anthropometry. [8]

**SECTION - II**

- Q4)**
- a) Explain the concept of productivity measurement. [5]
  - b) Discuss in brief the methodology of Operations Research. [5]
  - c) Define with respect to L.P.P. [6]
    - i) Basic solution.
    - ii) Degenerate solution.
    - iii) Slack variable.
    - iv) Alternate optimum solution.

OR

- a) A paper mill produces rolls of paper used in cash registers. Each roll of paper is 100 m in length and can be used in a width of 3, 4, 6 and 10 cm. The company's production process results in rolls that are 24 cm in width. Thus the company must cut its 24 cm roll to the desired widths. It has six basic cutting alternatives as follows :

Cutting alternatives	Width of the rolls (cm.)				Waste (cm.)
	3	4	6	10	
I	4	3	-	-	-
II	-	3	2	-	-
III	1	1	1	1	1
IV	-	-	2	1	2
V	-	4	1	-	2
VI	3	2	1	-	1

The maximum demand for four rolls is as follows :

Roll width (cm.)	-	3	4	6	10
Demand		2000	3600	1600	500

The paper mill wishes to minimise the waste resulting from trimming to size. Write only the L.P. model for problem. [6]

- b) Maximise the function by simplex method. [10]

$$\text{Max } z = 3x_1 + 4x_2, \text{ s.t. } x_1 + x_2 \leq 450, 2x_1 + x_2 \leq 600, x_1, x_2 \geq 0.$$

- Q5)** a) Explain with suitable examples the relation between plant layout and selection of material handling system. [8]

- b) Explain the characteristics of good plant layout. [8]

OR

- a) State and explain various factors affecting the selection of plant location. [8]

- b) State and explain the principles of material handling. [8]

- Q6)** a) Discuss briefly the ABC analysis of inventory control. [6]

- b) Write short notes on : [12]

- i) 'P' & 'Q' system of inventory management.
- ii) Master production schedule.

OR

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

- a) Disaggregation of aggregate plan.
- b) JIT and KANBAN.
- c) Job sequencing.
- d) Types of production.





**P1211****[3664]-285****B.E. (Chemical)****PROCESS MODELING AND SIMULATION****(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)** a) Explain with suitable example - lumped parameter system and distributed parameter system. [8]
- b) Describe the classification of model in detail. [8]

**OR**

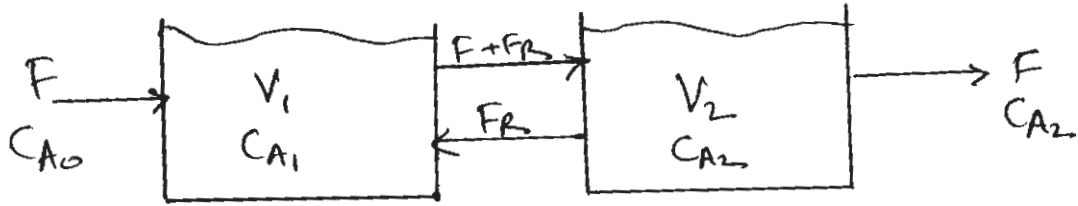
- Q2)** a) Explain various steps involved in model building. [8]
- b) Provide a classification of the major categories of equations in a mechanistic process model. What are the subclasses in each major category. Outline how each of the classes of equations is interrelated. [8]
- Q3)** a) Write the energy equation for the CSTR in which consecutive first order reactions occur with exothermic heats of reaction  $\lambda_1$  and  $\lambda_2$ . The given reaction is  $A \xrightarrow[\lambda_1]{K_1} B \xrightarrow[\lambda_2]{K_2} C$ . [8]
- b) Fluid is flowing through a constant diameter cylindrical pipe. The flow is turbulent and therefore we can assume plug-flow conditions. There is no radial gradients in velocity or any other properties. Develop the mathematical model for the given system. [8]

**OR**

- Q4)** An isothermal, irreversible reaction  $A \xrightarrow{K} B$  takes place in the liquid phase in a constant volume reactor. The mixing is not perfect. Observations of flow patterns indicates that a two tank system with back mixing, as shown

**P.T.O.**

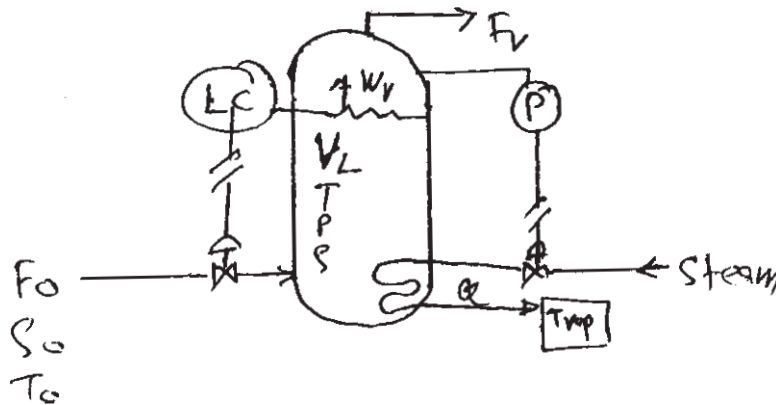
in the sketch below. Assuming  $F$  and  $F_R$  are constant write the equations describing the system. [16]



- Q5)** Derive and discuss model for batch reactor with heating phase and cooling phase. Draw a neat diagram of batch reactor and draw batch profiles. [18]

OR

- Q6)** Consider the vaporizer as shown in fig. LPG is fed into a pressurized tank to hold the liquid level in the tank. We will assume that LPG is a pure component propane. The liquid in the tank is assumed perfectly mixed. Heat is added at a rate  $Q$  to hold the desired pressure in the tank by vaporizing the liquid at a rate  $W_v$ . Heat losses and mass of the tank walls are assumed negligible. Gas drawn off the top of the tank at a volumetric flow rate  $F_v$ . Consider liquid and vapour dynamics. [18]



Develop mathematical model for the given system.

## SECTION - II

- Q7)** Develop the state model for gas absorption column with  $N$  number of trays. Write all assumptions made. [18]

OR

- Q8)** Develop the state model for an ideal binary mixture of component A and B to be separated into two product streams using conventional distillation. [18]

- Q9)** An ice cube is dropped into a glass of water at room temperature and then stirred. Develop a mathematical model describing the time varying behaviour of the system. This model should predict the behaviour for both

short term and long term dynamics. Typical values of problem are 28°C ambient temperature, glass liquid volume of 250ml at initial temperature of 24°C and an ice of 25cm<sup>3</sup>. Typical aspect ratio of the ice cube is 1:1.25 : 2.5

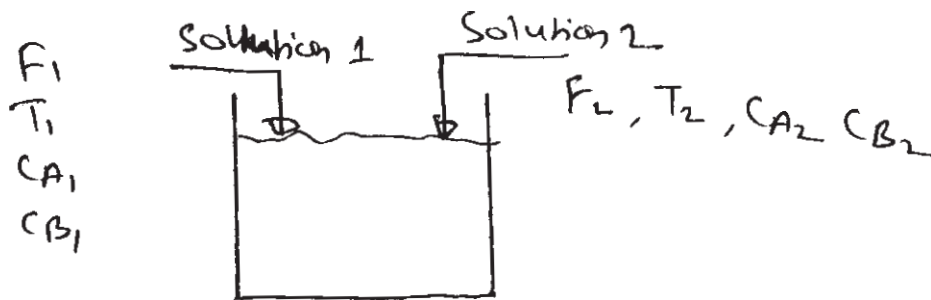
- Prepare a model definition.
- State all modeling assumptions and develop the mathematical model.
- Analyse the degrees of freedom.

[16]

OR

**Q10)** Develop the state model for the batch mixing of two solutions. Initially the tank is empty. The volume of tank is  $V$  (m<sup>3</sup>). The flow rates are volumetric and the concentrations are in moles per volume.

- How long does it take to fill up the tank.
- Show how would you find the composition and temperature of the mixture in the tank during the time that the tank is being filled up. Assume that the heat of solution depends on the composition.



[16]

**Q11)** a) Consider the case of turbulent flow through a valve. Simplification of the mechanical energy balance in the mathematical model leads to the following relationship between flowrate and pressure drop.

$$W = C \sqrt{P_1 - P_2}$$

where  $W$  = mass flow per unit time

$C$  = constant

$P_1$  = upstream pressure

$P_2$  = downstream pressure

show that  $P_1$  is linear with  $P_2$  [8]

- State and explain law of mass action. [8]

OR

**Q12)** a) Give different uses of mathematical model and give its limitations. [8]

- What is process simulation? Explain in detail. [8]

XXXX

Total No. of Questions : 12]

[Total No. of Pages : 3

**P1213**

**[3664]-286**

**B.E. (Chemical)**

**COMPUTER-AIDED PROCESS CONTROL**

**(2003 Course) (Elective - II) (Sem. - II)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) Answer 3 questions from Section - I and 3 questions from Section - II.*
- 2) Answers to the two sections should 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) Distinguish between control strategies used for controlling batch and continuous processes. [6]
- b) Explain functions of HMI in computer control of processes. [6]
- c) Distinguish between DDC & DCS control systems. [6]

OR

- Q2)** a) Explain hierarchial computer control systems. [6]
- b) State advantages of using digital computer in process control. [6]
- c) Draw and explain block diagram of computer-aided process control system. [6]

- Q3)** a) Explain state-space model of MIMO systems. Define controllability and observability of MIMO systems and state conditions for testing them. [8]
- b) Draw block diagram of  $2 \times 2$  process and derive closed-loop transfer function for this system. Also derive relation between transfer function and state-space matrices. [8]

OR

**P.T.O.**

**Q4) a)** Derive the expression for RGA for a  $2 \times 2$  process modeled as [6]

$$\bar{y}_1(s) = k_{11} \bar{m}_1(s) + k_{12} \bar{m}_2(s)$$

$$\bar{y}_2(s) = k_{21} \bar{m}_1(s) + k_{22} \bar{m}_2(s).$$

**b)** A  $3 \times 3$  process has state - space matrices [10]

$$A = \begin{bmatrix} -6 & -18 & -6 \\ 2 & 3 & 1 \\ -4 & -8 & -3 \end{bmatrix}, B = \begin{bmatrix} 2 \\ -3 \\ 7 \end{bmatrix}, C = \begin{bmatrix} 1 & 3 & 1 \end{bmatrix}.$$

**Q5) a)** What are hold elements in digital control systems? Explain construction of ZOH & FOH elements and justify their working mathematically. [8]

**b)** Derive discrete - time model of digital PID - controller in position and velocity form. Compare their performances. [8]

OR

**Q6) a)** Find inverse z-transform of the function

$$\hat{y}(z) = \frac{0.39z^{-1}}{(1 - z^{-1})(1 - 0.61z^{-1})}$$

using partial fraction method. Comment on stability of this system.[8]

**b)** Explain discretization of continuous - time signals from continuous signals. [8]

### SECTION - II

**Q7) a)** Describe various types of analog interfaces used in computer control system. [6]

**b)** Describe data transfer techniques used in computer control systems. [6]

**c)** State different parts of process control software. [6]

OR

- Q8)** a) Describe communication hierarchy in computer - aided process control. [6]  
b) Explain various layers used in networking of process control systems. [6]  
c) Starting from difference equation model, derive z-domain transfer function of first - order discrete - time systems. [6]

- Q9)** a) Explain the essential components of DCS systems. [8]  
b) Explain PLC architecture. [8]

OR

- Q10)** a) Describe supervisory control functions. [8]  
b) Describe I/O systems and modules used in PLC. [8]

- Q11)** a) Explain temporal hierarchy of control structure. [8]  
b) Explain sequence of steps followed in process control design. [8]

OR

- Q12)** a) Describe MIMO control system for heat exchanger. [8]  
b) Describe control schemes for fired heaters, pumps and compressors. [8]



Total No. of Questions : 12]

[Total No. of Pages : 2

**P1214**

**[3664]-292**

**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.*
- 5) Assume suitable data, if necessary.*

**SECTION - I**

**Q1)** Discuss in details the scenario of petrochemical industry in India. **[16]**

OR

**Q2)** Explain in depth the types of crude oil distillation. **[16]**

**Q3)** What are hydrocarbons? Write down the classification of hydrocarbons. **[16]**

OR

**Q4)** Write in details about various methods of production of aromatics. **[16]**

**Q5)** With neat sketch, explain catalytic cracking. **[18]**

OR

**Q6)** Explain various purification techniques used in Petrochemical Industry. **[18]**

**SECTION - II**

**Q7)** Describe the types and uses of second generation intermediates used as solvents and formulating agents. **[16]**

OR

**Q8)** Discuss in detail the production of ethylene glycol. **[16]**

**P.T.O.**

**Q9)** Describe the bulk polymerization methodology. **[16]**

OR

**Q10)** Enlist important physical and chemical properties of polymers. **[16]**

**Q11)** Discuss various pollution abatement techniques in petrochemical industry. **[18]**

OR

**Q12)** What are advanced methods being implemented in petrochemical industry for safer and cleaner operations? **[18]**

XXXXX



Total No. of Questions : 8]

[Total No. of Pages : 1

**P1216**

**[3664]-316**

**B.E. (Petroleum Engineering)**

**PETROLEUM PRODUCTION ENGINEERING - II**

**(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) Attempt three questions from each section.*
- 3) Figures to the right indicate full marks.*
- 4) Neat diagrams should be drawn wherever necessary.*
- 5) Use of a non-programmable calculator is allowed.*
- 6) Assume suitable data if necessary.*

**SECTION - I**

- Q1)** Draw a neat diagram showing the various parts of a SRP. Explain the different parts in detail. **[16]**
- Q2)** Explain in detail the design of an continuous Gas Lift System. **[16]**
- Q3)** Explain in detail the parts of an ESP? **[16]**
- Q4)** Describe with the help of a suitable figure : **[18]**
- a) Design of tapered rods for SRP.
  - b) Design of ESP.
  - c) Dynagraphs.

**SECTION - II**

- Q5)** Explain the damage due to scale and its removal. **[16]**
- Q6)** Explain different solutions to sand problem in detail with suitable diagrams. **[16]**
- Q7)** Derive the equation for gas flow in a pipeline. **[16]**
- Q8)** Write short notes on : **[18]**
- a) Gravel Packing.
  - b) Asphaltenes and Paraffin Problem.
  - c) Pigging.



**P1218**

**[3664]-321**

**B.E. (Petrochemical)  
REFINING OPERATIONS  
(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.*

**SECTION - I**

- Q1)** a) Elaborate on ‘Overall Petroleum Refinery Flow’. (Flow diagram is not necessary.) [8]  
b) Elaborate on ‘Low Boiling Refinery Products’. (i.e. the compounds which are in the gas phase at ambient temperatures and pressures.) [8]
- Q2)** a) With the help of flow diagram, describe single stage electrostatic desalting of crude oil. [10]  
b) What is the significance of steam addition to the furnace inlet of a Vacuum Distillation Unit? What do you mean by dry, wet and damp operation of the same unit? [6]
- Q3)** a) Elaborate on ‘FCC Regenerator’. (Diagram is necessary.) [8]  
b) Discuss hydrocracker feedstock preparation in detail. [5]  
c) Describe the GoFinishing Process as a typical fixed-bed hydrocracking process in detail. (Flow diagram is not necessary.). [5]
- Q4)** Write short notes on following (Any 4) : [16]  
a) Composition of petroleum.  
b) Crude assay.  
c) Gasoline.

- d) Petroleum coke
- e) Visbreaking.
- f) Hydrotreating catalysts.

### **SECTION - II**

- Q5)** a) Give the significance of catalytic reforming and enlist the typical feedstocks to the catalytic reformer. Also, enlist the undesired reactions in a catalytic reformer. [6]
- b) Elaborate on 'Reforming Catalyst'. [6]
- c) With the help of neat sketch, discuss typical fixed-bed downflow catalytic reformer in detail. [6]
- Q6)** a) How are lubricating oils produced? What is the significance of additives in the production of lubricating oils? Enlist at least four important properties of lubricating oils. [6]
- b) With the help of flow diagram, describe 'Ketone Dewaxing Unit' for lubricating oil manufacturing. [10]
- Q7)** a) Elaborate on 'Once-through Claus Sulfur Process'. (Flow diagram is necessary.) [12]
- b) Enlist at least four sources of wastewater in refineries. [4]
- Q8)** Write short notes on following (Any 4) : [16]
- a) Air Pollution Control in Refineries.
  - b) SCOT Process.
  - c) Isomerization.
  - d) Reformer Feed Preparation.
  - e) Dehydrogenation Reactions in a Catalytic Reformer.
  - f) Lube Additives.



**P1219**

**[3664]-333**

**B.E. (Petrochemical Engineering)**  
**PETROLEUM EXPLORATION AND PRODUCTION**  
**OPERATIONS**  
**(2003 Course) (Elective)**

*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)** Give a detailed account of the present upstream petroleum industry in the world with particular reference to the thrust areas for exploration, production scenario, natural gas, economics, business and status in India. **[16]**

OR

- a) List and explain different physical and chemical properties of fuels that are normally determined while deciding quality of fuels. Give ranges of such properties for gasoline, kerosene and diesel wherever possible. **[10]**
- b) Explain any one method to determine calorific value of a liquid fuel. **[6]**

**Q2)** What are sedimentary rocks? Explain : **[16]**

- a) Fluvial
- b) Transitional and
- c) Marine depositional environments with the help of neat sketches.

OR

**P.T.O.**

Write short notes on any four of the following :

[16]

- a) Remote sensing in oil exploration,
- b) Condensate, free gas and associated gas,
- c) Source rocks,
- d) Reservoir rock properties,
- e) Migration of hydrocarbons,
- f) Rock cycle.

**Q3)** Answer any three of the following :

[18]

- a) What is kerogen? What are the different types of kerogen? Explain each in brief.
- b) How are petroleum reserves classified?
- c) Explain in brief different methods of reserves estimation.
- d) With the help of neat sketches explain different types of reservoir traps.
- e) Give the “Standard Geologic Time Scale”.

## **SECTION - II**

**Q4)** a) What are the basic land rig components? Draw a sketch and label the important parts. [10]

b) Give a classification of drilling locations for wells. Explain the terms.[6]

OR

What is drilling fluid? Explain its important properties and procedures to measure them. [16]

**Q5)** Write short notes on any four of the following :

[16]

- a) Mud pumps.
- b) Drilling bits.
- c) Blow out preventors.
- d) Jack up rig.
- e) Submersible rig.
- f) Well casing.
- g) Fishing.

OR

How is directional drilling carried out? Explain the equipments used specially for inducing deviation. [16]

**Q6)** Answer any three of the following : [18]

- a) What is meant by 'Production Engineering' with respect to oil industry? What are the reasons that affect production from a well?
- b) Explain the processes involved in 'Treating of oil' (oil conditioning).
- c) Write a note of surface storage facilities for oil.
- d) What are the different methods of increasing recovery of oil from a reservoir.
- e) Explain in brief various alternate hydrocarbon sources that are likely to replace conventional oil and gas.



Total No. of Questions : 12]

[Total No. of Pages : 3

**P1221**

**[3664]-346**

**B.E. (Computer / I.T.) (Common)**  
**SOFTWARE ARCHITECTURE**  
**(2003 Course) (414451) (Elective - II)**

*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) & (Q3 or Q4) & (Q5 or Q6).*
- 4) From Section - II, answer (Q7 or Q8) & (Q9 or Q10) & (Q11 or Q12).*
- 5) Make suitable assumptions wherever relevant and appropriate.*

**SECTION - I**

- Q1)** a) Discuss how models, diagrams can be used to characterize and reason about system design/architecture. [6]  
b) Why has there been recently such excitement about software architecture. [6]  
c) Write short notes on Architecture styles. [6]

OR

- Q2)** a) What does engineering mean and what does it mean to bring engineering practices and approach to software development. [6]  
b) Give two definitions of software architecture, explain them. [6]  
c) Write short notes on Architecture business cycle. [6]

- Q3)** Give any four quality attributes that apply to software systems, discuss their importance and how to specify them in SRS. [16]

OR

- Q4)** Explain the given terms in context of quality : [16]  
a) Scenario template elements (source, stimulus, environment, response).  
b) Business quality.  
c) Tactics.  
d) MTTF, MTTR.

**P.T.O.**

- Q5)** a) Can design patterns be invented, comment. [4]  
b) In implementing design patterns often inheritance and composition is used, explain with examples. [6]  
c) Explain an example template to document design patterns. [6]

OR

- Q6)** a) Give two known uses of any two design patterns. [4]  
b) Write in brief on command pattern. [4]  
c) Explain intent of iterator pattern. [4]  
d) What do you by understand by architectural patterns. [4]

## **SECTION - II**

- Q7)** In brief write about the technology and its need : [16]  
a) JXTA.  
b) Middleware.  
c) Stateless session beans.  
d) J2ME.

OR

- Q8)** a) Compare the java world and microsoft world for their middleware offerings. [8]  
b) What is XML, How J2EE supports XML processing? [8]
- Q9)** a) What is the architecture of World wide web, in terms of hardware, protocols, infrastructure. [8]  
b) What is a N Tier application. What is the role of the data Tier, the third tier. How do following technologies play a role in the third tier? ERP systems, flat files. [8]

OR

- Q10)** In brief explain the concept and give good examples to illustrate : [16]  
a) XHTML.  
b) Well formed XML.  
c) Active X controls.  
d) JSP page navigation.



- Q11)**a) Write short notes on COM Interfaces. [6]  
b) What is the idea behind CLR, explain. [6]  
c) Write short notes on integration of systems in context of web services. [6]

OR

- Q12)**a) Write function prototype for release () method of IUnknown interface in Com and write C++ code to show the use of that method and explain its application. [6]  
b) What is COM DLL server, how many components can it have, how is it deployed. [6]  
c) How is COM used on client side. [6]



Total No. of Questions : 12]

[Total No. of Pages : 3

**P1222**

**[3664]-356**

**B.E. (IT)**

**SYSTEM OPERATIONS AND MAINTENANCE**

**(2003 Course) (414448)**

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

**SECTION - I**

- Q1)** a) Classify telecom service providers. [5]  
b) With a neat diagram explain the organizational structure of an average telecom service provider. [5]  
c) Explain service delivery cycle with a neat diagram. [8]

OR

- Q2)** a) What is Telecommunicating Management Network? Explain with neat diagram the architecture of TMN. [9]  
b) List the key function of following support process [9]  
i) Customer care and billing process.  
ii) Order processing and provisioning process.

- Q3)** a) What is LDAP? Explain the features and limitation of the same. [8]  
b) Discuss differentiation of market segments. [8]

OR

- Q4)** a) With the neat diagram explain directory enabled networking. [8]  
b) With respect to SNMP protocol explain [8]  
i) Traditional SNMP manage.  
ii) RMON.

***P.T.O.***

- Q5)** a) Compare and contrast CMIP and SNMP. [8]  
b) What is proactive management in problem handling process? [8]

OR

- Q6)** a) What are sources of information of IP billing? List the challenges and solutions in IP billing. [8]  
b) Explain (any 8) [8]  
i) TINA.  
ii) WAP.  
iii) CRM.  
iv) EDGE.  
v) CMIP.  
vi) B2C.  
vii) CDR.  
viii) GPS.  
ix) Non Source Routing.  
x) PVC.  
xi) Call Rating.  
xii) Resource Reservation Protocol.

### **SECTION - II**

- Q7)** a) Discuss the site design considerations for a service providers vibrant website. [9]  
b) Customer care is a typical front office function - Explain. [9]

OR

- Q8)** a) What SLA list some service dependent and service independent metrics? [9]  
b) Explain Mediation and Mediation System. [9]

- Q9)** a) Draw a neat diagram for a generic architecture for micro payments. [8]  
b) With a flowchart explain a typical service level management process. [8]

OR

- Q10)** a) Explain the significance of periodic security audit for a telecommunication service provider. [8]  
b) With a neat diagram give the overview of management operations support services. [8]

- Q11)** a) Write a job profile of typical network operations manages. [8]  
b) Compare and contrast building teams and keeping teams. [8]

OR

- Q12)** a) Draw a neat diagram of business data collection, processing distribution architecture. [8]  
b) List the importance of documentation and management tools in customer care and billing process. [8]  
Comment on the same using B2B or B2C application.



Total No. of Questions : 10]

[Total No. of Pages : 2

**P1272**

**[3664]-88**

**B.E. (Computer Engineering)**

**PROJECT PLANNING AND MANAGEMENT**

**(1997 Course) (410250)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) Answer any three questions from each section.*
- 2) Answers to the 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 importance of Project Scope? How Planning and Scheduling are dependent on Project Scope? [8]
- b) What are the tasks of Project Managers? What are the situations and issues that a Project Manager should be able to manage? How role of Project Manager is important in Team Building? [8]
- Q2)** a) How needs are mapped to requirements? What are the ways for Requirement Elicitation? What is the role of Prototyping in Requirement Analysis? [8]
- b) Explain merits and demerits of Functional and Matrix Project Organizations. [8]
- Q3)** a) What the purpose of risk identification? Why risks need to be prioritized and monitored? What is meant by Proactive and Reactive Risk Management? [8]
- b) What are the mechanisms to control the risks? Why risks need to be prioritized and monitored? What are the ways to understand the impact of risks? How risks are categorized? [8]
- Q4)** a) What is meant by Classic Mistake? Explain in detail process related Classic Mistakes. [8]
- b) Why Software Project Plan is essential? What is Software Change? How it is identified? What is Change Control Cycle? [8]

***P.T.O.***

- Q5)** Write short notes on (any three) : **[18]**
- a) Requirement Traceability.
  - b) High Risk and Gambling.
  - c) SQA plan.
  - d) Importance of Non-Functional Requirements.

### **SECTION - II**

- Q6)** a) What is Size Oriented estimation? What is the role of Metrics in Estimation? What are the techniques for effort estimation? **[8]**
- b) What is meant by Function Points? Explain in detail the process to calculate Function Points. **[8]**
- Q7)** a) What is Gantt chart? What is expected to be traced with the help of Gantt chart? What is the purpose of Decision Tree? How Off-the-Shelf components are selected? **[8]**
- b) What is PERT? What are the applications of PERT? **[8]**
- Q8)** a) What is Work Breakdown Structure? Explain the following : **[8]**
- i) Activity based WBS.
  - ii) Deliverable based WBS.
- b) What is Rapid Development? What are the characteristics of High Performance team? How Team Models are established and used? **[8]**
- Q9)** a) Explain in detail Domain Engineering. What are the advantages of Domain Engineering? **[8]**
- b) What is Functional Testing? What are the methods available for performing functional testing? **[8]**
- Q10)** Write short notes on (any three) : **[18]**
- a) Reuse Process.
  - b) Ballpark estimate.
  - c) Forward Engineering.
  - d) Personal Software Process.



Total No. of Questions : 10]

[Total No. of Pages : 2

**P1273**

**[3664]-91**

**B.E. (Computer Engineering)  
Advanced Unix Programming (Elective - II)  
(1997 Course) (410251)**

*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) What is the need of macros? Give two examples. [8]  
b) What is process accounting? List the benefits of it. [8]
- Q2)** a) What is the need of shell programming? Give two examples. [8]  
b) Write the pseudo code for the creations of zombie processes. [8]
- Q3)** a) What is race condition? Give at least two examples to support it. [8]  
b) Explain any two important file types from network communication point of view. [8]
- Q4)** a) Why reentrant functions are required? Give two examples. [8]  
b) Describe the directory structure of Unix in detail. [8]
- Q5)** Write short notes on : [18]  
a) Signals.  
b) Slow system calls.  
c) Unreliable Signals.

**SECTION - II**

- Q6)** a) How to tune the performance of system? Explain any two key parameters. [8]  
b) Describe the RPC in detail. [8]

***P.T.O.***

- Q7)** a) Describe the working of shared memory. [8]  
b) Compare between stream and datagram mode provided in socket programming. [8]
- Q8)** a) Explain the organization of serial line buffer. [8]  
b) Explain the stepwise procedure for rebuilding the kernel. [8]
- Q9)** a) What is binary semaphore? Give some applications which require the binary semaphore rather than general semaphore. [8]  
b) What are the differences between the simple pipe and stream pipe? [8]
- Q10)** Write short notes on : [18]  
a) LWP.  
b) FIFO.  
c) Raw Sockets.





Total No. of Questions : 12]

[Total No. of Pages : 3

**P1274**

**[3664]-284**

**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) 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) What are main factors should be consider in making feasibility study?  
Explain in detail. [9]
- b) Explain significance of laboratory data in process development. [9]

OR

- Q2)** a) Discuss the various functions of pilot plant. [9]
- b) Explain the importance of flow sheeting in chemical industry. [9]
- Q3)** a) Explain in detail the factors affecting process selection. [8]
- b) A project engineer would like to choose a plant location for following manufacturing units. Please help him during selection of proper site giving justification. [8]
- i) Polysterene Plant.
  - ii) Sulphuric Acid Plant.

OR

- Q4)** a) 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. [8]
- b) What are the factors to be considered while selecting the plant location. [8]
- Q5)** Explain the primary and secondary process utilities required for process plant. [16]

**P.T.O.**

OR

- Q6)** Distinguish between water treatment and waste water treatment. Enlist the various methods of waste treatment and explain any two with neat sketches. [16]

**SECTION - II**

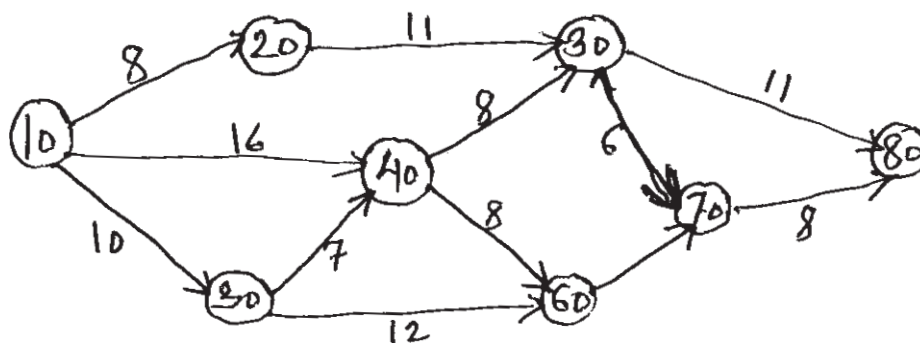
- Q7)** a) Explain the factors governing the selection of piping and insulation. [6]  
b) Explain normal pipe size. [6]  
c) Give the details of colour code for piping. [6]

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) Give the classification of pumps and explain the principle, construction and working of centrifugal pump. [10]  
b) Explain the term cavitation and NPSH. [6]

OR

- Q10)** a) Explain the characteristic of single acting and double acting reciprocating pumps with neat diagram. [10]  
b) Explain typical characteristic curve for the fan. [6]
- Q11)** a) What is float and how it is useful in CPM network. [4]  
b) Explain static & mobile pressure vessel. [4]  
c) Consider the network shown below. Determine the critical path. [8]



OR

- Q12)** a) A chemical manufacturing company wants to estimate the time for the project, various activities are identified as 10, 20, 30..... etc. Their sequence is as under **[12]**

Activity Sequence	Estimated Time in Week
(10, 20)	12
(10, 30)	13
(10, 40)	12
(20, 50)	10
(30, 70)	19
(40, 60)	11
(50, 70)	10
(50, 80)	12
(60, 90)	09
(70, 100)	20
(80, 100)	15
(90, 100)	20

Draw the network for these activity and estimate the time for critical path?

- b) Define “Intrinsically” and “Extransic” safe process. **[4]**



**P1276**

**[3664]-315**

**B.E. (Petroleum Engineering)  
RESERVOIR ENGINEERING - II  
(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 No. 7(seven) is compulsory. Out of remaining attempt any three questions from Section - I any two questions from Section - II.*
- 3) Figures to the right indicate full marks.*
- 4) Neat diagrams should be drawn wherever necessary.*
- 5) Use of a non-programmable calculator, log-log, semi-log paper is allowed.*
- 6) Assume suitable data if necessary.*
- 7) If you attempt Question No.7(seven), detach Figure one(1) from the question paper and attach it inside the answer booklet.*

**SECTION - I**

- Q1)** a) Derive the Buckley Leverette equation and explain its usefulness. [6]  
b) Derive the fractional flow equation for two phases and draw and explain different fractional flow curves. [10]
- Q2)** Explain all the thermal EOR techniques. [16]
- Q3)** Explain surfactant polymer flood in detail. [16]
- Q4)** Explain CO<sub>2</sub> miscible and immiscible EOR. [18]

**SECTION - II**

- Q5)** What is history matching? Explain in detail the procedure. [16]
- Q6)** a) Given a one-dimensional reservoir, with the following data, set up the matrix using the Implicit method. L = 500 ft,  $c_t = 5E-6$ ,  $P(x, 0) = 5000$  psi,  $P(500, t) = 5000$  psi,  $P(0, t) = 50$  psi, viscosity = 5cp, permeability = 5 md, porosity = 20%. [12]  
b) Show the solution profiles for different times on a P-x diagram and the steady state solution. [4]

**P.T.O.**

**Q7)** Hanofer Oil Field, Eastern Europe, has an isopach map and production history from one of its wells given in Figure 1 and 2. In figure 2, series 2 denotes actual production and series 3 denotes simulated production. Assume any other data and clearly state it. If you attempt this question, attach figure 1 inside the answer booklet.

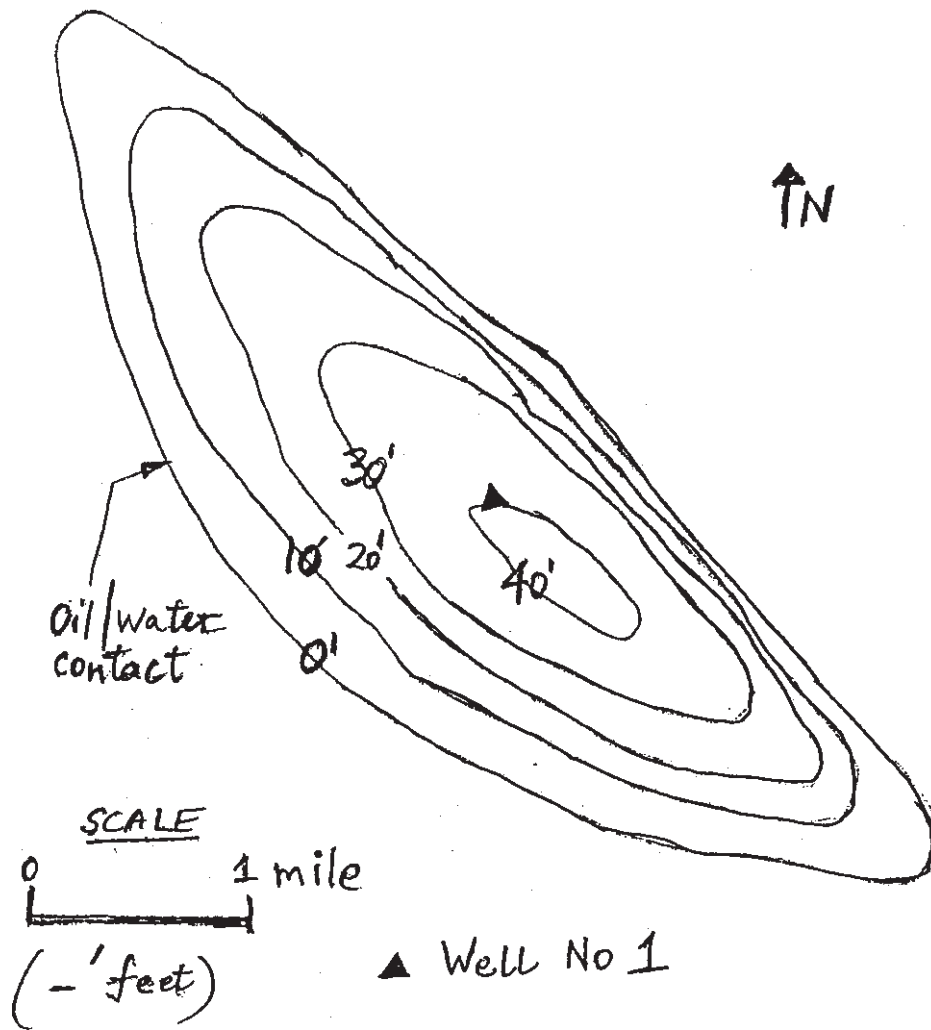
Discovery Date :	Jan, 86
No. of producing wells	One (shown by triangle)
Formation type	limestone
Depth	5000 ft
Average Porosity	11 %
Average Permeability	43 md
Average water saturation	17 %
Reservoir Temperature	154F
Initial Reservoir Pressure	2422 psia
Drive Mechanism	Water Drive
Oil Gravity	25 API

- Where will you drill the next well? To what depth? Explain [5]
- What waterflood pattern do you recommend? Show it on the isopach map stating clearly injectors and producers. When do you recommend the initiation of the water flood project? Why? [5]
- Which EOR process would you recommend? When do you recommend the EOR project be started? Why? [5]
- What changes in the waterflood pattern would you recommend for the EOR process? [3]

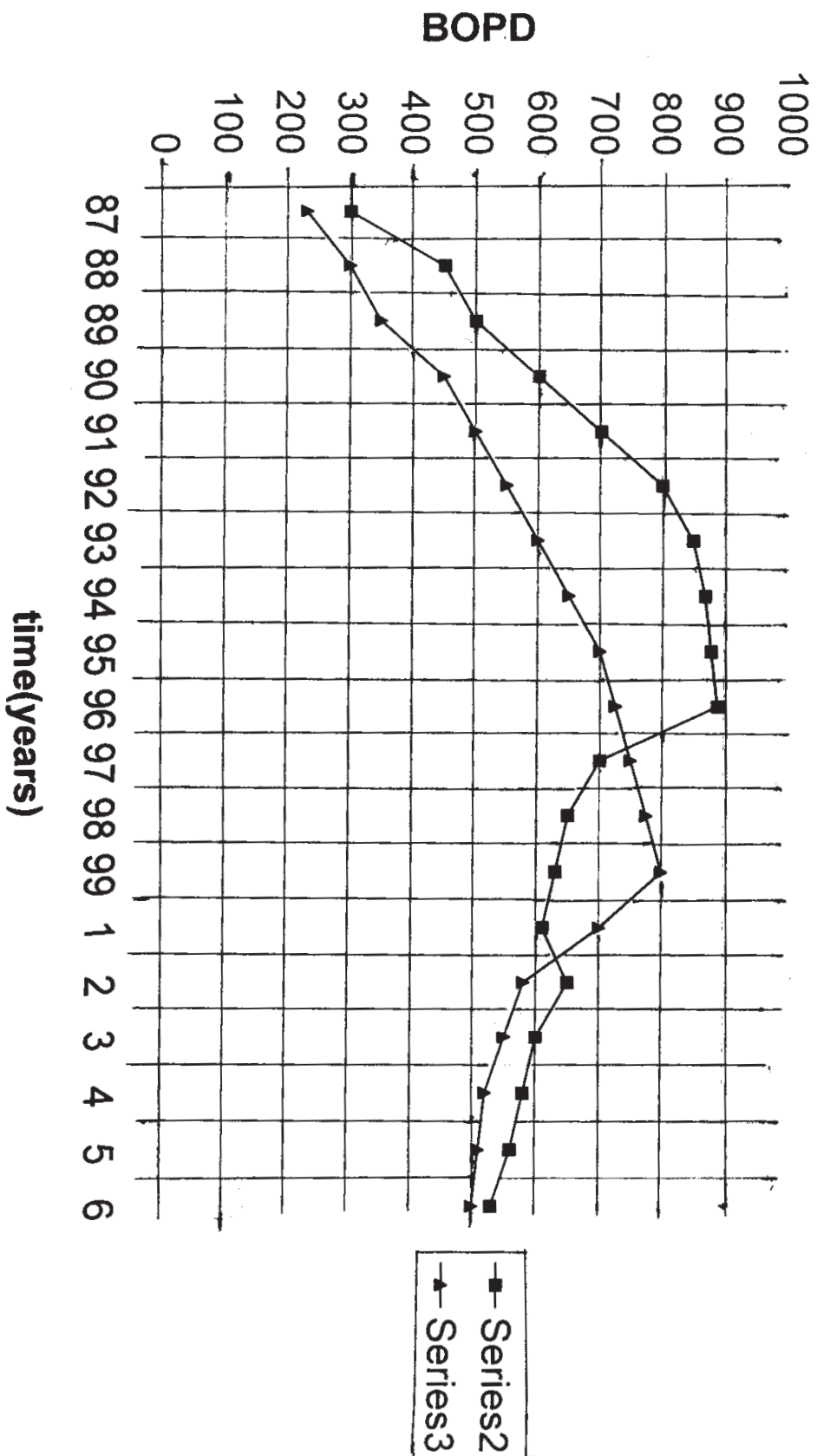
**Q8)** Answer the questions according to the Hanofer field in Eastern Europe. Refer to Question 7 for all the data.

- Why does the production increase and then decrease twice? [6]
- In what year will the well produce 150 BOPD? Explain with mathematical calculations. [6]
- A simulation of the well is done as shown in the figure? State possible errors in your simulator. [4]

FIGURE 1  
ISOPACH MAP



Production History  
Figure 2



**P1277**

**[3664]-342**

**B.E. (Computer Engineering)  
NETWORKS AND INFORMATION SECURITY  
(2003 Course) (410448)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:-*

- 1) Attempt three questions from Section - I and three questions from Section - II.*
- 2) Figures to right indicate full marks.*
- 3) Draw neat diagrams wherever necessary.*
- 4) Make suitable assumptions wherever necessary.*

**SECTION - I**

- Q1)** a) What do you mean access control? Explain how access control matrix provides the security. [8]
- b) List and explain the OSI security model. [8]

OR

- Q2)** a) What is the difference between active and passive attack? Give one example of each. [8]
- b) Describe how DNS poisoning is carried out. How attacker knows the transfer of DNS databases? [8]
- Q3)** a) Explain how message authentication code (MAC) ensures the integrity of message. Why private and public keys cannot be used in creating a MAC? [8]
- b) With respect to elliptical curve cryptography, explain the following points : [8]
- i) How to find the equation of the curve?
  - ii) How to generate public and private keys?
  - iii) How to create cipher text and
  - iv) How to decrypt cipher text.

OR

**P.T.O.**



- Q4)** a) Using RSA algorithm calculate the following : [8]  
i) Given  $n = 221$  and  $e = 5$ , find  $d$ .  
ii) Given  $n = 3937$  and  $e = 17$ , find  $d$ .  
b) Explain the following with respect to X.509 : [8]  
i) Certificate Renewal and  
ii) Certificate Revocation.
- Q5)** a) What is the block size in DES? What is the cipher key size in DES? What is the round key size in DES? Why does the DES function need an expansion permutation? [10]  
b) What is double DES? What kind of attack on double DES makes it useless? [8]

OR

- Q6)** a) AES defines three different cipher key sizes (128,192, and 256); DES defines only one cipher key size. What are the advantages and disadvantages of AES over DES with respect to this difference. [10]  
b) What do you mean by the key expansion? Explain key expansion in IDEA. [8]

## **SECTION - II**

- Q7)** a) Compare between PPTP and L2TP VPN protocol. [8]  
b) Explain IKE protocol along with phase I and phase II. Explain quick mode of phase two in detail. [8]

OR

- Q8)** a) Explain the IPSec security protocol AH and ESP. How AH provides the authentication and integrity checking capabilities? [8]  
b) List ISAKMP payload types and explain the purpose of each. [8]
- Q9)** a) What do you mean by proxy firewall? Give the pros and cons of proxy firewalls. [8]  
b) How NAT in routers can be used to achieve the security for internal network? [8]

OR

- Q10)**a) How to prevent the denial of service attack against the wireless LAN? [8]
- b) How a stateful firewall works? Explain stateful filtering and stateful inspection in this regard. [8]

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

- a) SSL.
- b) PGP.
- c) PEM.

OR

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

- a) SET.
- b) E-Cache.
- c) Kerberos.



**P1278**

**[3664]-362**

**B.E. (Biotechnology) (Semester - I)**  
**ENZYME AND FERMENTATION ENGINEERING**  
**(2003 Course) (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 must be drawn wherever necessary.*
- 4) Figures to the right indicate full marks.*

**SECTION - I**

- Q1)** a) Describe in detail the two methods of determining the constants in the Michaelis-Menten equation for kinetics of enzyme acting on one substrate. State the advantages of both the methods. **[10]**
- b) State the expression, application and limitations of the Monod's growth kinetic model. **[6]**

OR

- Q2)** a) Explain the kinetic implications of endogenous and maintenance metabolism with respect to microbial growth kinetics. **[8]**
- b) What are the different types of reversible inhibitions encountered in enzyme systems? Write the rate expressions for each type. **[8]**
- Q3)** a) Differentiate between the two types of fermentation. Also state the advantages and disadvantages of both types. **[12]**
- b) Describe in brief the different types of continuous fermentation systems. **[6]**

OR

- Q4)** a) Explain the batch mode of fermenter operation. Also enlist its advantages and disadvantages. **[6]**
- b) Write notes on the following (any two) : **[12]**
- i) Fed-batch mode of fermenter operation.
  - ii) Hollow fibre bioreactors.
  - iii) Tray Bioreactors.

- Q5)** a) How is the power consumption of an agitator affected in the presence of gas in a fermenter system? Give correlations for calculating power required in the presence and absence of gas. [8]
- b) What are the different factors which cause a change in rheology of a fermentation broth? [8]

OR

- Q6)** a) Describe in detail the dynamic method of gassing out for the determination  $K_L a$ . Also state its advantages and disadvantages. [8]
- b) Explain the procedure for the measurement and control of pH during a fermentation operation. [8]

### **SECTION - II**

- Q7)** Write notes on the following (any four) : [16]
- a) Thermal death kinetics.
  - b) HTST sterilization.
  - c) Filter sterilization of media.
  - d) Process variables used for fermenter scale-up.
  - e) Factors affecting scale-up of fermenter systems.
  - f) Advantages and disadvantages of direct steam sterilization.
- Q8)** a) Differentiate between the physical and chemical methods of enzyme immobilization. [8]
- b) Write notes on the following : [10]
- i) Medical applications of immobilized enzymes.
  - ii) Utilization and regeneration of co-factors.

OR

- Q9)** a) What are the advantages offered by immobilized enzyme over soluble enzyme? Enlist few applications of immobilized enzymes. [6]
- b) What are the factors which affect diffusion of a substrate when an enzyme is immobilized on the internal surface of the support? [6]
- c) Derive an expression for kinetics of immobilized enzymes when the enzyme is bound to the external surface of the support. [6]

**Q10)** Write notes on the following (any four) :

**[16]**

- a) Disposable bioreactors.
- b) Advantages of Microfermentation.
- c) Design of bioreactors for animal cell cultures.
- d) Bioreactors for suspension culture of animal cells.
- e) Semi-synthetic fermentation process.
- f) Disadvantages of disposable reactors.



**P1279**

**[3664] - 365**

**B.E. (Biotechnology)**

**ENVIRONMENTAL BIOTECHNOLOGY**

**(2003 Course) (416281) (Sem. - I) (Theory)**

*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.*

**SECTION - I**

- Q1)** a) What is the purpose of sedimentation? Where is it located in the treatment process? [6]
- b) The B.O.D. 5 of a surface water sample is 200 mg/litre at 20° C. The value of the reaction constant is  $K = 0.2 \text{ day}^{-1}$  with base 'e'. Calculate the ultimate B.O.D. of the sample. [6]
- c) With the help of examples differentiate between unit operations and unit processes. [6]

OR

- a) Why is disinfection significant in waste water treatment? How is it done?[6]
- b) Write the equation for unseeded and seeded BOD5 estimations. [6]
- c) Distinguish between primary and secondary treatment process for waste water. [6]
- Q2)** a) How is oxygen controlled in the aeration system? What happens when the DO of waste water increases above the standards specified? [8]
- b) The daily flow to a trickling filter is 54,50,000 gpd (20628 cubic meter). If the BOD content of the trickling filter influent is 260 mg/L, calculate per day (either in pounds or grams) BOD entering the trickling filter. [8]

OR

**P.T.O.**

- a) The DO of a given water sample was 7.4 mg/L at the start of the test. After 5 days the sample had a DO of 2.5 mg/L. Calculate the BOD<sub>5</sub> of the sample if seeding was done with 2 ml of seed material having concentration 90 mg/L. [8]
- b) Microorganisms are critical in biological treatment. Discuss. [8]
- Q3)** a) What is activated sludge process? Write the advantages and disadvantages of the activated sludge process. [8]
- b) In a rotating biological contractor, explain how the slime growth (biomass) on the plastic media looks under (i) normal conditions, and (ii) abnormal conditions? [8]
- OR
- a) Briefly describe the different types of fixed film biological process for waste water treatment? [8]
- b) What are Aerated lagoons? Discuss the principle, advantages and disadvantages of aerated lagoons. [8]

### **SECTION - II**

- Q4)** a) Draw a schematic diagram for the process flow of waste water treatment. [8]
- b) What is neutralization? Why is it done in waste water treatment? [8]
- OR
- a) Discuss the treatment methods commonly used for distillery effluent. [8]
- b) With the help of a neat sketch discuss the working of grit chamber. [8]
- Q5)** Write short notes on ANY TWO : [16]
- a) Characteristics of Tannery effluent.
  - b) Hazardous wastes.
  - c) Sludge disposal.
  - d) Waste minimization.
- Q6)** a) With the help of a neat sketch describe the process of land farming. Discuss the applications of land farming. [9]
- b) How is composting done? What are its applications in waste management? [9]

OR

Compare and Contrast ANY THREE :

[18]

- a) Ex-situ and In-situ Bioremediation
- b) Biostimulation and Engineered bioremediation
- c) Bioventing and Bioaugmentation
- d) Bioremediation and Phytoremediation
- e) Suspended and Fixed film bioreactors





**P1280**

**[3664] - 367**

**B.E. (Biotechnology) - Final Year  
PHARMACEUTICAL BIOTECHNOLOGY  
(2003 Course) (416281) (Sem. - 1) (Elective - I)**

*Time : 3 Hours]*

*[Max. Marks:100*

*Instructions to the candidates:*

- 1) Section I and II are compulsory and have to be attended on different answer sheets which will be provided.*
- 2) At the end of the questions the numbers in the parenthesis indicates marks.*
- 3) Answer what is asked for. Draw neat, clean and labeled diagram at appropriate places.*

**SECTION - I**

**Q1)** Classify routes of drug administration with example of dosage form. Classify various tablets and discuss in detail about different modify release dosage forms. **[18]**

OR

**Q2)** Discuss in detail five evaluation tests for tablet dosage form. **[18]**

**Q3)** Derive  $C_{max}$ ,  $t_{max}$ ,  $K_a$  and  $K_E$  for oral drug administration. Drug follows one compartment model. **[16]**

OR

**Q4)** Discuss bioavailability and bioequivalence. **[16]**

**Q5)** Classify four important classes of receptors. Discuss these in detail. **[16]**

OR

**Q6)** Write short notes on : **[16]**

- a) Bioassay
- b) Bioavailability
- c) Tachyphylaxis and desensitization.

**P.T.O.**

## **SECTION - II**

**Q7)** Discuss drug induced mutagenesis and carcinogenesis. **[18]**

OR

**Q8)** Discuss allergic reactions induced by drugs. Discuss the first-line of treatment in drug toxicity. **[18]**

**Q9)** Discuss in detail physicochemical parameters useful during drug discovery process. **[16]**

OR

**Q10)** Write about the clinical stages a research molecule has to undergo to finally reach the market. **[16]**

**Q11)** Enlist schedules given in Drug and Cosmetic Act. Define drug, adulterated drug, spurious drug. **[16]**

OR

**Q12)** Enlist biological methods presented in the Indian Pharmacopoeia 2007. Discuss any four of these biological methods. **[16]**



Total No. of Questions : 12]

[Total No. of Pages : 3

**P1283**

**[3664]-317**

**B.E. (Petroleum)**

**OIL WELL DRILLING ENGINEERING**

**(2003 Course) (New)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) Answer Q. no. 1 or Q. no. 2, Q. no. 3 or Q. no. 4, Q. no. 5 or Q. no. 6 from Section-I and Q. no. 7 or Q. no. 8, Q. no. 9 or Q. no. 10, Q. no. 11 or Q. no. 12 from Section - II.
- 2) Answers to the two sections should 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) To achieve the basic functions of drilling fluids; which side effects or hole problems must be minimized? List at least six. [6]
- b) What is well planning? Write drilling cost formula and explain with equations, how drilling cost predictions are useful in well planning. [12]

OR

- Q2)** Write a short note on : [18]
- a) Top Drive.
  - b) Journal Angles in Roller Cone Bits.
  - c) Toolface orientation.
  - d) Preventing stuck pipe and procedure to remove stuck pipe.
- Q3)** a) A 12 ppg mud is being circulated at 400 gpm. The 5.0 in drillpipe has an internal diameter of 4.33 inch and the drill collars have an ID of 2.5 inch. The bit has a diameter of 9.875 inch. Calculate the average velocity in the [8]
- i) Drill pipe.
  - ii) Drill collars.
  - iii) Annulus opp. to drill pipe in ft/s.
- b) Describe in detail the overall factors affecting rig hydraulics program. Also write the general objectives of mud hydraulics to be designed for a rig. [8]

**P.T.O.**

OR

- Q4)** a) Determine the pressure at the bottom of the drill string, if the frictional pressure loss in the drill string is 1400 psi, the flow rate is 400 gals/min, the mud density is 12 lbm/gal, and the well depth is 10,000 ft. The internal diameter of the drill collars at the bottom of the drill string is 2.5 inch and the pressure increase developed by pump is 3000 psi. [8]
- b) Explain in detail, how the rate of penetration during drilling is affected by drilling fluid properties and hydraulic program. [8]
- Q5)** What are the objectives of directional well? Describe the different type of BHA tools used to drill the directional well. Draw the geometry of a typical directional well trajectory and give the nomenclature for this well profile. [16]

OR

- Q6)** It is desired to drill under the lake using a build and hold trajectory. Horizontal departure to the target is 2,655 ft. at a TVD of 9,650 ft. The recommended rate of build is 2.0°/100 ft. The kick off depth is 1,600 ft. Determine,
- a) The radius of curvature.
- b) The maximum inclination angle.
- c) The measured depth to the end of build.
- d) The total measured depth. [16]

### **SECTION - II**

- Q7)** a) Compute the body yield strength for 20 inch K - 55 casing with a normal wall thickness of 0.635 inch and a nominal weight per foot of 133 lbf/ft. This pipe has a minimum yield strength of 55,000 psi. Also define, [10]
- i) Pipe body yield strength.
- ii) Tension failure.
- iii) Burst failure.
- iv) Collapse failure.
- b) Describe in detail the graphical method to decide casing seat position. Draw the generic nature of pressure gradient profile for mud, formation pressure and fracture gradient. Indicate the features of the casing setting procedure on sketch. [8]

OR

- Q8)** a) Write a note on the concept of, 'combination casing'. Also write a typical casing-hole-bit size program. [8]

- b) Draw the typical behavior of formation pressure, well pressure and formation fracture resistance in a abnormally pressured well. Also explain, using this schematic sketch/graph, how the knowledge of the pressure at which formation fracture will occur at all depths in the well is essential for planning and drilling a well into a abnormally pressured formations. [10]

- Q9)** a) What do you mean by blow out? Describe the system of typical BOP stack arrangement with a schematic sketch. [8]
- b) Write the symptoms of blow out during drilling, tripping and during drill string out of the well. Explain well control method in brief, 'using two circulations'. [8]

OR

- Q10)** a) Calculate, hydrostatic pressure at the bottom of a well having TVD (True Vertical Depth) 2300m., containing 1.2gm/cc mud. [3]
- b) If the influx has entered around 6.5 inch drill collar in a 12.52 inch wellbore, calculate the height of 2m<sup>3</sup> gas influx. [4]
- c) Draw the circuit diagram and explain BOP well control unit. [9]
- Q11)** a) List five basic mechanisms of rock removal that are employed in the design of bits. [6]
- b) Draw the schematic sketch of an offshore floating vessel and demonstrate drilling operations using marine riser-BOP system. Indicate all the features. Write the purpose of flex joint, slip joint, marine riser in brief. [10]

OR

- Q12)** a) Classify different types of offshore structures and explain any one in brief. [8]
- b) Write short notes on : [8]
- i) Leak Off Test.
- ii) MWD.



**P1305**

**[3664] - 13**

**B.E. (Mechanical)**

**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 following semiconductor memories: **[8]**
- i) RAM
  - ii) ROM
  - iii) PROM
  - iv) EPROM
- b) With the help of diagram, explain the interfacing of memory to microprocessor / microcontroller. **[8]**
- c) Compare static and dynamic RAMs. **[2]**
- Q2)** a) What are different addressing modes of 8051? Give example of each mode. **[8]**
- b) Explain in detail the special function registers of 8051. **[8]**
- Q3)** a) Draw and explain the internal architecture of 8051. **[8]**
- b) Explain in detail timer/counter modes of 8051. **[8]**
- Q4)** a) How data transmission and reception is achieved using RS232C? Also explain RS232C standards in detail. **[10]**
- b) Explain bit oriented instructions in 8051. **[6]**

**P.T.O.**

- Q5)** a) What are different performance parameters of ADC? Explain in detail.[8]  
b) With the help of diagram, explain direct-conversion ADC. [8]

## **SECTION - II**

- Q6)** a) Explain different components of data acquisition system. Also explain a typical application of DAS. [10]  
b) What are different types of DACs? Explain any one in detail. [8]
- Q7)** a) Define PLC and state features of PLC. Explain architecture of PLC with block diagram. [10]  
b) What are the operating modes of PLC? Explain the PLC operating cycle.[6]
- Q8)** a) Design a cooling system using PLC. Draw necessary PLC ladder diagram.[10]  
b) Sketch following common notations for PLC ladder diagram. [6]  
i) Double pole push button.  
ii) Fuse.  
iii) Motor.
- Q9)** a) What is smart instrument? Explain the role of microprocessor in smart instrument with suitable example. [10]  
b) Explain different types of input devices of PLC. [6]
- Q10)**a) Design a weighing machine using microprocessor. Draw the necessary block diagram and flow chart. [12]  
b) Enlist the different specifications of differential pressure transmitter. [4]



**P1307**

**[3664]-54**

**B.E. (Electronics)**

**MEDICAL ELECTRONICS - I**

**(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.*

**SECTION - I**

- Q1)** a) Draw the block diagram of ECG machine? Explain the working of each block in detail. **[8]**
- b) Name the different types of Electrodes used for measurement of ECG. Explain any two in detail. **[8]**
- Q2)** a) Explain any two electrodes used for EEG and EMG. **[8]**
- b) Draw the set-up to measure the Blood pressure. Explain the direct method to measure the Blood pressure. **[8]**
- Q3)** a) Which are the different method to measure the blood flow rate? Explain any one with necessary diagram. **[8]**
- b) Draw and explain the concept of Einthoven triangle. **[8]**
- Q4)** a) Explain the ECG system for stress testing. **[8]**
- b) What is pacemaker? Explain the ventricular synchronous demand pacemaker. **[8]**
- Q5)** Write short notes on : **[18]**
- a) Programmable pacemaker.
  - b) ECG Recorder.
  - c) Phonocardiography.



## **SECTION - II**

- Q6)** a) What is Defibrillators? Explain with necessary diagram the DC-Defibrillation. [8]  
b) Explain the blood cell counter by Coulter method. [8]
- Q7)** a) Draw the set-up required for flame photometer? Explain its working with its standard reading. [8]  
b) Describe the application of spectrophotometer with necessary diagram.[8]
- Q8)** a) Draw the block diagram of complete blood gas analyser. Explain the function of each block in short. [8]  
b) What is X-rays? Draw the block diagram of X-ray machine and explain each block in detail? [8]
- Q9)** a) Explain the working of image intensifier with neat diagram. [8]  
b) What are the different methods for reducing the leakage current. [8]
- Q10)** Write short notes on : [18]  
a) Patient Safety.  
b) Potentiometric Recorder.  
c) Non-fade CRO.



P1308

[3004]-03

**B.E. (Industrial Electronics)**  
**DATA COMMUNICATION**  
**(1997 Course) (Elective - I) (404222)**

[Max. Marks : 100]

[Time : 3 Hours]

Instructions to the candidates:

- 1) Answers any three questions from each section.
- 2) Answers to the two sections should 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 cable modem technology with the help of diagram. [8]  
b) Compare packet switching with circuit switching. [6]  
c) Describe the factors on which achievable data rate limits are dependent. [4]
- Q2) a) Explain HDLC. Also explain different HDLC frames with their formats. [8]  
b) Describe time division multiplexing in detail. Also state the specification of different T lines. [8]
- Q3) a) Explain point-to-point protocol. Also discuss the different sub-protocols of PPP along with the frame format. [8]  
b) What do you mean by congestion? Discuss the open loop and closed loop congestion control mechanism. [8]
- Q4) a) Describe CSMA/CD. What are the advantages of CSMA/CD over CSMA? [10]  
b) Compare bridge, switch and hub. [6]



- Q10) a) Write short notes on : [10]  
 i) B-ISDN.  
 ii) Gigabit Ethernet.
- b) Explain light emitter and detector with neat diagram. [6]

- Q9) a) Describe the token passing access used in FDDI with an appropriate example. [8]  
 b) Discuss various losses occurring in fiber optic communication. [8]

- Q8) a) What is SONET? What are Synchronous Transport Signals? Also explain SONET frames and various SONET devices. [8]  
 b) Discuss the principle used in transmitting light waves through a fiber optic cable. [8]

- Q7) a) Describe in detail ISDN transmission structure. [8]  
 b) Explain the function of e-mail system. [8]

- Q6) a) Describe OSI model in detail. [10]  
 b) What is socket? Explain various socket primitives used in client-server interaction. [8]

## SECTION - II

- c) State types of wide area networks. [2]  
 b) Compare R2322 and R2482 specifications. [6]  
 Also discuss advantages and disadvantages of each topology.

- Q5) a) Explain the following network topologies with suitable examples. [8]  
 i) Star.  
 ii) Ring.  
 iii) Bus.  
 iv) Hierarchical.

**P1312**

**[3664]-140**

**B.E. (Mech.)**

**AUTOMOBILE ENGINEERING (Elective - II)**

**(2003 Course) (402050) (Theory)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) Answer three questions from section-I and three questions from section-II.*
- 2) Answers to the two sections should be written in separate books.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Figures to the right indicate full marks.*
- 5) 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 with neat sketches the following lay outs **[8]**

- i) Front Engine - Rear Wheel Drive.
- ii) Four wheel drive.

Explain the advantages and disadvantages of each layout.

b) Explain with sketch the diaphragm spring type clutch; covering the advantages and characteristic curves comparing with coil spring type clutch. **[8]**

OR

**Q2)** a) What are the requirements of good clutch? **[4]**

b) Discuss classification of Automobiles. **[4]**

c) Explain the fluid coupling with sketch covering the advantages/disadvantages and characteristics. **[8]**

**Q3)** a) Explain the working of constant Mesh Gear Box with suitable sketch. What are its advantages/disadvantages compared to other type of gear boxes. **[8]**

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

- i) Rolling Resistance.
- ii) Air Resistance.
- iii) Gradient Resistance.
- iv) Draw bar pull.

**P.T.O.**

OR

**Q4)** A motor vehicle weighs 7975.5N and its engine develops 14.7kW at 2500 RPM. At this engine speed, the road speed of the car on the top gear is 64.37km/hr. Bottom gear reduction is 3.5 : 1 and the transmission efficiency is 88% on top gear and 80% on bottom gear. The diameter of the tyres is 0.762m and the projected frontal area of the vehicle is 1.116m<sup>2</sup>. The coefficient of air resistance is 0.0314 N-hr<sup>2</sup>/km<sup>2</sup>-m<sup>2</sup>.  $R = kAV^2$  where R is resistance in N, K is coefficient of resistance, A is the frontal area in m<sup>2</sup>, V is the vehicle speed in km/hr. The coefficient of rolling resistance is 0.023. Calculate :

- a) Speed of car on bottom gear.
- b) Tractive effort available at the wheels on top and bottom gear.
- c) Gradient which car can climb on bottom gear.
- d) The tractive force at the wheels required to start-up the car on the level and attain a speed of 48.28 km/hr in 10 second. (Average air resistance may be taken as half the maximum and accelerating force to vanish at 48.28 km/hr speed. [16]

- Q5)** a) Discuss Air Suspension with a neat sketch. What are the advantages/disadvantages of this suspension? [10]
- b) Write a short note on 'Torsion Bar' with a neat sketch. [8]

OR

- Q6)** Write short notes on any three : [18]
- a) Shock Absorber.
  - b) Preventive maintenance Vs breakdown maintenance.
  - c) Leaf spring.
  - d) Helper spring.

### **SECTION - II**

- Q7)** a) Name the different types of steering Gear Boxes. Explain the most popular type with a neat sketch. [8]
- b) Discuss steering geometry with neat sketches. Covering their effects on vehicle performance. [8]

OR

- Q8)** a) Draw cross-section of an automobile tyre and show on it various constructional features. [4]  
b) How are the tyres classified and rated? [4]  
c) Discuss in detail various factors affecting tyre life. [8]
- Q9)** a) Compare Torque Tube Drive and Hotchkiss Drive in detail with sketches. [8]  
b) Explain the function construction and working of differential with a neat sketch. [8]

OR

- Q10)** Explain the following :  
a) Slip joint and universal joint. [8]  
b) Various forces and torques experienced by Rear Axle. [8]
- Q11)** a) What are the parameters which affect vehicle stopping distance when brakes are applied. [5]  
b) Discuss with a sketch the working of Hydraulic Brakes, covering the advantages/disadvantages. [8]  
c) Write a short note on Brake Fluid Characteristics. [5]

OR

- Q12)** Write short notes on any three : [18]  
a) Automobile Battery.  
b) Dash Board Instruments.  
c) Vehicle starting system.  
d) Vehicle charging system.



**P1313**

**[3664]-146**

**B.E. (Mechanical S/W)  
AUTOMOBILE ENGINEERING  
(2003 Course) (Elective)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:-*

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

**SECTION - I**

- Q1)** a) What are the main components of automobile? Describe all of them in brief. [8]
- b) Explain with sketch the rear engine and rear wheel drive layout. What are the advantages and disadvantages of this layout over the conventional layout of automobile. [8]

OR

- Q2)** a) Discuss with sketch the construction and working of single plate clutch. [8]
- b) Discuss the causes and remedies for the trouble : [8]
- i) Clutch drag.
  - ii) Clutch judder.
- Q3)** a) Discuss with sketch the construction and working of sliding mesh type of gear box. [8]
- b) Write a short note on 'Lubrication of Gear Box'. [4]
- c) Explain the following : [4]
- i) Draw bar pull.
  - ii) Transmission Efficiency.

**P.T.O.**

OR

**Q4)** A Leyland truck has a gross vehicle weight of 89026 N. Engine power is 77.3 kW at governed speed of 2400 RPM and maximum torque is 345.8 Nm at 1400 RPM. Rear Axle Ratio is 6.166:1. Fourth speed reduction ratio in transmission is 1.605:1. Drive line losses amount to 10.7 kW at 2400 RPM and 6.3 kW at 1400 RPM. Effective wheel diameter is 0.95 meter. Frontal area of truck is 6.95 m<sup>2</sup>.

Calculate the grades which the vehicle can climb in fourth gear.

- a) At governed engine speed.
- b) At speed of maximum torque in the equation

$$R = k_r W + k_a A V^2$$

where  $k_r = 0.014$  and  $k_a = 0.0462$  where  $V$  in km/hr. [16]

- Q5)**
- a) Discuss leaf spring suspension with a neat sketch. [7]
  - b) Discuss the construction and working of shock absorber with a neat sketch. [7]
  - c) What is sprung weight and unsprung weight? Why unsprung weight is kept as low as possible? [4]

OR

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

- a) Torsion Bar.
- b) Helper spring.
- c) Causes and Remedies for trouble 'rough ride'.
- d) Air suspension.

## **SECTION - II**

- Q7)**
- a) Describe with help of simple diagram the general arrangement of the steering system. [8]
  - b) State different types of wheel rims used in auto-mobiles. Give Disc wheel Nomenclature. [8]

OR



- Q8)** a) Describe with help of a neat sketch, the working of power steering unit used in modern automobiles. [8]  
b) Explain the following : [8]  
i) Trade pattern used in tyres.  
ii) Wheel balancing.

- Q9)** a) Describe principle and working of a differential, used in vehicles, state clearly purpose of using it in automobiles. [8]  
b) Differentiate between cross type and ball & trunnion type universal joint. Explain briefly construction of the propeller shaft. [8]

OR

- Q10)** a) Explain the construction and operation of any one double reduction axle used in final drive. [8]  
b) Describe and explain with help of sketch wheel cylinder and its construction used in braking systems. [8]

- Q11)** a) Explain with sketch principle and working of air operated brake system. [8]  
b) Draw a diagram of simple two pole shunt wound generator and explain its construction and working. [10]

OR

- Q12)** Write short note on following (any three) : [18]  
a) Principle of CUTOFF used in Automotive electrical system.  
b) Automotive lamps.  
c) Wind screen wiper.  
d) Brake fluid.  
e) Maintenance schedule of automobile.



**P1314**

**[3664]-223**

**B.E. (Electronics)**

**REAL TIME OPERATING SYSTEMS**

**(2003 Course) (404212) (Elective - II)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answers to 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 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) What is context switching? Give suitable example. [6]  
b) How priorities are assigned to the task in multitasking system? [5]  
c) Explain how interrupts are responding in systems. Define interrupt latency interrupt response and interrupt recovery. [6]

OR

- Q2)** a) What is critical section? Give suitable example. [6]  
b) Compare preemptive and non preemptive Kernel. Explore the application of both. [5]  
c) What is dead lock? Give suitable example. [6]
- Q3)** a) What are the data structures and variables used to handle priority of task for scheduling? [6]  
b) What is statistic task? How it is initialized. [5]  
c) What is event in uCOSII. Explain ECB data structure? [6]

OR

- Q4)** a) Draw and explain state diagram of task. Show various conditions for transitions. [6]  
b) Explain and describe TCB data structure in uCOSII. [6]  
c) How to set and query on system time? [5]

**P.T.O.**

- Q5)** a) Enlist different MUTEX services. What configuration constants provided to configure MUTEX? [5]  
b) Explain Event Flag Group data structure OS \_ FLAG \_ GRP and OS \_ FLAG \_ NODE. [6]  
c) What is relationship between Task, Mutex and ISR in uCOSII? [5]

OR

- Q6)** a) What is relationship between Task, ISR and Semaphore in uCOSII?[6]  
b) Write short note on any two : [10]  
i) Semaphore management in uCOSII.  
ii) Mutual exclusion semaphore in uCOSII.  
iii) Event flag management in uCOSII.

### **SECTION - II**

- Q7)** a) How to use Mailbox as binary semaphore. Explain by using pseudo code. [6]  
b) What is relationship between Task, ISR and Message Queue in uCOSII. [5]  
c) What are Message Queue services in uCOSII? How Message Queue services enabled/disabled in uCOSII. [6]

OR

- Q8)** a) What is relationship between tasks, ISR and Mailbox in uCOSII? [5]  
b) How to use Message Queue as counting semaphore, use pseudo code?[6]  
c) Explain Mailbox services and configuration in uCOSII. [6]  
**Q9)** a) Explain uCOSII hardware and software architecture. [6]  
b) Explain memory control block in uCOSII. [6]  
c) Explain the system requirements for porting of uCOSII. [5]

OR

- Q10)** a) What is the need of memory management services by OS as compare to compiler function? [6]  
b) Explain memory management services provided in uCOSII. [5]  
c) What is memory partition and multiple memory partition, explain. [6]

**Q11)** Assume appropriate data wherever necessary and consider the design and implementation of ‘Temperature Controller’ by using uCOSII.

- a) Enlist the performance parameters. [4]
- b) State the constraints and assign priorities to the defined tasks. [4]
- c) Enlist the API required to be used for implementation. [4]
- d) Write application code for the above system. [4]

OR

**Q12)** Assume appropriate data wherever necessary and consider the design and implementation of “Chocolate Vending Machine’ by using uCOSII.

- a) Enlist the performance parameters. [4]
- b) State the constraints and assign priorities to the defined tasks. [4]
- c) Enlist the API required to be used for implementation. [4]
- d) Write application code for the above system. [4]



**P1315**

**[3664] - 280**  
**B.E. (Chemical)**  
**CATALYSIS**  
**(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 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) Explain the mechanism of homogeneous catalysis with suitable examples. [10]
- b) Explain the significance of catalyst activity and turnover number in heterogeneous catalysis. [8]

OR

- Q2)** a) Give a brief account of reaction feasibility with respect to activation energy and temperature in catalysis. [8]
- b) Write a note on various processes in petroleum refining explaining the role of catalysts. [10]
- Q3)** a) Derive Langmuir - Hinshelwood model in engineering kinetics. [6]
- b) Kinetic experiments on the solid catalyzed reaction  $A \rightarrow 3R$  are conducted at 8 atm and 700°C in a basket type mixed reactor of 960 cm<sup>3</sup> volume and containing 1 g of catalyst of diameter  $d_p = 3$  mm. Feed consisting of pure 'A' is introduced at various rates into the reactor. Partial pressure of 'A' in the exit stream is measured for each feed rate. Find a rate equation to represent the rate of reaction on catalyst of this size, using the following results : [10]

**P.T.O.**

Feed rate liter/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 each term in detail : **[6]**

- i) Film resistance as rate controlling step
- ii) Pore diffusion controlling the reaction.

b) The catalytic reaction  $A \rightarrow 4R$  is run at 4 atm and 215°C in a plug flow reactor which contains 12 g of catalyst and uses a feed consisting of the partially converted product of 0.4 liter/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 : **[10]**

Run	1	2	3	4
$C_{A,in}$ (mol/liter)	0.100	0.080	0.060	0.040
$C_{A,out}$ (mol/liter)	0.084	0.070	0.055	0.038

**Q5) a)** Compare and contrast alumina and silica as catalyst support/carrier. **[6]**

b) The following kinetic data on the reaction  $A \rightarrow R$  are obtained in an experimental packed bed reactor using various amounts of catalyst and a fixed feed rate  $F_{A0} = 10$  kmol/hr.

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 35% conversion.
- ii) In designing a large packed bed reactor with feed rate  $F_{A0} = 400$  kmol/hr, how much catalyst would be needed for 35% 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)** Write a brief note on adsorption on catalysts. **[6]**

b) The second order reaction  $A \rightarrow R$  is studied in a recycle reactor with very large recycle ratio. Following data are recorded :

Void volume of reactor = 1 liter

Weight of catalyst used = 3 g

Feed to the reactor:  $C_{A0} = 2$  mol/liter,  $V_0 = 1$  liter/hr

Exit stream condition:  $C_{A,out} = 0.5$  mol/liter

- i) Find the rate constant for this reaction.
- ii) How much catalyst is needed in a packed bed reactor for 80% conversion of 1000 liter/hr of feed of concentration  $C_{A0} = 1 \text{ mol/liter}$ ? [10]

## SECTION - II

- Q7)** a) Derive mathematical equation for determining catalyst surface area by BET method. [8]
- b) Outline the method of preparation of metal catalysts. State the role of each step in influencing the properties of catalyst. [8]

OR

- Q8)** a) Outline the impregnation method of catalyst preparation. State the role of each step in influencing the properties of catalyst. [8]
- b) Experimental findings of a solid porous catalyst indicate following data : Solid density = 3.567 g/cc, apparent density = 1.745 g/cc, bulk density = 0.823 g/cc. BET method carried out with oxygen at  $-183^\circ\text{C}$  suggest that the intercept of BET plot is  $0.40 \times 10^{-3} \text{ cm}^3$  and the slope is  $13.2 \times 10^{-3} \text{ cm}^3$ . If density of liquid oxygen at  $-183^\circ\text{C}$  is 1.14 g/cc, find [8]
- i) Surface area per g of catalyst.
  - ii) Pore volume per g of catalyst.
  - iii) Mean pore radius.

- Q9)** a) Give a full account of Zeolites and their importance as catalysts in various chemical reactions. [8]
- b) What is the relative activity and the degree of inhibition caused by a competitive inhibitor when  $[S] = K_m$  and  $[I] = K_i$ ? [10]

OR

- Q10)** a) Discuss shape selectivity of Zeolites in chemical reactions and otherwise. [8]
- b) Estimate 'k', the first order rate constant for an enzyme preparation with a  $V_{\max}$  of  $4.6 \mu\text{mol}/(\text{lit}.\text{min})$  under the given experimental conditions.  $K_m = 2 \times 10^{-6} \text{ M}$ . [10]

- Q11)** An enzyme has a  $K_m$  of  $4.7 \times 10^{-5} \text{ M}$ . If the  $V_{\max}$  of the preparation is  $22 \mu\text{moles} / (\text{lit}.\text{min})$ , what velocity would be observed in the presence of  $2 \times 10^{-4} \text{ M}$  substrate and  $5 \times 10^{-4} \text{ M}$  of (i) a competitive inhibitor, (ii) a non-competitive inhibitor. What is the degree of inhibition in these cases?  $K_i$  is  $3 \times 10^{-4} \text{ M}$ . [16]

OR

**Q12)** An enzyme was assayed at an initial substrate concentration of  $10^{-5}$  M. The  $K_m$  for the substrate is  $2 \times 10^{-5}$  M. At the end of 1 min, 2% of the substrate has been converted to the product. (i) What percent of the substrate will be converted to the product at the end of 3 min? What would be the product and substrate concentrations after 3 min? (ii) If the initial substrate concentration were  $10^{-6}$  M, what percent of the substrate will be converted to the product after 3 min? (iii) What is the maximum attainable velocity ' $V_{max}$ ' with the enzyme concentration used? (iv) At about what substrate concentration will ' $V_{max}$ ' be observed? **[16]**





**P1317**

**[3664]-293**

**B.E. (Polymer)**

**POLYMER STRUCTURE AND PROPERTY RELATIONSHIP**

**(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) Explain the reason for variation in density and melting point of PP, LDPE & HDPE. [5]
- b) Write a short note on how following factors are affected due to chemical composition of polymers [8]
- i) Density.
  - ii) Flammability.
  - iii) Charring.
  - iv) Moisture absorption.
  - v) Weatherability.
- c) Out of N - 66 & N - 6, which absorb more moisture and why? [3]
- d) What is an isocyanate linkage? [2]

OR

- Q2)** a) Explain the bonds carbon atom makes with other atoms & thus the properties. [8]
- b) Write a short note on LCP. [5]
- c) Write a note on the bonds formed by oxygen atom & its effect on properties. [5]

**P.T.O.**

- Q3)** a) Why inspite of having amide linkages, PU have low melting point than polyamide. [3]
- b) Write a short note on adhesion. [5]
- c) What modifications can be suggested to soften the brittle nature of PS. [5]
- d) What factors will give any polymer  $\uparrow$  temperature stability. [3]

OR

- Q4)** a) Methyl group is present in Natural Rubber as well as PP. Explain its effect on both. [3]
- b) Is PVC amorphous or crystalline. Why PVC has high Tg than PVDC. [3]
- c) Explain surface tension and role of chemical groups in bonding enhancement. [7]
- d) Explain why modulus of Nylon is very high than polyolefins. [3]
- Q5)** a) Give the role of stabilizers and antioxidants when added to polymer, and how do they function. [6]
- b) What is meaning of NMWD & BMWD. How can they be found out? In case of blow molding which of the two will give better result & why? [7]
- c) Give effect of plasticizer on polymers. [3]

OR

- Q6)** a) Explain following terms : [12]
- i) Dielectric nature.
  - ii) Dielectric constant.
  - iii) Capacitance.
  - iv) Dielectric loss and
  - v) Dissipation factor.
- Also explain what all parameters have effect on dielectric constant.
- b) Why presence of halogens makes a polymer selfextinguishable. [4]

## **SECTION - II**

- Q7)** a) With egs. show what is the effect of following factors on flexibility of polymer (any 3) [6]
- i) Branching.
  - ii) Tacticity.
  - iii) Polarity.
  - iv) Side groups.
- b) What is meant by molecular flexibility. Explain what is potential energy barrier for rotation. [6]
- c) Give the effect of lengthening of n-alkyl groups on steric hinderance giving egs. [6]

OR

- Q8)** a) With egs. give the effect of structure on freedom of rotation. [10]
- b) Give the role of tensile strength with molecular flexibility. Also give its effect w.r.t. modulus and percentage elongation. [5]
- c) What is 1<sup>st</sup> & 2<sup>nd</sup> order phase transition. [3]
- Q9)** a) What are the factors that favour crystallisation in a polymer. [8]
- b) Explain terms like fringed micelle model, lamella & spherulite. [5]
- c) Explain role of symmetry towards crystallisation. [3]

OR

- Q10)** a) Explain the effect of crystallinity on processing techniques like : [10]
- i) Injection molding.
  - ii) Thermoforming.
  - iii) Heat sealing.
  - iv) Orientation &
  - v) Fiber forming.
- b) What is the difference between crystallisation and orientation. Do both the processes lead to same effect on polymer properties. Explain [6]

- Q11)**a) What is meant by intermolecular bonding & significance of length & strength of primary & secondary covalent bonds. [5]
- b) Explain all those parameters that result/depend on eventually breaking of primary and secondary covalent bonds. [4]
- c) Explain why larger and heavier atoms and molecules exhibit stronger dispersion forces than small & lighter ones. [4]
- d) Write a short note on H-bonding. [3]

OR

- Q12)**a) What is meant by CED and how can it be found. [5]
- b) Explain different types of forces that lead to stronger inter molecular forces. Explain any one in detail. [8]
- c) Explain with eg. the fact that shape of molecules affect the magnitude of dispersion forces and thus properties. [3]



**P1321**

**[3664]-305**

**B.E. (Polymer)**

**FIBER TECHNOLOGY**

**(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) Explain what is meant by natural source & synthetic source of obtaining fibers. Give advantages of fibers obtained by both sources. **[10]**
- b) Explain melt spinning process with diagram and give limitation of this process. Give the list of polymers that can be obtained in fiber form by melt spinning. **[8]**

OR

- Q2)** a) Explain solution spinning method; and explain dry & wet spinning with diagrams. **[10]**
- b) Explain H4S spinning process with its advantages. **[8]**
- Q3)** a) What are the raw materials used to produce synthetic fibers. **[8]**
- b) Give the list of fibers that can be obtained with dry jet wet spinning along with the method of obtaining them. **[8]**

OR

**P.T.O.**

- Q4)** a) What are the factors affecting formation of DEG in PET and how can it be controlled. [7]  
b) What all side reactions are formed during PET synthesis and what are their drawbacks. [9]
- Q5)** a) Why is the process of texturing called as false twist process. Explain the process with neat diagram. [10]  
b) Why multiple stages of stretching and drawing is given to fibers. [6]

OR

- Q6)** a) With diagram explain how spin finish is applied. Give the composition of spin finish. [8]  
b) Other than false twist process, which all techniques can be used for texturing. [8]

## **SECTION - II**

- Q7)** a) Explain the structural changes taking place during spinning and drawing. [8]  
b) What is the importance of heat setting and how is it done. [5]  
c) Write short note on 'Saram' fibers. [5]

OR

- Q8)** a) What are staple fibers and how are they obtained. What is the difference between staple fiber yarn & filament yarn. [8]  
b) Are the properties of fiber same as to the polymer from which it is obtained. Justify. [5]  
c) Write a short note on 'Lycra'. [5]
- Q9)** a) Give the different ways fiber can be man coloured. Is there any other technique of coloration of fabric other than man coloration. [10]  
b) What is meant by high temperature dyeing and thermosol process. [6]

OR

- Q10)**a) What is meant by disperse dyeing. [4]  
b) Explain what is meant by acid and base dye for fibers. [6]  
c) Give pictorial representation to show simultaneous and sequential draw texturing. [6]

- Q11)**a) Why was it necessary to modify synthetic fibers and what are the methods used to do so. [8]  
b) Write a short note on “tire cord”, in regards use of fibers in its making. [4]  
c) Apart from making textiles, list all the other applications where fiber can be made use with or without modification. [4]

OR

- Q12)**a) Explain the method of preparing hydrophilic acrylic fibers. [8]  
b) What are bicomponent acrylic fibers and what are their advantages. [8]



**[3664]-313**

**B.E. (Petroleum Engineering)**

**APPLIED COMPUTATIONAL TECHNIQUES**

**(2003 Course) (Elective)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) Answers to the two sections should be written in separate answer books.*
- 2) Attempt any 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 electronic pocket calculator is allowed.*
- 6) Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) Find the roots of the equation  $x^4 + 3x^2 + 2x - 3 = 0$ , using Regula Falsi method. [6]
- b) Find the roots of the equation using  $x^2 + xy = 10$ ,  $y + 3xy^2 = 57$  by Newton Raphson method. [6]
- c) Give one example of linear and non linear equations in Petroleum Engineering. What do the roots represent? [4]

**Q2)** Given the differential equation,  $y' = 2x^2y + x$ ,  $y(0) = 4$ ,  $h = 0.1$

- a) Using Runge Kutta 4, find  $y(0.1)$ . [6]
- b) Using Adams Bashforth Predictor Corrector Method find  $y(0.1)$ . [8]
- c) Give two examples of differential equations in Petroleum Engineering. [2]

**Q3)** Write a detailed note on software package in Petroleum Engineering Reservoir Simulation, with reference to data required, equations used. [18]

**P.T.O.**



- Q4)** a) Write an algorithm for solving an integration using trapezoidal rule.[7]  
 b) Write an algorithm for solving an integration using Gauss Quadrature. [7]  
 c) Give two examples of numerical integration in Petroleum Engineering.[2]

**Q5)** Do only one iteration for the problem below and use (1,1,1) as the starting value.

For the system of equations  $3x - 0.1y - 0.2z = 0$ ,  $0.1x - 7y - 0.3z = 6$ ,  $0.3x - 0.2y + 10z = -2$ , find  $x, y, z$  using SOR method and LU Decomposition method  $w = 1.1$ . [16]

### **SECTION - II**

- Q6)** a) Explain database management and its application. [14]  
 b) What is spatial contiguity analysis? [4]

- Q7)** a) Explain networking and various types of networks. [8]  
 b) Explain with two examples an application of networking in Petroleum field. [8]

- Q8)** a) Explain fuzzy logic, genetic algorithm and AI in Petroleum Industry.[8]  
 b) Explain object oriented programming. [8]

- Q9)** a) Explain the various forms of Inheritance and write a programme for the following problem using Inheritance. Create class PI containing variables  $q$ ,  $Pr$ , and  $Pwf$  and find  $J$ . Inherit the class PI.  $J = q/(Pr - Pwf)$ ,  $FE = (Pr - Pwf - dp)/(Pr - Pwf)$ . [10]  
 b) Explain the concept of classes. [6]

- Q10)**a) Explain the use of Petroleum Engineering Software in real time oil industry. [10]  
 b) Draw the flow chart to explain any one Petroleum Engineering Software. [6]



**P1327**

**[3664]-334**

**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) Prove there exist two irrational numbers X and Y such that  $X^Y$  is rational. [8]
- b) Prove by mathematical induction “All horses are the same color”. [8]
- c) State whether the function is CORRECT or INCORRECT and justify your answer :  $10n^2 + 4n + 2 = O(n^2)$ . [2]

OR

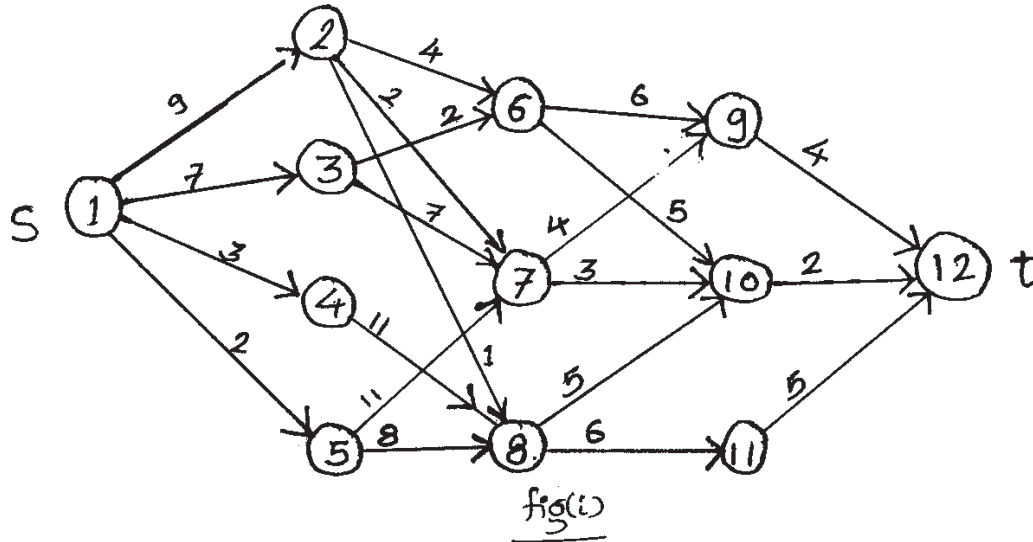
- Q2)** a) Easter Sunday is in principle the first Sunday after the full moon after the spring equinox. Is this rule sufficiently precise to be called an algorithm? Justify your answer. [6]
- b) Explain building a heap and maintaining the heap property. [6]
- c) Recursive permutation generator  
$$A(x_0) = (\dots(a_n x_0 + a_{n-1})x_0 + \dots a_1)x_0 + a_0$$
  
Write an algorithm to evaluate a polynomial using Horner's rule. [6]
- Q3)** a) Write an algorithm for recursively finding the maximum and minimum of the set of elements  $\{a(i), a(i + 1), \dots, a(j)\}$ . [8]
- b) Prove GREEDY-ACTIVITY-SELECTOR always produces solutions of maximum size for the activity-selection problem. [8]

**P.T.O.**

OR

**Q4) a)** Let  $n = 5$ ,  $(p_1, \dots, p_5) = (20, 15, 10, 5, 1)$   
and  $(d_1, d_2, \dots, d_5) = (2, 2, 2, 3, 3)$ . Find the optimal solution with  
prove it. [8]

**b)** Find a minimum cost path from  $s$  to  $t$  in the multistage graph of fig(i). [8]



**Q5) a)** Define the following : [8]

- i) Principle of optimality.
- ii) Explicit and implicit constraints.
- iii) Asymptotic notations.
- iv) Amortized analysis.

**b)** Consider the following instance of the Knapsack Problem :  
 $n = 3$ ,  $m = 20$ ,  $(P_1, P_2, P_3) = (25, 24, 15)$  and  $(W_1, W_2, W_3) = (18, 15, 10)$ . [8]

OR

**Q6) a)** Write an algorithm for finding a minimum cost binary search tree.  
And show its computing time is  $O(n^2)$ . [8]

**b)** Prove if  $l_1 \leq l_2 \leq \dots \leq l_n$ , then the ordering  $i_j = j$ ,  $1 \leq j \leq n$ ,  
Minimizes

$$\sum_{k=1}^N \sum_{j=1}^k l_{ij}$$

Over all possible permutations of  $i_j$ . [8]

## SECTION - II

- Q7)** a) Write an recursive Backtracking algorithm for sum of subsets problem. [8]  
b) Explain Backtracking solution to the 0/1 knapsack problem. [8]

OR

- Q8)** a) Explain in detail model for parallel computation. [8]  
b) Prove a sorting network with  $n$  inputs correctly sorts any set of values on its input if and only if correctly sorts all the  $2^n$  input vector consisting only of zeros and ones. [8]
- Q9)** a) Prove the problem of determining whether a Boolean expression is satisfiable is NP complete. [8]  
b) CNF satisfiability is polynomially transformable to the clique problem. Therefore, prove the clique problem is NP-complete. [8]

OR

- Q10)** a) Prove partition  $\alpha$  the minimum finish time preemption flow shop schedule ( $m > 2$ ). [8]  
b) Prove FNS  $\alpha$  the optional code generation for level one dags on a one register machine. [8]

- Q11)** Write short notes on : [18]  
a) The 8-Queen problem.  
b) Cook's Theory.  
c) Hamiltonian cycles.

OR

- Q12)** a) Consider the following search algorithm :  
     $j = \text{any value between } 1 \text{ to } n$   
    if( $a[j] = x$ ) then  
        print "Success";  
    else print "Fails"  
Is this algorithm non-deterministic? Justify your answer. [6]  
b) Prove, if  $L1, L2 \subseteq \{0, 1\}^*$  are languages  $L1 \leq_p L2$ , then  $L2 \in P$  implies  $L1 \in P$ . [8]  
c) Explain in brief NP complete problem. [4]



Total No. of Questions : 12]

[Total No. of Pages : 3

**P1331**

**[3664]-349**

**B.E. (I.T.)**

**INFORMATION SYSTEM SECURITY**

**(2003 Course) (414441)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

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

**SECTION - I**

- Q1)** a) What are the two basic functions used in encryption algorithms? [6]  
b) What is the difference between Monoalphabetic and Polyalphabetic cipher? [6]  
c) What are the two problems with one time pad cipher? [6]

OR

- Q2)** a) Explain avalanche effect. [6]  
b) What is the difference between block and stream cipher? [6]  
c) Give examples of replay attacks. List approaches to deal with them. [6]
- Q3)** a) Show that enforcement rules of Clark-Wilson model can emulate the Biba model. [8]  
b) Explain : [8]  
i) Mandatory.  
ii) Discretionary.  
iii) Role based access controls.

OR

- Q4)** a) Discuss the role of trust in security policy. [5]  
b) Discuss availability issues in security policies. [5]  
c) Compare and contrast confidentiality Vs. integrity policies. [6]

***P.T.O.***

- Q5)** a) Compare and contrast the four modes of operation for block ciphers with respect to implementation complexity and strength of encryption. [8]  
b) Explain meet-in-the-middle attack with help of Diffie-Hellman-algorithm. [8]

OR

- Q6)** a) Does repeated application of DES strengthens the security? Why or why not? [8]  
b) What are the time and space complexities for a dictionary attack on MD5? [8]

## **SECTION - II**

- Q7)** a) What are the limitations in using “rule based system” in general and firewalls in particular for peripheral security? [6]  
b) Argue the merits and demerits of having specific servers (E-mail, web, etc) in DMZ [6]  
“Authentication protocols that use random numbers are inherently more secure than the ones that don’t use random numbers”. Substantial or reject the statement. [6]

OR

- Q8)** a) The Alpha-Beta Corporation wants to provide a notarized email service with online notaries. The requirements for notaries are the same as human notary “Public” persons.  
Identify and list the requirements for this service.  
Provide a protocol that will meet your requirements.  
Write the protocol in simple, clear and precise steps. [8]  
b) In context of IDS systems compare and contrast [10]  
i) Stateless Vs. Stateful IDS.  
ii) Rule based system Vs. adaptive systems.  
iii) Anomaly Vs. Misuse Detection.

- Q9)** a) What protocols comprise SSL? What is the difference between SSL session and SSL connection? [8]  
b) Describe Kerberos Realm. [8]

OR

- Q10)** a) Distinguish between tunnel and transport mode. [8]  
b) Define hash function, requirements of hash function and compare MD4 and MD5 algorithm. [8]

**Q11)** Write notes on (any two) :

**[16]**

- a) Vulnerability classification.
- b) IPS (Intrusion Prevention Systems).
- c) Storing and Revoking keys.
- d) PGP.

OR

**Q12)** Write notes on (any two) :

**[16]**

- a) Cookies.
- b) Penetration testing.
- c) Steganography.
- d) Digital immune system.



Total No. of Questions : 8]

[Total No. of Pages : 2

**P1332**

**[3664]-34**

**B.E. (E & TC)**

**COMMUNICATION NETWORKS**

**(404188)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should 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 FECN & BECN process in Frame Relay. [8]  
b) Explain ATM header in detail. What is B-ISDN? [8]
- Q2)** a) What is 802.x bridge? What is encapsulation in layered communication? [8]  
b) What is difference between layer 2 and layer 3 switch? Also compare Hub Vs switch. [8]
- Q3)** a) Explain character stuffing and bit stuffing in detail. [8]  
b) Explain ARQ techniques in detail? Explain the concept of “window size”. [8]
- Q4)** a) Explain CSMA/CD technique in detail? Draw and explain the frame format of IEEE 802.3. [9]  
b) Draw and explain IEEE 802.5 frame format in detail. What is FDDI system? [9]

**SECTION - II**

- Q5)** a) Define Unicast, Broadcast and Multicast Network. Explain use of ARP & RARP in LAN communication. [8]  
b) What is MTU? Compare IPV4 Vs IPV6. [8]

***P.T.O.***



- Q6)** a) Explain three way transport layer connection establishing and release procedure in detail. List out socket primitives used in socket communications. [8]  
 b) What is port address? Give example of TCP and UDP port address for different applications? Compare TCP Vs UDP in detail. [8]
- Q7)** a) Messages independently arrive to a system at the rate of 10 per minute. Their lengths are exponentially distributed with an average of 3600 characters. They are transmitted on a 9600bps channel. A character is 8 bits long. [8]  
 Calculate :  
 i) Average service time  $T_s$   
 ii) What is arrival rate  $A$ .  
 iii) What is Service rate  $D$ .  
 iv) What is utilization of server  $U$ .  
 b) Explain Erlang-B function. [4]  
 c) Explain M/M/1 queue system. [4]
- Q8)** Write short note on any three : [18]  
 a) Network layer protocols of TCP/IP stack.  
 b) RSA algorithm with example.  
 c) Traffic shaping algorithms.  
 d) Remote Execution application over Internet.



**P1347**

**[3664] - 208**  
**B.E. (E & TC)**  
**BIOMEDICAL 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) Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) Describe structure of **[6]**  
i) skeletal muscle fiber.  
ii) white blood cell.  
iii) motor neuron.  
b) Sketch 4 chambers of Heart. Show all the valves. Locate SA node & describe functioning of Heart for circulating & pumping blood in Human Body. **[10]**

OR

- Q2)** a) Describe with waveform resting potential, action potential, refractory period, depolarisation and repolarisation in a human body cell. **[6]**  
b) List different types of electrodes used in Biomedical electronic system, also state half cell potential of  $\text{Ag}^+$ ,  $\text{Cu}^{++}$ , and  $\text{H}^+$  ions with explanation for the term Half cell potential. **[6]**  
c) Describe sodium pump. **[4]**
- Q3)** a) What type of electrodes are used for EMG and EEG, describe with sketches and state their voltage and frequency ranges. **[8]**

**P.T.O.**

- b) Describe Systolic and Diastolic blood pressure. State their standard, normal values. If systolic pressure is 150 mmHg and diastolic pressure is 95 mmHg what is MAP. [8]

OR

- Q4)** a) Describe working of ECG machine. [8]  
b) Sketch all the 12 Lead configurations of the ECG, electrode placement. [8]

- Q5)** a) Describe non-invasive B.P. measurement, state different korotokoff sounds encountered during B.P. measurements. [10]  
b) With help of a sketch describe invasive BP measurement technique. [8]

OR

- Q6)** a) Discuss atrial and ventricular fibrillation of Human Heart. [8]  
b) Discuss DC Defibrillator with waveform and apt equipment used. [10]

## **SECTION - II**

- Q7)** a) Discuss a simple circuit explaining principle of pace maker. Which batteries are generally used and why only these batteries used. [8]  
b) Discuss, 'R wave' Triggered, 'R wave' inhibited and 'P wave' Triggered modes of a pace maker while explaining the purpose behind the necessity of pace maker. [8]

OR

- Q8)** a) Describe a technique to measure  $p\text{CO}_2$ . [8]  
b) Describe Auto analyser and its applications. [8]

- Q9)** a) Describe spectrophotometer with neat sketch. [8]  
b) With help of a sketch describe working of flame photometer. [8]

OR

- Q10)** a) Discuss multichannel EEG equipment. [8]  
b) Explain 10 - 20 electrode arrangement for EEG with sketch of placement of electrodes. [8]

- Q11)a)** Compare any four applications of Lasers in medicine. **[8]**
- b) Describe working of Excimer Laser and its application for medical field. **[10]**

OR

- Q12)a)** With help of suitable sketch and diagrams explain working of 'X' Ray machine. **[10]**
- b) Compare MRI and CT scan and distinguish their difference with ultrasound system. **[8]**



**P1350**

**[3664] - 254**

**B.E. (Instru)**

**POWER PLANT INSTRUMENTATION  
(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) Assume suitable data, if necessary.*

**SECTION - I**

**Q1)** Explain in brief various forms of energy & elaborate the major sources of it. [16]

OR

Compare & contrast between the Thermal & Hydroelectric Power Station.[16]

- Q2)** a) Explain open cycle gas turbine power plant neat sketch. Also state its advantages & disadvantages. [8]
- b) What are different types of systems & components which are used in thermal power plant? [8]

OR

- a) What is coal preparation? Explain coal Mill Temperature control system in detail. [8]
- b) Explain Furnace oil handling process with neat Instrumentation? [8]
- Q3)** a) What is differential expansion in turbine blades? How it controlled? Explain with neat schematic. [10]
- b) Explain in brief the measurement techniques of Parameters like [8]
- i) MW
  - ii) MVAR
  - iii) Frequency
  - iv) Excitation Voltage.

**P.T.O.**

OR

What is Turbine Automatic Run Up & Synchronization? Explain in detail with neat sketch. [18]

**SECTION - II**

- Q4)** a) Explain Regulation of Speed & Voltage of a Turbine used in Hydro Power Plant. [8]  
b) Draw & explain different types of surge tanks with necessary instrumentation for level measurement. What are the functions of surge tanks? [10]

OR

- a) How energy can be released from Nuclear Power Plant? What are various types of Nuclear reactions? Explain. [10]  
b) Draw & Explain the technique of waste heat recovery in boiler. [8]
- Q5)** a) Draw & Explain considerations for the layout of Control Room in Power plant. [10]  
b) Explain various boiler regulations in brief. [6]

OR

- a) Write Notes on (Any Two) : [16]  
i) Energy Audit.  
ii) Boiler Regulations.  
iii) Boiler Safety Standards.
- Q6)** a) Write advantages & disadvantages of wind power plant. [8]  
b) What is a Tidal Power? What are factors affecting the suitability of tidal power plant. [8]

OR

- a) Explain in brief [8]  
i) Photovoltaic cell.  
ii) Hydrogen cell.
- b) Explain in brief Solar Power Plant. [8]



**P1352**

**[3664]-263**

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

**SECTION - I**

- Q1)** a) Explain the role of Polyester in Packaging. [10]  
b) Define the term “Packaging and Basic requirements of Packaging”. [8]

OR

Write properties and applications of the following : [18]

- a) Cellophane.
- b) PET A.
- c) Aluminium foil.
- d) Polyethylene.

- Q2)** Explain with neat diagram different types of Lamination Techniques. [16]

OR

Write notes on : [16]

- a) Extrusion process.
- b) Co-extrusion process.
- c) Coating.
- d) Varnishing.

**Q3)** Explain in detail Aseptic Packaging and Processing of a product. [16]

OR

Write notes on : [16]

- a) Laminates.
- b) Blister-pack.
- c) Bag-in-Box.
- d) Retort.

### **SECTION - II**

**Q4)** Explain in detail Stretch and Shrink wrapping technique. [18]

OR

Answer the following : [18]

- a) Closures are inherent part of a Package.
- b) Features and Applications of Stand-up Pouches.

**Q5)** Explain in detail deterioration factors for Dairy products. [16]

OR

Mention the packaging technology for the following products [16]

- a) Coffee.
- b) Mineral water.
- c) Carbonated soft drinks.
- d) Alcoholic beverages.

**Q6)** Explain in detail Gravure press for Flexible packaging. [16]

OR

Explain in detail Flexo press for Flexible Packaging. [16]





**P1382**

**[3664] - 308**

**B.E. (Petroleum Engineering)  
RESERVOIR ENGINEERING - I  
(412381) (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) Questions No. 4 (four) and 8 (eight) are compulsory. Out of remaining attempt any two 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, log-log, semi-log paper is allowed*
- 6) Assume suitable data, if necessary.*
- 7) If you attempt question 6, detach Figure 3 and attach inside the answer booklet.*
- 8) If you attempt question 7, detach Figure 1 & 2 and attach inside the answer booklet.*

**SECTION - I**

- Q1)** a) What is reservoir engineering and how are its objectives accomplished?[6]  
b) Explain in detail classification of reserves and how are they calculated?[6]  
c) What are drive indices? [4]
- Q2)** a) Derive the material balance equation for an undersaturated reservoir considering rock and fluid expansion. [8]  
b) An undersaturated, volumetric reservoir has the following properties:  
 $P_i = 4000$  psia,  $P_b = 2500$  psia,  $S_w = 30\%$ , porosity = 10%,  $c_w = 3E-6$ ,  $c_t = 5E-6$ ,  $Bo_i = 1.300$  bbl/STB at 4000 psia, and  $Bo = 1.320$  bbl/STB at 3000 psia.  
i) Calculate total pore volume, connate water volume and hydrocarbon volume at 4000 psia, and 3000 psia. (express in bbl/acre-ft).  
ii) Calculate the stock tank oil in place at 4000 psia and 3000 psia.  
iii) Calculate the average compressibility of oil between 4000 psia and 3000 psia relative to the volume at 4000 psia.  
iv) Calculate the fractional recovery at 3000 psia by two different methods. [8]

**P.T.O.**

- Q3)** a) Explain the usefulness of the p/z graph. [4]
- b) The initial volume of gas in place in a certain reservoir is calculated from electric log and core data to be 200MMM SCF (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)** a) What are decline curves? [6]
- b) Explain in detail any one of the type curves (Blasingame, Carter, Fetkovich) used for decline curve analysis. [12]

## **SECTION - II**

- Q5)** a) What are dimensionless variables? Give some examples in Petroleum Engineering. [2]
- b) Why are they used? [2]
- c) State the dimensionless diffusivity equation. [2]
- d) Derive the dimensionless Ei solution to the diffusivity equation. [8]
- e) What is the physical meaning of this solution? [2]
- Q6)** a) What is pseudo pressure, why is it required? [3]
- b) (If you attempt this question, attach Figure 3 inside the answer booklet.) For the gas well test in the figure 3, find permeability and skin factor for pressure, pressure squared and pseudo pressure ( $\psi$ , PP) analysis. Show ETR, MTR, LTR clearly on graph. Data :  $q = 1100$  MSCF/D,  $t_p = 2940$  minutes,  $T_r = 248$  F, Porosity = 7.7,  $r_w = 0.2$  ft,  $c_t = 1.26E-4$ , viscosity = 0.0216 cp,  $h = 8$  ft,  $A = 320$  acre, average reservoir pressure = 3567 psi ,  $z = 0.9305$ , gas gravity = 0.7,  $P_{wf} = 2292$ ,  $\psi(P_{wf}) = 3460 \times 10^5$ . [10]
- c) Which analysis do you believe, why? [3]

- 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 :  $\phi=0.17$ ,  $q_o = 1135$  STB/D,  $\mu_o = 0.6$  cp,  $B_o = 1.214$  bbl/STB,  $c_t = 18E-6$ /psi,  $r_w = 0.5$  ft,  $h = 28$  ft,  $p_{wf} = 2752$  psia,  $r_e = 1320$  ft, well centered in square drainage area (160 acres) Determine.
- Time at which afterflow distortion ceased. [1]
  - Time at which boundary effects begin. [1]
  - On the graph draw a Unit Slope line, and identify ETR, MTR, LTR on both graphs. Explain the terms ETR, MTR, LTR. [4]
  - Formation permeability, skin,  $r_i$ . [3]
  - Find delp skin and flow efficiency. [2]
  - Is there a fault in the vicinity of the well, at what distance? [5]
- Q8)**
- What is the definition of Pressure Derivative? [2]
  - How is the pressure derivative plot obtained? [4]
  - Give five examples of pressure derivative plots for different reservoir models and explain them. [12]

TABLE 1.1\* - VALUES OF THE EXPONENTIAL INTEGRAL,  $-Ei(-x)$  $-Ei(-x)$ ,  $0.000 < x < 0.209$ , interval = 0.001

$x$	0	1	2	3	4	5	6	7	8	9
0.00	$+\infty$	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	$4.89 \times 10^{-2}$	$4.26 \times 10^{-2}$	$3.72 \times 10^{-2}$	$3.25 \times 10^{-2}$	$2.84 \times 10^{-2}$	$2.49 \times 10^{-2}$	$2.19 \times 10^{-2}$	$1.92 \times 10^{-2}$	$1.69 \times 10^{-2}$	$1.48 \times 10^{-2}$
3	$1.30 \times 10^{-2}$	$1.15 \times 10^{-2}$	$1.01 \times 10^{-2}$	$8.94 \times 10^{-3}$	$7.89 \times 10^{-3}$	$6.87 \times 10^{-3}$	$6.16 \times 10^{-3}$	$5.45 \times 10^{-3}$	$4.82 \times 10^{-3}$	$4.27 \times 10^{-3}$
4	$3.78 \times 10^{-3}$	$3.35 \times 10^{-3}$	$2.97 \times 10^{-3}$	$2.64 \times 10^{-3}$	$2.34 \times 10^{-3}$	$2.07 \times 10^{-3}$	$1.84 \times 10^{-3}$	$1.64 \times 10^{-3}$	$1.45 \times 10^{-3}$	$1.29 \times 10^{-3}$
5	$1.15 \times 10^{-3}$	$1.02 \times 10^{-3}$	$9.08 \times 10^{-4}$	$8.09 \times 10^{-4}$	$7.19 \times 10^{-4}$	$6.41 \times 10^{-4}$	$5.71 \times 10^{-4}$	$5.09 \times 10^{-4}$	$4.53 \times 10^{-4}$	$4.04 \times 10^{-4}$
6	$3.60 \times 10^{-4}$	$3.21 \times 10^{-4}$	$2.86 \times 10^{-4}$	$2.55 \times 10^{-4}$	$2.28 \times 10^{-4}$	$2.03 \times 10^{-4}$	$1.82 \times 10^{-4}$	$1.62 \times 10^{-4}$	$1.45 \times 10^{-4}$	$1.29 \times 10^{-4}$
7	$1.15 \times 10^{-4}$	$1.03 \times 10^{-4}$	$9.22 \times 10^{-5}$	$8.24 \times 10^{-5}$	$7.36 \times 10^{-5}$	$6.58 \times 10^{-5}$	$5.89 \times 10^{-5}$	$5.26 \times 10^{-5}$	$4.71 \times 10^{-5}$	$4.21 \times 10^{-5}$
8	$3.77 \times 10^{-5}$	$3.37 \times 10^{-5}$	$3.02 \times 10^{-5}$	$2.70 \times 10^{-5}$	$2.42 \times 10^{-5}$	$2.16 \times 10^{-5}$	$1.94 \times 10^{-5}$	$1.73 \times 10^{-5}$	$1.55 \times 10^{-5}$	$1.39 \times 10^{-5}$
9	$1.24 \times 10^{-5}$	$1.11 \times 10^{-5}$	$9.99 \times 10^{-6}$	$8.95 \times 10^{-6}$	$8.02 \times 10^{-6}$	$7.18 \times 10^{-6}$	$6.44 \times 10^{-6}$	$5.77 \times 10^{-6}$	$5.17 \times 10^{-6}$	$4.64 \times 10^{-6}$
10	$4.15 \times 10^{-6}$	$3.73 \times 10^{-6}$	$3.34 \times 10^{-6}$	$3.00 \times 10^{-6}$	$2.68 \times 10^{-6}$	$2.41 \times 10^{-6}$	$2.16 \times 10^{-6}$	$1.94 \times 10^{-6}$	$1.74 \times 10^{-6}$	$1.56 \times 10^{-6}$

\*Adapted from Nisile, R.G.: "How To Use The Exponential Integral," *Pet. Eng.* (Aug. 1956) B171-173.

Table 1.2

1.  $P = P_i + 70.6 \frac{q B \mu}{k h} E i \left( -\frac{948 \phi \mu c t r^2}{k t} \right)$
2.  $S = 1.151 \left[ \frac{P_{ihr} - P_{wf}}{m} - \log \left( \frac{k}{\phi \mu c t r_w^2} \right) + 3.23 \right]$
3.  $\Delta P_s = 141.2 \frac{q B \mu}{k h} \left( \frac{k}{k_s} - 1 \right) \ln \left( \frac{r_s}{r_w} \right) = 0.869 m s = \left( 1 - \frac{k_{wb}}{k_f} \right) \Delta P_d$
4.  $r_i = \left( \frac{k t}{948 \phi \mu c t} \right)^{1/2} ; \tau_{wa} = \tau_w e^{-S}$
5.  $J = \frac{0.00708 k h}{B \mu \left[ \frac{1}{2} \ln \left( \frac{10.06 A}{C_A r_w^2} - \frac{3}{4} + S \right) \right]} = \frac{k_J h}{141.2 B \mu \left[ \ln \left( \frac{r_e}{r_w} \right) - \frac{3}{4} \right]}$
6.  $\frac{3.79 \times 10^5 \phi \mu c t r_w^2}{K} (948 r_e^2) , \frac{\phi \mu c t A}{0.000264 K}$
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.  $\frac{250 \phi \mu c t r_e^2}{K} (750) ; V_P = \frac{-0.234 q B}{c t \left( \frac{\partial P_{wf}}{\partial t} \right)}$
11.  $t_{DA} = \frac{0.00264 K t_p}{\phi \mu c t A} ; P_D = \frac{2.303 (P^* - \bar{P})}{m_{MBH}}$
12.  $\Delta P_{ws}^* = -70.6 \frac{q B \mu}{k h} E i \left( -\frac{3792 \phi \mu c t L^2}{K \Delta t} \right) ; L = \left( \frac{0.000148 K \Delta t x}{\phi \mu c t} \right)^{1/2}$
13.  $S = 1.151 \left[ \frac{P_i - P_{wf}}{q} \cdot \frac{1}{l_{hr} m'} - \log \left( \frac{k}{\phi \mu c t r_w^2} \right) + 3.23 \right]$
14.  $\frac{P_i - P_{wf}}{q_n} = 162.6 \frac{\mu B}{k h} \left[ \sum_{j=1}^n \left( \frac{q_j - q_{j-1}}{q_n} \right) \cdot \log(t_n - t_{j-1}) \right] + 162.6 \frac{\mu B}{k h} \left[ \log \left( \frac{k}{\phi \mu c t r_w^2} \right) - 3.23 + 0.869 S \right]$
15.  $P_i - P_{ws} = 162.6 \frac{q_{n-1} \mu B}{k h} \left[ \frac{q_1}{q_{n-1}} \log \left( \frac{t}{t - t_1} \right) + \dots \log \left( \frac{t - t_{n-2}}{t - t_{n-1}} \right) \right]$
16.  $K = 141.2 \frac{q B \mu \Delta P_D (t_L / \Delta t_c)^2}{h A_P (t_L / \Delta t_c)^2} ; \phi C_t = \frac{0.000264 K t_L}{\mu r^2 [(t_L)_D / r_D^2]}$

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	$s' = 1.151 \left[ \frac{p_i - p_{1hr}}{m} - \log \left( \frac{k}{\phi \bar{\mu} \bar{c}_i r_w^2} \right) + 3.23 \right]$	$s' = 1.151 \left[ \frac{p_{1hr} - p_{wf}}{m} - \log \left( \frac{k}{\phi \bar{\mu} \bar{c}_i r_w^2} \right) + 3.23 \right]$
Definition of PMBH,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	$p_{wf}^2$ vs. $t$	$p_{ws}^2$ 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	$s' = 1.151 \left[ \frac{p_i^2 - p_{1hr}^2}{m} - \log \left( \frac{k}{\phi \bar{\mu} \bar{c}_i r_w^2} \right) + 3.23 \right]$	$s' = 1.151 \left[ \frac{p_{1hr}^2 - p_{wf}^2}{m} - \log \left( \frac{k}{\phi \bar{\mu} \bar{c}_i r_w^2} \right) + 3.23 \right]$
Definition of PMBH,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	$s' = 1.151 \left[ \frac{p_{p,i} - p_{p,1hr}}{m} - \log \left( \frac{k}{\phi \bar{\mu} \bar{c}_i r_w^2} \right) + 3.23 \right]$	$s' = 1.151 \left[ \frac{p_{p,1hr} - p_{p,wf}}{m} - \log \left( \frac{k}{\phi \bar{\mu} \bar{c}_i r_w^2} \right) + 3.23 \right]$
Definition of PMBH,D	NA	$\frac{kh(p_p^* - \bar{p}_p)}{711 q_g T}$

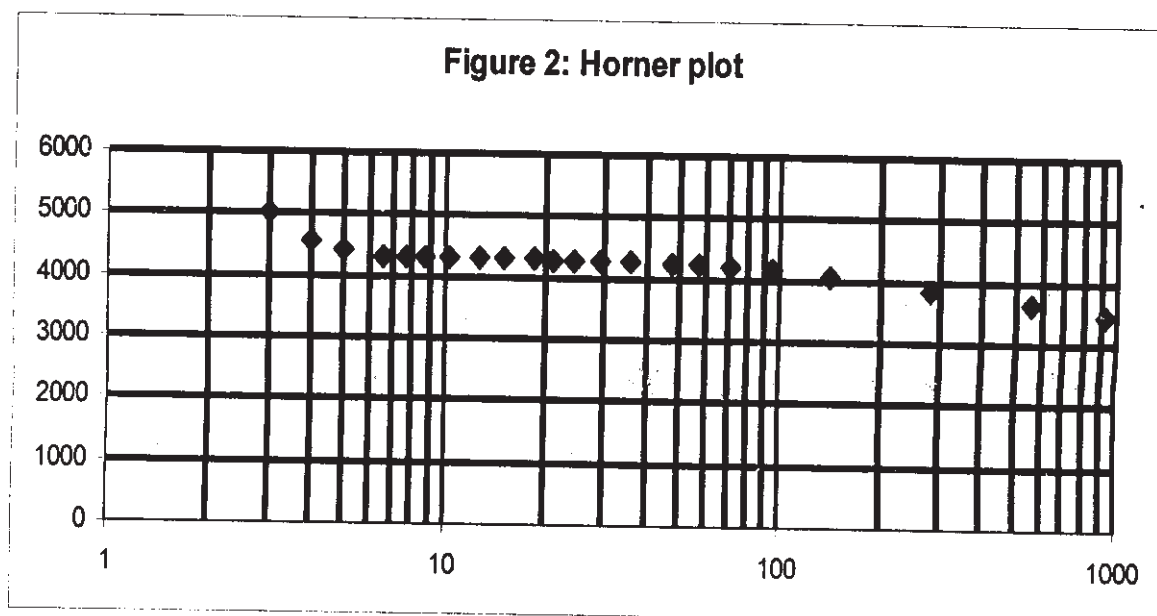
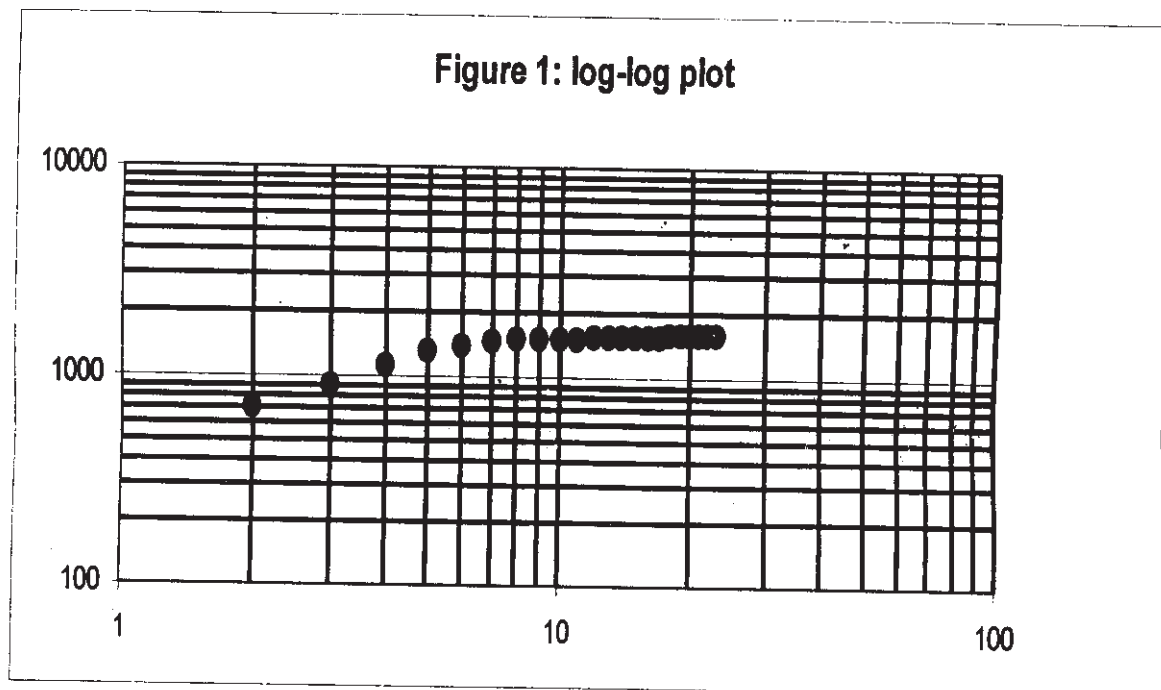
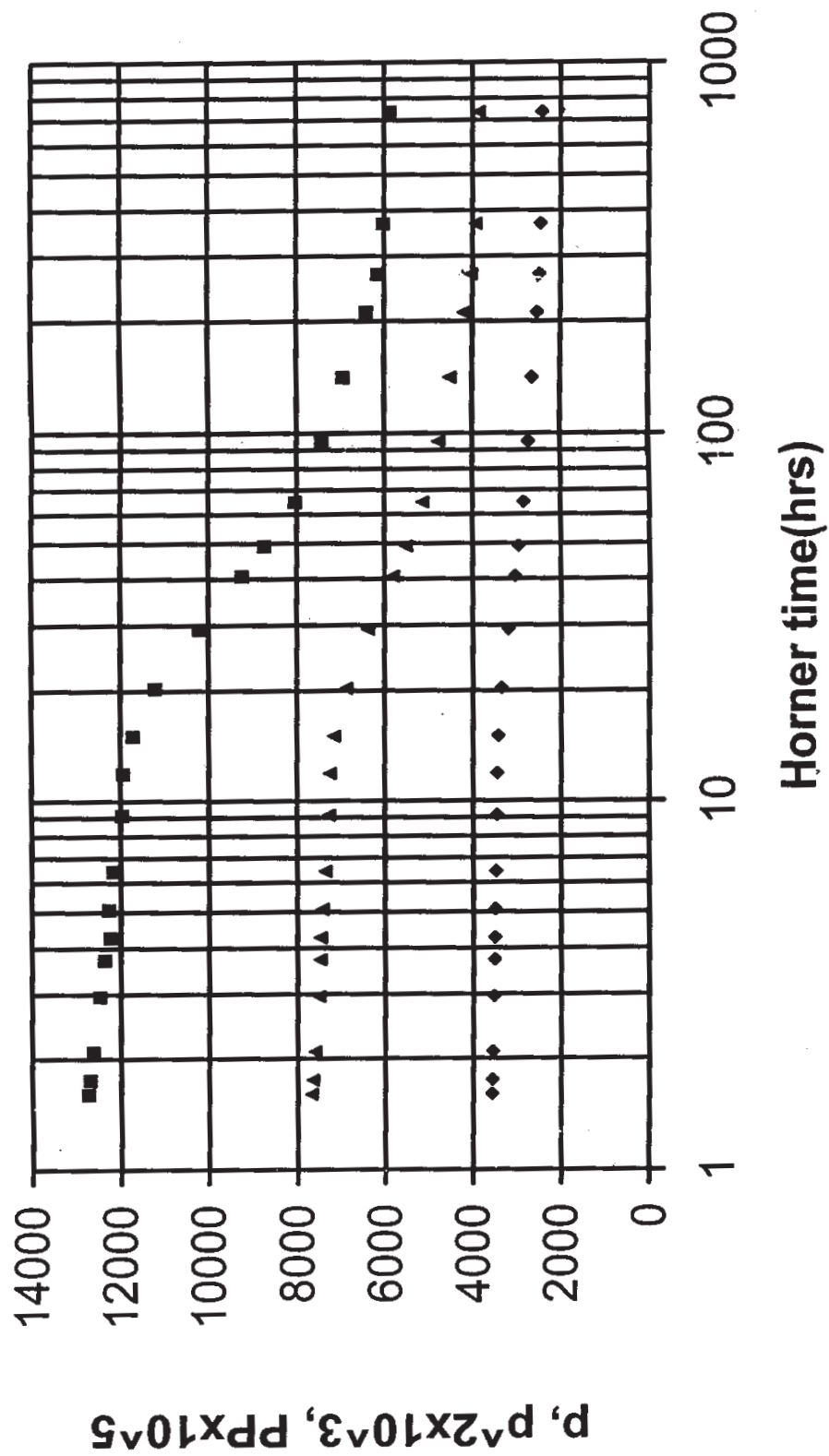




Figure 3



◆ Pressure ■ Pressure Squared ▲ Pseudo Pressure



**P1409**

**[3664]-128**

**B.E. (Mechanical)**

**ALTERNATIVE ENERGY SOURCES**

**(Elective - I) (402045)**

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

**SECTION - I**

- Q1)** a) What do you mean by solar constant & air mass ratio? With a diagram mention & define the related angles used in solar geometry. [12]
- b) Calculate the day length on June 08 2009 for south facing surface tilted at an angle of  $30^\circ$  & located in pune ( $18^\circ 30'N$ ). [4]

OR

- Q2)** a) Discuss the availability of solar energy in India & limitations of solar energy. [8]
- b) Distinguish between global & diffuse radiation. Describe the arrangement for measurement of diffuse radiation. [8]
- Q3)** a) Explain the working of conventional liquid flat plate collector with the help of neat sketch. Give the energy balance for the absorber plate & define the instantaneous collection efficiency. Explain briefly the various loss coefficients. [12]
- b) Differentiate between active & passive solar heating system. [4]

OR

**P.T.O.**

- Q4)** a) Discuss the brief applications of solar air heating. [6]  
b) What is significance of selective surfaces used in flat plate collector. Enlist some selective surfaces. [4]  
c) Discuss different factors which affect on performance of flat plate collectors. [6]

- Q5)** a) What are the limitations of solar flat plate collectors? Enlist various solar concentrators. Explain cylindrical parabolic concentrator with neat sketch. [12]  
b) Discuss materials used in reflectors & concentrator. [6]

OR

- Q6)** Write short notes on : [18]  
a) Solar pond as energy storage.  
b) Heliostats.  
c) Solar still desalination system.

## **SECTION - II**

- Q7)** a) Describe horizontal shaft wind turbine generator. Explain the terms pitch control & yaw control. [8]  
b) Derive an expression for efficiency of propeller type wind turbine & show that its limiting value is 0.593. [8]

OR

- Q8)** a) Which are the materials used for solar photovoltaic cells? Discuss their performances. Explain a solar photovoltaic system used in lighting. [8]  
b) Which are the types of solar power plants? Mention range of power produced for the same describe medium temperature solar power generation system with neat sketch. [8]
- Q9)** a) Give suitable locations for geothermal power plant in India. What are the limitations of geothermal power plant. [8]  
b) Explain the working of single pool, double effect Tidal power plant. [8]

OR

**Q10)a)** Explain with a schematic diagram the principle of closed cycle OTEC. What are the advantages? [8]

b) Which are different types of fuel cells? Explain working with neat sketch. Also discuss performance of the same. [8]

**Q11)a)** Describe floating dome type of biogas plant. Give example. Also state capacity of the plant. State advantages & limitations of floating type over fixed dome type of biogas plant. [12]

b) Discuss the merits & demerits of biogas digester designs. [6]

OR

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

a) Biogas for diesel engine.

b) Environment protection norms ISO 14000.

c) Biomass gasification.



**P1410**

**[3664]-29**

**B.E. (E & TC)**

**ADVANCE POWER ELECTRONICS**

**(1997 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) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) What are converters? Explain with neat circuit diagram & waveforms working of 3 $\phi$  semi converter with resistive load. Deduce the equation for O/P voltage & O/P unit. **[10]**
- b) What is overlap angle? Explain in brief. **[4]**
- c) What is free wheeling? Explain. **[4]**
- Q2)** a) What are Inverters? Explain with neat circuit diagram & waveforms working of 3 $\phi$  VSI with 180° mode conduction with balanced R-load. **[10]**
- b) What are PWM Inverters? Explain any one type. **[6]**
- Q3)** a) What are resonant converters? Explain the operation of Zero Voltage Switching (ZVS) resonant dc-dc converter with the help of equivalent diagrams & waveforms. **[10]**
- b) Compare Linear, switched mode & resonant converters. **[6]**
- Q4)** a) What is SMPS? Explain with circuit diagram. **[6]**
- b) Explain the need of feedback diodes in Inverters. **[4]**
- c) What is power factor? Explain any one method of improving power factor with suitable diagram. **[6]**

- Q5)** Write short notes (Any three) : **[16]**
- a) Flyback converter.
  - b) EMI/EMC.
  - c) Effect of Source Inductance on Converter output.
  - d) PWM Elimination techniques.
  - e) Zero count switching.

### **SECTION - II**

- Q6)** a) What are dual converters? Explain with circuit diagram & waveforms working of 1 $\phi$  Full controlled dual converter with circulating mode. Deduce the equation for circulating unit. **[10]**
- b) Justify why choppers are preferred over dual converters. **[6]**
- Q7)** a) What are dc drives? Explain with neat circuit diagram & waveforms working of Full controlled converter with motor load. **[10]**
- b) What is Regenerative braking? Explain in brief. **[3]**
- c) What is plugging. **[3]**
- Q8)** a) What are choppers? Explain with circuit diagram & waveforms working of step-up-chopper. **[10]**
- b) Unipolar & Bipolar modulation in choppers. **[6]**
- Q9)** a) What is Induction Motor? Explain with circuit diagram, speed control technique of 3 $\phi$  I.M by using v/f Method. Comment on  $T_q$ , slip characteristics & power. **[10]**
- b) What is slip-power recovery? Explain in brief. **[6]**
- Q10)** Write short notes on (Any three) : **[18]**
- a) Brushless DC Motor.
  - b) Stepper Motor.
  - c) UPS.
  - d) Switching Regulator LM 305
  - e) 4Q-choppers.

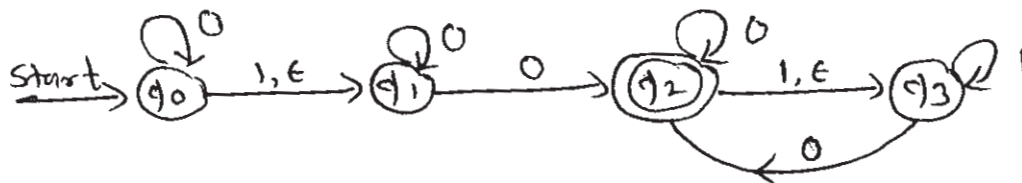


**P388****[3634]-202****M.C.A. - I (Under Science Faculty)****COMPUTER SCIENCE****CS - 202 : Theoretical Computer Science****(Sem. - II) (2008 pattern)****Time : 3 Hours]****[Max. Marks : 80****Instructions to the candidates:**

- 1) Neat diagrams must be drawn wherever necessary.
- 2) Figures to the right indicate full marks.
- 3) All questions carry equal marks.
- 4) Assume suitable data, if necessary.
- 5) All questions are compulsory.

**Q1) Attempt any four of the following :****[4 × 4 = 16]**

- a) Find the transitive, the reflexive and transitive closure of the relation :  
 $R = \{(a,b), (b,c), (c,d), (e,d)\}$  over set  $S = \{a,b,c,d,e,f\}$ .
- b) Design a DFA which accepts all string whose last and second character are same over  $\Sigma = \{a, b, c\}$  and minimum length of string is 3.
- c) Construct NFA without  $\epsilon$ -transition for following NFA



- d) Design a mealy machine which toggles its input over  $\Sigma = \{0, 1\}$ .
- e) Determine if following language is regular or not  
 $L = \{a^n b^m \mid n = 2m, n > 0\}$ .

**Q2) Attempt any four of the following :****[4 × 4 = 16]**

- a) Prove that the regular sets are closed under intersection.
- b) Construct the regular expression for following :
  - i) All words over  $\Sigma = \{a, b\}$  that have at least one 'a' and at least one 'b'.
  - ii) The set of all string containing at least one combination of double letter over  $\Sigma = \{a, b\}$ .

**P.T.O.**

- c) Construct NFA- $\epsilon$  for following R.E.  
 $(ab + ba)^* a (ab^*)^*$
- d) Prove that CFL is closed under the Operation Union, concatenation and kleene star.
- e) Minimize the following DFA.  
 $M = (\{A, B, C, D, E, F, G, H\}, \{0, 1\}, \delta, A, \{D\})$ . Where  $\delta$  is given by

	0	1
A	B	A
B	A	C
C	D	B
*D	D	A
E	D	F
F	G	E
G	F	G
H	G	D

**Q3)** Attempt any four of the following : **[4 × 4 = 16]**

- a) Convert the following grammar to an equivalent grammar with no useless symbols.  
 $S \rightarrow AB \mid BC \mid bA$   
 $A \rightarrow aB \mid a$   
 $B \rightarrow BC$   
 $C \rightarrow AS$
- b) Convert the following CFG to CNF  
 $S \rightarrow aA \mid ABa$   
 $A \rightarrow AA \mid a$   
 $B \rightarrow AbB \mid bb$
- c) Convert the following CFG to GNF  
 $S \rightarrow AB \mid B$   
 $A \rightarrow BS$   
 $B \rightarrow A1 \mid 1$
- d) Construct CFG for following :
- $L = \{0^n 1^m \mid n, m \geq 0, n \text{ is not equal to } m\}$ .
  - Language L having all string where there are twice as many 0's as 1's over  $\Sigma = \{0,1\}$ .

- e) Define :
  - i) Derivation
  - ii) Nullable symbol
  - iii) Prefix of a string
  - iv) Suffix of a string

**Q4)** Attempt any four of the following :

**[4 × 4 = 16]**

- a) Construct PDA for language  
 $L = \{a^n b^{2n} \mid n > 0\}$ .
- b) Construct PDA for language  
 $L = \{WW^R \mid W \in (0,1)^*\}$ .
- c) Construct PDA equivalent to following grammar :  
 $S \rightarrow aAA$   
 $A \rightarrow aS \mid bS \mid a$ .
- d) Construct regular grammar for language over  $\Sigma = \{a, b\}$  consisting of all strings starting with 'a' and having substring 'ba' in it.
- e) Show that following grammar is ambiguous  
 $S \rightarrow a \mid abSb \mid aAb$   
 $A \rightarrow bS \mid aAAb$ .

**Q5)** Attempt any four of the following :

**[4 × 4 = 16]**

- a) Design TM to accept following language  
 $L = \{a^n b^n a^n \mid n > 0\}$
- b) Design TM to recognize well formedness of parenthesis.
- c) Explain the following form of TM in brief :
  - i) Multitape TM.
  - ii) Restricted TM.
- d) What is the difference between recursive and recursively enumerable language.
- e) Prove that Halting problem of TM is unsolvable.





**P389**

**[3634]-203**

**M.C.A. - I (Under Science Faculty)**

**CS - 203 : OBJECT ORIENTED PROGRAMMING (C++ PROGRAMMING)**

**(Sem.- II) (2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 80*

*Instructions to the candidates:*

- 1) All questions are compulsory.*
- 2) Figures to the right indicate full marks.*

**Q1) Attempt any four of the following :** **[4 × 4 = 16]**

- a) What are the applications of object oriented programming?
- b) Write a note on reference variable.
- c) Explain the following terms :
  - i) Data abstraction.
  - ii) Message passing.
- d) Explain the use of new and delete operators.
- e) What are the applications of scope resolution : : operator in C++.

**Q2) Attempt any four of the following :** **[4 × 4 = 16]**

- a) Differentiate between early binding and late binding.
- b) What is function overloading? Explain the rules for function overloading.
- c) When should we use an inline functions.
- d) What is a virtual functions? Why do we need virtual functions.
- e) Explain various classes available for file operations.

**Q3) Attempt any two of the following :** **[2 × 8 = 16]**

- a) Write a C++ program to read the following information from keyboard: Employee name, employee code, designation, account number, date of joining, basic pay, DA, HRA, CCA, deductions like PPF, LIC, NSC etc. Design a base class containing employee name, code and designation and another base class with account number and date of joining. The derived class consists of the data members of basic pay plus earnings and deductions. Calculate the net salary of employees.
- b) Write a C++ program using operator overloading for integers to perform simple arithmetic operations that has functions to add, subtract, multiply and divide.

**P.T.O.**

- c) What is a constructor? Explain different types of constructor with suitable e.g.

**Q4)** Attempt any four of the following : **[4 × 4 = 16]**

- a) Write a C++ to find sum of the following series using
- i) Copy constructor.
  - ii) Parameterized constructor.
- Sum = 1 + 2 + 3 + ----- + n
- b) Write a C++ program to find minimum of 2 no's using inline function.
- c) Write overloaded functions for computing area of a triangle, a circle and a rectangle.
- d) What is a class template? Explain the syntax of a class template with suitable example.
- e) Explain the functions for manipulations of file pointers.

**Q5)** Attempt any four of the following : **[4 × 4 = 16]**

- a) What is exception handling? Explain types of exceptions.
- b) Write a note on iterators.
- c) What are allocators? Explain types of allocators.
- d) What is arithmetic exceptions? Explain it with a suitable e.g.
- e) Write a program to calculate simple interest using default arguments.



Total No. of Questions : 6]

[Total No. of Pages : 2

**P918**

**[3644]- 305**

**III - M.B.B.S.**

**OBSTETRICS AND GYNAECOLOGY**

**(Paper - I)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

**Q1)** Discuss the physiological changes in cardiovascular system in pregnancy.[8]

How will you manage a case of mitral stenosis in pregnancy and labour?[8]

**Q2)** Enumerate causes for abnormal presentation and position. [6]

How will you manage a case of uncomplicated breech in pregnancy and labour? [10]

**Q3)** Write short notes (any three) : [18]

- a) Magnesium sulphate.
- b) Parental iron therapy.
- c) Concealed accidental haemorrhage.
- d) Cervical tear.
- e) Polyhydramnios.

**Q4)** Discuss the supports of uterus. [4]

How will you manage a case of third degree uterine prolapse with cystocele in a 34 years old Woman? [8]

Enumerate complications of hysterectomy. [4]

**Q5)** Define menorrhagia. [2]

Enumerate causes of menorrhagia. [4]

Discuss the investigations, complications and management of case fibroid uterus. [10]

**P.T.O.**

**Q6)** Write short note (any three) :

**[18]**

- a) Trichomoniasis.
- b) Barrier Contraceptions.
- c) Neonatal jaundice.
- d) Ultrasound in obstetrics and gynaecology.
- e) Dysmenorrhoea.



Total No. of Questions : 6]

[Total No. of Pages : 2

**P919**

**[3644]- 306**

**III - M.B.B.S.**

**PREVENTIVE AND SOCIAL MEDICINE**

*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.*

**SECTION - I**

- Q1)** a) What is Sewage? Describe in brief the working of a modern sewage treatment plant. [8]
- b) Write short notes on (any two) : [6]
- i) Ortho Toluidine Test.
  - ii) Sanitation barrier.
  - iii) Biological control against mosquitoes.
- Q2)** a) Enumerate the various National Health Programme in India related to communicable diseases. Describe briefly the components of National AIDS Control programme. [8]
- b) Write short notes on (any two) : [6]
- i) National Immunization Schedule.
  - ii) Concurrent disinfection.
  - iii) Abate.
- Q3)** a) Discuss briefly the epidemiological Triad. Uses of epidemiology. [8]
- b) Write short notes on (any two) : [6]
- i) Types of Bias.
  - ii) Cluster sampling.
  - iii) Quarantine.
- c) Write short notes on (any two) : [8]
- i) Notifiable diseases.
  - ii) Difference between “incidence” and “prevalence”.
  - iii) Random sampling.

**P.T.O.**

## **SECTION - II**

- Q4)** a) Name the diseases transmitted by mosquitoes. Describe various prevention and control measures you would recommend for mosquito borne diseases. [8]
- b) Write short notes on (any two) : [6]
- i) Risk factors in Diabetes Mellitus.
  - ii) Warning signs of cancer.
  - iii) Blocked Flea.
- Q5)** a) Define Maternal Mortality Rate. State the reasons for high material mortality in India. [8]
- b) Write short notes on (any two) : [6]
- i) Pasteurization.
  - ii) Downs syndrome.
  - iii) Juvenile delinquency.
- Q6)** a) Describe briefly the provisions under Employees State Insurance Schemes (ESIS). [8]
- b) Write short notes on (any two) : [6]
- i) Enumerate the principles of Primary Health Care strategy.
  - ii) Barriers in communication.
  - iii) Primordial prevention.
- c) Write short notes on (any two) : [8]
- i) Occupational hazards of agricultural workers.
  - ii) Control of alcoholism.
  - iii) Genetic counselling.



Total No. of Questions : 12]

[Total No. of Pages : 2

**P943**

**[3664]-190**

**B.E. (Electrical)**

**VLSI DESIGN (Elective - II)**

**(2003 Course)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

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

**SECTION - I**

- Q1)** a) Explain Mealy and Moore machine modelling with example. [10]  
b) Draw Mealy machine state diagram for 1011 and 0101 sequence. [8]

OR

- Q2)** a) Draw and explain universal shift register. [9]  
b) Draw ckt. diagram, truth table and timing diagram for 4 bit ring counter. [9]

- Q3)** a) Write VHDL code for multiplexer 8:1 using structural and dataflow type of modelling. [8]  
b) Explain the terms : [8]  
i) Entity.  
ii) Configuration.  
iii) Component.  
iv) Architecture.

OR

- Q4)** a) Explain with example configuration. [8]  
b) What is architecture? Explain its modelling types. [8]
- Q5)** a) Explain any four data types and data objects. [8]  
b) Explain with example concurrent and sequential statements. [8]

**P.T.O.**

OR

- Q6)** a) What do you mean by subprogram? Explain with example. [8]  
b) Define package and explain it in detail with VHDL example. [8]

**SECTION - II**

- Q7)** a) Explain in detail the construction of depletion type MOSFET. [8]  
b) Implement basic gates using CMOS. [8]

OR

- Q8)** a) Explain the terms : [8]  
i) Propagation delay.  
ii) Power dissipation.  
iii) Figure of merit.  
iv) Fan-out.  
b) Draw the circuit diagram and layout of XOR gate by using CMOS. [8]
- Q9)** a) Explain in detail the architecture of FPGA. [9]  
b) Explain the difference between CPLD and FPGA. [9]

OR

- Q10)** a) Explain EDA tool design flow in detail. [9]  
b) Differentiate PLD, CPLD and PAL. [9]
- Q11)** a) Write VHDL code for comparator. [8]  
b) Write VHDL code and explain  $8 \times 8$  RAM. [8]

OR

- Q12)** a) Write VHDL code for 8 bit binary to integer converter. [8]  
b) Write VHDL code for ALU with addition, sub, increment and decrement operation. [8]

☒☒☒☒



**P944**

**[3664] - 201**  
**B.E. (E & TC)**  
**ARTIFICIAL NEURAL NETWORKS**  
**(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 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)** The logic networks shown in Fig 1 a) and Fig 1b) uses the McCulloch pitts model neuron. Show that both the networks are logically equivalent of each other. [8]

The network uses following transfer function

$$f(\text{net}) = \begin{cases} 0 & \text{net} \leq 0 \\ 1 & \text{net} > 0 \end{cases}$$

Tabulate the answers by showing intermediate outputs.

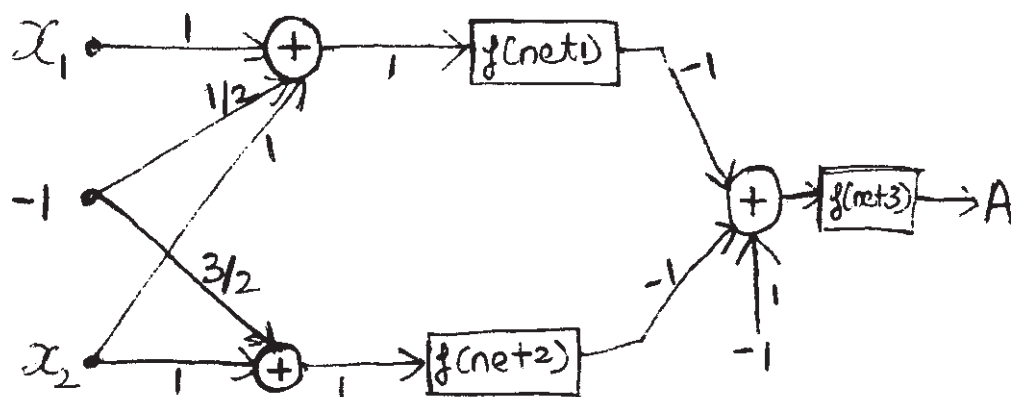


Fig 1a

P.T.O.

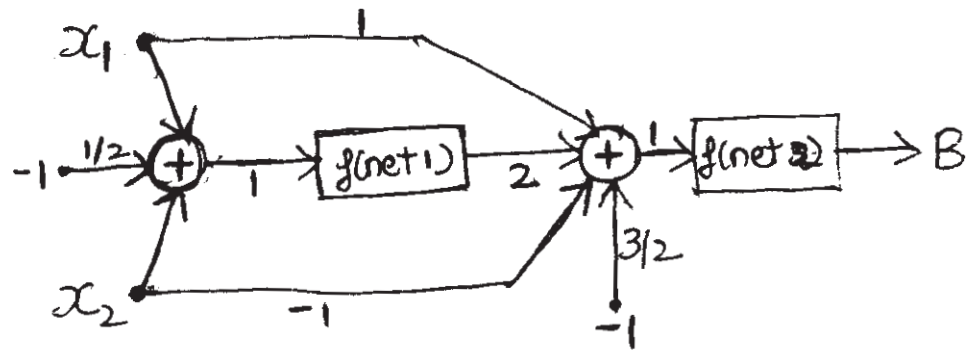


Fig b

- b) Design following two i/p gates using McCulloch Pitts Model. Clearly show the threshold for each neurons, truth table and the transfer function used. [8]
- i) NAND      ii) NOR      iii) Exclusive - or (X O R).
- c) Draw the structure of Biological Neuron & label the various parts. [2]

OR

- Q2) a) What is the noise saturation dilemma in activation dynamics. Explain how shunting activation model solves this dilemma. [8]
- b) Explain how to interpret perceptron learning as a gradient descent algorithm. What is the gradient term here. [5]
- c) Explain the distinction between supervised, unsupervised & Reinforcement learning. [5]
- Q3) a) Design an Adaline network with the inputs  $x_1$  and  $x_2$ . The corresponding targets are  $t_1$  and  $t_2$  respectively. Train the adaline network with learning rate ( $\eta$ ) equal to 0.4 for three iterations

$$x_1 = \begin{bmatrix} 1 \\ -1 \\ -1 \end{bmatrix} \quad t_1 = [-1]$$

$$x_2 = \begin{bmatrix} 1 \\ 1 \\ -1 \end{bmatrix} \quad t_2 = [1]$$

Assume initial weight vector [ 0 0 0 ]. Find error in each iteration. [8]

- b) Explain the various steps involved in the training of Back propagation network. Also explain the architecture. [8]

OR

- Q4)** a) Explain the training algorithm used in MRIII (Madaline Rule III). Also explain the minimum disturbance principle in context to Madaline networks. [8]

- b) Define Radially symmetric function. Give some examples and sketch them. Give the steps used in training a RBF network. [8]

- Q5)** a) Explain Simulated Annealing in detail. Clearly explain its role in escaping local minima. [6]

- b) Explain the algorithm used in training Boltzmann machine. [6]

- c) Explain stochastic update in short. [4]

OR

- Q6)** a) Design a Hopfield network for 4 bit bipolar patterns. The training patterns are

$$S_1 = [1 \ 1 \ -1 \ -1]$$

$$S_2 = [-1 \ 1 \ -1 \ 1]$$

$$S_3 = [-1 \ -1 \ -1 \ 1]$$

Find the weight matrix & energy associated with sample  $S_1$ . [8]

- b) Explain the architecture of Hopfield model of neural network. Also give the training algorithm for the same. [8]

## SECTION - II

- Q7)** a) Cluster the following data samples using k-means algorithm.

$$x_1 (1, 1.2) \quad x_2 (1.5, 2) \quad x_3 (1.6, 3.2) \quad x_4 (0, 1) \quad x_5 (2.1, 3) \quad x_6 (2.8, 0) \\ x_7 (0.5, 3.5) \quad x_8 (0.9, 2.5) \quad x_9 (3, 1.1) \quad x_{10} (2, 2.8)$$

Assume initial number of clusters  $K = 3$  with representative vectors / centroids  $C_1 (1, 1.2)$   $C_2 (2.1, 3)$  and  $C_3 (3, 1.1)$ . Use Euclidean distance to cluster all ten samples. Tabulate the distances of all the samples from  $C_1$ ,  $C_2$  and  $C_3$  for 1 epoch. After 1 epoch is done list the samples belonging to each clusters  $C_1$ ,  $C_2$  and  $C_3$  and also find the new centroids. [12]

- b) Find out the winner using Maxnet with four neurons and inhibitory weights  $\epsilon = 0.25$ . When initial activation are  
 $a_1(0) = 0.1$ ,  $a_2(0) = 0.6$ ,  $a_3(0) = 0.3$ ,  $a_4(0) = 0.5$  [6]

OR

- Q8)** a) Explain the learning algorithm for kohonen's topology preserving network (SOM). [6]
- b) Explain the architecture of Hamming network. Give the steps used to find out hamming distance using Hamming network. [6]
- c) Explain LVQ1 (Linear Vector Quantizer 1) algorithm. [6]

- Q9)** a) Design TAM to associate the characters as shown in Fig 2a and 2b.

Assume  $A = [1 \ 1 \ -1 \ -1]$

$N = [-1 \ 1 \ 1 \ -1]$

$N1 = [-1 \ 1 \ -1 \ 1]$

[8]

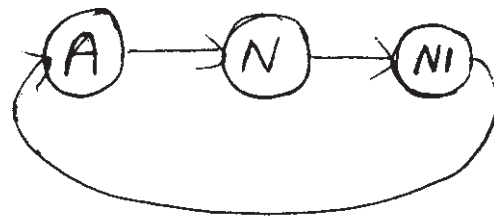


Fig 2a

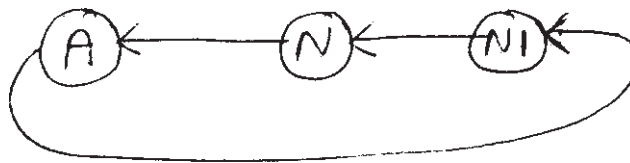


Fig 2b

- b) Explain the following :
- i) Pattern Association.
  - ii) Pattern Classification.
  - iii) Pattern Clustering.
  - iv) Pattern Mapping. [8]

OR

- Q10)**a) Explain the following terms in context to autoassociative memory

- i) Storage
  - ii) Encoding
  - iii) Retrieval
  - iv) Performance. [8]
- b) Explain the need to define energy function for associative networks. State and explain BAM energy theorem. [8]

- Q11)a)** Explain how neural network principles are useful in control system applications. [8]
- b) How neural network can be used in the problem of hand written digit recognition. [8]

OR

- Q12)a)** Explain the difficulties involved in getting the solution of Travelling Salesman problem. How a Hopfield network can be used in this application. [8]
- b) Explain the steps in the solution of a general optimization problem by a neural network. [8]



**P945**

**[3664]-203**

**B.E. - (E & TC)**

**ELECTRONIC MEASUREMENT SYSTEMS**

**(2003 Course) (404222)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) Answer three questions from Section I and 3 questions from Section II.*
- 2) Answers to the two sections should be written in separate answer books.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Figures to the right indicate full marks.*
- 5) Use of logarithmic tables, slide rule, electronic no-programmable pocket calculator is allowed.*
- 6) Assume suitable data, if necessary.*

**SECTION - I**

**Q1)** With appropriate example, explain following terms. **[16]**

- a) Instrument.
- b) Accuracy.
- c) Precision.
- d) Sensitivity.
- e) Resolution.
- f) Error.
- g) Repeatability
- h) Linearity.

OR

**Q2)** a) Write important specifications of Digital LCR-Q meter and its applications. **[8]**

b) Explain the static characteristics of measuring instruments. **[8]**

**Q3)** a) Why calibration is required? What should be the frequency of calibration? Write steps to calibrate any instruments. **[8]**

b) Draw and explain suitable diagram for period measurement using universal counter. **[8]**

OR

**P.T.O.**

- Q4)** a) What is the difference between systematic and random errors? What are the typical sources of these errors? [8]  
b) How is the standard meter defined? What is the difference between a primary and secondary standard? [8]

- Q5)** Write short note on : [18]  
a) Probes.  
b) DSO.  
c) Sampling Oscilloscope.

OR

- Q6)** a) Explain alternate and chop mode of operation w.r.t. dual trace oscilloscope. [8]  
b) W.r.t. DSO explain following : [10]  
i) Maths function.  
ii) FFT.  
iii) Roll Mode.  
iv) Zoom Mode.  
v) Glitch Mode.

## **SECTION - II**

- Q7)** a) Compare logic analyzer and spectrum analyzer. [8]  
b) Explain functional block diagram of heterodyning wave analyzer. [8]

OR

- Q8)** a) Draw block diagram and explain fundamental suppression harmonic distortion analyzer. [8]  
b) Explain following terms w.r.t. spectrum analyzer. [8]  
i) Dynamic range.  
ii) Resolution bandwidth.  
iii) Span.

- Q9)** a) What are the different features of RF signal generator? Describe any one method to implement it. [8]  
b) Explain SINAD sensitivity test setup. [8]

OR

- Q10)** a) What are the differences between scalar and vector network analyzer. **[8]**  
b) How S-parameters measurement is carried out by network analyzer? Explain it with suitable diagram. **[8]**

- Q11)** a) Explain IEEE 488 bus. **[8]**  
b) What are the virtual instruments and how it is used for applications such as TDM & FDM? Explain any one in details. **[10]**

OR

- Q12)** Write short note on : **[18]**  
a) PCI/PCI express.  
b) Computer controlled test measurements.  
c) OTDR.





**P947**

**[3664]-212**

**B.E. (Electronics)**

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

**SECTION - I**

- Q1)** a) What are different components of product's selling price? Draw schematic block diagram of a Laboratory Function Generator. Assume reasonable raw material and derive selling price using above components. **[10]**
- b) Draw a sketch of front panel of a Laboratory Function Generator and explain how ergonomic and aesthetic design considerations are taken care of in the same. **[8]**

**OR**

- Q2)** a) Explain the mechanism of generation of : **[6]**
- i) Conducted EMI.
  - ii) Radiated EMI.
- b) For following situations, suggest suitable suppression device / component / mechanism and also explain how it is effective in suppressing the EMI :
- i) The power transformer in a PID controller fails due to 1800V transient measured on AC mains when a nearby DC Motor is switched OFF.
  - ii) When there is a call on mobile phone of a person operating PC, the monitor screen loses synchronization.
  - iii) In a multi-PCB industrial DC drive housed in 19" rack, the CPU is reset whenever driver circuit in one of the cards switches on four or more Electromagnetic relays. **[12]**

**P.T.O.**

**Q3)** A mixed signal system on single PCB houses following sub-circuits :

- a) Power supply for Analog circuits.
- b) Power supply for Digital circuits.
- c) Analog signal conditioning circuit.
- d) ADC.
- e) Microcontroller.
- f) Digital I/O.
- g) Clock for digital circuits and Microcontroller.

Discuss in details the recommended PCB design practices for each of the above sub-circuits and draw a sketch indicating relative placement of sub-circuits. Justify your recommendations regarding relative placement. [16]

OR

**Q4)** a) For a 70-micron copper clad laminate, what will be the value of resistance of a 2.0 mm wide track that is 16 cm long? Assume resistivity of copper to be  $1.724 \times 10^{-6}$  Ohm-cm. [4]

b) What will be resistance of same geometry if temperature rises by 20°C? Assume temperature coefficient of resistance to be equal to 0.004 Ohm per °C. [2]

c) For a standard 35-micron copper clad laminate, calculate the inductance of 20 cm long track on PCB having width of 0.8 mm. [5]

d) A 1.6 mm thick PCB laminate having dielectric constant of 4.2 is used to implement distributed capacitance concept for power supply bypassing. The VCC track is routed on top surface of PCB having width 2.0 mm while the underlying GND conductor has a width of 2.5 mm. Both tracks have a length of 20 cm. Calculate the value of capacitance for given track geometry. If the type of laminate is changed to one having dielectric constant of 3.2, what will the value of capacitance? Which laminate is better for the intended purpose and why? [5]

**Q5)** With the help of a schematic arrangement explain in details the type of diagnostic instrument and which of its feature(s) of will be used in following situations :

a) A Short circuit exists on two thin tracks running adjacent to each other on PCB. One of the tracks is from data bus and other is from Address bus of a Microprocessor based system. [8]

- b) SDRAM interface on an embedded Microprocessor based circuit is suspected to be malfunctioning due to set-up and/or hold time violation for RAS (Row Address Select) line. [8]

OR

- Q6)** a) In selecting DSO (Digital Storage Oscilloscope), explain the significance and importance of following specifications : [8]
- i) Memory Depth.
  - ii) Bandwidth.
  - iii) Sampling rate.
  - iv) Type of sampling.
- b) Explain limitations of following Hardware diagnostic instruments for their use in Mixed signal, high-speed designs where signal integrity is of prime importance : [8]
- i) Analog Oscilloscope
  - ii) Digital Storage Oscilloscope
  - iii) Logic Analyzer.

Hence establish the need for Mixed Signal Oscilloscope.

## **SECTION - II**

**Q7)** A four-channel temperature data logger has following components :

- a) Two RTD and two Thermocouple sensors
- b) Signal conditioning circuit.
- c) ADC
- d) A Microcontroller
- e) 4-digit multiplexed LED display
- f) Data Memory.

Explain in details how will you design software for the data logger using Top-down approach. Explain function of each software module and clearly indicate which module(s) will be coded in Assembly language and which ones in C? Justify your choice. [18]

OR

- Q8)** a) Explain in details the process of developing software for a Microcontroller based system using a combination of Assembly and C language. [8]
- b) In finding software faults in a real-time Embedded system, explain the features and limitations (if any) of : [10]
- i) Debugger.
  - ii) Simulator.
  - iii) Microcontroller Starter kits.
  - iv) Emulators.

**Q9)** Explain how environmental tests are related to Warrantee of a product? What are different environmental tests performed on an Electronic Product? How the severities of different tests are decided? [16]

OR

**Q10)** Establish the need for performing different EMI/EMC tests on an electronic Product. Discuss various types of EMI and EMC tests carried out on them. Also explain why the nature and type of test carried out varies with intended location and application of the product? [16]

**Q11)** For the Mini-project that you have done, draw the block schematic and produce all necessary formatted documents that will be released to Production Department for manufacturing. [16]

OR

- Q12)** a) Draw-up a formatted documents list for a PCB assembly that your company wants to take up on large scale. [8]
- b) What do you understand by the term- Bare Board Testing? Justify the need for it in large-scale manufacturing. Draw a sketch of typical BBT arrangement. In what situation you must use Bare Board Testing? Why? [8]



**P948**

**[3664] - 215**

**B.E. (Electronics)**

**EMBEDDED SYSTEMS DESIGN**

**(2003 Course)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

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

**SECTION - I**

- Q1)** a) Explain the architecture of a general purpose embedded system. [8]
- b) What do you mean by design metric? Explain the following design metrics.
- i) Power.
  - ii) Time to market.
  - iii) Safety.
  - iv) Maintainability. [10]

**OR**

- Q2)** a) Explain the architecture of IEEE 802.11. [8]
- b) Explain the protocol architecture of IrDA. Compare short CAN and MODBUS serial communication. [10]

**P.T.O.**

- Q3)** a) Explain the software architecture of an embedded system. [6]  
b) Describe the processor selection criteria for an embedded system for any three systems. [10]

OR

- Q4)** a) Explain the architecture of N/W processor. [8]  
b) What is interrupt latency? Explain the difference between interrupt latency for processor and operating system. Explain different I/O devices. [8]

- Q5)** a) Explain the following : [8]  
i) Semaphores for RTOS.  
ii) Mail-box for RTOS.  
b) Discuss the guidelines for code optimization. [8]

OR

- Q6)** a) Explain the characteristics of round-robin interrupt architecture. [8]  
b) Differentiate ISR task, threads and processes. Define & explain context switching. [8]

## **SECTION - II**

- Q7)** a) Distinguish: pre-emptive and non-pre-emptive scheduling. [6]  
b) How data output generated for a IPC in process transfer. [6]  
c) Explain Rate Monotonic Analysis (RMA). [6]

OR

- Q8)** a) Explain the objects of kernel in operating system. [8]  
b) What do you mean by shared data bugs? Explain. [6]  
c) Explain 'deadly embracing'. [4]

- Q9)** a) Explain the features of real time system development. [4]  
b) Explain in brief RT-Linux module. [4]  
c) Explain the application areas of RT-Linux. [8]

OR

***Q10)***a) What is  $\mu\text{C}/\text{OS II}$ ? Explain the features of  $\mu\text{C}/\text{OS II}$ . [8]

b) Explain following for  $\mu\text{C}/\text{OS II}$  : [8]

i) Time-delay functions.

ii) Task-related function.

***Q11)***a) Explain in detail basic features of smart card hardware. [8]

b) Explain the functioning of RFID system. [8]

OR

***Q12)*** Explain the embedded system used in digital camera. [16]



**P949**

**[3664] - 295**

**B.E. (Polymer Engineering)**

**POLYMER COMPOSITES AND BLENDS**

**(2003 Course) (409363)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) Answer 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 in detail all E's or advantages in employing polymer blend technology. [6]
- b) Classify the polymer alloys and blends on the basis of Miscibility and methods of preparation with one example. [8]
- c) Discuss the significances related to processing via polymer blend technology. [4]

OR

- Q2)** a) Explain different polymeric modifier used to improve the following properties such as impact strength, chemical resistance, heat deflection temperature, flame resistance and barrier properties. [8]
- b) Explain the term polymer alloy with its importance. [4]
- c) Discuss the advantages and disadvantages of the following engineering polymeric modifier : [6]
- i) Polycarbonate.
  - ii) Acrylonitrile Butadiene Styrene (ABS).

**P.T.O.**



- Q3)** a) Discuss with necessary diagram the effect of temperature on the phase stability. [6]  
b) Explain the importance of molecular weight parameter with necessary diagram on the miscibility of polymer blend systems. [10]

OR

- Q4)** a) Define the term spreading coefficient and discuss with examples the method of compatibilization via addition of block or graft copolymers. [10]  
b) Discuss with suitable diagram all function of compatibilization. [6]
- Q5)** a) Write a short note on Elastomer Alloy. [6]  
b) Discuss in detail the applicable models to understand the Rheology of Miscible Blend systems. [10]

OR

- Q6)** a) Write a note on classification of polymer Blends on the basis of log additivity rule in terms of viscosity and volume fraction. [2]  
b) Discuss in detail the applicable models to understand the Rheology of Immiscible Blend systems. [10]  
c) Write a note on any one Commercial polymer blend involving engineering polymer. [4]

## **SECTION - II**

- Q7)** a) State various commercially available unsaturated thermosetting polyester resins forms and explain any four grades of the same along with their formulation and applications. [8]  
b) What is Reinforcement and list the different types and forms of the reinforcing materials? Compare the Aramide Fiber reinforcements with Boron Fiber Reinforcements. [6]  
c) Define the term composite and explain in detail the different constituents of the composite with their functions. [4]

OR

- Q8) a)** What are the selection criteria's used for Epoxy resin used in composites and list the various commercial grades of the same and brief about diluents used in epoxy resins. [8]
- b)** Explain the three stages of the curing reaction of the unsaturated thermosetting polyester resin with its significances. Discuss the various catalyst used in unsaturated thermosetting polyester resin curing and classify them and explain any one in detail. [10]
- Q9) a)** What is Resin transfer molding process and name any two products manufactured by the same process and compare the same with Vacuum bag forming process. [8]
- b)** What are different winding techniques used in filament winding? State and explain any four process parameter that affect the quality of filament winding products. [8]

OR

- Q10)a)** Explain with neat sketch spray lay up process? Compare what are the advantages of the same over hand lay up and state what are the products manufactured by the spray lay up technique. [8]
- b)** Write in detail about Gel Coat used in composite. [8]
- Q11)a)** What are Nano composite? How they are classify and compare the Nano composite with conventional composite system. [6]
- b)** Explain in brief the necessity of Maintenance of FRP products? What are the different methods of maintenance used for the composite? [6]
- c)** Write a note on trouble shooting in hand lay up process. [4]

OR

- Q12)a)** Explain with neat sketch repairing techniques of holes on the composite product accessible from both sides. [6]
- b)** Write a note on application of Nano composite. [6]
- b)** Write a note on trouble shooting in pultrusion process. [4]



Total No. of Questions : 12]

[Total No. of Pages : 7

**P950**

**[3664]-326**

**B.E. (Petrochemical Engg.)**

**NOVEL SEPARATION PROCESSES**

**(Elective - I) (2003 Course)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

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

**SECTION - I**

**Q1)** Attempt Any Four from the following (Any Three) : **[18]**

- a) Compare and contrast on Macroemulsions and Microemulsions with suitable examples.
- b) Classify membrane separation processes by giving examples.
- c) Discuss in brief on: adsorptive bubble separation techniques.
- d) Explain the process principles involved in Froth Flotation. Indicate it's Industrial applications.
- e) Explain in brief the selection criteria for chemical engineering separation processes.

OR

**Q2)** Classify the models for gas separation by membranes. Develop complete mixing model for membrane separation processes. State the assumption made. Discuss the solution strategy for different cases. **[18]**

**P.T.O.**

**Q3) a)** A 9-micron tubular membrane is used to recover salt A from a dilute solution. The solutions to either side are at 0.025 and 0.0045 kmol/m<sup>3</sup>, with mass transfer coefficients of  $3.5 \times 10^{-5}$  and  $2.2 \times 10^{-5}$  m/s respectively. The distribution coefficient is 0.79 and the diffusivity of A in the membrane is  $2.9 \times 10^{-11}$  m<sup>2</sup>/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 0.013 kmol/hr.

Flow inside the tube is turbulent and mass transfer follows the Gilliland, Sherwood & Linton correlation. If the velocities of both solutions are doubled, what will the membrane resistance now be? [8]

**b)** A liquid containing dilute solute A at a concentration  $3 \times 10^{-2}$  kgmol/m<sup>3</sup> is flowing rapidly by a membrane of thickness,  $3 \times 10^{-5}$  m. The solute diffuses through the membrane and its concentration on the other side is  $0.5 \times 10^{-2}$  kgmol/m<sup>3</sup>. The mass transfer coefficient  $k_{c1}$  is large and can be considered as infinite and  $k_{c2} = 2.02 \times 10^{-5}$  m/s.

Data: Distribution coefficient =  $K' = 1.5$  and Diffusivity,

$D_{AB} = 7 \times 10^{-11}$  m<sup>2</sup>/sec in the membrane.

- i) Derive the equation to calculate the steady state flux,  $N_A$  and make a sketch.
- ii) Calculate the flux and concentration at the membrane interfaces.[8]

OR

**Q4) a)** A membrane is to be used to separate a gaseous mixture of A and B in one of the chemical complex near Mumbai. The following information is known : [9]

Feed flow rate	=	$2 \times 10^5$ cm <sup>3</sup> (STP)/s
Feed composition of A	=	0.5 mole fraction
Desired composition of reject	=	0.25 mole fraction
Thickness of membrane	=	$2.5 \times 10^{-3}$ cm
Pressure on feed side	=	100 cm Hg
Pressure on permeate side	=	25 cm Hg
Permeability of A, $P_A$	=	$20 \times 10^{-10}$ cm <sup>3</sup> (STP). cm/(s.cm <sup>2</sup> .cm. Hg)
Permeability of B, $P_B$	=	$10 \times 10^{-10}$ cm <sup>3</sup> (STP). cm/(s.cm <sup>2</sup> .cm. Hg)

Assuming complete mixing model, calculate the following:

- i) The permeate composition
  - ii) The fraction permeated
  - iii) Membrane area
- b) Reverse osmosis of salt solution at 25°C is tested with a  $5.2 \times 10^{-3} \text{ m}^2$  cellulose acetate membrane. On one side of the membrane is 1 mol NaCl/kg H<sub>2</sub>O solution at 60 atmospheres (abs.) pressure, on the other is 0.01 mol NaCl/kg H<sub>2</sub>O at atmospheric pressure. The permeation rate is 96.12 ml/hour. Find the solvent permeability and the rejection rate.[7]

**Q5)** Write short notes on (Any Three) : [16]

- a) Energy requirement for separation processes.
- b) Different types of membrane modules.
- c) Ultrafiltration and Nanofiltration-Principles and applications.
- d) Diffusion type model for Reverse osmosis.
- e) PSA and TSA- Principles and applications.

OR

- Q6) a)** A heart-lung machine uses a 0.175 mm silicone rubber membrane with a permeability of  $6.40 \times 10^{-7} \text{ cm}^3 \text{ O}_2 \text{ (STP) mm/s.cm}^2\text{cmHg}$ . The machine is to supply 35 cm<sup>3</sup>/min of oxygen to a patient, where the partial pressure of oxygen in the blood is the equivalent of 30 mmHg. The machine is supplied with pure oxygen at 700 mmHg, so gas film resistance can be neglected. If the resistance on the blood side were neglected also, how large would the membrane need to be? [7]
- b) Explain in brief the basic process principles involved in Reverse Osmosis. State the industrial applications. [9]

### SECTION - II

**Q7)** Answer Any Three from the following : [18]

- a) Differentiate physical and chemical adsorption.
- b) Name five of the most important commercial adsorbents? What is the distinguishing feature of the molecular-sieve zeolites?
- c) Suggest one or more types of chromatography to separate each of the following mixture:
  - i)  $\alpha$  and  $\beta$  pinenes
  - ii) Blood serum proteins
  - iii) Hexane Isomers
  - iv) Purification of Cefonicid-a synthetic antibiotic.

- d) Copper ions are removed from aqueous solution by an ion exchange resin. Pilot-scale tests where 94.6 ml/min of solution was passed through a cylindrical bed of resin 0.0254 m in diameter and 0.365 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 0.91 meters high, with a flow rate of 283.90 ml/min.

Find

- New breakthrough time;
- Diameter required;

Assume that “zone” of resin in transition is to be the same in both towers.

- e) A wastewater solution having a volume of 2.5 m<sup>3</sup> contains 0.25 kg phenol/m<sup>3</sup> of solution. This solution is mixed thoroughly in a batch process with 3 kg of granular activated carbon until equilibrium is reached. Calculate the final equilibrium values and the percent phenol extracted.

Equilibrium data:

$c,$ $\frac{\text{kg phenol}}{\text{m}^3 \text{ solution}}$	0.322	0.117	0.039	0.0061	0.0011	0.009	0.005
$q,$ $\frac{\text{kg phenol}}{\text{kg carbon}}$	0.150	0.122	0.094	0.059	0.045	0.036	0.030

OR

- Q8)** Activated carbon is used to adsorb ethanol vapor from an airstreams. The laboratory experiment to investigate this has a bed 4 cm in diameter and 14 cm high. Exit data for an input of 0.754 liter/second are as follows: **[18]**

Time (hours)	0	3	3.5	4	4.5	5	5.5	6.0	6.2	6.5	6.8
$C/C_0$	0	0	0.002	0.030	0.155	0.396	0.658	0.903	0.946	0.978	0.993

Do as follows:

- Determine breakthrough time if break point is  $C/C_0 = 0.05$
- Calculate the height of a new column of the same diameter that has breakthrough at 8.5 hours.
- Calculate the diameter of this new column if it is to process 3 liter/min.

- Q9) a)** From Darcy's Law, the velocity through a packed bed for a given pressure drop (P) is given by :

$$u = \frac{\phi P d_p^2}{4 \eta l}$$

Where,

$\phi$  = Darcy's constant

P = Pressure drop

$d_p$  = Particle diameter

l = Length of column

$\eta$  = 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, 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: [8]

$$HETP = A + B/u + Cu$$

Physically, what do the terms A, B and C represent? Calculate the optimum value of the mobile phase velocity and the plate height in terms of these parameters.

OR

- Q10)a)** Two solutes have a relative retention of  $\alpha = 1.08$  and capacity factor,  $k_1' = 5$  and  $k_2' = 5.5$ . The number of theoretical plates is nearly the same for both the compounds. How many plates are required to give a resolution of 1.5? and of 3?

If the plate height is 0.2 mm, how long must the column be for a resolution of 1.5? [6]

- b) The retention ratio in chromatography is defined as: [4]

$$R = t_M/t_R = \frac{\text{time for solvent to pass through the column}}{\text{time for solvent to pass through the column}}$$

Show that R is related to the capacity factor, given by equation :

$$R = 1/k' + 1.$$

- c) Define the following terms in connection with chromatographic separations and give appropriate equations: [6]

- i) Partition coefficient (K)
- ii) Retention Volume ( $V_R$ )
- iii) Retention Ratio (R)
- iv) Capacity factor ( $k'$ )
- v) Separation factor ( $\alpha$ )
- vi) Resolution ( $R_s$ )

- Q11)a)** You are working as Separation technologist in one of the chemical complex near Mumbai. Your company has been contracted to purify a new peptide mixture, which has been produced by PQR Company. Your research department has optimized the separation on two exiting columns and the production department needs to know which column can operate at the higher volumetric flow rates. Since the stationary phase chemistries are slightly different, each column is operated at different mobile phase mixture so you will need to take this consideration for your calculations [8]

Data :

Column - I	Column - II
Mobile Phase 50/50 MeOH/H <sub>2</sub> O by weight $d_{col} = 0.55 \text{ cm}$ $L_{col} = 25 \text{ cm}$ $\epsilon_c = 0.4888$ $d_p = 10\mu\text{m}$	Mobile Phase 70/30 MeOH/H <sub>2</sub> O by weight $d_{col} = 1 \text{ cm}$ $L_{col} = 50 \text{ cm}$ $\epsilon_c = 0.5330$ $d_p = 10\mu\text{m}$



- b) Two amino acids, glycine and alanine, were separated by liquid chromatography with the following results :

Amino Acid	T <sub>R</sub> , (minutes)	W (minutes)
Glycine	4.35	0.52
Alanine	5.10	0.64

- Calculate the resolution of amino acids
- Calculate the plate number for alanine.
- What is the minimum plate numbers needed to provide a resolution of 1.5?
- How do you get this high plate number? [8]

OR

**Q12)** Write Short notes on (Any Three) : [16]

- Reactive Separations.
- Ion Exchange Separations.
- Bioseparation.
- Classification of Chromatographic separations.
- Biofiltration-Principles and applications.



**P985**

**[3664]-195**  
**B.E. (E & TC)**  
**VOICE NETWORKS**  
**(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)** a) Write a Lex specification to read a C program and calculate number of new line characters, tabs and white spaces in the program. [8]  
b) Whether lexical analysis detects any errors? Explain with example.[8]

OR

- Q2)** a) Explain with example various compiler construction tools. [9]  
b) Why compilation phases are divided into front-end and back-end? what are the advantages? [4]  
c) Explain the following : [3]  
i) token  
ii) pattern  
iii) lexeme

- Q3)** a) Show that the following grammar is LR(1) but not LALR(1) [10]  
 $S \rightarrow Aa \mid bAc \mid Bc \mid bBa$   
 $A \rightarrow d$   
 $B \rightarrow d$   
b) Explain Recursive-Descent parser with an example. [8]

OR

**P.T.O.**

- Q4)** a) Show that the following grammar is LL(1) but not SLR(1) [8]  
 $S \rightarrow AaAb \mid BbBa$   
 $A \rightarrow \epsilon$   
 $B \rightarrow \epsilon$
- b) What is Shift-Reduce-Reduce conflict? How these can be resolved? With examples explain in which condition S-R and R-R conflict can occur in SLR, canonical LR and LALR parsers. (Make use of LR(0), LR(1) items. [10]
- Q5)** a) Write a translation scheme to generate three address code for assignment sentences with array and pointer references. [8]  
 b) Explain concept of back-patching with example. [8]

OR

- Q6)** a) Translate executable sentences of the following C program [8]  

```
main()
{
    int i = 1;
    int a = [10];
    while (i<=10)
    {
    }
}
```

 into  
 a) Syntax tree.  
 b) Postfix notation.  
 c) Three-address code.
- b) What are synthesized and inherited attributes? What are Marker Non-terminal symbols? Give example. [8]

## SECTION - II

- Q7)** a) With example explain different parameter passing methods. [8]  
 b) Explain Runtime support and storage organization. [8]

OR

- Q8)** a) What are different storage allocation strategies? Explain anyone in detail. [8]

- b) Explain how the security aspect handled in GSM network. [8]
- Q9)** a) Draw the architecture of IS-95 system and explain in detail various functional entities. [8]
- b) “CDMA is having better security than GSM”. Explain. [8]

OR

- Q10)** a) Describe physical and logical channels of IS-95. [8]
- b) Compare IS-95 and CDMA-200 system in detail. [8]
- Q11)** a) Explain in detail various low level protocol used in IP telephony. [8]
- b) Describe speech coding technique i.e. ADPCM in detail. [8]

OR

- Q12)** a) Explain in detail DTMF generation and detection. [8]
- b) Describe MEGACO and H.248 in detail. [8]



**P958**

**[3664]-353**

**B.E. - (I.T.)**

**MOBILE COMPUTING**

**(Elective - I) (2003 Course) (414445)**

*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)** a) What do you mean by mobile computing environment? Explain atleast 4 application areas where mobile computing environment is used. [8]
- b) Explain the role of Context Manager and describe it's various informations and relevances in the mobile computing environment. [8]

OR

- Q2)** a) Explain various types of mobilities in mobile communication environment. [8]
- b) Explain the three tier architecture of mobile computing. [8]

**Q3)** Explain GSM in the following context.

- a) General features & frame details. [6]
- b) Architecture and it's entities in detail. [6]
- c) Security issues used. [6]

OR

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

- a) Bluetooth and it's protocol stack.
- b) Java card.
- c) IPv6.

- Q5)** a) Explain various services, applications and limitations of GPRS. [8]
- b) Explain in detail the WAP protocol stack. [8]

*P.T.O.*

OR

- Q6)** a) Explain the spread spectrum technologies you know. [8]  
b) Explain GPRS transmission plane protocol architecture. [8]

**SECTION - II**

- Q7)** a) What are the various issues to be considered in designing the WLAN environment. [8]  
b) What are the design constraints in applications for handheld devices? [8]

OR

- Q8)** a) Explain the authentication process in 802.11 framework. [8]  
b) Explain SS#7 network architecture. [8]
- Q9)** a) Explain the three layers of Palm OS in detail. [8]  
b) Describe various security issues used in symbian OS. [8]

OR

- Q10)** a) Compare J2ME with J2SE or J2EE. [8]  
b) What are the functions of various layers used in symbian OS architecture? [8]
- Q11)** a) Explain the three layers of windows CE architecture. [8]  
b) Compare SIP and H.323 [5]  
c) Explain SAP/SDP in detail. [5]

OR

- Q12)** a) Explain the various components of information security. [10]  
b) Explain various security models used in mobile computing. [8]



**P959**

**[3664]-355**

**B.E. - (I.T.)**

**ORGANISATIONAL BEHAVIOUR & MANAGEMENT CONCEPTS**  
**(Elective - I) (2003 Pattern) (414445)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) Q.5 & Q.10 are compulsory.*
- 2) Answer any two out of the remaining from each section.*
- 3) Both the sections should be written in separate answer books.*
- 4) Figures to the right indicate full marks.*

**SECTION - I**

- Q1)** Define the term organisational behaviour. Elaborate any two models of O.B. **[16]**
- Q2)** What are the different types of motives. Explain A.H. Maslow's hierarchy need theory of motivation, in detail. **[16]**
- Q3)** Define performance appraisal. Explain MBO, in detail. **[16]**
- Q4)** Explain the various sources of stress with its ill-effects on human beings in an organisation. **[16]**
- Q5)** Write short notes on : (Any three) **[18]**
- a) Attributions.
  - b) Decision making.
  - c) Reward systems.
  - d) Human Resource Planning.
  - e) Defence mechanism.

**SECTION - II**

- Q6)** Explain the different types of organisational structures. Distinguish between organisational climate & organisational culture. **[16]**

- Q7)** What is the importance of leadership in an organisation? Elaborate Fiedler's contingency model, in detail. **[16]**
- Q8)** Define 'change'. Why do people resist for change in an organisation? **[16]**
- Q9)** Explain the conflict process. What are the different strategies for resolving conflict? **[16]**
- Q10)** Write short notes on : (Any three) **[18]**
- a) TQM.
  - b) Organisational Effectiveness.
  - c) Goal-setting.
  - d) Levels of conflict.
  - e) Power & Behaviour.





Total No. of Questions : 12]

[Total No. of Pages : 2

**P960**

**[3664]-357**

**B.E. - (I.T.)**

**DISTRIBUTED SYSTEMS**  
**(2003 Course) (414449)**

*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.*
- 5) *Figures to the right indicate full marks.*

**SECTION - I**

- Q1)** a) What is transparency? State different forms of transparencies. [9]  
b) Explain fundamental models. [9]

OR

- Q2)** a) Explain the issue of scalability. [9]  
b) What is HTTP? Explain its main features. [9]

- Q3)** a) Explain any four RMI Call Semantics. [8]  
b) What is Asynchronous RPC? Draw necessary diagrams. [8]

OR

- Q4)** a) Explain how RMI is implemented in Java. [8]  
b) Explain Events and Notifications. [8]

- Q5)** Write a note on :  
a) NFS file system. [8]  
b) Record Types in DNS. [8]

OR

- Q6)** Write a note on :  
a) Plan 9. [8]  
b) xFS. [8]

*P.T.O.*

## **SECTION - II**

**Q7)** Write a note on : **[18]**

- a) Bully Algorithm.
- b) Distributed Algorithm for mutual exclusion.
- c) Berkeley algorithm.

OR

**Q8)** a) What are locks? What is 2-phase locking? **[9]**

b) Explain Lamport Timestamps with Happened Before relationship. **[9]**

**Q9)** a) How are replicated writes handled? **[8]**

b) What are orphan calls? How are they handled? **[8]**

OR

**Q10)** Why is 1-phase commit protocol not suitable for distributed transactions?  
What is 2-phase commit? What is 3-phase commit? **[16]**

**Q11)** a) What are the services offered by CORBA? **[8]**

b) How does CORBA implement caching and replication? **[8]**

OR

**Q12)** a) Explain general organization of CORBA. **[8]**

b) Discuss how CORBA supports naming. **[8]**



**P961**

**[3664]-358**

**B.E. - (I.T.) (Semester - II)  
INFORMATION RETRIEVAL  
(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 - I and Question 7 or 8, 9 or 10, and 11 or 12 from section - II.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Assume suitable data, if necessary.*

**SECTION - I**

**Q1)** a) With the help of Block diagram explain typical Information Retrieval System. [8]

b) Explain conflation algorithm in detail. [8]

OR

**Q2)** a) Explain Rochhio's Algorithm. [8]

b) What is Clustering? Explain the use of clustering in IR. [8]

**Q3)** a) What is inverted file? How it can be used in information retrieval? [8]

b) Describe various classification methods based on relations between properties, classes & objects. [8]

OR

**Q4)** a) Explain Suffix arrays with the help of diagram. What is supra index? How it can be constructed? [8]

b) Describe the Boolean & Vector Model. [8]

**Q5)** a) What are the different starting points. [10]

b) Explain Information Access Process. [8]

OR

- Q6)** Write short Notes on : **[18]**
- a) Precision and Recall.
  - b) 'Online Public Access Catalog' (OPAC).
  - c) Luhn's idea.

**SECTION - II**

- Q7)** a) Write a note on : SQL3 and Online Retrieval Systems. **[8]**
- b) Discuss the Write a short note on following points with respect to Digital Libraries; **[8]**
- DL architecture issues.
  - Document models, representation and access.
  - Prototypes, projects and interface standards.

OR

- Q8)** a) Explain with formulae the basic probabilistic model. **[8]**
- b) Design user interface of search engine using various visualization techniques. **[8]**
- Q9)** a) Describe MIMD architecture with respect to parallel IR. **[8]**
- b) Explain the automatic Feature Extraction. **[8]**

OR

- Q10)** a) Explain the One dimensional time series. **[8]**
- b) Describe query processing in distributed IR systems. **[8]**
- Q11)** a) Write a note on : characterizing the web. **[10]**
- b) Explain MULTOS data model. **[8]**

OR

- Q12)** a) Write a note on : Multilingual IR. **[10]**
- b) Elaborate the characteristics of the query language used in multimedia IR systems. **[8]**



**P962**

**[3664]-360**

**B.E. - (I.T.)**

**REAL TIME SYSTEM  
(Elective - II) (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) Assume suitable data, if necessary.*

**SECTION - I**

**Q1)** a) Draw neat block diagram of Real Time System (RTS) and explain its different components. **[8]**

b) Explain the following properties of good performance measure.

- i) Efficient encoding.
- ii) Object basis for ranking.
- iii) Objective optimization criteria.
- iv) Verifiable facts.

**[8]**

OR

**Q2)** a) What is performability of RTS? In what way it is different then traditional measure of performance? **[8]**

b) In a real-time-system, how do the following factor affect the estimation of program run time?

- i) Analysis of source code.
- ii) Use of cache.

**[8]**

**Q3)** a) Explain the classification of uniprocessor scheduling algorithm. With the help of suitable example explain the RM scheduling algorithm. **[10]**

b) Write short note on (Any two)

- i) The buddy strategy.
- ii) MOS (Myopic Offline Scheduling) algorithm.
- iii) IRIS (Increase Reward Increase Service)

**[8]**

OR

**Q4)** a) Explain the preemptive Earliest Deadline algorithm with the help of suitable example. In what way preemptive-Earliest Deadline First algorithm (EPF) is different than Rate Monotonic Scheduling algorithm (RM)? [10]

b) Write short note on (Any two)

i) Focused Addressing and Bidding algorithm. [FAB]

ii) Fault tolerant scheduling algorithm.

iii) Disk scheduling algorithm. [8]

**Q5)** a) Mention the desired characteristics of real time language. [8]

b) Describe the priority inheritance protocol. Give an example to show this protocol can lead to deadlock. [8]

OR

**Q6)** a) State the features of hard real time database system MDARTS. Illustrate with the help of neat diagram how shared memory is encapsulated using the object oriented approach. [10]

b) Describe the Adaptive Earliest Deadline (AED) algorithm used in transaction priorities. [6]

### SECTION - II

**Q7)** a) Explain Virtual Time Carrier Sensed Multiple Access (VTCSMA) algorithm with flow chart. Draw the VCRC trajectory for example for  $n = 2$ . [10]

b) Describe the stop and GO multihop protocol and comment on its performance. [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 Timed Token protocol. Why this protocol is attractive for RTS. [8]

**Q9)** a) Write short notes on :

i) RT Linux.

ii) VX-Work. [8]

b) Describe the following capabilities of a real-time operating system. [8]

i) Split Interrupt Handling.

ii) Memory management through virtual memory mapping and memory locking.

OR

**Q10)** a) Write short note on the following mechanism Present in a real-time operating system. [8]

- i) Time Services.
- ii) Scheduling Mechanism.

b) Discuss the real time extension of Linux operating system. [8]

**Q11)** a) Illustrate with the help of neat diagram the implementation of N-Modular Redundancy. [8]

b) Describe the following software redundancy method.

- i) N-version Programming.
- ii) Recovery Block approach. [8]

OR

**Q12)** a) Describe the 3-type of voters in cases where an approximate agreement is required to achieve hardware redundancy through voting and consensus. [8]

b) Explain the Byzantine's algorithm for fault tolerance with an example. Also specify the interactive consistency condition. [8]

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**P966**

**[3664] - 121**

**B.E. (Civil)**

**FOUNDATION ENGINEERING**

**(2003 Course) (401010) (Theory)**

*Time : 3 Hours]*

*[Max. Marks:100*

*Instructions to the candidates:*

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

**SECTION - I**

- Q1)** a) What are the objectives of soil investigation? [4]  
b) How would you plan subsurface exploration for an important building project. [4]  
c) Describe chunk sampling with a neat sketch. [4]  
d) Explain the working of a piston sampler. [5]

**OR**

- a) Define the terms :  
i) Area ratio ii) Density index  
iii) Significant depth iv) Recovery ratio. [4]  
b) What are the factors that influence the depth and number of exploratory holes. [4]  
c) Describe the standard penetration test explaining its applications in foundation engineering. [6]  
d) What is the corrected blow count in a fine saturated sand if the recorded blow count is 38? [3]

**P.T.O.**



- Q2)** a) What is contact pressure? Sketch the contact pressure distribution for a rigid base for i) Clay soil ii) Sandy soil. [6]
- b) Distinguish between i) Elastic settlement and consolidation settlement ii) Uniform settlement and differential settlement. [6]
- c) Determine the settlement of a footing  $2\text{m} \times 3\text{m}$  carrying a load of 1250 kN if a plate load test (0.3m square) on the same soil gave the settlement of 3mm under a load of 25 kN (Take  $I_s = 1.2$  for footing & 0.95 for plate). [5]

OR

- a) Enlist the causes of foundation settlement. [4]
- b) Explain in brief consolidation test and enlist the consolidation parameters obtained from test result. [6]
- c) A normally consolidated clay layer of 3m thickness is sandwiched between two permeable layers. The liquid limit & the initial void ratio of the clay are 36% and 0.82 respectively, while the initial overburden pressure at the middle of the clay layer is  $2\text{kg/cm}^2$ . Due to the construction of a new building this pressure increases by  $1.5\text{ kg/cm}^2$ . Find consolidation settlement of the building. [7]
- Q3)** a) Define the terms : ultimate, net and safe bearing capacity. [3]
- b) With neat sketches explain the terms : punching shear, local shear and general shear failures. [6]
- c) State and explain Terzaghi's bearing capacity equation. [4]
- d) Determine the net bearing capacity of a footing  $2\text{m} \times 3\text{m}$  resting on a saturated clay ( $\phi = 0$ ) with unconfined strength of  $35\text{ kN/m}^2$ . Depth of footing is 2.5m. [3]

OR

- a) Explain plate load test with a neat sketch and explain how the test results are used to find bearing capacity of soil as per IS criteria. [8]
- b) Explain allowable soil pressure and enlist methods to obtain the same. [4]
- c) Explain perimeter shear concept as suggested by Housel. [4]

## **SECTION - II**

- Q4)** a) Draw a neat cross section of arrangement of pile load test by showing all component parts, name them properly and also enlist the test procedure

in ten steps. [6]

- b) Explain three types of settlements with load settlement curve and also explain the method of calculating working load from test data by 3 different methods as suggested by Indian standards. [6]
- c) Explain with suitable sketches method of installation of bored and cast in situ pile in ten steps. [5]

OR

- a) Explain with sketches method of calculating settlement of pile group in clays. [6]
- b) In connection with drilled pier explain with sketches
  - i) Necessity.
  - ii) Equipment used for boring.
  - iii) Equipment used for widening base. [6]
- c) Explain with sketches the following difficulties met during sinking of well.
  - i) Sand blow
  - ii) Rectification of tilt. [5]

- Q5)** a) Draw a neat sketch of three strutted braced sheet pile wall excavation of height 'H' and show there on as well as explain soil pressure on it when backfill is
  - i) Dense sand
  - ii) Clay. [6]
- b) A cantilever sheet pile of height H above the dredge line and with D as depth of embedment, assuming approximate pressure distribution work out depth of embedment in terms of H,  $K_a$ ,  $K_p$  (with usual conversions) [6]
  - c) Draw a sketch of anchored sheet pile, driven to shallow depth and another driven to deep depth. Explain the comparison of deflection of these two cases for i) At top of pile ii) At junction of anchor iii) At point of contraflexure iv) At bottom. [5]

OR

- a) Explain with suitable sketches
  - i) Differential free swell as a concept
  - ii) Classification of expansive soil as suggested by Indian standards and based on DFS
  - iii) How would you measure the same in laboratory. [6]
- b) State and explain five important recommendations for building foundation in B.C. soil. [6]
- c) Draw a neat sketch of double under reamed pile giving details of dimension and state how would you work out its load bearing capacity. [5]

- Q6)** a) Define, explain and compare with sketches in tabular form two types of body waves. [4]
- b) Explain four different types of earthquake scales used in engineering practice. [4]
- c) Explain with sketches two types of liquefaction. [4]
- d) Explain four effects of liquefaction on built environment. [4]

OR

- a) Explain with sketches four important functions of geosynthetics. [4]
- b) Explain with sketches four different types of geosynthetic fibres indicate their symbols and use. [4]
- c) Explain with sketches four failure mechanisms to check external stability of reinforced earth. [4]
- d) Explain with sketches components of nailed soil wall and its construction. [4]



**P967**

**[3664] - 122**  
**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, electronic pocket calculator is allowed.*
- 6) Assume suitable data, if necessary.*
- 7) State Assumptions made.*

**SECTION - I**

**Unit - I**

- Q1)** a) Derive Lamé's equation for thick cylinders. Highlight the assumptions made. **[8]**
- b) A closed vessel having internal diameter of 430mm is to be designed to withstand an internal pressure of 45 MPa. Material to be used is ductile material with  $S_{yt}$  300MPa,  $S_{ut}$  500MPa and Poisson's ratio 0.3. Estimate the wall thickness by using Factor of Safety 1.5  
So designed cylinder if overloaded above the designed pressure, what will be the magnitude of pressure at which the cylinder will actually fail? **[8]**

OR

- Q2)** a) What is meant by pre-stressing of a cylinder? What is its necessity? Explain any one method of pre-stressing cylinder. **[6]**
- b) A reaction vessel of cylindrical shell of 1200mm is provided with a nozzle having an opening of 125mm diameter. Protruding length of nozzle inside and outside the shell is same and it is made up of seamless tube. The thickness of shell is 8mm and that of nozzle is 12mm. Internal pressure in the shell is 0.8MPa. The corrosion allowance is 1.5mm. Permissible tensile stress for shell and nozzle material is 80MPa.  
Design the dimensions of reinforcing pad if required (Round off the obtained dimension to nearest Tens digit. The reinforcing material is of same quality as that of the shell and is available in thickness of 4mm. (Assume weld efficiency as 85%). **[10]**

**P.T.O.**

## Unit II

- Q3)** a) Define 'Optimum design'. How it is different from adequate design? How to decide whether a given problem on optimum design is based on normal specifications or on redundant specifications? State any one practical illustration where the concept of optimum design is required to be used. [4]
- b) A tensile bar of length 400mm is subjected to constant tensile force of 4000N. If the factor of safety is 2, design the bar diameter with the objective of minimizing material cost using optimum material from the list given in **Table 1**. What will be the cost of designed shaft? [12]

Material	Density ( $\rho$ ) kg/m <sup>3</sup>	Cost (c) Rs/kg	Syt N/mm <sup>2</sup>	G N/mm <sup>2</sup>
Steel	7800	14	400	82000
Aluminum alloy	2800	70	150	27000
Titanium Alloy	4500	1100	800	41000

**Table 1**

OR

- Q4)** In a lightweight equipment, a shaft is required to transmit 45kW power at 480 RPM. Required stiffness of shaft is 90N-m/ Degree. Factor of safety based on  $S_{ys}$  is 1.5. From manufacturing considerations, the diameter must be greater than 30mm. Using max shear stress theory of failure design the shaft with the objective of minimum weight by using optimum material from the list given in **Table 1** above. [16]

## Unit - III

- Q5)** a) Derive expression for hoop stress due to centrifugal force in the flywheel rim. [8]
- b) In a certain machine, the intermittent operations demand the torque to be applied to its shaft in the following manner:  
During the first half revolution, the torque is to increase uniformly from 1380 N-m to 2760 N-m; in the following one revolution, it is to remain constant at 2760N-m. In the following half revolution, it is to decrease uniformly to 1380 N-m; and in the last revolution, it is to remain constant at 1360 N-m.

The machine is directly coupled to the motor, which delivers uniform torque on machine shaft and rotates at 400 RPM.

Decide rim cross sectional dimensions of the flywheel that is to be added to the system so as to limit the speed fluctuation within 8%. To accommodate the flywheel in confined space, its mean rim radius should be 0.5 m.

Other necessary data: Material- FG 200, Ratio of rim width to thickness is = 2, Factor of Safety for design= 1.5, Density of wheel material =  $7800\text{kg/m}^3$ . [10]

OR

**Q6) a)** Fill in the blanks with proper alternative and **rewrite the sentences.** [5]

i) Moment of inertia of flywheel is \_\_\_\_\_ proportional to the coefficient of speed fluctuation.

- 1) directly.
- 2) inversely.

ii) Maximum possible theoretical value of coefficient of speed fluctuation of any load prime-mover combination is \_\_\_\_\_.

- 1) 0.5
- 2) 1
- 3) 2
- 4) 3

iii) For same moment of inertia of both the flywheels, Outer Diameter of rimmed flywheel is \_\_\_\_\_ than that of the solid disc flywheel.

- 1) more
- 2) less

iv) \_\_\_\_\_ limits the overall size of flywheel.

- 1) Mass.
- 2) Moment of inertia.
- 3) Linear velocity of rim.
- 4) Angular velocity.

v) If power capacity of a two-stroke engine is same as that of another four-stroke engine, Size of flywheel will be small in case of the \_\_\_\_.

- 1) Two stroke engine.
- 2) Four stroke engine.

b) The cycle of operations performed by a machine is of three revolutions. The torque required has a constant value of 400 N-m for one revolution; zero for second revolution, 550 N-m for the first half of last revolution and zero for the rest of the cycle.

The driving torque is constant and mean speed of the system is 180RPM, which can be allowed to fluctuate up to 4%. Design rim cross sectional dimensions of a flywheel with mean rim radius of 0.5 m. Other relevant data: Ratio of rim width to thickness = 2, density of wheel material = 7800kg/m<sup>3</sup>. [10]

If the flywheel available with mean rim radius 0.5m is so small such that it just avoids stoppage of the system, find out its rim cross sectional dimensions. [3]

## SECTION - II

### Unit - IV

**Q7) a)** A shaft and hole assembly of nominal diameter 40mm have the following dimensions :

$$\text{Hole Dia} = 40 \begin{matrix} +0.01 \\ +0.00 \end{matrix}$$

$$\text{Shaft Dia} = 40 \begin{matrix} -0.1 \\ -0.15 \end{matrix}$$

Assuming the shaft and hole diameters are normally distributed, determine :

The percentage of assemblies having clearance less than 0.15mm.

The percentage of assemblies having clearance greater than 0.22mm.

(Refer Table 2 for Areas below normal distribution curve). [10]

z	0	1	2	3	4	5	6	7	8	9
1.5	0.4332	0.4345	0.4357	0.4370	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	0.4750	0.4756	0.4761	0.4767
2.0	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	0.4830	0.4834	0.4838	0.4842	0.4846	0.4850	0.4854	0.4857
2.2	0.4861	0.4864	0.4868	0.4871	0.4875	0.4878	0.4881	0.4884	0.4887	0.4890
2.3	0.4893	0.4896	0.4898	0.4901	0.4904	0.4906	0.4909	0.4911	0.4913	0.4916
2.4	0.4918	0.4920	0.4922	0.4925	0.4927	0.4929	0.4931	0.4932	0.4934	0.4936

**Table 2**

b) Write a short note on : Design for Forgings. [6]

OR

**Q8) a)** An assembly of three components A, B and C is shown in figure 1. If the dimensions of the three components are normally distributed with design tolerance equal to the natural tolerance, determine the percentage of assemblies where interference is likely to occur. [12]

(Refer Table 2 for Areas below normal distribution curve)

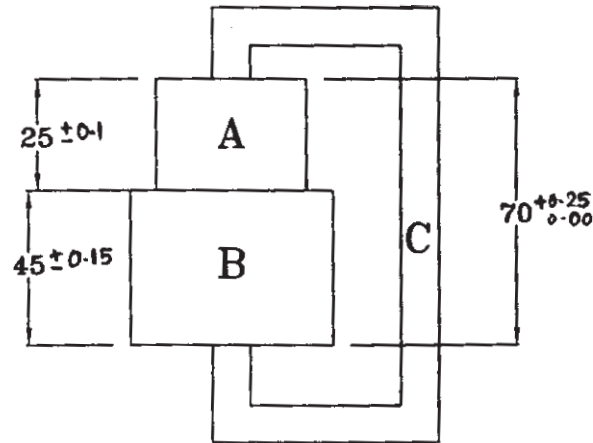


Fig 1

- b) Write a short note on : Design for Assembly. [4]

### Unit - V

- Q9) a)** What is meant by 'Structure Formula'? Is the Structure Formula 2(1) 2(4) 3(2) valid? If yes, how? If not, Why? Explain with the help of structure diagram. [3]

- b) A multi-speed sliding mesh gearbox is to be designed for tapping speeds ranging from 20rpm to near about 3170 rpm according to R5 preferred series. It is to be driven by a three-phase induction motor running at 1440rpm.

For the proposed system, List out intermediate speeds. Write all structure formulae. Select only those formulae that are leading to minimum number of speeds on output shaft of each stage. Select set of optimum formulae from the short listed sets. (Write down the reason for discarding each of the other sets based on standard selection criteria). Draw **symmetric** structure diagrams based on short listed formulae. Select optimum structure diagram. (Write down the reason for discarding each of the other diagrams based on standard selection criteria). Draw speed diagram. Draw gearing diagram when Third speed from bottom is being tapped. Find out number of teeth on each gear. Draw deviation diagram of the system. [15]

OR

- Q10)a)** Prove that 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. [4]



- b) Figure 2 shows Gearing diagram of a multi-speed gear drive with number of teeth on each gear as specified. If the input shaft is rotating at 120 rpm, what are the speeds available at output shaft? Draw structure diagram of this gear drive. What speed is being tapped in the shown position? What is the factor  $\phi$  for this gear drive? [10]

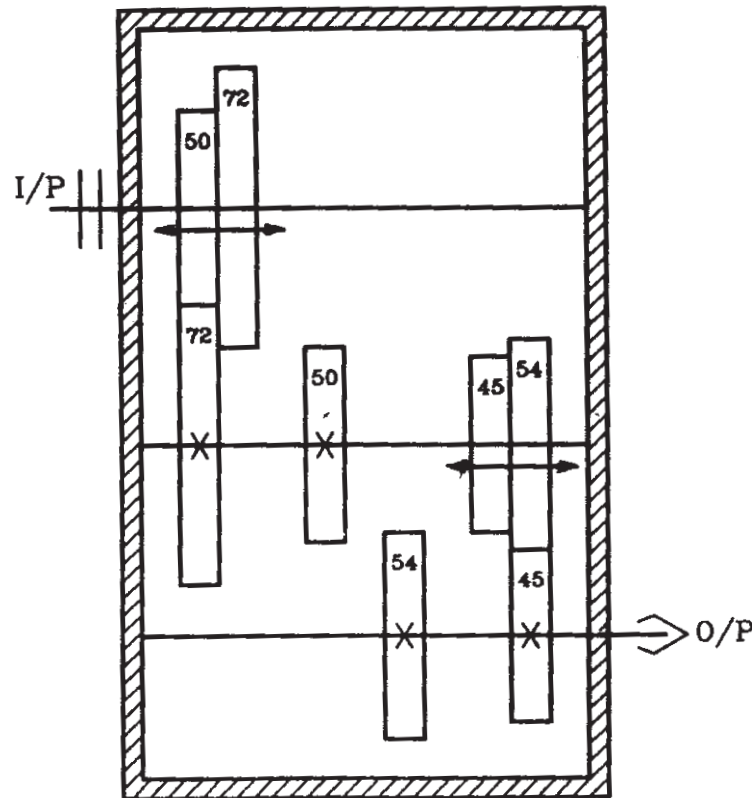


Fig 2

- c) What are different ergonomic considerations involved in the design of Controls. [4]

### Unit - VI

Q11)a) Answer the following in one sentence [4]

- What are the basic objectives of a material handling system?
  - What are the types of loads that can be handled by a material handling system?
  - What is the basic classification of the material handling systems?
  - What is meant by containerization?
- b) Draw a schematic sketch of a flat belt conveyor. Name all its components. Write down the equation used to calculate power required to drive the conveyor. [4]
- What is the need of tension take up device? How a vertical gravity type take-up works? [4]

- c) A Horizontal flat belt conveyor is to be used for transporting 350 metric ton of iron ore per hour at belt speed of 2 m/s. The mass density of iron ore is  $1700 \text{ kg/m}^3$ . If surcharge factor is 0.1, determine the required belt width. [4]

OR

**Q12)** Following data relate to a horizontal belt conveyor used for conveying coal in a thermal power station:

Capacity of conveyor : 400 ton/hr  
 Density of coal:  $800 \text{ kg/m}^3$   
 Belt speed: 2 m/s  
 Surcharge factor: 0.1  
 Number of plies: 3  
 Material Factor  $K_1$  : 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:  $210^\circ$   
 Coefficient of friction between belt and pulley: 0.4  
 Drive efficiency: 93 %  
 Motor speed 1440 RPM

Determine following parameters of the conveyor:

Standard belt width rounded off to nearest hundred mm.  
 Reduction ratio of the gear reducer  
 Power required to drive the conveyor.

[16]



***P.T.O.***

- Q4)** a) Explain any two transducers for level measurement. [6]  
b) Explain the working principle of Thermocouple and state its advantages and limitations. [6]  
c) Explain temperature compensation technique used in strain gauge circuits. [4]

- Q5)** a) Explain building blocks of Thermal system. [6]  
b) Compare feed back and feed forward control system. [6]  
c) Derive the model equation of a rotational mechanical system with spring, mass and damper. [6]

OR

- Q6)** a) Explain feed back control system with suitable example. [6]  
b) Explain the building blocks of mechanical system. [6]  
c) Write a short note on electromechanical system model. [6]

## **SECTION - II**

- Q7)** a) Explain P+I+D control action. [5]  
b) Write a short note on : -  
i) proximity switch ii) magnetic switch. [6]  
c) Explain Bode plots. [5]

OR

- Q8)** a) Explain the use of relays in control system. [5]  
b) Explain on-off control action in brief. [5]  
c) Explain dynamic response of first order system to a step input. [6]

- Q9)** a) Explain integrator and differentiator operational amplifier. [6]  
b) Explain JK flip flop. [5]  
c) Write a short note on schmitt trigger. [5]

OR

- Q10)** a) Explain analog to digital converter. [5]  
b) Explain inverting and non-inverting operational amplifier. [6]  
c) Discuss the characteristics of operational amplifier. [5]

- Q11)** a) Write a short note on microcontroller. [6]  
b) Explain any one application using PLC along with its ladder diagram. [12]

OR

- Q12)** a) Explain the use of counters and timers in PLC. [6]  
b) State the specifications of PLC. [6]  
c) Explain the block diagram of PLC with a neat sketch. [6]



**P971**

**[3664] - 130**

**B.E. (Mechanical)**

**OPERATIONS RESEARCH**

**(2003 Course) (Sem. - I) (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 rules, Mollier charts, electronic pocket calculator and steam tables in allowed.*
- 5) *Assume suitable data, if necessary.*

**SECTION - I**

**Q1)** A company makes two kinds of leather belts. Belt A is a high quality belt and belt B is of a lower quality. The respective profits are Rs. 4 and Rs. 3 per belt. Each of type A requires twice as much time as belt of type B, and if all the belts were of type B, the company could make 1000 per day. The supply of leather is sufficient for only 800 belts per day (both A and B combined). Belt A requires a fancy buckle and only 400 days per day are available. There are only 70 buckles available for belt B.

What should be daily production of each type of belt? Formulate the linear programming problem and solve it by simplex method. **[16]**

OR

**Q1)** Solve the following LP problem by using the two-phase simplex method:

Minimize  $Z = x_1 + x_2$  **[16]**

Subject to the constraints

$$2x_1 + 4x_2 \geq 4$$

$$x_1 + 7x_2 \geq 7$$

$$\text{And } x_1, x_2 \geq 0.$$

**P.T.O.**

**Q2) Solve Transportation Problem by all methods and check optimality by MODI method. [16]**

	A	B	C	D	SUPPLY
X	2	3	11	7	6
Y	1	0	6	1	1
Z	5	8	15	9	10
REQUIREMENT	7	5	3	2	

OR

**Q2) a) Solve the following assignment problem. [8]**

	P	Q	R	S	T
A	10	5	13	15	16
B	3	9	18	13	6
C	10	7	2	2	2
D	7	11	9	7	12
E	7	9	10	4	12

- b) i) Explain in detail the procedure for solving travelling Salesman problem. [4]  
 ii) Explain that assignment is a special case of transportation problem. [4]

**Q3) a) Derive the formula for Economic Lot Size model with constant demand.[8]**

- b) The production department for a company requires 3,600 kg of raw material for manufacturing a particular item per year. It has been estimated that the cost of placing an order is Rs. 36 and the cost of carrying inventory is 25% of the investment in the inventories. The price is Rs. 10 per kg. [10]

Find

- i) Optimal lot size.  
 ii) Optimal order cycle time.  
 iii) Minimum yearly variable inventory cost.  
 iv) Minimum yearly total cost.

OR

**Q3) a) Explain the EOQ models with quantity discounts. [8]**

- b) The annual demand of a product is 10,000 units. Each unit costs Rs.100. if orders placed in quantities below 200 units but for orders of 200 or above, the price is Rs.95. The annual inventory holding costs is 10% of the value of item and the ordering cost is Rs. 5 per order. Find the economic lot size. [10]

## SECTION - II

- Q4)** a) Solve the game whose payoff matrix is given below : [8]

	Player B			
	$B_1$	$B_2$	$B_3$	$B_4$
Player A	3	2	4	0
	3	4	2	4
	4	2	4	0
	0	4	0	8

- b) What is replacement? Describe some important replacement situations. [8]

OR

- Q4)** a) A firm has a machine whose purchase price is Rs.1,00,000. It's running cost and resale price (Rs.) at the end of different years are as follows:

Year	1	2	3	4	5	6
Running cost	7,500	8,500	10,000	12,500	17,500	27,500
Resale price	85,000	76,500	70,000	60,000	40,000	15,000

- i) Obtain the economic life of the machine and the minimum average cost.
  - ii) The firm has obtained a contract to supply the goods produced by machine, for the period of five years from now. After this time period, the firm does not intend to use the machine. If the firm has a machine of this type which is one year old, what replacement policy should it adopt if it intends to replace the machine not more than once? [8]
- b) Write short notes (any 2) : [8]
- i) Two person zero sum.
  - ii) Principle of dominance.
  - iii) Pure strategy in game theory.



**Q5) a)** In a railway marshalling yard, goods trains arrive at a rate of 30 trains per day. Assuming that the inter-arrival time follows an exponential distribution and the service time (the time taken to jump a train) distribution is also exponential with an average of 36 minutes. Calculate

- i) Expected queue size (line length)
- ii) Probability that the queue size exceeds 10.

If the input of trains increases to an average of 33 per day what will be the change in (i) and (ii)? **[8]**

**b)** Find the sequence that minimizes the total time required in performing the following jobs on three machines in the order ABC. Processing times (in hours) are given in the following table:

Job	:	1	2	3	4	5	
Machine A	:	8	10	6	7	11	
Machine B	:	5	6	2	3	4	
Machine C	:	4	9	8	6	5	<b>[8]</b>

OR

**Q5) a)** Derive the difference equations for the queuing model  $\{(M/M1): (\infty/FCFS)\}$ . **[8]**

**b)** Arrivals at a telephone booth are considered to be Poisson with an average time of 10 minutes between one arrival and the next. The length of phone call assumed to be distributed exponentially, with mean 3 minutes,

- i) What is the probability that a person arriving at the booth will have to wait?
- ii) The telephone department will install a second booth when convinced that an arrival would expect waiting for at least 3 minutes for a phone call. By how much should the flow of arrivals increase in order to justify a second booth?
- iii) What is the average length of the queue that form from time to time?
- iv) What is the probability that it will take him more than 10 minutes altogether to wait for the phone and complete his call? **[8]**

**Q6)** A small project is composed of 7 activities whose time estimates are listed in the table below. Activities are identified by their beginning (i) and ending (j) node numbers.

- a) Draw the project network.
- b) Find the expected duration and variance for each activity. What is the expected project length?
- c) Calculate the variance and standard deviation of the project length. What is the probability that the project will be completed?
  - i) At least 4 weeks earlier than expected time?
  - ii) No more than 4 weeks later than expected time?
- d) If the project due date is 19 weeks, what is the probability of not meeting the due date? **[18]**

Given :

Z	0.50	0.67	1.0	1.33	2.00
Prob.	0.3085	0.2514	0.1587	0.0918	0.0228

OR

**Q6)** Write short notes (any three) : **[18]**

- a) Updating of the network.
- b) Project crashing.
- c) Types of float.
- d) Role of statistical techniques in PERT.



**P972**

**[3664] - 133**  
**B.E. (Mechanical)**  
**POWER PLANT 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.*
- 6) All questions are compulsory.*

**SECTION - I**

**UNIT - I**

- Q1)** a) Give comparison of gas turbine and steam power plant. **[4]**
- b) With the help of neat schematic sketch, explain the working of CANDU reactor. **[6]**
- c) Explain pumped storage plant in detail. **[6]**

OR

- Q2)** Write short notes on the followings (Any four) : **[16]**
- a) Classification of a nuclear reactor.
  - b) Present status of power generation.
  - c) Nuclear fission.
  - d) Site selection for nuclear power plant.
  - e) Shielding against nuclear radiations.

**UNIT - II**

- Q3)** a) Explain with neat sketch the followings :
- i) Bowl mill
  - ii) Cyclone Burner. **[8]**
- b) What are the different types of coal conveyors? Indicate the use of each and justify. **[8]**

**P.T.O.**

OR

- Q4)** a) Explain the working of electrostatic precipitator with a neat diagram. List out its outstanding features over other collectors. [8]  
b) What do you understand by word draught? How draughts are classified? [8]

**UNIT - III**

- Q5)** a) Explain salient features of high pressure boilers. State their advantages. [8]  
b) A steam power plant uses the following cycle :  
Steam condition at boiler stop valve : 150 bar, 550°C.  
Reheat at 40 bar to 550°C  
Condenser pressure = 0.1 bar  
Assuming all processes to be ideal, find :  
i) cycle efficiency.  
ii) specific steam rate. [10]

OR

- Q6)** a) Write a short note on regenerative feed water heating. [6]  
b) A steam power plant working on reheat-regenerative cycle has the following data ;-  
Steam inlet to HP turbine = 80 bar and 400°C.  
Steam extraction for feed heating at 7 bar.  
Remainder steam reheated to 350°C in reheater.  
Exhaust pressure from Lp turbine = 0.035 bar.  
Neglect the pump work.  
Determine :  
i) Fraction of steam bled off for feed heating.  
ii) Heat supplied per kg of steam in boiler and reheater.  
iii) Power output of the turbine.  
iv) Thermal efficiency. [12]

**SECTION - II**

**UNIT - IV**

- Q7)** a) Show by analytical method that for Isentropic flow of steam through a convergent-divergent nozzle, the velocity at throat is local acoustic velocity. [6]

- b) Steam at a pressure of 15 bar and dryness fraction 0.97 is discharged through a convergent divergent nozzle to a back pressure of 0.2 bar. The mass flow rate is 9 kg/kWh. If the power developed is 220 kW, determine :-
- throat pressure
  - Number of nozzles required if each nozzle has a throat of rectangular cross-section of  $4\text{mm} \times 8\text{mm}$ .
  - If 12% of the overall isentropic enthalpy drop reheats by friction the steam in divergent portion, find the cross-section of the exit rectangle.
- [10]**

OR

- Q8)** a) What are the advantages of using a condenser in a steam power plant? **[3]**
- b) Define and explain i) vacuum efficiency ii) condenser efficiency. **[2]**
- c) A surface condenser deals with 13625 kg of steam per hr at a pressure of 0.09 bar. The steam enters 0.85 dry and the temperature at the condensate and air extraction pipes is  $36^\circ\text{C}$ . The air leakage amounts to 7.26 kg/hr. Determine
- The surface required if the average heat transmission rate is  $3.97 \text{ kJ/cm}^2 \text{ per sec}$ .
  - The cylinder diameter for the dry air pump if it is to be single acting at 60 RPM, with a stroke to bore ratio of 1.25 & volumetric efficiency of 0.85.
- [11]**

### UNIT - V

- Q9)** a) Derive expression for optimum value of the ratio of blade speed to steam speed for maximum efficiency for a single stage impulse turbine. **[6]**
- b) The following data refers to a single stage impulse turbine:-  
 Isentropic heat drop in nozzle = 251 kJ/kg, nozzle efficiency = 90%,  
 nozzle angle =  $20^\circ$ , ratio of blade speed to whirl, component of steam speed = 0.5 blade velocity coefficient = 0.9, velocity of steam entering the nozzle = 20 m/sec.  
 Determine :-
- blade angles at inlet and outlet if the steam enters into the blades without shock and leaves the blades in an axial direction.
  - Blade efficiency.
  - Power developed and axial thrust if the steam flow is 8kg/sec. **[12]**

OR

- Q10)a)** Derive an expression for maximum efficiency of Parson's reaction turbine. List the assumptions made. [6]
- b)** A 20 stage Parson turbine receives steam at 15 bar and 300°C. The steam leaves the turbine at 0.1 bar. The turbine has a stage efficiency of 80% and the reheat factor 1.06. The total power developed by the turbine is 10665 kW. Find the steam flow rate through the turbine assuming all stages develop equal power. The pressure of steam at certain stage of the turbine is 1 bar abs, and is dry and saturated. The blade exit angle is 25° and the blade speed ratio is 0.75. Find the mean diameter of the rotor of this stage and also the rotor speed. Take blade height as 1/12<sup>th</sup> of the mean diameter. [12]

### UNIT - VI

- Q11)a)** Explain the economic scheduling principle for load distribution and prove that combined input is minimum if the incremental heat rate of each two unit is same. [6]
- b)** Discuss in detail how the unit energy cost is determined. [6]
- c)** Define i) Annual load factor ii) use factor iii) capacity factor. What are their importance? [4]

OR

- Q12)a)** What do you mean by load curve & load duration curve? Draw typical load curves for industrial load and residential load and construct load duration curves. [6]
- b)** A base load station having a capacity of 18 MW and a standby station having a capacity of 20 MW share a common load. Find (i) Annual load factor (ii) use factor (iii) capacity factor of two power station from following data :-
- |                                  |   |                            |
|----------------------------------|---|----------------------------|
| Annual stand by station output   | = | 7.35×10 <sup>6</sup> kWh   |
| Annual base load station output  | = | 101.35×10 <sup>6</sup> kWh |
| Peak load on stand by station    | = | 12 MW                      |
| Hours of use of stand by station | = | 2190 hours.                |
- during the year [10]



**[3664] - 155**

**B.E. (Production & Production S/W)  
MANUFACTURING AUTOMATION & CONTROL  
(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 pump has a displacement volume of 100 cm<sup>3</sup>. It delivers 0.00152 m<sup>3</sup>/sec at 1000 rpm and 70 bars. If the prime mover input torque is 125 N-m
- i) What is overall efficiency of the pump?
  - ii) What is theoretical torque required to operate the pump? **[6]**
- b) Explain the terms i) Beta rating ii) Absolute rating. **[4]**
- c) Explain with neat sketch the working of a counterbalance valve and draw a typical circuit showing its application. **[6]**

**OR**

- Q2)** a) A cylinder has to carry a load of 25000 N and it is to move over a horizontal surface at a speed of 25 m/min. It has to brought to speed as well as stopped within 15 mm, which results into a surge pressure of 440 bar. Calculate the diameter of cylinder. Assume coefficient of friction to be 0.15. **[6]**
- b) Find the offset angle for axial piston pump, which delivers 0.0019 m<sup>3</sup>/sec at 3000 rpm. Pump has nine 16 mm diameter pistons arranged on a 127 mm piston circle diameter. **[4]**
- c) Draw a neat sketch & explain pressure compensated flow control valve. **[6]**

**P.T.O.**

- Q3) a)** A hydraulic cylinder has to operate as follows : It extends in 5 seconds at 25 bar, flow rate 12 lpm; It remains extended for 25 seconds at 200 bar, no flow; It retracts in 4 seconds at 35 bar, flow rate 12 lpm; remain retracted for 26 seconds at 200 bar, no flow; Design the size of accumulator required and size of pump. Assume isothermal condition in gas during charging and discharging. [10]
- b) Draw neat sketch and explain working of a regenerative circuit. [6]

OR

- Q4) a)** A hydraulic system requires 350 lpm flow at 20 bar pressure for some part of cycle and 40 lpm flow in remaining part of cycle at 320 bar pressure. Calculate the size of pump and input energy to pump if intensifier is to be used in circuit. [4]
- b) What are the functions of fluid reservoir in hydraulic system? Explain the steps to design the reservoir considering heat dissipation criteria. [8]
- c) Name the four types of cylinder mountings with neat sketches. [4]
- Q5) a)** A pneumatic cylinder is needed to press fit a pin into a hole. Design and draw a circuit using a twin pressure valve which is operated by two 3/2 valves. A 4/2 valve is used as the main direction control valve to operate the double acting cylinder. [8]
- b) What are the selection criteria for air compressors? [4]
- c) What is function of shuttle valve? Draw any suitable pneumatic circuit showing application of shuttle valve. [6]

OR

- Q6) a)** Draw a position step diagram and suitable pneumatic circuit for a 2 cylinder system in which the cylinder extends sequentially but retracts simultaneously. [8]
- b) Explain use of pneumatics in low cost automation. [6]
- c) Explain with neat sketch the time delay valve. [4]

### SECTION - II

- Q7) a)** What are various components of process control system? Explain the function of each component briefly. [8]
- b) How many status flags does 8085 have? Discuss the role of each flag. [8]



OR

- Q8)** a) Draw and explain ladder diagram for a motor with the following : Normally open start button, normally closed stop button, thermal overload switch opens at high temperature, green light when running, red light for thermal overload. [10]
- b) Explain for a microprocessor, the roles of i) Accumulator ii) Memory address iii) Program counter registers. [6]
- Q9)** a) A PI controller has  $K_p = 5$ ,  $K_i = 1.5 \text{ s}^{-1}$ . The controller output for no error  $P_i(o) = 20\%$ . Plot the controller output as a function of time for an error given by figure 1.  $K_p$  and  $K_i$  are proportional gain and integral gain respectively. [10]

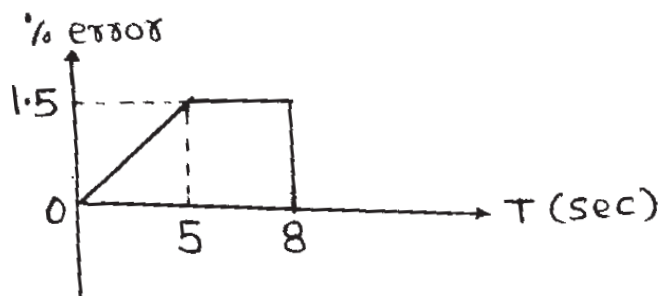


Figure 1

- b) Explain the digital to analog converter as an input device. [6]

OR

- Q10)** a) Explain with suitable example the use of accumulating timer in PLC. [8]
- b) Explain with suitable example the latch circuit. [4]
- c) Find the digital word that results from a 3.127 volt input into a 5 bit ADC with a 5 volt reference. [4]
- Q11)** a) Explain various types of work transfer systems. [8]
- b) Explain with neat sketches various types of rotary feeders. [6]
- c) What factors should be considered while deciding type of transfer device to be used in automated systems. [4]

OR

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

- a) Industrial robots.
- b) Automated guided vehicles.
- c) Flexible manufacturing system.



**P977**

**[3664]-159**

**B.E. (Production)**

**PLANT ENGINEERING AND MAINTENANCE**

**(2003 Course) (411085) (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) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 5) Assume suitable data, if necessary.*

**SECTION - I**

**Unit- I**

- Q1)** a) What factors will be considered for the site selection for following :  
i) Textile unit.  
ii) Consumable durable industry like refrigerator manufacturing unit. **[10]**
- b) Explain the scope and importance of plant engineering function in industrial activities. **[8]**

OR

- Q2)** a) What possible errors can be committed in new site selection. **[10]**  
b) Write a short note on selection of machines and equipments. **[8]**

**Unit - II**

- Q3)** a) What are the principles for planning the layout of a new factory? **[8]**  
b) Explain in short various accident prevention practices. **[8]**

OR

- Q4)** a) Write a short note on : **[8]**  
i) Cellular layout.  
ii) PQRST analysis.  
b) Discuss the use of computers in planning and evolving layout. **[8]**

**P.T.O.**

### **Unit - III**

- Q5)** a) Discuss the various duties of safety officer in the plant. [8]  
b) What are the principles of material handling explain? [8]

OR

- Q6)** a) Write short note on : [8]  
i) Transportation service.  
ii) Water supply.  
b) Explain any two methods of comparing alternative material handling plans while evaluating alternative in SHA. [8]

### **SECTION - II**

#### **Unit - IV**

- Q7)** a) What should be the objective of maintenance management for successful working of a maintenance department? [8]  
b) Explain in short how job card system is useful in equipments maintenance. [8]

OR

- Q8)** a) Explain in detail condition based maintenance. [8]  
b) How is work planning and scheduling carried out in a maintenance organisation? [8]

#### **Unit - V**

- Q9)** a) List the physical parameters which can monitor the condition of an equipment/system. Discuss in detail. [8]  
b) Describe how store management can help in keeping a better spare parts inventory. [8]

OR

- Q10)** a) Describe various types of lubrication system used in practice. [8]  
b) Discuss the factors which need to be considered for implementation of an efficient spare parts control system. [8]

### **Unit - VI**

**Q11)** a) What is Total Productive Maintenance? Explain the various tools and techniques associated with TPM? [10]

b) What is reliability? Discuss various reliability models used in practice for maintenance of equipment. [8]

OR

**Q12)** a) Write short note on : [10]

i) House keeping and maintenance.

ii) Failure mode and effect analysis (FMEA)

b) Explain how computers can be helpful in discharge of maintenance functions. [8]



**P978**

**[3664]-160**

**B.E. (Production)**

**MATERIAL HANDLING TECHNOLOGY AND EQUIPMENT  
DESIGN**

**(2003 Course) (Elective - I)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) Answer 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 different tools and techniques of Industrial Engineering which can be used to develop Material Handling System. **[8]**
- b) Explain functions of material handling. Explain engineering factors and economic factors to be considered in M.H. problems. **[10]**

OR

- Q2)** Write short note on : **[18]**
- a) Unit load and equipments handling unit loads.
  - b) Costs associated with MH system.
  - c) Engineering factors in MH system.

- Q3)** a) Explain basic guidelines for designing and operating MH system. **[10]**
- b) Explain position restricted MH system with neat sketch. **[6]**

OR

- Q4)** a) Explain various lifting and lowering devices of MH system. **[10]**
- b) A recirculating conveyor has total length 2000 ft. It's speed is 50 ft/min and the spacing of the part carries along its length is 25 ft. Each carrier can hold 10 parts. The time required to load a part is 0.30 minute and unload time is same. Determine

- i) What is the maximum possible flow rate of parts on the conveyor system?
- ii) How many parts could be contained on conveyor system if every carrier were filled to full capacity?
- iii) How much time is required for conveyor to make one complete loop?

[6]

**Q5)** a) Explain Drag and Flight conveyor system with neat sketch & state its applications. [10]

b) Explain screw conveyors with neat sketch and state its applications. [6]

OR

**Q6)** Write note on :

a) Drag conveyor. [5]

b) Screw conveyor. [6]

c) Bridge crane. [5]

## SECTION - II

**Q7)** a) Explain & state the financial justification for the implementation of automated MH system. [8]

b) Explain various factors to be considered during bulk material handling. [8]

OR

**Q8)** (a) State the advantages and disadvantages of automated MH system. [8]

(b) Explain why it is necessary to carry out cost benefit analysis before automating MH system. [8]

**Q9)** a) Explain the steps in the design of AGV system. [10]

b) A 'XYZ' company is planning to integrate AGV's and AS/RS with their flexible manufacturing system. The company is interested to estimate number of AGV's which should capable of making 37 deliveries per hour. The following data is collected : [6]

Vehicle speed = 100 ft/min.

Average loaded travel distance per delivery = 740 ft.

Average empty travel distance per delivery = 560 ft.

Pick-up time = 0.50 min.

Drop-off time = 0.50 min.

Traffic factor = 0.9.

Calculate number of vehicles required.

OR

**Q10)** a) Explain various types of AS/RS. State their applications. [10]

b) Explain self guided vehicles. [6]

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

a) ADC technologies.

b) MH system and Productivity improvement.

c) Ergonomics and Manual MH system.



**P981**

**[3664]-173**

**B.E. (Production/SW)**

**ADVANCE PRODUCTION TECHNOLOGY**

**(2003 Course) (Elective - I) (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) *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) Discuss the key features & philosophy of Toyota production system.[6]  
b) Write down the basic frame work for TPS & discuss the automation in TPS. How the lead time is shortened in TPS? [10]

OR

Justify the statement 'The most dominant system in TPS is Just In Time and the key element of JIT is KANBAN', with the help of various types of KANBAN systems. [16]

- Q2)** a) Define & explain the 'Bench Marking'. What does it aim at? How does an organisation identity partners for B.M.? [9]  
b) Write short notes on : [8]  
i) Competitive bench marking.  
ii) Strategic bench marking.

OR

- a) Discuss the concept of 'Value Stream Mapping'. [9]  
b) Write short notes on : [8]  
i) BPR.  
ii) SMED.

- Q3)** a) What are the objectives of productivity measurements? How the Management by Objectives (MBO) & productivity measurements are linked to each other? [8]

**P.T.O.**



- b) Explain in detail partial, total factor & multifactor productivity. What is total productivity model. [9]

OR

- a) Define the ILO & other definitions of productivity. Explain the hard & soft factors in an organisation affecting the productivity. [9]  
b) Discuss in detail the productivity measurement in small & medium scale industries. [8]

### **SECTION - II**

- Q4)** a) Define simulation. Explain the steps involved in a simulation study with the help of neat sketch. [9]  
b) List the various simulation software packages. Explain any one in detail. Mention the recent trends in the simulation software. [8]

OR

- a) Define the 'Artificial Intelligence'. Discuss AI knowledge based expert systems in manufacturing. [9]  
b) Discuss the logical rules for decision making in AI. [8]

- Q5)** a) Discuss the basic concepts of system & its application in engineering design. [9]  
b) Justify the statement 'The Product Design Specification (PDS)' is the basic control & reference document for design & manufacture of the product with suitable sketch. [8]

OR

- a) Explain the 'Morphology of Design' with suitable diagram. [9]  
b) Discuss Design Synthesis & Functional Analysis of design. [8]

- Q6)** a) Define the term 'Technology' along with features of technology. Discuss various levels of technology development. [8]  
b) Explain in detail the technology transfer process. [8]

OR

- a) Define the term 'Management of Technology' from the historical background along with its scope. [8]  
b) Discuss the Management of Technology in manufacturing industries. [8]



**P982**

**[3664]-179**

**B.E. (Electrical)**

**UTILIZATION OF ELECTRICAL ENERGY  
(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) 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 methods of electric heating? Describe briefly the methods of direct and indirect resistance heating. List the application of these two methods. [8]
- b) Name and describe various resistance welding processes. [8]

OR

- Q2)** a) Discuss advantages of electrically produced heat. State the properties of a heating element that you will look for. [8]
- b) A 15 kW, 220 V, single phase resistance oven employs nickel-chrome wire for its heating elements. If the wire temperature is not to exceed 1000°C and the temperature of the charge is to be 600°C. Calculate the diameter and length of the wire. Assume radiating efficiency to be 0.6 and emissivity as 0.9. For Nickel chrome resistivity is  $1.016 \times 10^{-6} \Omega\text{-m}$ . [8]
- Q3)** a) Describe the process of extraction of metals. Explain how zinc and aluminium are extracted from their ores. [8]
- b) What is electroplating and what for is it done? Describe the various operations involved in electroplating. [8]

**P.T.O.**

OR

- Q4)** a) What is the principle of electrodeposition & state and explain the factors which the quality of electro-deposition depends. [8]  
b) Draw electric ckt of a refrigerator and explain its working. How can temperature inside the refrigerator be adjusted? [8]
- Q5)** a) Explain with a neat diagram the principle of operation of sodium vapour lamp. Mention its use. [10]  
b) State and describe various lighting schemes. [8]

OR

- Q6)** a) Describe with the help of a neat diagram the construction and working of high pressure mercury vapour lamp. [10]  
b) A shop measuring 15m × 35m is illuminated by 20 lamps of 500W each. The luminous efficiency of each lamp is 15 Lumens/Watt. Allowing a depreciation factor of 0.7 and coefficient of utilization of 0.5, determine the illumination on working plane. [4]  
c) Discuss various factors which have to be considered while designing any lighting scheme. [4]

## **SECTION - II**

- Q7)** a) Discuss the merits and demerits of steam engine drive and electric drives used for traction. [8]  
b) Describe the various types of current collectors in common use for overhead contact system. [8]

OR

- Q8)** a) Describe the different systems of track electrification. [8]  
b) Draw a general block diagram for A.C. electric locomotive and explain it. [8]
- Q9)** a) Draw the speed-time curves of electric trains for [8]  
i) Main line service and  
ii) Suburban service and explain their characteristics.

- b) An electric train is to have acceleration and braking retardation of 0.8 km/hour/sec and 3.2 km/hour/sec 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]

OR

**Q10)a)** Derive expression for specific energy consumption and factors which affecting energy consumption. [8]

- b) An electric train accelerates uniformly from rest to a speed of 50 kmph in 25 seconds it then coasts for 1 minute 10 seconds against a constant resistance of 70N per tonne and is braked to rest at 4 kmphs in 10 seconds. Calculate the schedule speed, if the station stops are of 15 second duration. [8]

**Q11)a)** Compare shunt transition & bridge transition. [6]

b) Discuss suitability of dc series motor for traction system. [6]

- c) Two 600V motors are started by series parallel control. Each motor takes 400A during starting time of 20 sec. and has  $0.1\Omega$  resistance calculate [6]

- i) Energy lost in starting rheostate.
- ii) Energy lost in motor.
- iii) Motor O/P.
- iv) Total energy I/P from line.
- v) Efficiency of starting.

OR

**Q12)a)** Explain how regenerative braking is used in electric traction. [6]

- b) Explain with the energy diagram how the energy is saved with series parallel starting in case of locomotive engine using 4 motors for the operation. [6]

c) What should be essential electric and mechanical feature of traction motors. [6]



**P984**

**[3664]-194**  
**B.E. (E & TC)**  
**COMPUTER NETWORKS**  
**(2003 Course) (404214)**

*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) How do the layers of the TCP/IP model correlate to layers of OSI model. [8]
- b) What are the responsibilities of the data link layer. [4]
- c) Explain client server model. [4]

OR

- Q2)** a) Explain the TCP/IP protocol suite. [8]
- b) Differentiate between wired and wireless network. [4]
- c) Explain briefly the steps involved to establish network between two standalone computers. Also explain steps to form a network of more than 2 standalone machines. [4]

- Q3)** a) What is DSL technology. What are the services provided by telephone companies using DSL? Distinguish between DSL modem and a DSLAM. [8]
- b) Distinguish between baseband and broadband transmission. [4]
- c) Explain the IEEE standards for the twisted pair cable, coaxial cable and fiber optic cable with their standard length, number of tappings and use. [4]

OR

**P.T.O.**

- Q4)** a) Draw and explain typical cable TV system. How cable video signal and Internet data can be send over the same cable. [8]  
b) Compare LEO Vs MEO Vs GEO. [4]  
c) A channel has bandwidth of 1MHz. the SNR for the channel is 63. Calculate bit rate. Also calculate signal level for 4 Mbps bit rate. [4]

- Q5)** a) Draw and explain the HDLC frame format. [6]  
b) Explain the static and dynamic channel allocation in LAN system. [6]  
c) Explain the DQDB system in brief for data communication. [6]

OR

- Q6)** a) Compare token bus Vs Token Ring system. [6]  
b) Explain the fast Ethernet system and its requirements in detail. [6]  
c) Explain any one collision free protocol. [6]

## **SECTION - II**

- Q7)** a) Classify the routing algorithms and explain any one of them. [8]  
b) What is QoS? Explain related parameters? [4]  
c) Compare connection oriented Vs connection less service. [4]

OR

- Q8)** a) Compare virtual circuit Vs Datagram communication system. [8]  
b) What are the duties of Transport layer in ISO-OSI system. [4]  
c) What is network congestion? How one can overcome it? [4]

- Q9)** a) Draw and explain the basic encryption model? Also explain the concept of stream cipher. [8]  
b) Compare authentication and authorization. [4]  
c) Compare public key Vs private key cryptography. [4]

OR

- Q10)**a) What is importance of the DNS? Explain the component of the DNS system. [8]  
b) Explain the concepts of sockets with suitable example. [4]  
c) Explain the HTML programming and related TAGS in brief. [4]

- Q11)**a) Compare FTP and TFTP protocol in detail. [6]  
b) Explain with suitable example the use of TFTP and BOOTP protocols. [6]  
c) Explain the ICMP protocol with different commands utility. [6]

OR

- Q12)**a) Explain the DHCP communication with suitable example. [6]  
b) Explain the Traceroute utility in Internet applications. [6]  
c) Explain the role of NFS and RPC in TCPIP communication. [6]



**P985**

**[3664]-195**  
**B.E. (E & TC)**  
**VOICE NETWORKS**  
**(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)** a) What are the different levels of control functions in a distributed SPC? Explain the operations of each level in detail. [8]
- b) Explain the memory controlled time division time switching with neat diagram. [6]
- c) Calculate the unavailability of the dual processor system for a period of 30 years if its MTBF = 4000 Hrs. and MTTR = 9 Hrs. [4]

OR

- Q2)** a) Explain the concept of message switching and packet switching in a typical S & F switching network. [8]
- b) Describe in detail Interoffice switch signaling. [6]
- c) Calculate the availability of the dual processor system for a period of 25 years if its MTBF = 2500 Hrs. and MTTR = 6 Hrs. [4]
- Q3)** a) A call processor in an exchange requires 120 ms to service a complete call. What is the BHCA rating for the processor? If the exchange is capable of carrying 700 Erlangs of traffic, what is the call completion rate? Assume an average call holding time of three minutes. [6]
- b) Define and explain the “Erlang C” formula for blocking probability. [6]
- c) Define Grade of service & blocking probability. [4]

OR

**P.T.O.**



**Q4) a)** Following data is collected to estimate voice traffic during 2 hour period

Call No.	Call Duration in seconds
1	85
2	89
3	76
4	110
5	92
6	68
7	54

calculate the traffic intensity in Erlangs, CS and CCS. [6]

- b) Describe different traffic measurement units in telecommunication network. [6]  
c) Define call congestion and time congestion. [4]

**Q5) a)** With the help of neat diagrams explain different services supported by ISDN. [8]

b) Describe the significance of B and D channel in ISDN. [8]

OR

**Q6) a)** Explain in detail ISDN interfaces. [8]

b) Describe Non-voice and value added services provided by ISDN. [8]

## **SECTION - II**

**Q7) a)** Explain in detail various mechanism to enhance spectral efficiency. [10]

b) Explain Radio link features in GSM system. [8]

OR

**Q8) a)** Describe in detail logical channels used in GSM system. [10]

b) Explain how the security aspect handled in GSM network. [8]

**Q9) a)** Draw the architecture of IS-95 system and explain in detail various functional entities. [8]

b) "CDMA is having better security than GSM". Explain. [8]

OR

- Q10)**a) Describe physical and logical channels of IS-95. [8]  
b) Compare IS-95 and CDMA-2000 system in detail. [8]
- Q11)**a) Explain in detail various low level protocols used in IP telephony. [8]  
b) Describe speech coding technique i.e. ADPCM in detail. [8]

OR

- Q12)**a) Explain in detail DTMF generation and detection. [8]  
b) Describe MEGACO and H.248 in detail. [8]



**P987**

**[3664]-198**  
**B.E. (E&TC)**  
**EMBEDDED SYSTEM DESIGN**  
**(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) Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) Explain the design metrics in detail for embedded system. [10]  
b) Explain the following communication protocols. [8]  
i) IrDA.  
ii) Blue tooth.

OR

- Q2)** a) Compare the following in complete details. [10]  
i) CAN with MODBUS.  
ii) IEEE 802.11 with IEEE 802.16.  
b) Explain the protocol architecture of blue tooth & all details of physical layer. [8]
- Q3)** a) Explain the processor selection criteria for : [10]  
i) Surveillance IP camera.  
ii) Smart card based access control.  
b) Explain the concept of context switch. List and explain the different states of a Task. Also draw a task state diagram. [6]

**P.T.O.**

OR

- Q4)** a) What is the memory selection criteria in embedded system and explain in detail any one case study of your memory selection. What is MMU? [8]
- b) Explain in detail software and hardware architecture for interfacing keyboard, graphics LCD and camera in an embedded system. [8]
- Q5)** a) Explain the software tools used in designing of an embedded system. [8]
- b) Write a device driver for  $4 \times 4$  keyboard. Define your APIS for the device driver for  $\mu$ COS/VX Works. Implement the c code for each of them. [8]

OR

- Q6)** a) Explain in detail interprocess communication and synchronisation.[8]
- b) What is foreground task and background task. Explain with example. [8]

### **SECTION - II**

- Q7)** a) Explain in detail pipe, message & events and compare them. [10]
- b) Write a c code for implementing a message mailbox for RTOS. [8]

OR

- Q8)** a) Write a c code for implementing a scheduler for RTOS. [8]
- b) List and explain services provided by RTOS and what are the minimum services RTOS must provide. [6]
- c) Explain the boot sequence in embedded system. [4]
- Q9)** a) What is operating system selection criteria for embedded system. [6]
- b) Compare in detail [6]
- i) Vx Works with nucleus.
- ii) RT Linux with QNX.
- c) Explain stages in software development cycle with the help of waterfall model. [4]

OR

- Q10)**a) What is operating system selection criteria for mobile computing. [6]  
b) Compare four commercial mobile computing OS. [6]  
c) Explain stages in software development cycle with the help of waterfall model. [4]

**Q11)** Draw hardware block diagram for implementing 4 digit, seven segment LED display and write c code for it assuming  $\mu$ COS. [16]

OR

**Q12)** Implement MODBUS protocol for Rs 485 using  $\mu$ COS for embedded system. [16]



**P988**

**[3664]-199**  
**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) *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 effect of source inductance on the performance of a single phase full converter with waveforms. **[10]**  
Derive expression for its output voltage in terms of maximum voltage ( $V_m$ ), firing angle  $\alpha$ , & overlap angle  $\mu$ .
- b) Explain how two 3- $\phi$  full converters can be connected back to back to form a circulating current type of dual converter.  
Explain its operation with the help of voltage waveform across  
1) Each converter.      2) Load.      3) Reactor. **[8]**

OR

- Q2) a)** Draw the circuit diagram of 3- $\phi$  fully controlled converter operating with highly inductive load & explain operation with following waveforms for  $\alpha = 60^\circ$ .  
i) Load voltage.  
ii) Load current.  
iii) Supply current (any one phase).  
iv) Current through SCR (any one). **[12]**
- b) Define “string efficiency” and state its significance in connection with series and parallel operation of power devices. **[6]**

**P.T.O.**

- Q3)** a) With the help of a neat circuit diagram, relevant waveforms, explain the operation of three-phase  $180^\circ$  mode voltage source inverter feeding a balanced, star-connected resistive load. [8]
- b) Three phase bridge inverter is operating with dc supply of V volts. The load is star connected and it is purely resistive. The load resistance per phase is R ohms. Calculate the device utilization factor (DUF) for  $180^\circ$  and  $120^\circ$  mode and comment on the result. [8]

OR

- Q4)** a) With the help of circuit diagram, explain the circuit of boost inverter circuit. [6]
- b) Briefly explain any one techniques for output voltage control and harmonic reduction in inverters. [6]
- c) Compare between voltage source inverter and current source inverter. [4]
- Q5)** a) With the help of neat circuit diagram, relevant waveforms, explain the operation of a class E resonant converter. [8]
- b) How will you measure : [8]
- i) Sinusoidal voltage and current.
- ii) Nonsinusoidal voltage and current.

OR

- Q6)** Explain the concept of power factor. On which parameters does the power factor depend? Enlist various power factors improvement techniques for line commutated converters. Explain any one method of power factor improvement in details. Compare it with other techniques. [16]

## SECTION - II

- Q7)** a) Draw and explain the power circuit of semiconverter feeding a separately excited d.c motor. Explain with typical voltage and current waveforms, the operation in both continuous armature current and discontinuous armature current mode. [10]
- b) What are the effects of discontinuous armature current for d.c motor drive. [6]

OR

**Q8) a)** A separately excited d.c motor is fed from a 230V, 50Hz supply via a single-phase half controlled bridge rectifier. Armature parameters are inductance 0.06 H, resistance  $0.3\Omega$ , the motor voltage constant is  $k_a = 0.9\text{V/Arad/sec}$  and the field resistance is  $R_F = 104\Omega$ . The field current is also controlled by a semiconverter and is set to the maximum possible value. The load torque is  $T_L = 50\text{N-m}$  at 800 rpm. The inductances of the armatures and field circuits are sufficient enough to make the armature and field currents continuous and ripple free compute. [10]

- i) The field current  $F_f$ ,
  - ii) The firing angle of the converter in the armature circuit and
  - iii) The input power factor of the armature circuit converter.
- b) Draw the circuit diagram and explain the working of Chopper drive (unipolar) for stepper motor. [6]

**Q9) a)** Explain the induction motor operation, when the V/f ratio is held constant. Also derive the expression for the maximum torque. [8]

- b) Explain briefly the following methods of braking a d.c. motor [6]
- i) Regenerative braking.
  - ii) Dynamic braking.
  - iii) Plugging.
- c) What do you understand by soft start? State and explain the soft start methods employed for motors. [4]

OR

**Q10)a)** Draw and explain the operation of 3- $\phi$  brushless d.c motor drive also explain the related waveforms. [8]

- b) Justify “The speed range of an induction motor is restricted to about 30% of full range while operating with slip power regulation system”. [4]
- c) Explain the following speed control method for an induction motor  
Stalar voltage control. [6]



***Q11***)a) What is power quality? Why it is required? Explain different types of power line disturbances. [8]

b) Define the term sag? Explain different sources of sags & interruptions.[8]

OR

***Q12***)a) What is energy audit? Explain types of energy audit. [8]

b) Explain probable preventive solutions to control the factors contributing the power quality distortions. [8]



**P989**

**[3664]-200**

**B.E. (E & TC)**

**ADVANCED DIGITAL SIGNAL PROCESSING**

**(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.*
- 6) *Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 from Section - I.*
- 7) *Attempt Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12 from Section - II.*

**SECTION - I**

- Q1)** a) Find the power spectrum for each of the following WSS random processes that have the given autocorrelation sequences. **[10]**
- i)  $r_x(k) = 2\delta(k) + j\delta(k-1) - j\delta(k+1)$ .
  - ii)  $r_x(k) = \delta(k) + 2(0.5)^{|k|}$ .
- b) For a factor-of-L up sampler governed by  $x_u(n) = x(n/L)$  for  $n = 0, \pm L, \pm 2L$ , obtain a Z-Transform equivalent relationship. **[8]**

OR

- Q2)** a) Define a Wide Sense Stationary (WSS) and Strict Sense Stationary (SSS) process. Every WSS process can be SSS but every SSS process may not be so explain. **[8]**
- b) Let  $x(n)$  be a random process that is generated by filtering white noise  $w(n)$  with a filter having system function  $H(Z) = (1/1 - 0.25 Z^{-1})$ . The variance of the white noise is  $\sigma_w^2 = 1$ . Obtain the autocorrelation function  $r_x(k)$ . **[10]**
- Q3)** a) Draw the block diagram of a typical adaptive filter. Explain the terms presented. **[8]**
- b) Justify the reason for considering mean square Error (MSE) cost function for adaptive algorithms in terms of its mathematical suitability and optimization of error. **[8]**

**P.T.O.**

OR

- Q4)** a) Write down the generalized expression for gradient based adaptive algorithms, and explain the 'steepest descent algorithm' with a neat sketch. [8]
- b) Compare and comment on the performances of the Least Mean Square (LMS) and Recursive Least Square (RLS) algorithm. [8]
- Q5)** a) Explain what is an innovations process with the help of a neat sketch. [8]
- b) Consider an FIR filter with system function  $H(z) = 1 + 2.88 Z^{-1} + 3.4048 Z^{-2} + 1.74 Z^{-3} + 0.4 Z^{-4}$ . Sketch the direct form and lattice realizations. One of the reflection coefficients will be observed to behave differently. Indicate which one and why. [8]

OR

- Q6)** a) Define and explain : [8]
- i) AR
- ii) MA and
- iii) ARMA processes.
- iv) For which type of process is the Toeplitz symmetry useful?
- b) Given a 3-stage lattice filter with coefficients  $K_1 = 0.8$ ,  $K_2 = 0.5$ ,  $K_3 = 0.14$ , determine the FIR filter coefficients with the direct form of structure. Sketch the direct form and lattice form structure. [8]

### SECTION - II

- Q7)** a) Explain in detail the differences in parametric and non parametric methods of power spectral estimation. Indicate the limitations of the non-parametric method. Highlight with the help of example. [8]
- b) Determine the frequency resolution of the Bartlett method and Welch method of power spectral estimates for a quality factor  $Q = 10$ . Assume that overlap in Welch's method is 50% and the length of the sample sequence is 1000. [8]

OR

- Q8)** a) Compare the salient features of Bartlett method and Welch method of power spectral density estimation. [8]  
b) Explain the terms periodogram and correlogram with neat sketches and examples. [8]

- Q9)** Explain the following terms for a typical DSP processor (any 3) : [18]  
a) Zero overhead looping.  
b) Circular buffering.  
c) Barrel shifter and its role.  
d) Unique features of 218X / TMS 320C 6713 Processor.

OR

- Q10)a)** Highlight the major differences between and application areas of fixed point DSP processor and floating point DSP Processor. [8]  
b) Justify the statement ‘majority of the basic DSP operations are MAC’. and Explain how the MAC block in a typical DSP processor implements the same efficiently. Enlist special instructions if any for any suitable DSP processor platform. [10]
- Q11)a)** Describe the mechanism of human speech production with the help of a neat sketch. [10]  
b) Explain the meaning of the term format in the context of speech processing. [6]

OR

- Q12)a)** Explain how short time spectral analysis be used in the analysis of speech signals. [10]  
b) Explain the terms briefly : [6]  
i) Channel vocoders.  
ii) Sub band coding.



Total No. of Questions : 12]

[Total No. of Pages : 2

**P990**

**[3664]-204**

**B.E. (E & T/C)**

**TELECOMMUNICATION NETWORK MANAGEMENT**

**(2003 Syllabus)**

*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 or Pocket calculator.*
- 6) *Figures on the right side of question indicates marks.*
- 7) *Assume suitable data if necessary.*

**SECTION - I**

**Q1)** How Computer Telecommunication networks are represented in the form of layers? What is the need of representing computer network in the form of layers? Describe OSI reference model in detail mentioning the functions of each layer. Describe how these layers are used communication between two users. **[18]**

OR

**Q2)** Which are the most popular packet switched technologies? Describe them in detail. **[18]**

**Q3)** To which class of networks frame relay networks belongs whether circuit switched or packet switched? What are the advantages of frame relay networks over its predecessors? What are the features of Frame Relay Networks? Describe frame relay networks using neat diagram. **[16]**

OR

**Q4)** Bring out the differences between switched virtual connection (SVC) and permanent virtual connection (PVC). How SVCs are identified in Frame Relay Networks? What DLCI represents? How DLCIs are assigned in frame relay networks? What is the relevance of LMI specification in Frame Relay Networks? **[16]**

**Q5)** Write notes on :

- a) Digital Subscriber Lines (DSL). **[8]**
- b) Broadband Cable Modem. **[8]**

**P.T.O.**

OR

**Q6)** Write notes on :

- a) Local Multipoint Distribution Systems. [8]
- b) ADSL verses SDSL. [8]

**SECTION - II**

**Q7)** What are various types of routing methods? Explain them in detail. [16]

OR

**Q8)** What is static and dynamic routing? With the help of neat diagrams explain static and dynamic routing in detail? [16]

**Q9)** Write notes on :

- a) Delay and jitter in Networks. [8]
- b) Bandwidth and Crosstalk in Networks. [8]

OR

- Q10)** a) Describe various issues in Network Operation and Maintenance. [8]  
b) Discuss security aspects of networks and how security is ensured. [8]

**Q11)** What are the traps? To which devices traps are associated? How traps are represented? What information traps contain? [18]

OR

**Q12)** Answer only in one sentence : [18]

- a) What is network protection?
- b) What are the basic requirement of protection?
- c) What are the network protection mechanisms?
- d) What are the approaches for implementation of protection mechanisms?
- e) What are the scopes of repair?
- f) What are the two layers of recovery model?
- g) Which layer is responsible for providing QoS?
- h) What is network survivability?
- i) What is the use of repeater?

☒☒☒☒

**P991**

**[3664]-205**

**B.E. (E & T/C)**

**OPTICAL AND MICROWAVE COMMUNICATION**

**(2003 Course)**

*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.*
- 5) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 6) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) Explain in detail the structure of edge emitting LED. [6]
- b) A GaAs planar LED emitting at a wavelength of  $0.85 \mu\text{m}$  has an internal quantum efficiency of 60% when passing a forward current of  $20 \text{ mAs}^{-1}$ . Estimate the optical power emitted by the device into air, and hence determine the external power efficiency if the potential difference across the device is 1V. It may be assumed that the transmission factor at the GaAs - Air interface is 0.68 and that the refractive index of GaAs is 3.6. [6]
- c) Explain the working of avalanche photodiode. Which are three factors that limits the response time of the device? [6]

OR

- Q2)** a) What are the advantages of semiconductor injection laser over other semiconductor sources that may be used for optical communications?[6]
- b) The radiative and nonradiative recombination lifetimes of the minority carriers in the active region of a double heterojunction LED are 50 ns and 110 ns respectively. Determine the total carrier recombination lifetime and the power internally generated within the device when the peak emission wavelength is  $0.87 \mu\text{m}$  at a drive current of 40 MA. [6]
- c) With the help of neat diagram explain the construction and working of p-i-n photodiode. [6]

**P.T.O.**

- Q3)** a) Explain material absorption losses in silica glass fibers. [6]  
 b) Compare MMSIF, SMSIF, MMGIF with reference to the pulse broadening due to intermodal dispersion. Also comment on bandwidth-length product for these three fibers. [6]  
 c) A 5km optical link consists of multimode step index fiber with a core refractive index of 1.5 and a relative refractive index difference of 1%. Estimate : [4]  
 i) The delay difference between the slowest and fastest modes at the fiber output.  
 ii) The rms pulse broadening due to intermodal dispersion on the link.  
 iii) The maximum bit rate that may be obtained without substantial errors on the link assuming only intermodal dispersion.  
 iv) The bandwidth-length product corresponding to (iii).

OR

- Q4)** a) What is a fiber splice? Explain any two splicing techniques. [6]  
 b) Explain in detail optical timedomain reflectometer. [6]  
 c) A step index fiber has a core refractive index of 1.5 and a core diameter of 50  $\mu\text{m}$ . The fiber is jointed with a lateral mis alignment between the core axes of 5  $\mu\text{m}$ . Estimate the insertion loss at the joint due to the lateral mis alignment assuming a uniform distribution of power between all guided modes when : [4]  
 i) There is a small air gap at the joint.  
 ii) The joint is considered index matched.

- Q5)** a) What are the key system requirements that are needed in analyzing a point-to-point link? Explain the point-to-point link design with reference to the choice of components and their associated characteristics. [8]  
 b) Explain the operational principles of WDM. [8]

OR

- Q6)** a) What are the three classes of optical amplifiers and explain their applications. [8]  
 b) Explain  $2 \times 2$  fiber coupler in detail. [8]

## **SECTION - II**

- Q7)** a) Express Maxwell's Curl equations for  $\vec{E}$  and  $\vec{H}$  fields, in free space, in scalar form in a rectangular co-ordinate system. [4]  
 b) What is critical about the number ' $K_c$ ' for an e.m.wave to travel in a rectangular waveguide? [4]



- c) A section of X-band waveguide with dimensions  $a = 2.286\text{cm}$ ,  $b = 1.016\text{cm}$ . has perfectly conducting walls and is filled with a lossy dielectric ( $\sigma_d = 367.5 \mu\text{s} / \text{m}$ ,  $\epsilon_r = 2.1$ ,  $\mu_r = 1$ ). Find the attenuation factor in dB/m, for the dominant mode of propagation at a frequency of 9GHz. [10]

OR

- Q8)** a) Write the S-matrix of an N-port Network and state how to determine a specific element  $s_{ij}$  of the [S] matrix? [6]

- b) A two-port network has the following scattering matrix :

$$[S] = \begin{bmatrix} 0.15 \angle 0^\circ & 0.85 \angle -45^\circ \\ 0.85 \angle 45^\circ & 0.2 \angle 0^\circ \end{bmatrix}$$

Determine if the network is reciprocal and lossless. If the port two is terminated with a matched load, what is the returnloss seen at port 1? [6]

- c) Draw a neat diagram of a co-axial to waveguide transition and explain its principle of working. [6]

- Q9)** a) Write down an S-matrix of a magic tee. [4]

- b) Define the following parameters which are used to characterize a directional coupler : [6]

- i) Coupling.
- ii) Directivity.
- iii) Isolation.

- c) For a directional coupler the incident power is 350 mwatt. Calculate the power in the main arm and auxiliary arm. The coupling factor is 20dB. [6]

OR

- Q10)** a) Explain the principle of working of a Reflex-Klystron. Where it is used. [8]

- b) An X-band cylindrical magnetron has the following operating parameters : [8]

Anode voltage	$V_o = 32 \text{ kV.}$
Beam current	$I_o = 84 \text{ A.}$
Max. Flux-density	$B_o = 0.01 \text{ wb/m}^2.$
Cathode radius	$a = 6 \text{ cms.}$
Anode radius	$b = 12 \text{ cms.}$

[Given data :  $e/m = 1.759 \times 10^{11}$ ].

Compute :

- i) The cyclotron angular frequency.
- ii) The cutoff voltage for a fixed  $B_0$ .
- iii) The cutoff magnetic flux density for a fixed  $V_0$ .

- Q11)** a) Describe with constructional details the performance characteristics of a microwave transistor. Also give its power-frequency limitations. [8]
- b) Explain with the help of block-diagram the working of a typical wireless microwave link for long-distance communication. [8]

OR

- Q12)** Describe the salient features and applications of the following microwave devices : [16]

- a) TWT - Amplifier.
- b) PIN - diode.
- c) Microstrip line.
- d) Gunn - diode.



**P992**

**[3664]-206**

**B.E. (E & TC)**

**40425: ADVANCED COMMUNICATION SYSTEMS**

**(Elective - II) (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) *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 key system features of WDM? List and explain. [6]  
b) Explain the principal role of 'Tunable Filter' with neat diagram. [5]  
c) Enlist the basic applications and types of 'Optical Amplifiers'. [5]

OR

- Q2)** a) What are the operational principles of WDM? Explain with neat diagram. [6]  
b) Explain the principal role of 'Star Coupler' with neat diagram. [5]  
c) Define and explain the 'Wavelength Converters'. [5]
- Q3)** a) What is meant by Broadcast-and-Select WDM networks? Draw the physical architecture of a 'Broadcast-and-Select Single-Hop' Network and explain its detail. [8]  
b) List important challenges encountered while designing an optical networks? What are the 'Nonlinear effects on network performance' and their possible solutions? [8]

OR

- Q4)** a) Why SONET/SDH Rings are commonly called 'self-healing rings'? Draw and explain the two-fiber unidirectional and bidirectional network configurations. [8]  
b) Write the applications and notes on 'Optical Spectrum Analyzer (OSA)'. [8]

**P.T.O.**

**Q5)** a) Define and explain the following terms with respect to the satellite communication: [8]

- i) Equator.
- ii) Longitude.
- iii) Prime meridian.
- iv) Major circles of latitude.

b) What is termed as 'Sun Transit Outage'? Explain in detail. [5]

c) Calculate the 'Azimuth & Elevation' angles to a geosynchronous satellite in the Indian Ocean operated by INSAT. The details of the earth station and the satellite are as follows : [5]

Earth station latitude and longitude are  $74.0^\circ$  N and  $0^\circ$

Satellite longitude (subsatellite point) is  $66.0^\circ$

OR

**Q6)** a) Define and explain the following terms with respect to the satellite communication : [8]

- i) Poles.
- ii) Latitude.
- iii) Hemispheres.
- iv) Greenwich Meridian.

b) What is termed as 'Subsatellite Points'? Explain in detail. [5]

c) A satellite is in an elliptical orbit with a perigee of 1400 km and an apogee of 3900 km. Using mean earth radius of 6378.14 km, find the period of the orbit in Hours, Minutes and Seconds. [5]

### 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 air 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)** Explain and define the following terms in detail. **[8]**

- i) Effective Isotropic Radiated Power.
- ii) Carrier to Noise ratio.

b) Consider that the satellite communication receiver operating at 4 GHz has the following gains and noise temperatures : **[8]**

$$\begin{array}{ll} T_{in} = 25 \text{ K} & G_{RF} = 23 \text{ dB} \\ T_{RF} = 50 \text{ K} & G_{IF} = 30 \text{ dB} \\ T_{IF} = 1000 \text{ K} & T_m = 500 \text{ K} \end{array}$$

Calculate the system Noise Temperature assuming that the mixer has a gain  $G_m = 0\text{dB}$ . Recalculate the system noise temperature when the mixer has a  $-10 \text{ dB}$  loss. How can the Noise Temperature of the receiver be minimized when the mixer has a loss of  $10 \text{ dB}$ ?

OR

**Q10) a)** Explain and define the following terms in detail. **[8]**

- i) Direct Broadcast Satellite Television.
- ii) G/T ratio.

b) A satellite receiver operates at 6 GHz, has an LNA with a gain of 50 dB records the following gains and noise temperatures : **[8]**

$$\begin{array}{ll} T_{in} = 50 \text{ K} & G_{RF} = 23 \text{ dB} \\ T_{RF} = 50 \text{ K} & G_{IF} = 30 \text{ dB} \\ T_{IF} = 1000 \text{ K} & G_m = 0 \text{ dB} \\ T_m = 500 \text{ K} & \end{array}$$

A section of lossy wave guide with an attenuation of  $2 \text{ dB}$  is inserted between the antenna and the RF amplifier. Find the new system noise temperature for a wave guide temperature of  $300^\circ\text{K}$ .

- Q11)** a) Compare various multiple access techniques with respect to their parameters and performance characteristics. [8]
- b) With reference to VSAT earth station engineering, write detailed notes on : [10]
- i) Antennas and their feed mechanisms.
  - ii) Transmitters and Receivers.

OR

- Q12)** a) Draw and explain various network implementations of VSAT in detail.[8]
- b) Write detailed notes on : [10]
- i) Multiple Access Techniques.
  - ii) Link power budget.



**P993**

**[3664]-207**

**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) *Assume suitable data, if necessary.*

**SECTION - I**

**Q1)** a) Briefly explain the following : **[8]**

- i) Webber ratio.
- ii) Scotopic threshold and glare limit.

b)  $100 \times 100$  'B' bits/pixel image is processed as follows : **[8]**

Case 1 - Down-sampled by factor of 2.

Case 2 - Quantized to (B-1) bits/pixel.

Find effect on resolution, quality, image size and data size in each case.

OR

**Q2)** a) Explain the following : **[8]**

- i) Simultaneous contrast.
- ii) MTF of human vision system.

b) i) A gray level transform is given by  $T(f) = af + b$  where 'f' is the original gray level. What are the transform coefficients (a & b) if we are inverting image.

ii) An 8 bit image has mean value of 100 and standard deviation of 10. What can you say about quality of the contrast in image. If the image is passed through gray level transform

$$g(x, y) = 2f(x, y) + 10.$$

What is the mean value and standard deviation of the transformed image. **[8]**

**Q3)** a) Explain properties of Haar Transform. Give its applications. **[8]**

b) Discuss RGB, YIQ and HSI color models. **[8]**

**P.T.O.**

OR

**Q4)** a) Discuss the following properties of image transform. [8]

- i) Energy compaction.
- ii) Decorrelation.
- iii) Symmetry.
- iv) Separability.

b) Explain Homomorphic filter. State its applications. [8]

**Q5)** a) What is histogram matching? Explain. [9]

b) Explain how Laplacian can be used for image enhancement. [9]

OR

**Q6)** a) Explain median filtering? Give its applications. Compare median filter with averaging filter. [9]

b) With the help of neat diagram explain various steps in image processing. [9]

### **SECTION - II**

**Q7)** a) What is boundary representation? Explain how chain codes are used for boundary representation. [8]

b) Explain : [8]

- i) Point detection.
- ii) Line detection.
- iii) Edge detection.

Using appropriate masks.

OR

**Q8)** a) Explain edge detection procedure using sobel mask. Discuss the problems of edge detection in noisy image. [8]

b) Explain edge linking using Hough transform. [8]

**Q9)** a) Image matrix for 4 bit/pixel image is given as follows. [8]

$$\begin{bmatrix} 15 & 15 & 10 & 8 \\ 15 & 10 & 8 & 8 \\ 15 & 10 & 8 & 8 \\ 10 & 8 & 8 & 8 \end{bmatrix}$$



Find :

- i) Huffman code for gray levels in the image.
  - ii) Compression ratio.
  - iii) Average length of the code words.
- b) Explain lossy predictive coding technique for image compression. [8]

OR

**Q10)** a) With reference to transform coding explain : [8]

- i) Bit allocation.
  - ii) Zonal coding.
- b) Explain redundancies observed in image. [8]

**Q11)** a) What is image restoration? How it is achieved using inverse filtering. [9]

- b) Explain histogram equalization process for color images. [9]

OR

**Q12)** a) Explain binary erosion operation. How it can be used for boundary extraction. [9]

- b) Discuss how image processing can be used for fingerprint identification. [9]



**P994**

**[3664]-210**

**B.E. (E & TC)**

**SYSTEM PROGRAMMING & OPERATING SYSTEM  
(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 Question Q 7 or Q 8, Q 9 or Q 10, Q 11 or Q 12 from Section - II.
- 2) Answers to the two sections should be written in separate books.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Figures to the right indicate full marks.
- 5) Assume suitable data, if necessary.

**SECTION - I**

- Q1)** a) Describe data structure used for language processing. Explain any one data structure in detail. [8]
- b) Draw a block diagram of structure of a compiler. Explain lexical & syntax analysis phase of compiler. [8]

OR

- Q2)** a) Explain in short following terms : [8]
- i) Editor.
  - ii) Linker.
  - iii) Interpreter.
  - iv) Assemblers.
- b) Explain different development tools of language processing activities. [8]

- Q3)** a) Mention different features of assembler. Also mention advantage & disadvantage of pass-I assembler. [10]
- b) Define macro & explain nested macro calls with suitable example. [8]

OR

- Q4)** a) Explain data structures used for pass-I assemblers and pass-II assemblers. [10]
- b) Explain data structures used for pass-I macroprocessor. [8]

- Q5)** a) Explain data structures used for design of loaders. [8]  
b) What is program relocatability? What are the methods of relocation of program. Explain in detail. [8]

OR

- Q6)** a) What are the functions of loader? Explain direct linking loader. [8]  
b) What are the functions of linker? Explain subroutine linkers. [8]

### **SECTION - II**

- Q7)** a) What are semaphores? With example describe the use of semaphore in mutual exclusion. [8]  
b) What is an operating system? Explain the basic functions of operating system. [10]

OR

- Q8)** a) What is scheduling? Differentiate between pre-emptive and non-preemptive scheduling. Explain one method of scheduling for each. [10]  
b) Define deadlocks & describe how deadlocks detected & resolved in operating system. [8]

- Q9)** a) Describe paging technique. Explain the steps of page fault handling in a virtual memory system. [8]  
b) Explain virtual memory using segmentation. [8]

OR

- Q10)** a) Mention different file allocation methods. Explain any one method of file allocation. [8]  
b) Compare contiguous and non-contiguous memory allocation. [8]

- Q11)** a) Draw the diagram showing different IOCS layers. Explain it in detail. [8]  
b) What is device driver? Explain device drivers for USB. [8]

OR

- Q12)** a) Explain different requests and responses across the PLOCS interfacing. [8]  
b) Explain in short : [8]  
i) I/O organization.  
ii) I/O devices.



**P995**

**[3664]-211**

**B.E. (Electronics)  
COMPUTER NETWORKS  
(2003 Course) (404201)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) Answer any three questions from each section.*
- 2) Answers to the two sections should 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 protocol Architecture? What is peer protocol? Explain advantages of TCP/IP architecture Vs ISO-OSI architecture. **[8]**
- b) Compare Bus Vs Star network topology. **[4]**
- c) What are different Service primitives in protocol communication. **[4]**

OR

- Q2)** a) Explain Broadcast network and point to point network with proper example. **[8]**
- b) Explain the applications of LAN Vs WAN communication with proper example. **[4]**
- c) Explain the application of Distributed networks in Internet system? **[4]**

- Q3)** a) What is the maximum bit rate for a telephone line with BW 3700 Hz and 35 db SNR? If the BW considered is 3.2 kHz with same SNR, what will be the maximum data rate possible. **[8]**
- b) Explain the advantages of fiber optics cable in Modern networks? What technology is supported for backbone networks? **[4]**
- c) Explain the disadvantages of circuit switching network in detail. **[4]**

OR

- Q4)** a) Explain advantages, applications and types of Modems for Internet communication. [8]  
b) Compare LEO Vs MEO Vs GEO. [4]  
c) What is Asynchronous TDM system? Explain where it is used? [4]

- Q5)** a) Construct a systematic (7, 4) cyclic code using generator polynomial  $g(x) = x^3 + x^2 + 1$  for the message 1010. [6]  
b) What is the process of Framing? Explain character stuffing and character count methods in detail. [6]  
c) Compare Go-back-n Vs Selective repeat technique. [6]

OR

- Q6)** a) Draw and explain the Frame format of PPP protocol. [6]  
b) Compare collision and collision free protocols with suitable example. [6]  
c) Explain the Frame format for the fast Ethernet. [6]

## **SECTION - II**

- Q7)** a) Compare the leaky bucket and token bucket system in detail. [8]  
b) Explain the link state routing and its features. [4]  
c) Compare dynamic routing Vs Static routing. [4]

OR

- Q8)** a) Explain the TCP connection establishment & connection release procedure in detail. [8]  
b) What is network congestion and how to solve this problem. [4]  
c) Compare TCP and UDP protocols. [4]

- Q9)** a) Draw and explain basic encryption model briefly. Compare private key system Vs Public key security system. [8]  
b) Explain the Domain name finding procedure at client end in enterprise network? [4]  
c) Write a short note on HTML programming. [4]

OR

- Q10)** a) Explain RSA algorithm in detail. [8]  
b) Write a short note on Socket programming. [4]  
c) Explain the SMTP and POP3 protocols for EMAIL system? [4]

- Q11)** a) Compare IPv4 and IPv6. [6]  
b) Explain Telnet communication in INTERNET system. [6]  
c) Explain ARP communication for layer-2 switch based LAN system. [6]

OR

- Q12)** a) What are the different types of IP addresses? Explain static IP allocation and Dynamic IP allocation briefly. [6]  
b) Explain IGMP applications, specifying the IP address range and procedure in brief. [6]  
c) Explain BOOTP protocol requirement with suitable example. [6]



Total No. of Questions : 10]

[Total No. of Pages : 2

**P1000**

**[3664]-219**

**B.E. (Electronics)**

**SOFTWARE ENGINEERING**

**(404205) (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) Write any two software engineering challenges. Also explain application areas of software. [8]
- b) Identify in which phase of the life cycle the following documents are delivered : [8]
- i) Architectural design.
  - ii) Test plan.
  - iii) Cost estimate.
  - iv) Source code document.
- Q2)** a) Explain CMM in detail. [8]
- b) Explain the RAD model of software engineering with its advantages and disadvantages. [8]
- Q3)** a) Draw an E-R diagram for Hospital Management system. Also mention various entities and attributes. [10]
- b) Explain Hatelly-Pirabhai modeling. [8]
- Q4)** a) "Data Modeling can be viewed as a subset of OOA". Comment on this statement and justify your comments. [8]
- b) "Object Oriented Analysis is radically different from the conventional structured analysis approach", comment on this statement. [8]

**P.T.O.**

- Q5)** a) Explain the following terms (any two): [8]  
i) Reusability                      ii) Extensibility                      iii) Robustness  
b) Write differences between Forward Engineering and Reverse Engineering. [8]

## **SECTION - II**

- Q6)** a) What is the difference between measures, metrics and indicators? [6]  
b) Explain with example size oriented and function oriented metrics. [6]  
c) Discuss measures of software quality. [4]
- Q7)** a) What is software maintenance? Describe briefly three types of maintenance. [8]  
b) Define Testability and Operability. List and explain test characteristics. [8]
- Q8)** a) What is Software Quality? Explain. [8]  
i) Mc-Call's Quality factors.  
ii) ISO 9126 Quality factors.  
b) Explain the following repository features with respect to Software Configuration Management. [10]  
i) Versioning.  
ii) Dependency tracking and change management.  
iii) Requirement tracing.  
iv) Configuration management.  
v) Audit trails.
- Q9)** a) What is the problem with make/buy decision, how decision tree help to solve these problems. [8]  
b) Explain methods of tracking software project. [8]
- Q10)** a) What is difference between verification and validation? How Top-Down and Bottom-Up integration is achieved? [8]  
b) What is the importance of test data in case of black box testing? With suitable example illustrate in which situations you will prefer boundary value analysis over equivalence partitioning. [8]

□□□□



**P1001**

**[3664]-220**

**B.E. (Electronics)**

**ELECTRONICS MEASUREMENT**

**(404209) (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)** a) What do you mean by standard of measurement? State and explain different types of standards. Also define Traceability. [10]
- b) With the help of block diagram, explain digital LCR meter. [8]

OR

- Q2)** a) With the help of neat diagrams, explain : [9]
- i) Direct Comparison Calibration Setup.
  - ii) Indirect Comparison Calibration Setup.
  - iii) Echelon of Traceability.
- b) Explain the 'Series connection' method used in Q-meter circuit. What is the effect of distributive capacitance on the actual Q value? [9]

- Q3)** a) Explain in brief with respect to DFM. [8]
- i) Time base error
  - ii)  $\pm 1$  digit error
  - iii) Trimming
  - iv) Drift
- b) Draw the diagram and explain the Prescaler technique to count higher frequencies. [8]

OR

**P.T.O.**

- Q4)** a) Explain the principle of measurement of ratio of 2 frequencies using digital techniques. [8]  
b) Write a brief note on TCXO. [8]

- Q5)** a) Explain Continuous storage mode and Transitional storage mode used in clock generator of Logic Analyzer. [8]  
b) Write different applications of Spectrum Analyzer and Logic Analyzer. [8]

OR

- Q6)** a) With the help of block diagram explain the function of Logic Analyzer. [8]  
b) What is the need of Protocol Analysis? State in brief different applications of Protocol Analyzers. [8]

### **SECTION - II**

- Q7)** a) Why network analyzer is used? Explain Scalar Network Analysis. [10]  
b) Draw and explain the setup for Sinad Sensitivity Test. [8]

OR

- Q8)** a) Write the applications of Network Analyzer. Also explain Vector Network Analysis. [10]  
b) Comment on Network Analysis System elements. [8]

- Q9)** a) Explain the sampling techniques used in DSO. [8]  
b) Write a brief note on Front Panel Controls of CRO. [8]

OR

- Q10)** a) Explain various types of CRO probes and when to use them. [8]  
b) Write in short the concept of ATE. [8]

- Q11)** a) State the advantages and applications of virtual instrumentation. [8]  
b) Comment on PCI express technology. [8]

OR

- Q12)** a) State and explain Virtual Instrument Classes. [8]  
b) Write a note on any one virtual instrumentation software. [8]

□□□□

Total No. of Questions : 12]

[Total No. of Pages : 4

**P1002**

**[3664]-227**

**B.E. (Electronics)**

**DIGITAL IMAGE PROCESSING**

**(404212) (2003 Course)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates :*

- 1) Answer Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4, Q. No. 5 or Q. No. 6 from Section - I and Q. No. 7 or Q. No. 8, Q. No. 9 or Q. No. 10, Q. No. 11 or Q. No. 12 from Section - II.*
- 2) Answers to the two 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, electronic pocket calculator is allowed.*

**SECTION - I**

- Q1)** a) Draw and explain the block diagram of a digital image processing system. [8]
- b) Explain the steps taken to convert an analog image into digital one. [8]

OR

- Q2)** a) Explain the different ways of finding distance between two pixels. [6]
- b) Explain the reason for occurrence of false contouring & checkerboard patterns in an image. Suggest the techniques to avoid them. [8]
- c) Explain : [2]
- i) Mean.
  - ii) Standard deviation.

- Q3)** a) Compute the 2D DFT of the  $4 \times 4$  grayscale image given below : [8]

$$f(m, n) = \begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \end{bmatrix}$$

**P.T.O.**

- b) Explain YIQ colour model. How a RGB model is converted to YIQ and vice versa? [8]

OR

- Q4)** a) Explain DCT and write expressions for forward and inverse 2D DCT of a signal  $f(m, n)$ . [6]

- b) Explain CIE chromaticity diagram. Write expressions for [10]
- chromaticity coordinates.
  - conversion of tristimulus values to RGB.
  - conversion of RGB to tristimulus values.

- Q5)** a) Perform histogram equalization on the image given below containing gray levels 0 to 7. [10]

$$\begin{bmatrix} 4 & 4 & 4 & 4 & 4 \\ 3 & 4 & 5 & 4 & 3 \\ 3 & 5 & 5 & 5 & 3 \\ 3 & 4 & 5 & 4 & 3 \\ 4 & 4 & 4 & 4 & 4 \end{bmatrix}$$

Also draw the histograms before & after equalization.

- b) What is the value of the central pixel (marked by a round) if it is smoothened by a  $3 \times 3$  box filter? [8]

$$\begin{bmatrix} 1 & 2 & 3 \\ 2 & \textcircled{4} & 5 \\ 3 & 4 & 3 \end{bmatrix}$$

OR

- Q6)** a) Explain any 4 point processing techniques for enhancing an image with application of each. [10]

- b) Write a note on : [8]
- High boost filtering.
  - Unsharp masking.

## SECTION - II

- Q7)** a) Explain Runlength coding. Which type of redundancy is exploited by RLC? Derive RLC codes considering a binary image. [8]
- b) Compute the entropy of the image given by  $f(m, n)$ , where

$$f(m, n) = \begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 1 & 2 & 2 \\ 0 & 1 & 2 & 3 \\ 1 & 2 & 2 & 3 \end{bmatrix} \quad [8]$$

OR

- Q8)** a) Calculate the efficiency of Huffman code for the following symbol whose probability of occurrence is given below : [8]

Symbol	→	$a_1$	$a_2$	$a_3$	$a_4$
Probability	→	0.9	0.06	0.02	0.02

- b) State and explain various types of redundancies in an image. Suggest any one technique to remove these redundancies. [8]

- Q9)** a) Explain algorithm for adaptive thresholding. [8]

- b) Derive the Kernel for second order derivative for detecting edges. Compare its performance with first order derivative. [8]

OR

- Q10)** a) Write a note on : [8]

- i) Region splitting.
- ii) Region merging.

b) A binary image X and the structuring element are given as follows : [8]

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    i)  $Y_1 = X \oplus B$   
                  ii)  $Y_2 = X \ominus B$

**Q11)** a) Explain Weiner filtering for image restoration. [8]

b) Explain with the help of a neat block diagram, the steps to be taken for fingerprint recognition. [10]

OR

**Q12)** a) Write a note on Inverse filtering for image restoration. [8]

b) Explain with the help of a neat block diagram, the steps to be taken for Remote sensing. [10]

□□□□

Total No. of Questions : 8]

[Total No. of Pages : 2

**P1003**

**[3664]-229**

**B.E. (Industrial Engg.)**

**BUSINESS ACCOUNTING AND COSTING**

**(411102) (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) Use of electronic pocket calculator is allowed.*
- 5) Assume suitable data, if necessary.*

**SECTION - I**

**Q1)** a) Distinguish between Capital expenditure and Revenue expenditure; as well as Capital Receipts and Revenue Receipts; with examples. **[8]**

b) Identify the type of account : **[8]**

- |                            |                           |
|----------------------------|---------------------------|
| i) Namita Account          | ii) Advertisement Account |
| iii) Furniture Account     | iv) Capital Account       |
| v) Loss by fire Account    | vi) Bank of India Account |
| vii) Stock on Hand Account | viii) Salary Account      |

**Q2)** Explain any four accounting concepts and conventions giving examples. **[16]**

**Q3)** Explain the following terms (Any Nine): **[9 × 2 = 18]**

- |                  |                    |
|------------------|--------------------|
| a) Journal       | b) Debit Note      |
| c) Creditor      | d) Drawings        |
| e) Ledger        | f) Current Asset   |
| g) Trial Balance | h) Posting         |
| i) Bad Debts     | j) Returns Inwards |

**P.T.O.**

- Q4)** Write short notes on (Any Four): **[4 × 4 = 16]**
- a) Errors affecting Trial Balance.
  - b) Limitations of Financial statements.
  - c) Balance Sheet.
  - d) Depreciation.
  - e) Accounting period-end adjustments.

### **SECTION - II**

- Q5)** a) Mention different types of budgets. Explain the concept of Master Budget. **[8]**
- b) What is standard costing? Explain the procedure of undertaking the standard costing exercise. **[8]**
- Q6)** a) Explain with suitable examples how the concept of marginal costing is used in decision-making. **[6]**
- b) Discuss in brief the special aspects of Zero Based Budgeting. Where can it be used? **[6]**
- c) Explain the difference between Budget and Budgetary Control. **[6]**
- Q7)** a) What is Overhead? Discuss different classifications of Overheads. **[8]**
- b) Differentiate between Cost Control and Cost Reduction on the basis of their purpose and methodology. **[8]**
- Q8)** Write short notes on (Any Four): **[4 × 4 = 16]**
- a) Joint products and by products.
  - b) Secondary distribution of overheads.
  - c) Treatment of Material losses in process costing.
  - d) Absorption of overheads.
  - e) Activity Based Costing.

□□□□



P1004

[3664]-245

B.E. (Instrumentation &amp; Control)

DIGITAL CONTROL

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates :

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

SECTION - I

- Q1) a) Derive the pulse transfer function of the system shown in Figure No. 1 by first principle. [6]

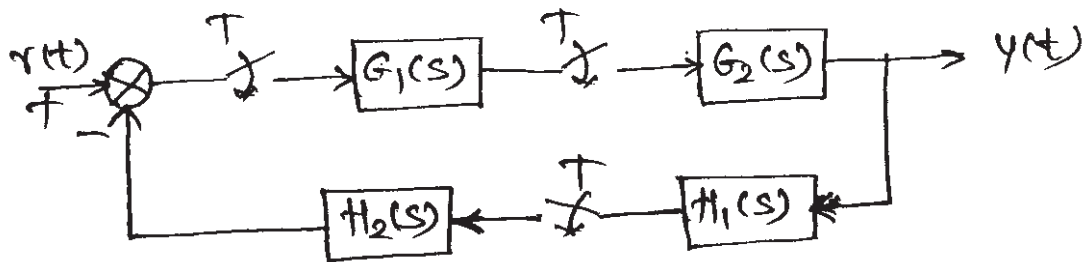


Figure No.1

- b) Examine the stability of the system with closed loop characteristic equation  $F(z)$  given below using Jury stability test.

$$F(z) = z^4 - 1.2z^3 + 0.22z^2 + 0.066z - 0.008 = 0 \quad [10]$$

OR

- Q2) a) Obtain the pulse transfer function of the system shown in Figure No. 2.

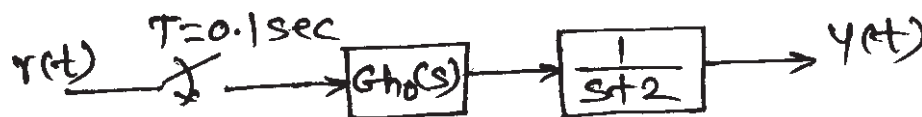
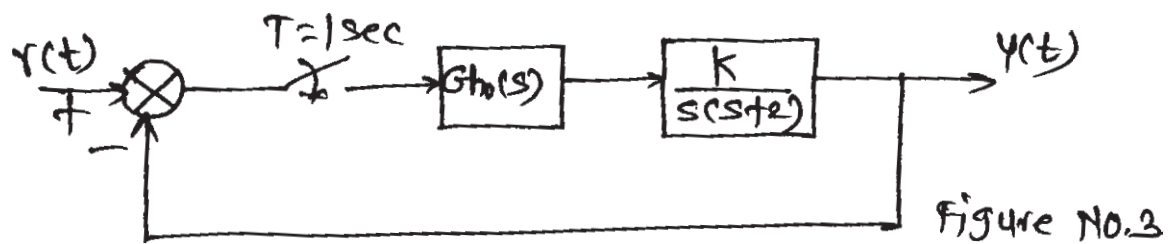


Figure No.2

Also obtain output response  $y(k)$  if  $r(k)$  is step input. [6]

P.T.O.

- b) Find the range of  $k$  for the closed loop stability of the system shown in Figure No. 3 using bilinear transformation and Routh array. [10]



- Q3) a) Find the state transition matrix of the system with state equation.

$$x(k+1) = \begin{bmatrix} 0 & 1 \\ -0.12 & -0.7 \end{bmatrix} x(k)$$

Also find solution of state equation if  $x(0) = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$ . [8]

- b) Using Liapunov stability test, investigate the stability of the system with state equation. [8]

$$x(k+1) = \begin{bmatrix} 0 & 0.81 \\ 1 & 0 \end{bmatrix} x(k). \text{ Also find Liapunov function } v(x).$$

OR

- Q4) a) Diagonalise the plant matrix given below: [8]

$$G = \begin{bmatrix} 2 & 1 & 4 \\ 0 & 2 & 0 \\ 0 & 3 & 1 \end{bmatrix}$$

- b) Obtain the state model in  
i) Controllable canonical form.  
ii) Jordan canonical form.  
for the pulse transfer function.

$$G(z) = \frac{(z+0.5)(z-0.3)}{z(z+1)^2} \quad [8]$$

**Q5)** For a system with continuous time transfer function.

$$G(S) = \frac{1}{(1 + 3S)(1 + 7S)}$$

Design a continuous time controller such that the desired closed loop response

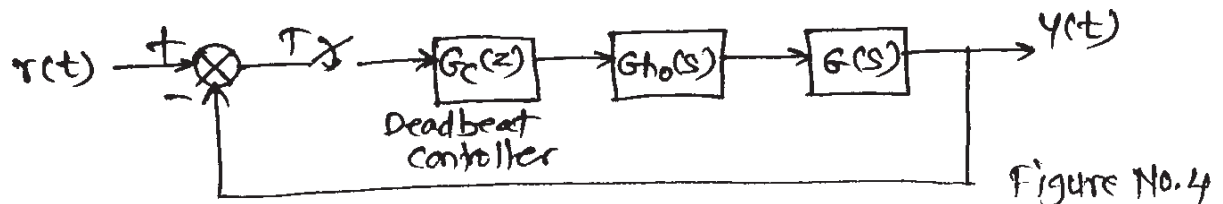
is described by,  $Q(S) = \frac{1}{(1 + 2S)(1 + 4S)}$  using controller synthesis formula.

List the controller tuning parameters  $K_C$ ,  $T_I$ ,  $T_D$  and filter time constant. Also convert the continuous time controller – filter structure into discrete time

form using Bilinear transformations,  $S = \frac{2}{T} \frac{z - 1}{z + 1}$  with  $T = 0.5$  sec. [18]

OR

**Q6)** For a system shown in Figure No. 4 design a deadbeat controller such that error is zero after two sampling instants, that is,  $Q(z) = a_1 z^{-1} + a_2 z^{-2}$ .



Where,  $T = 1$  sec,  $r(t) =$  step input,  $G(S) = \frac{1}{S(S + 5)}$ . [18]

## SECTION - II

**Q7)** a) Define the term state observability and state the condition for complete state observability. Investigate for the complete state observability of system.

$$x(k + 1) = \begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix} x(k) + \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} u(k)$$

$$y(k) = \begin{bmatrix} 2 & 0 \\ 0 & 2 \end{bmatrix} x(k) \quad [8]$$

b) What is State Observer? List and define its types. State necessary and sufficiency condition for the design of state observer. List the steps in state observer design. [10]

OR

**Q8)** Derive the formula for state variable feedback gain matrix K. Determine the state feedback gain matrix K for the system

$$x(k+1) = \begin{bmatrix} 0 & 0 & -0.25 \\ 1 & 0 & 0 \\ 0 & 1 & -0.5 \end{bmatrix} x(k) + \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix} u(k)$$

such that the desired closed loop poles are placed at,

$$z_1 = 0.2, z_{2,3} = -0.4 \pm j0.5 \quad [18]$$

**Q9)** Explain the internal model control (IMC) strategy and its design procedure.

Design IMC controller for the system with transfer function,  $G(S) = \frac{1-5S}{1+10S}$ .

Also convert it into conventional controller. [16]

OR

**Q10)** Explain the concept of adaptive control, necessity of adaptive control. With the help of suitable block diagrams discuss the following: [16]

- Model Reference Adaptive Control.
- Self Tuning Regulator.

**Q11)** For the system with state model

$$x(k+1) = \begin{bmatrix} 0 & 1 \\ -1 & 1 \end{bmatrix} x(k) + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u(k) \text{ with } x(0) = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$$

Find optimal control sequence  $u(k) = -k(k)x(k)$  such that the following performance index is minimised.

$$J = \frac{1}{2} x_1^2(3) + \frac{1}{2} \sum_{k=0}^2 [x_1^2(k) + u^2(k)]$$

Also find  $J_{\min}$ . [16]

OR

**Q12)** Explain the system identification procedure with the help of neat flow chart. Obtain the parameter vector  $\theta$  for the ARX model with  $e(t) = 0$  using least square method. [16]

□□□□

Total No. of Questions : 12]

[Total No. of Pages : 2

**P1005**

**[3664]-247**

**B.E. (Instru. & Control)**

**INSTRUMENTATION FOR ENVIRONMENTAL ENGINEERING**

**(406264 (2)) (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) What are the components of an ecosystem? Describe different biotic components of an ecosystem and their interactions. [10]

b) Describe the socio-economic functions of the natural environment. [8]

OR

**Q2)** a) Discuss on various sensors used for measurement of pollution. [10]

b) Explain conservation of biodiversity. [8]

**Q3)** a) Explain analysis of common toxic agents. [8]

b) Describe ecological risk assessment paradigm. [8]

OR

**Q4)** a) Discuss on Heat environmental testing. [8]

b) Write a note on ISO14001. [8]

**Q5)** a) Define air pollution. Describe different types of primary air pollutants and their effect on environment. [8]

b) Describe the techniques adopted for gaseous emission control. [8]

OR

**P.T.O.**

- Q6)** Write in brief on : [16]
- a) Cyclone separator
  - b) Electro static precipitator
  - c) Ventary scrubber
  - d) Bag filter.

**SECTION - II**

- Q7)** a) Describe the physical methods of wastewater treatment. [8]
- b) Describe the biological method of treatment. [8]

OR

- Q8)** Write short notes on : [16]
- a) Detoxication
  - b) Sedimentation
  - c) Activated sludge treatment process.
  - d) Physical method of characterization.

- Q9)** a) Explain effects of Radiation pollution. How it is controlled? [8]
- b) Suggest instrumentation scheme for automobile noise measurement & control. [8]

OR

- Q10)** a) What is sonic boom? Explain noise measurements techniques using suitable diagram. [8]
- b) Explain effects of radiation pollution on non-living organisms. [8]

- Q11)** a) How pesticides are analysed? Explain spectroscopic analysis of pesticides. [10]
- b) Explain chromatographic characterization of pollution analysis. [8]

OR

- Q12)** Write short notes on : [18]
- a) Analysis of micronutrients in soil.
  - b) Instrumentation scheme for soil pollution reduction.
  - c) Polorographic analysis of pesticides.

□□□□

Total No. of Questions : 8]

[Total No. of Pages : 2

**P 1107**

**[3664] - 18**

**B.E. (Production)**

**MATERIALS MANAGEMENT**

**(1997 Course) (Elective - I)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

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

**SECTION - I**

- Q1)** a) Explain purchase cycle in detail with neat flow chart. [10]  
b) Explain various stores management functions. [6]
- Q2)** a) Explain job plan techniques of value analysis. [10]  
b) Explain various types of discounts. [6]
- Q3)** a) Define Vendor Rating. Explain briefly the methods of vendor rating.[8]  
b) Explain and differentiate between centralised store and decentralised store. [8]
- Q4)** Write short note on : [18]  
a) E - purchasing.  
b) Ethics in purchasing.  
c) Vendor development.

**P.T.O.**

## **SECTION - II**

**Q5)** a) Explain various types of Inventories. [8]

b) A company requires 4000 items annually. The price of that item is Rs. 10. The cost to place an order is Rs. 50 and inventory carrying cost as a percentage of average inventory investment is 18%. [8]

Calculate

i) Economic Order Quantity.

ii) No. of orders.

iii) Length of purchase cycle (Assume 300 working days).

iv) Annual total cost.

**Q6)** a) Explain the various costs associated with inventory decisions. [8]

b) Explain waste disposal system. [8]

**Q7)** a) Explain and differentiate between Annual stock taking and continuous stock taking. [8]

b) Explain ABC analysis in detail. [8]

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

a) Causes of surplus and obsolete stock.

b) Supply chain management.

c) Stock Recording Process.





Total No. of Questions : 10]

[Total No. of Pages : 2

P 1112

[3664] - 52

**B.E. (Electronics Engg.)**  
**PROCESS INSTRUMENTATION**  
**(1997 Course) (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.*
- 6) Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) Define the term automatic control system. With suitable block diagram explain closed loop control system. [8]  
b) Define the term transducer. Explain in detail classification of transducer. [8]
- Q2)** a) Explain the following terms related to thermocouple [8]  
i) Seebeck effect.  
ii) Peltier effect.  
iii) Thomson effect.  
iv) Thermopiles.  
b) Explain any one method for non contact type speed measurement. [8]
- Q3)** a) Explain in detail variable area flowmeter. [8]  
b) Explain any one method for pH measurement. [8]
- Q4)** a) With neat diagram explain V/F converter. [8]  
b) A strain gauge is bonded to a beam 0.1m. long & has a cross sectional area 4 cm<sup>2</sup>. Young's modulus for steel is 207 GN/m<sup>2</sup>. The strain gauge has an unstrained resistance of 240Ω & a gauge factor of 2.2. When a load is applied, the resistance of strain gauge changes by 0.013Ω. Calculate the change in length of steel beam & the amount of force applied to the beam. [8]

*P.T.O.*

- Q5)** Write a short note on (any three) : [18]
- a) Electropneumatic converter.
  - b) Pneumatic PID controller.
  - c) Electronic PI controller.
  - d) Control valve noise.

### **SECTION - II**

- Q6)** a) Define the term PLC. Explain in detail the architecture of PLC. [8]  
b) Define the term ladder diagram. With suitable assumptions construct the ladder diagram for elevator system. [8]
- Q7)** a) List out the different types of control valves. Explain control valve characteristics. [8]  
b) Explain two element feedwater control for boilers. [8]
- Q8)** a) Explain cascade & ratio control systems. [8]  
b) Explain in detail multichannel data acquisition system. [8]
- Q9)** a) Explain in detail factors for selection of control valve. [8]  
b) Define the term heat exchanger. Explain in detail LMTD. [8]
- Q10)** Write a short note on (any three) : [18]
- a) Recorders.
  - b) SCADA.
  - c) Cavitation.
  - d) Square root extractor.



Total No. of Questions : 10]

[Total No. of Pages : 2

P 1113

[3664] - 62

**B.E. (Industrial Electronics)**

**OPTO ELECTRONICS**

**(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 with energy diagram working of He-Ne laser. [8]  
b) Explain working of gas discharge lamp and list advantages, disadvantages and applications. [8]
- Q2)** a) Explain working of Bulk photo detector, LDR with neat diagram. [8]  
b) Why photomultiplier tubes are required? Explain with neat diagram its operation. [8]
- Q3)** a) Explain battery charging application of solar cell with neat circuit diagram. [8]  
b) Explain solar cell operation with neat diagram. [8]
- Q4)** a) Explain four important specifications of Opto-coupler. [8]  
b) Draw a source detector combinations circuit diagram  
i) LED - phototransistor.  
ii) Incandescent lamp - LDR.  
iii) LED - LASCR.  
iv) LASER Diode - Photo Diode. [8]
- Q5)** Write short note on : [18]  
a) IR and UV detectors.  
b) Thermal Detectors.  
c) Photo-Detector characteristics.

**P.T.O.**

## **SECTION - II**

- Q6)** a) Explain working of CRT display. [8]  
b) With neat diagram explain Bar-Graph display. [8]
- Q7)** a) Explain with construction details and refractive index profiles  
i) Step-index multimode fiber.  
ii) Graded-index multimode fiber. [8]  
b) Explain with neat diagram how light propagates through optical fiber. [8]
- Q8)** a) Explain attenuation characteristics of optical fiber. [8]  
b) How to measure illumination using LDR as a sensor. [8]
- Q9)** a) Explain displacement measurement using optical fiber sensor. [8]  
b) Explain working principle of hologram. [8]
- Q10)** Write short notes on : [18]  
a) OTDR.  
b) RPM measurement using optical sensor.  
c) Compare optical fiber and copper wire.



Total No. of Questions : 8]

[Total No. of Pages : 2

**P 1146**

**[3664] - 22**

**B.E. (Prod./SW)**

**INDUSTRIAL RELATIONS & MANUFACTURING MANAGEMENT**

**(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) What are the characteristics of Indian industrial labour? Discuss. [8]  
b) What is a meaning of labour relations? What are the causes & effect of strained relations? [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 are the financial & non-financial incentives? How they improve the industrial Relations? [8]  
b) Two workers, A & B, while working on two identical machines produced 750 & 850 numbers of the same job respectively, whose standard production is 100 pieces 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 and above standard performance. Assuming 8 hours working day, calculate earning of each operator. [8]

**P.T.O.**

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

- a) Collective bargaining.
- b) Wage administration.
- c) Industrial psychology.
- d) Objectives of ILO.
- e) Objectives and functioning of trade unions.

## **SECTION - II**

**Q5)** a) Explain the role played by the following departments in the manufacturing management. [9]

- i) Personnel.
- ii) Materials.
- iii) Design.

b) What is material handling? State the principles of it. [7]

**Q6)** a) Discuss the types of maintenance. [8]

b) List the 'types of productions' - based on volume of production & explain characteristics of any one of them. [8]

**Q7)** a) Discuss the main functions of 'Production, planning & control'. [8]

b) Discuss the 'Break-even Analysis' in detail. [8]

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

- a) Process planning.
- b) Investment decisions.
- c) Factory layouts.
- d) Productivity measurement.
- e) Forecasting.



Total No. of Questions : 12]

[Total No. of Pages : 2

**P 1159**

**[3664] - 187**

**B.E. (Electrical)**

**ENERGY MANAGEMENT**

**(2003 Course) (403147)**

**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.**
- 7) Your answers will be valued as a whole.**

**SECTION - I**

**Q1) a)** Explain primary and secondary sources, commercial and non commercial sources and conventional, non conventional Energy sources. **[10]**

**b)** Explain Energy security and importance of Energy conservation. **[6]**

**OR**

**Q2) a)** Explain various salient features of Electricity Act 2003. **[8]**

**b)** Explain short term policies. **[8]**

**Q3) a)** Explain Energy management and structure of Energy management group. **[6]**

**b)** Explain supply side and demand side management concept with advantages and disadvantages. **[10]**

**OR**

**Q4) a)** Explain TOD and ABT tariff and impact of tariff on Energy management. **[10]**

**b)** Explain various principles of Energy management. **[6]**

**Q5) a)** Explain the detailed procedure to conduct detailed Energy Audit. **[12]**

**b)** Explain CUSUM technique. **[6]**

**OR**

**Q6) a)** Explain various instruments required to conduct Energy Audit with function of each equipment. **[10]**

**b)** Explain Sankey diagram and its importance. **[8]**

**P.T.O.**

## **SECTION - II**

**Q7)** a) Explain following financial tools [10]

- i) Simple pay back period.
- ii) Return on Investment.
- iii) Net present value method.

b) Cost of an heat exchanger is Rs. 1.25 lakhs. Calculate simple payback period and ROI considering annual saving potential of Rs. 70,000/- and annual operating cost of Rs. 12,000/-. [6]

OR

**Q8)** a) Investment for an energy proposal is Rs. 12 lakhs. Annual saving for first three years is 1,45,000, 1,90,000/- and Rs. 3,10,000. Considering capital cost of 10%, what is the net present value of proposal. [10]

b) What are the objectives of carrying sensitivity analysis? [6]

**Q9)** a) Explain various Energy conservation opportunities in motive power application. [8]

b) Explain various Energy conservation opportunities in Illumination. [8]

OR

**Q10)**a) Explain the concept of cogeneration with its advantages. [6]

b) Explain various Energy conservation opportunities in pumping system. [10]

**Q11)** Explain Energy Audit case studies of following industries [18]

- a) Sugar Industry
- b) Thermal power station.

OR

**Q12)** Explain Energy Audit case studies of following sector [18]

- a) Municipal corporation.
- b) Chemical Industry.





Total No. of Questions : 12]

[Total No. of Pages : 3

**P 1164**

**[3664] - 251**

**B.E. (Instrumentation & Control)**

**COMPUTER TECHNIQUES & APPLICATIONS**

**(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)** With a neat diagram, explain the Process Control Block and its various fields. **[8]**
- b)** List and explain the five states through which a process may go during its execution. **[10]**

**OR**

- Q2) a)** List and explain any four CPU scheduling algorithms. **[8]**
- b)** What are deadlocks? Explain any four methods for preventing deadlocks. **[10]**

- Q3) a)** What is external and internal fragmentation? How does paging help in minimizing fragmentation? **[8]**
- b)** What is virtual memory? With the help of neat diagram explain the implementation of virtual memory through Demand Paging. **[8]**

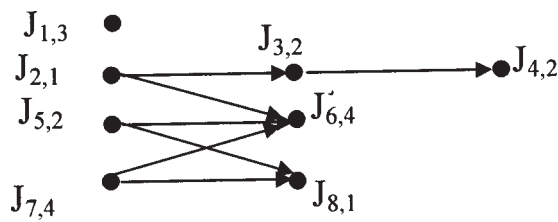
**OR**

- Q4) a)** With neat diagrams, explain any two file allocation methods. **[8]**
- b)** With neat diagram explain Overlays. **[8]**

- Q5) a)** The following figure is the precedence graph of Jobs  $J_1$  to  $J_8$ . The number next to the name of each job is its execution time. The priorities are  $J_1, J_2, J_3, \dots, J_8$ ,  $J_1$  being the highest priority job. All jobs are released at

**P.T.O.**

$t = 0$ . Jobs are scheduled and executed on two processors, P1 and P2. All the jobs are preemptable.



Show the schedule of jobs on P1 and P2 generated by the following priority algorithms :

- i) Preemptive. [4]
- ii) Non preemptive. [4]
- b) Explain Flynn's classification of Parallel computers. [8]

OR

- Q6)** a) Explain the following methods of parallelism : [8]
- i) Temporal parallelism.
  - ii) Data parallelism.
  - iii) Temporal and data parallelism.
  - iv) Data parallelism with dynamic assignment.
- b) Compare the following with respect to parallel computers : [8]
- i) Loosely Coupled and tightly coupled systems.
  - ii) UMA and NUMA parallel computers.

### SECTION - II

- Q7)** a) Compare Circuit Switching and Packet Switching Networks. [8]
- b) Write a note on IEEE 802.3 with respect to following points : [8]
- i) Data Frame.
  - ii) Description of Working.

OR

- Q8)** Write short notes : [16]
- a) LAN and LAN topologies.
  - b) TCP / IP reference model.

- Q9)** a) Explain any four levels of CMM. [8]  
b) i) Define Software Reliability. [2]  
ii) Explain the following Software reliability terms which can be used to quantify the reliability of software products : [6]  
1) Rate of Occurrence of failure.  
2) Mean time to failure.  
3) Mean time to repair.  
4) Mean time between failure.  
5) Probability of Failure on Demand.  
6) Availability.

OR

- Q10)** a) List the two types of instruction sets available with ARM processors. Also list the seven basic operating modes of ARM processors. [8]  
b) Discuss the features of IEEE 488. [8]

- Q11)** a) With respect to Software testing explain the following : [10]  
i) Black box testing.  
ii) White box testing.  
iii) Unit Testing.  
iv) System Testing.  
v) Control Structure Testing.  
b) Discuss CASE and CASE tools. [8]

OR

- Q12)** a) What is software testing? With respect to Software testing explain the following : [10]  
i) Test Plan.  
ii) Requirement Analysis.  
iii) Verification.  
iv) Validation.  
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.



Total No. of Questions : 12]

[Total No. of Pages : 3

**P 1170**

**[3664] - 302**

**B.E. (Polymer)**

**POLYMER PROCESSING OPERATION - II**

**(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 and Q11 or Q12 from Section-II.*
- 2) Answers to the two sections should write on separate answer book.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Use of logarithmic table, slide rule and electronic pocket calculator is allowed.*
- 5) Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) Discuss the trouble-shooting guide for calendering process. [6]
- b) Why roll crowing & roll bending is necessary in case of calender rolls used in manufacturing of PVC sheet? [4]
- c) Differentiate between sheet manufactured by calendering process & extrusion process. [4]
- d) List the material used for calendering process and explain the any two material used in calendering process with processing condition. [4]

OR

- Q2)** a) List the material used in construction of calender roll. What are material merits & demerits. [4]
- b) Derive the expression for maximum pressure & point of maximum pressure in case of calendering assuming steady, laminar, isothermal & incompressible fluid using Newtonian fluid. [6]
- c) Discuss movable and fixed roll position for different types of calender roll. [4]
- d) Write a short note on bearing used in calender of calendering unit. [4]
- Q3)** a) Explain with neat sketch rotational molding process in detail. [8]
- b) List different types of rotational molding machine and explain rock and roll type machine in detail. [8]

**P.T.O.**

OR

- Q4)** a) How particle size & shape affect the quality of rotational molding product and process? [6]  
b) Discuss the use of “Kiss-off” ribs for providing additional stiffness to rotational molding parts. [6]  
c) How vacuum can be used to remove bubble in rotational molding process? [4]
- Q5)** a) Explain the process of flexography with neat sketch. Also state it's advantages and disadvantages. [6]  
b) Name the plastic material used in electroplating technique. State the principle of electroplating technique. List electroplated plastic products. [4]  
c) Name the process and the material by which “plastic gloves” are manufactured? Explain process with neat sketch to manufacture gloves.[6]

OR

- Q6)** a) Compare vacuum metallising process with electroplating. Describe vacuum metallising in detail. [8]  
b) Why surface treatment is necessary in case of PE film? Name different techniques of surface treatment, explain any one in detail. [8]

### **SECTION - II**

- Q7)** a) List the plastic materials used to manufacture fiber. What properties are necessary for material to use as fiber? What are criteria to select different process of fiber manufacturing? [6]  
b) Name any four process parameter that affect the quality of nylon fiber and explain any two in detail. [6]  
c) Explain the term [4]  
i) Staple fiber and staple yarn.  
ii) Denier of fiber.

OR

- Q8)** a) Explain wet spinning techniques with neat sketch. [8]  
b) Discuss the trouble shooting guide for dry spinning process. [4]  
c) What is texturing? How it carried out? [4]

- Q9)** a) Explain in brief about standards used for recycling plastic waste. [8]  
b) Name different equipments used for recycling of plastic. Explain any one equipment with neat sketch. [8]

OR

- Q10)** a) Describe the SPI resin identification coding system? Why is necessary to have such system? [4]  
b) List different methods of separation of plastic waste. Explain separation method of PVC with neat sketch. [6]  
c) What are various methods of waste management and explain about land fill in brief. [6]

- Q11)** a) Explain the process used for welding of PVC with respect to process parameter and equipment used. [8]  
b) List factor to be consider while selecting adhesive for particular application. Explain pressure sensitive adhesive. [6]  
c) Write principle and application of ultrasonic welding. [4]

OR

- Q12)** a) Discuss the snap fits used as method for assembly of plastic component. [6]  
b) Explain the solvent cementing method of polymer joining. [4]  
c) Describe the process of high frequency dielectric welding in detail. [6]  
d) List the various fastening techniques in assembly of plastic product.[2]



Total No. of Questions : 10]

[Total No. of Pages : 2

**P 1181**

**[3664] - 46**

**B.E. (Electronics)**

**MEDICAL ELECTRONICS - II**

**(1997 Course)**

***Time : 3 Hours]***

***[Max. Marks : 100***

***Instructions to the candidates:***

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

**SECTION - I**

- Q1)*** a) Explain the working of Electroencephalography. How the sensitivity of EEG machine is controlled? [8]  
b) Draw the blocks diagram of single channel ECG machine. Explain its working with necessary waveform. [8]
- Q2)*** a) With the help of neat diagram, explain the working of EMG machine. [8]  
b) Define systole and diastole? Explain the direct method of measurement of blood pressure. [8]
- Q3)*** a) Explain the working of bedside monitor used in ICU for the measurement of ECG, heart rate and blood pressure. [8]  
b) Name the different methods used for the measurement of respiration rate? Explain the CO<sub>2</sub> method of respiration rate measurement. [8]
- Q4)*** a) Explain the working of Widened QRS detectors with necessary diagram. [8]  
b) Describe the process of communication in Neurons. [8]
- Q5)*** Write short note on : [18]  
a) Magnetic Resonance Imaging.  
b) ANS.  
c) Arrhythmia monitor.

***P.T.O.***

## **SECTION - II**

- Q6)** a) What is the function of diathermy machine? Explain the working of microwave diathermy machine. [8]  
b) Differentiate between single channel and multichannel telemetry system. Explain how single channel telemetry system is used for transmission of ECG. [8]
- Q7)** a) Explain the working of Radiotelemetry transmitter for ECG and respiration activity. [8]  
b) What are the different stimulating unit available? Explain any one in detail. [8]
- Q8)** a) Explain the merits and demerits of MRI system in detail. [8]  
b) What is CT scanner? Explain the basic working principle of CT scanner. [8]
- Q9)** a) State the different types of LASERS? Explain any one in detail. [8]  
b) Draw and explain the blocks diagram of X-ray machine. [8]
- Q10)** Write short notes on [18]  
a) ECG Amplifier.  
b) Cardiac Pacemaker.  
c) AC defibrillator.





**Total No. of Questions : 12]**

**[Total No. of Pages : 2**

**P 1192**

**[3664] - 341**

**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 are the basic components of multimedia? Why do we need multimedia? [8]  
b) What is streaming technology? Explain in detail advantages of streaming media over conventional media. [8]

**OR**

- Q2)*** a) What is multimedia? Explain the goals & objectives of multimedia. [8]  
b) Explain distributed multimedia applications in detail. [8]

- Q3)*** a) Explain JPEG file format in detail. [8]  
b) With the help of block diagram explain the different operations involved in processing of image. [8]

**OR**

- Q4)*** a) State and explain different image enhancement techniques. [8]  
b) State different image compression techniques. Explain Shannon-Fano compression algorithm in detail. [8]

- Q5)*** a) What is multimedia sound or audio? What are its properties? [6]  
b) State different audio file formats? Explain AVI file format in brief. [6]  
c) Draw the block diagram of components of elementary audio system and explain in brief. [6]

**OR**

- Q6)*** a) Compare VOC & WAV file formats. [6]  
b) Explain MIDI message formats with different command names available. [6]  
c) State different types of microphones and explain any one in brief. [6]

***P.T.O.***

## **SECTION - II**

- Q7)** a) What is text compression? Compress the string “**ABABBABCABABBA**” using LZW compression techniques. Also calculate the compression ratio? [9]  
b) Compare different Television broadcasting standards. [5]  
c) Write short note on “Digital Video”. [4]

OR

- Q8)** a) An NTSC encoded video clip has a frame size of  $720 * 480$  pixels and is digitized using a bit-depth of 8 bits for each of Y, Cb and Cr, and a chroma sub-sampling scheme of 4 : 2 : 2. Calculate the file size of 1 minute of the video clip and the total time taken for it to be transmitted over a 2 Mbps transmission line. [9]  
b) Differentiate between Huffman’s coding and LZW coding. [5]  
c) Write short note on - “Nero digital file format”. [4]

- Q9)** a) What is Augmented Reality? Write VRML code to create a Virtual Coffee House. [8]  
b) Discuss various peripheral devices used in VR applications. [8]

OR

- Q10)** a) What is Virtual Reality? Write VRML code to create a Virtual Garden. [8]  
b) What is 3D sound? How does a human being determine the position of a sound source? Does ITDs provide any information for locating a sound source directly in front and behind of a human being? Justify. [8]

- Q11)** a) What is 3D Animation? How it is used in development of web based applications. [8]  
b) Discuss impact and use of - [8]  
i) Interpolation.  
ii) Parameter Curve editing.  
iii) Inverse Kinematics.  
iv) Motion Paths.  
in the development of animation.

OR

- Q12)** a) Explain different techniques of animations along with the example. [8]  
b) Discuss the issues in development of animations on the web. Compare client-pull and Server-push animation. [8]



Total No. of Questions : 12]

[Total No. of Pages : 4

**P1205**

**[3664] - 127**

**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) Solve the following :**

- a) Explain the austenite to pearlite transformation with sketches. Explain the effect of cooling rate on the morphology and properties of pearlite. **[6]**
- b) Explain the effect of non-equilibrium cooling with the use of iron - cementite phase equilibrium diagram on microstructure and properties of steel. **[4]**
- c) Explain the effect of alloying elements on the following : **[6]**
  - i) Volume change during hardening.
  - ii) Corrosion and oxidation.
  - iii) Critical cooling rate.

**OR**

**Q2) Solve the following :**

- a) How carbon is estimated from microstructure of
  - i) Slowly cooled hypoeutectoid steels.
  - ii) Slowly cooled hypereutectoid steels. **[4]**
- b) Discuss the correlation between machinability, microstructure and properties of steels. Why manganese is added in free cutting steels? **[6]**
- c) Explain the development of microalloyed steels with respect to composition, properties and applications. **[6]**

**P.T.O.**

**Q3)** Solve the following :

- a) State the applications of TTT curves and explain the effect of following on TTT curves.
  - i) Carbon.
  - ii) Nickel. [4]
- b) Explain the mechanism of austenite to martensite transformation. What is the effect of following on the properties of martensite.
  - i) Alloying elements.
  - ii) Carbon.
  - iii)  $M_s$  temperature. [6]
- c) Explain the detailed procedure of pack carburising. State its limitations. [6]

OR

**Q4)** Solve the following :

- a) Draw the TTT curve for eutectoid steel and explain the following heat - treatments.
  - i) Austempering.
  - ii) Martempering. [6]
- b) Why nitriding is done at lower temperature? State the advantages and disadvantages of nitriding. [6]
- c) Draw the CCT curve for eutectoid steel. Superimpose the cooling curves for obtaining coarse and fine pearlite. [4]

**Q5)** Solve the following :

- a) Draw iron-graphite phase equilibrium diagram. Comment on first and second stage graphitisation. [6]
- b) Explain the effect of following factors on the formation of white and gray cast iron.
  - i) Carbon.
  - ii) Silicon.
  - iii) Cooling rate.
  - iv) Thickness of casting. [6]
- c) Explain the precipitation hardening treatment with one example. [4]
- d) Draw Aluminium - Silicon phase diagram & label the temperatures & phases. [2]

OR

**Q6)** Solve the following :

- a) Draw copper-zinc phase equilibrium diagram and explain single and two phase brasses. [6]
- b) Select the proper material for the following and give your justification.
  - i) Piston.
  - ii) Non-sparking tools.
  - iii) Master gauge. [6]
- c) Draw the microstructure of C-G iron and state its properties. [4]
- d) Why cast irons have poor strength? [2]

### **SECTION - II**

**Q7)** Solve the following :

- a) What are the agglomerated composites? Distinguish between laminated and reinforced composites. [4]
- b) Compare between the following :
  - i) Hybrid and non hybrid composites.
  - ii) Flake and particulate composites.
  - iii) Whisker reinforced and fiber reinforced composites. [9]
- c) Describe briefly how following factors modify strength of polymers
  - i) Degree of cross linking.
  - ii) Branching. [5]

OR

**Q8)** Solve the following :

- a) State suitable composite for the following and give justification (any three) :
  - i) Offset structures.
  - ii) Automobile car body.
  - iii) Television body.
  - iv) Body of drilling machine. [9]
- b) Classify fibers from different point of views. How do they affect the properties of composites. [5]
- c) State the properties and applications of liquid crystal polymer. [4]

**Q9)** Solve the following :

- a) Compare between the following :
  - i) Coating and electroless plating.
  - ii) Plasma and thermal spray coating.
  - iii) Adhesive and abrasive wear. [9]

- b) A forming die of tool steel ( $H_{13}$ ) is to be coated to improve the life. Suggest a suitable material and method of coating. Give your justification. [7]

OR

**Q10)** Solve the following :

- a) Explain with neat sketch the principle of CVD coating. State its advantages, disadvantages and applications. [7]
- b) Explain the co-relation between metallurgical factors and wear. [5]
- c) Explain the principle of hard facing and state its limitations. [4]

**Q11)** Solve the following :

- a) With neat sketch explain the arc discharge method used for the production of carbon nanotubes. How properties of carbon nanotubes changes with respect to dimensions? State the applications of carbon nanotubes. [10]
- b) Discuss the shape memory alloys with one example. State their applications. [4]
- c) Explain the principle of super conductivity. [2]

OR

**Q12)** Solve the following :

- a) Explain the effect of high temperature on the following with one example.
  - i) Yield strength.
  - ii) Oxidation.
  - iii) Impact strength.
  - iv) Creep resistance. [8]
- b) What is biocompatibility? State the requirements of biomaterials. [4]
- c) State the types of biomeric tissue attachment with examples. [4]



Total No. of Questions : 12]

[Total No. of Pages : 2

P 1208

[3664] - 186

B.E. (Electrical)

RESTRUCTURING AND DEREGULATION

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

**SECTION - I**

- Q1)** a) Explain institutional structure of power sector in India during the phase of regulatory reforms. [8]  
b) What are the objectives of Electricity act 2003? State various national policies and guidelines under this act. [8]

OR

- Q2)** a) State the challenges before Indian Power Sector. [8]  
b) Explain functions of Central Electricity Authority and Ministry of Power. [8]

- Q3)** a) Elaborate the concepts : [10]  
i) Capital cost. ii) Debt and equity.  
iii) Fixed and variable cost. iv) Working capital.  
v) Life cycle cost.  
b) State the desirable characteristics of tariff as well as factors governing tariff. [8]

OR

- Q4)** a) Explain the term depreciation. Describe various methods to determine it. [8]  
b) Cash flows for an industrial project are shown in the following table. Calculate the net present values at the discount rates of 10%. Analyse whether the project is economically justified. [6]

Year	0	1	2	3	4
Cash flow (Rs.)	2,00,000	75,000	60,000	55,000	50,000

- c) Explain the concepts of subsidy and cross subsidy. [4]

P.T.O.

- Q5)** a) State and explain types and methods of regulation. [10]  
b) Explain the role and evolution of regulatory commissions in India. [6]

OR

- Q6)** a) Explain the non price issues in regulation. [10]  
b) Explain the roles of Central Electricity Regulatory Commission (CERC) and State Regulatory Commission in the power sector. [6]

### **SECTION - II**

- Q7)** a) Explain wholesale competition and retail competition model based on industry structure. [8]  
b) Explain various ownership models. [8]

OR

- Q8)** a) Explain electricity reforms in Nordic pool and UK. [8]  
b) Explain electricity reforms in Maharashtra and Orissa. [8]

- Q9)** a) Explain rules that govern the electricity markets. Also state peculiarities of electricity as a commodity. [8]  
b) Explain wheeling trading model in details. [8]

OR

- Q10)** a) Compare integrated trading model and decentralized trading model. [8]  
b) Explain retail access framework, competing retailers, metering and accounting issues. [8]

- Q11)** a) State the importance of transmission pricing under open access conditions. Explain various methods of transmission pricing. [10]  
b) Write a detailed note on Availability Based Tariff (ABT). [8]

OR

- Q12)** Write brief notes on : [18]  
a) Ancillary services.  
b) Grid codes.  
c) Methods of congestion management.





Total No. of Questions : 12]

[Total No. of Pages : 3

**P 1209**

**[3664] - 202**

**B.E. (E & TC)**

**ROBOTICS AND INDUSTRIAL AUTOMATION**

**(2003 Course) (404218)**

**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, Q.7 or Q.8, Q.9 or Q.10, and 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) Discuss the classification of robot by co-ordinate system with the help of neat sketches. [10]
- b) Define the following terms : [8]
- i) Work envelope.
  - ii) Work cell.
  - iii) Tip speed.
  - iv) Co-ordinated motion.

OR

- Q2)** a) Explain the classification of robot by control method. Give application of each type. [10]
- b) What is meant by fixed and flexible automation? Explain the differences between them. [8]
- Q3)** a) Give E-L formulation. Discuss its significance for a robotic manipulator. [8]
- b) Give the steps for obtaining Direct solution of a robotic manipulator and explain. [8]

OR

- Q4)** a) Explain the term-Robot arm dynamics. Discuss any dynamic model of a robotic manipulator. [8]

**P.T.O.**

- b) Explain the Geometric approach for obtaining the back solution of a robotic manipulator. [8]

- Q5)** a) Discuss the classification of grippers. Sketch the end effector with bilateral gripping action. [8]  
b) Which sensor can be used along with the gripper to sense whether the object is falling? Explain the working principle. [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) Discuss the Jacobian control of a manipulator in terms of D-H matrices. [10]  
b) Explain the term Trajectory planning. Discuss the Trajectory planner block diagram. [8]

OR

- Q8)** a) Describe the types of motion used in motion planning.  
R - R manipulator is at initial position (50, -50) degrees. It is required to move to (100, 50) degrees. Joints have maximum acceleration / deceleration of (40, 80) degree/s<sup>2</sup> respectively. Maximum velocity of joints is (30, 60) deg/sec. If the robot follows trapezoidal velocity pattern using joint interpolated motion, find the travel time and velocity of each joint. [10]  
b) Describe the types of motion that can be achieved in cartesian coordinates. [8]

- Q9)** a) How vision sensors can be categorized according to their dimensionality? Discuss any one type with neat diagram. [8]  
b) What are the different techniques for carrying out segmentation in Robot vision system? Explain any one of them in detail. [8]

OR

**Q10)**a) Draw a neat diagram of robot system employing computer vision and discuss. [8]

b) What considerations are required in providing computer vision for robotic system? Discuss any one of them in detail. [8]

**Q11)**a) Explain the terms - MEMS and Micro systems. Discuss their applications. [8]

b) Describe MEMS as microsensor and microactuator with the help of neat block diagrams. [8]

OR

**Q12)**Write notes on - [16]

a) Intelligent sensors in Robot vision systems.

b) Perspective Transformation.

c) Task planning.

d) Link & Joint parameters.



Total No. of Questions : 12]

[Total No. of Pages : 3

**P 1215**

**[3664] - 304**

**B.E. (Polymer)**

**ELECTIVE - SPECIALTY POLYMERS**

**(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 books.**
- 2) Solve 3 questions from Section - I and 3 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)** What are liquid crystalline polymers? Give examples of liquid crystalline polymers. **[4]**
- b)** Write a short note on Classification of Liquid Crystalline Polymers. **[10]**
- c)** Briefly comment on structural factors that cause liquid crystalline behavior. **[4]**

**OR**

- Q2) a)** Differentiate between Thermotropic and Lyotropic Liquid crystalline polymers? **[4]**
- b)** Between Aliphatic and Wholly Aromatic polyamides which one are liquid crystalline polymers? Justify your answer. **[4]**
- c)** Enlist various examples and applications of liquid crystalline polymers. **[6]**
- d)** State typical characteristics of liquid crystalline polymers. **[4]**

- Q3) a)** What are conducting polymers? Give two examples of conducting polymers. **[4]**
- b)** Enlist the various applications of conducting polymers. **[6]**
- c)** Write a short note on Band theory of conducting polymers. **[6]**

**OR**

**P.T.O.**

- Q4)** a) Write a short note on use of conducting polymers in rechargeable batteries. [6]  
b) What are the important properties of conducting polymers? [6]  
c) Explain in brief Doping process and its various types. [4]

- Q5)** a) What are heat resistant polymers? Give two examples and draw their repeating unit structures. [6]  
b) Comment on Structural features of heat resistant polymers. [4]  
c) Write a short note on factors affecting heat resistance of polymers. [6]

OR

- Q6)** a) Enlist various applications of heat resistant polymers. [6]  
b) Write a short note on Thermal behavior of heat resistant polymers. [6]  
c) Write down applications of poly(ether ether ketone) i.e. PEEK. [4]

### **SECTION - II**

- Q7)** a) What are photo-resists? List various types of photo-resists and briefly explain their working. [6]  
b) Give examples of polymeric photo-resists. List the applications of photo-resists polymers. [6]  
c) Briefly explain Photolithography process. [4]

OR

- Q8)** a) Write short note on mechanisms to impart selectivity to polymeric membranes. [6]  
b) What are the different methods to manufacture membranes? [6]  
c) Write down various applications of polymeric membranes. [4]

- Q9)** a) Write a short notes on [12]  
i) Biocatalysts,  
ii) Biodegradable polymers.  
b) What are Biomaterials? Enlist the factors affecting degree of performance of biomaterials. Give examples of Biomaterials. [6]

OR

- Q10)a)** Write short note of Polymers in [12]  
i) Drug Release systems  
ii) Polymers in Surgical applications.  
b) What are the limitations of Biomaterials? [6]

- Q11)a)** Enlist merits, demerits and advantages of Polymer concretes. [6]  
b) What are the ingredients present in polymer concrete. [4]  
c) Write a short note on materials used in communication. [6]

OR

- Q12)a)** Enumerate various polymers used in construction and agricultural applications. [6]  
b) Write short note on polymers in Mulches and Green Houses. [6]  
c) Briefly explain role of polymers in fiber optics. [4]



Total No. of Questions : 6]

[Total No. of Pages : 4

**P 1217**

**[3664] - 318**

**B.E. (Petroleum Engineering)**

**PETROLEUM ECONOMICS**

**(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) Answer two questions from Section I and two questions from Section II.**
- 3) Neat diagrams should be drawn wherever necessary.**
- 4) Figures to the right indicate full marks.**
- 5) Use of cm scale graph paper is allowed.**
- 6) Assume additional data, if necessary.**

**SECTION - I**

**Q1) a)** Write a detailed note on guidelines given by SPE and UN for the evaluation of petroleum reserves and resources. **[15]**

**b)** How is reserves estimation carried out using different methods? What are the likely errors in the calculations? **[10]**

**Q2) a)** An offshore prospect is projected to produce 12,000 BOPD from following cost expenditures : **[9]**

- i)** Well cost : 100 million dollars,
- ii)** Production facilities : 100 million dollars.
- iii)** Direct operating costs : \$ 5/bbl.
- iv)** Other costs : 60 million dollars.

What is the breakeven oil price for the project over the first five years of operations for possible payout?

**b)** Write notes on any two of the following : **[16]**

- i)** Crude oil differential,
- ii)** Crude oil pricing mechanism and factors controlling oil price,
- iii)** Oil Trading,
- iv)** Gas Economy.

**P.T.O.**

- Q3) a)** The company management is thinking of investing \$50 MM in a small field, which has economically producing capacity of 12 years. The project would require an investment of \$ 5 MM at year 5 and again at year 10 of \$ 5 MM. Annual maintenance cost would be \$ 1 MM throughout the tenure of the project. The interest rate for the first eight years is 10%, and for the last four years will be 12%.

What is the present worth of this cash flow? Draw a cash flow diagram for the above data. **[15]**

- b) How is sensitivity analysis helpful in handling uncertainty? Discuss with suitable examples. **[10]**

## **SECTION - II**

- Q4) a)** Following information is available on reserves, production and demand :

Name	Proven Reserves Billion bbl	Prod. 2006 MM BOPD	Prod. 2007	Prod. 2008	Demand 2006, Million BOPD	Demand 2007, Million BOPD	Demand 2008, Million BOPD
N. America	63.8	13.9	13.9	14.04	23.54	23.56	23.66
S. America	102.2	6.89	6.81	6.94	4.66	4.86	4.69
Eurasia	105.9	14.93	15.44	16.25	19.45	19.60	19.57
Middle east	726.6	23.16	22.51	20.90	4.31	4.37	4.44
Africa	101.8	7.8	7.86	7.96	2.44	2.47	2.51
Asia Pacific	47.7	7.97	7.91	7.94	21.05	21.16	21.74

Analyse the data and give your comments on following points :

- i) Plot the information on production and demand to infer future trends for the same. What may be the production and demand forecast for the year 2009?
- ii) What are the existing reserves to production ratio? Where is the highest ratio observed?

Compare the production and demand to ascertain the likely areas of greater demand. **[15]**

- b) Initial cost of equipment is \$ 45,000 and its salvage value towards the completion of useful life is \$ 5,000. Service life of the reactor is 10 years. Calculate its depreciation using Straight Line (SLD), Declining Balance (DBD) and Double Declining Balance (DDB) methods. Prepare a plot of book value against number of years and compare the results obtained with different methods. **[10]**



**Q5) a)** The company management is considering a proposal of buying drilling rights for a large block of good potential.

- ❖ \$ 5 MM are required to secure drilling rights.
- ❖ No seismic coverage is available which is estimated to cost \$ 2MM.
- ❖ Two reservoir sizes are possible, a large reserve with a NPV of \$ 75 MM and a smaller marginal worth a NPV of \$ 30 MM excluding development costs.
- ❖ Two exploration strategies are under consideration :
  - Drill exploratory wells on the basis of available geological knowledge,
  - Spend on seismic and take decision after confirmation or drop acreage,
  - It is also possible to drill second exploratory well if first well is dry.
- ❖ The company management is uncertain about the prospect and has thus given a task for evaluation. Here are some details :
  - Drilling a wildcat is \$ 8 MM each.
  - If second well is dry the field has to be abandoned.

Following is the probability of occurrence of different events :

Outcome	One wildcat Drilled on Geological control	Second wildcat drilled on geological control	One wildcat drilled on Seismic	Second Wildcat Drilled on Seismic
Large Field	0.05	0.075	0.15	0.20
Marginal Field	0.05	0.075	0.15	0.20
Dry Hole	0.90	0.85	0.70	0.60

Construct a suitable decision tree taking into consideration different possibilities and data available. Solve the tree using conventional approach and give solution with proper justification. Show calculations at every step. [15]

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

- i) Petroleum accounting system,
- ii) Petroleum concessionary contacts,
- iii) Investment yardsticks in the economic evaluation of E and P company,
- iv) Risk analysis.

**Q6)** Use production data given in table 1 for this calculation.

**[25]**

Year	BOPD
1	1050
2	1170
3	1305
4	1455
5	1761
6	1761
7	1761
8	1542
9	1351
10	1183
11	1037
12	908
13	795
14	697
15	610

Following are the assumptions for the analysis :

- Oil price is \$ 60 and escalation of 1.50% is assumed. Initial Investment is \$ 27 MM and production cost is \$ 4.00 BOPD.
- Royalty is 10% on annual production, which has to deducted from gross revenue.
- Rate of return is 10%.
- Cost recovery is 80% and is allowed to deduce with the commencement of commercial production. The unrecovered cost is allowed to carry forward to next year.
- Profit petroleum is to be shared between government and contractor @ 60% and 40% respectively.
- Contractor is entitled to pay 30% income tax on profit.

Prepare a tabular form giving details of cumulative production, gross cash flow, royalty, net cash flow, cost recovery, recovered cost, profit petroleum, government share and contractor share, NPV for contractor BFIT and AFIT. How is one barrel distributed?



Total No. of Questions : 12]

[Total No. of Pages : 3

**P 1220**

**[3664] - 339**

**B.E. (Computer Engineering)**

**ADVANCED DATABASES**

**(2003 Course) (410445) (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) Assume suitable data, if necessary.**

**SECTION - I**

- Q1) a)** “Some parallel database systems store an extra copy of each data item on disks attached to a different processor” **[4]**
- i) Explain the reason for above strategy.
  - ii) What is the advantage if you partition the copies of data items of a processor across multiple processors.
- b)** Explain the following with suitable example **[6]**
- i) Pipelined parallelism.
  - ii) Independent parallelism.
- c)** What is meant by horizontal partitioning? Explain any two partitioning techniques. **[6]**

**OR**

- Q2) a)** In a range selection on a range - partitioned attribute, it is possible that only one disk may need to be accessed. Describe the benefits and drawbacks of this property. **[4]**
- b)** What is interquery parallelism? Explain cache coherency problem and protocol available to guarantee cache coherency. **[6]**
- c)** Explain parallel External sort-Merge. **[6]**
- Q3) a)** Explain Data Replication in distributed databases. **[6]**
- b)** Explain the different system failure modes in distributed transaction model. How the two-phase commit protocol handles these failures. **[10]**
- c)** What is multimaster replication? **[2]**

**OR**

**P.T.O.**

- Q4)** a) Explain Data Fragmentation in distributed databases. [6]  
b) Explain the following with respect to robustness of distributed databases. [10]  
i) Read one, write all available protocol.  
ii) Co-ordinator selection.  
iii) Majority-based approach.  
c) What is Persistent messages? [2]
- Q5)** a) Explain the following with respect to web architecture [8]  
i) Web server.  
ii) Common gateway interface.  
iii) Cookie.  
iv) Uniform Resource Locator.  
b) Explain the components of an XML document with suitable example.[8]

OR

- Q6)** a) Explain the following terms and describe what they are used for [6]  
i) XPath.  
ii) SOAP.  
b) Write short notes on [8]  
i) Client - Server architecture.  
ii) Advantages of N-tier architecture.  
c) What is XSL? [2]

### **SECTION - II**

- Q7)** a) What is a Data warehouse? Explain the key features of Data warehouse.[6]  
b) Write short notes on : [12]  
i) Handling missing values in Data cleaning.  
ii) Three-Tier data warehouse architecture.  
iii) Data cubes.

OR

- Q8)** a) Explain the following OLAP operations on multidimensional data [6]  
i) Roll-up.  
ii) Slice and dice.  
b) Write short notes on [12]  
i) Data Transformation.  
ii) Data Reduction.  
iii) Fact constellation.

- Q9)** a) Explain the following with suitable example [8]  
i) Data characterization.  
ii) Data discrimination.  
b) State and explain the algorithm to generate a decision tree from training tuples. [8]

OR

- Q10)** a) Explain in detail classification and prediction. [8]  
b) What is outlier analysis? [4]  
c) Write the k-means algorithm for partitioning. [4]

- Q11)** a) What is relevance feedback? Explain in brief. [4]  
b) Explain in detail Web Search Engines. [6]  
c) What is the difference between a false positive and a false drop? [2]  
d) Explain the following terms [4]  
i) Homonyms.  
ii) Ontologies.

OR

- Q12)** a) What is meant by search engine spanning? Explain in brief. [4]  
b) Explain in detail Information retrieval and structured data. [6]  
c) What is the difference between precision and recall? [2]  
d) Explain the following terms : [4]  
i) Synonyms.  
ii) Inverted index.



Total No. of Questions : 12]

[Total No. of Pages : 3

**P 1282**

**[3664] - 283**

**B.E. (Chemical)**

**PROJECT COSTING & APPRAISAL**

*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 concept of market survey & compare it with market research. [8]  
b) What is meant by project evaluation? Explain. [8]

OR

- Q2)** a) Explain the terms in detail : [10]  
i) Supply & demand.  
ii) Concept of cost.  
iii) Margin.  
iv) Profit.  
v) Returns.  
b) What are the factors of production? [6]

- Q3)** a) Discuss the statement of income and expenditure in detail. [8]  
b) Calculate EPS, cash ratio, current ratio, Debt equity ratio and earning per share for given data. [10]  
i) Net profit Rs. 2,00,000/-.  
ii) Current Assets Rs. 75,000/-.  
iii) Current Liabilities Rs. 25,000/-.  
iv) Cash at Bank Rs. 10,000/-.  
v) Long term debts Rs. 6,00,000/-.  
vi) Total capital Investments Rs. 10,00,000/-.  
vii) Sales Rs. 1,50,000/-.  
1,000 shares of Rs. 10/- each sold out for capital.

OR

**P.T.O.**

- Q4)** a) Discuss with example, the concept of journal, ledger and entries for financial accounts. [10]  
b) Explain the balance sheet with detailed analysis. [8]
- Q5)** a) What are the basic factors involved in equipment costing? [8]  
b) Explain the terms :- [8]  
i) Basic concept of cost.  
ii) Prime cost.  
iii) Overhead cost.  
iv) Cost Index.

OR

- Q6)** a) Calculate in detail the cost of any equipment of your choice giving details about technical specifications and costing of the equipment. [10]  
b) Explain how the allocation of over heads for various cost elements is worked out. [6]

## **SECTION - II**

- Q7)** a) Write in detail about various methods for raising the finance and about financial institutions. [10]  
b) For the case of a nominal annual interest rate of 20% for capital of Rs. 1,000/-; determine : [6]  
i) Total amount accumulated after 1 yr with daily compounding.  
ii) The effective annual interest rate if compounding is continuous.

OR

- Q8)** a) Explain the terms : [8]  
i) Fixed capital.  
ii) Working capital.  
iii) 6/10 factor rule.  
iv) Bonds.  
b) A bond has maturity value of Rs. 1,000/- and is paying discrete compound interest at an effective annual rate of 3%. Determine for 4 years. [8]  
i) Present value.  
ii) Discount.  
iii) Discrete compound rate of effective interest which will be received by a purchaser if bond valued Rs. 700/-.

- Q9) a)** Explain in detail discounted cash flow diagram. [8]
- b)** A company has 3 alternative investments, which are being considered. Because all the investments are for the same type of unit and yield same service life only one of them can be selected. If company in charge expects 10% rate of return on original investment, which one will be suitable.

Item	Investment I	Investment II	Investment III
1) Initial Fixed Capital (Rs.)	1,00,000	1,70,000	2,10,000
2) Working Capital Investment (Rs.)	10,000	10,000	5,000
3) Annual cash flow (Rs.)	30,000	52,000	59,000
4) Annual Expenditure (Rs.)	15,000	28,000	21,000

**[10]**

OR

- Q10)a)** Discuss the concept of marginal additional investment. [8]
- b)** Explain the concept of taxes and their types. [10]

- Q11)a)** Define depreciation and discuss its need and significance with limitations. [6]

- b)** A piece of equipment having a negligible salvage and scrap value is estimated to have a service life of 10 years. The original cost of equipment was Rs. 4,00,00,000. Determine the following : [10]
- Depreciation charge for the fifth year if sum of the years digits method is used.
  - Depreciation charge for the 5<sup>th</sup> year if double declining balance depreciation is used.

OR

- Q12)a)** Discuss various methods of determining depreciation charges. [8]
- b)** The process equipment costing Rs. 12 lacks, has a life of 10 years and salvage value of Rs. 60,000. Determine the depreciation by straight line method for 2<sup>nd</sup> and 4<sup>th</sup> year. [8]





Total No. of Questions : 10]

[Total No. of Pages : 2

**P 1309**

**[3664] - 96**

**B.E. (Information Technology)**  
**ENTERPRISE RESOURCE PLANNING**  
**(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 must be written on separate answer books.*
- 3) Draw sketches wherever necessary.*
- 4) Figures to the right indicate full marks.*
- 5) Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) Define Enterprise and ERP. What are the facilities, which form “multi-facility” environment of ERP? [9]  
b) Which applications can be addressed by ERP products? How can ERP help in resolution of domain issues? [9]
- Q2)** a) What is business process engineering? Explain role of IT in implementation of it. [8]  
b) Is ERP beneficial to all organizations? Why is it so? [8]
- Q3)** a) What are short-term and long-term management concerns about ERP? [8]  
b) What are different core processes in healthcare sector? How are they implemented with ERP? [8]
- Q4)** a) Why is ERP an asset? What kind of strategic planning is needed to maintain ERP system? [8]  
b) What is the role of consultants, vendors & users in implementation of ERP in academic environment? [8]
- Q5)** Write short notes on :  
a) HR management. [8]  
b) Role of ERP to get competitive advantage. [8]

**P.T.O.**

## **SECTION - II**

- Q6)** a) What are ERP products? Describe two global ERP products. [9]  
b) What is gap analysis? Discuss about post-implementation options. [9]
- Q7)** a) What are the key issues in determining the success of implementation of ERP? [8]  
b) Why is there a need to understand the markets to implement ERP solution? [8]
- Q8)** a) What is market strategy? How is it represented in documentation? [8]  
b) Explain the evaluation of ERP package. [8]
- Q9)** a) Explain the process of material management in automobile sector. [8]  
b) How does ERP sales cycle work? Explain it with a suitable example. [8]
- Q10)** Write short notes on :  
a) Inventory management. [8]  
b) Technology management. [8]



Total No. of Questions : 8]

[Total No. of Pages : 2

**P 1310**

**[3664] - 115**

**B.E. (Civil)**

**ADVANCED STRUCTURAL DESIGN**

**(2003 Course) (401007)**

*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 books.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Figures to the right indicate full marks.*
- 5) Use of cell phone is prohibited in the examination hall.*
- 6) Use of pocket calculator, relevant IS codes and steel table is allowed.*
- 7) Assume suitable data, if necessary.*

**SECTION - I**

**Q1)** Two channel sections without bent lips 180 mm x 50 mm are connected with the webs to act as a beam. The thickness of channel section is 2 mm. The effective span of a simply supported beam is 3.8 m. Determine the maximum uniformly distributed load including self weight, which may be supported by the beam. The beam is laterally supported throughout its length. Refer IS : 811 - 1961 for properties of channel section. **[25]**

OR

**Q2)** An advertising board of size 3.2 m x 1.8 m is to be provided on a hording. The hording is located at Pune. Design the hording structure neglecting the self weight of the board. **[25]**

**Q3)** Design castellated beam (open web) for a span of 12 m. The dead weight of the roofing is 750 N/m<sup>2</sup> and live load on the roof is 1500 N/m<sup>2</sup>. Cut the selected I - section at 45° and adjust the section such that the overall depth of section should not exceed 800 mm. Assume  $f_y = 250$  Mpa. **[25]**

OR

**Q4) a)** The bottom chord tension member of a roof truss is subjected to an axial pull of 300 kN. A differential chain hoist arrangement is attached to the bottom chord and gives a point load of 10 kN at the centre. The length of the member between panel points is 4 m. Design the section consisting of two unequal angles with long legs kept back to back and turned upwards. Assume  $f_y = 250$  Mpa. **[10]**

**P.T.O.**

- b) Design the column base for an axial load of 700 kN and a bending moment of 100 kN.m. The provided column section is ISHB 400 @ 82.2 kg/m. The bearing pressure from concrete may be assumed as 4000 kN/m<sup>2</sup>. [15]

### **SECTION - II**

- Q5)** Design the interior panel of a flat slab floor system of size 24 m x 24 m for a warehouse divided into panels of 6 m x 6 m.  
Loading class = 5 kN/m<sup>2</sup>.  
Materials M 20 grade of concrete  
Fe 415 HYSD bars  
Column size = 400 mm diameter  
Sketch the reinforcement details in an interior panel of the flat slab. [25]

OR

- Q6)** An Intze type water tank of capacity 1 million liters, supported on an elevated tower comprising 8 columns. The base of the tank is 16 m above ground level and depth of foundation is 1 m below ground level. Adopt M 20 grade of concrete and Fe 415 grade HYSD bars. Design top dome, top ring beam, cylindrical tank wall, bottom ring beam, conical dome and bottom spherical dome. Draw the sectional elevation of the water tank showing reinforcement details in the dome, tank walls and ring girder. [25]

- Q7)** Design a counterfort retaining wall based on the following data : [25]  
Height of wall above ground level = 6 m  
Safe bearing capacity of soil = 160 kN/m<sup>2</sup>  
Angle of internal friction = 33°  
Density of soil = 16 kN/m<sup>3</sup>  
Spacing of counterfort = 3 m c/c  
Adopt M 20 grade of concrete and Fe 415 grade HYSD bars.  
Draw the reinforcement details.

OR

- Q8)** A reinforced concrete grid is to be design to cover an area of 12 m x 16 m, the spacing of the ribs in mutually perpendicular direction being 2 m c/c. Live load is 1.5 kN/m<sup>2</sup>. Adopt M 20 grade of concrete and Fe 415 grade HYSD bars. Analyze the grid floor and design suitable reinforcements in the rib and slab. Draw the cross section of the grid showing reinforcement details in the two perpendicular directions. [25]



Total No. of Questions : 12]

[Total No. of Pages : 4

**P1311**

**[3664] - 131**

**B.E. (Mechanical Engg.)**

**COSTING AND COST CONTROL**

**(2003 Course) (402045) (Elective - I)**

**Time : 3 Hours]**

**[Max. Marks : 100**

**Instructions to the candidates:**

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

**SECTION - I**

**UNIT - I**

- Q1) a)** What is cost accounting? What are its objectives? How do cost accounting records help in the planning and control of operations of business enterprise? **[12]**
- b)** Indicate whether the following statements are True or False : **[4]**
- i)** Idle facility and idle time are the same.
  - ii)** Overtime premium paid to all factory workers is usually considered direct labor cost.
  - iii)** The rental of a car which includes a fixed daily rate plus an extra fee for each kilometer driven is an example of a step cost.
  - iv)** Assuming inflation, if a company wants to maximize net income, it would select FIFO as the method of pricing raw materials.

**OR**

- Q2) a)** Distinguish between Financial statement analysis and Funds flow analysis with an example? **[5]**
- b)** Explain the various elements of cost with an example? **[7]**
- c)** What are the limitations of financial accounting? **[4]**

**UNIT - II**

- Q3) a)** Distinguish between the following with an example for each : **[8]**
- i)** Controllable cost and Non-controllable cost.
  - ii)** Direct material cost and indirect material cost.
- b)** A manufacturing company has shown the following expenses as establishment expenses in its account records :

**P.T.O.**

	(‘000)
	(Rs.)
1. Warehouse charges	3,600
2. Office salaries	2,260
3. Office lighting	140
4. Directors remuneration	2,800
5. Rent and insurance of warehouses	620
6. Warehouse lighting	540
7. Trade magazine	140
8. Bank charges	200
9. Bad debts	340
10. Agents commission	11,500
11. Warehouse repair	1,020
12. Traveling expenses	1,520
13. Rent and insurance of office	460
14. Printing and stationary	3,000

From the above information, find out the total cost of

- i) Selling expenses.
- ii) Distribution expenses.
- iii) Administration expenses. [10]

OR

- Q4) a)** Distinguish between the following : [8]
- i) Cost control and Cost reduction.
  - ii) Direct and Indirect labor cost.
- b) The following inventory data relates to XYZ Ltd.,

		Inventories	
		Beginning	Ending
Finished goods	Rs.	1,10,000	95,000
Work-in-progress	Rs.	70,000	80,000
Raw materials	Rs.	90,000	95,000

Additional information :

Cost of goods available for sale	Rs. 6,84,000
Total goods processed during the period	Rs. 6,54,000
Factory overheads	Rs. 1,67,000
Direct materials used	Rs. 1,93,000

Determine the following :

- i) Raw materials purchases.
- ii) Direct labor cost incurred.
- iii) Cost of goods sold. [10]

### UNIT - III

- Q5)** a) What do you understand by classification, allocation and apportionment in relation to overhead expenses? Explain? [12]  
b) Explain the term 'material cost variance'? [4]

OR

- Q6)** a) Define 'budget' and 'budgetary control'. Discuss the objectives and limitations of budgetary control? [8]  
b) The standard materials cost to produce a tonne of chemical X is :  
300 kg of material A @ Rs. 10 per kg  
400 kg of material B @ Rs. 5 per kg  
500 kg of material C @ Rs. 6 per kg  
During a period, 100 tonnes of mixture X was produced from the usage of :  
35 tonnes of material A at a cost of Rs. 9,000 per tonne  
42 tonnes of material B at a cost of Rs. 6,000 per tonne  
53 tonnes of material C at a cost of Rs. 7,000 per tonne  
Calculate the price, usage and mix variances? [8]

### SECTION - II

#### UNIT - IV

- Q7)** a) Define and explain the term "Joint products and by-products". Enumerate the method which may be employed in costing 'Joint Product'? [9]  
b) A company manufactures product A which yield two by-products B and C. The actual joint expenses of manufacture for a period were Rs. 8,00,000.

It was estimated that the profits on each product as a percentage of sales would be 30%, 25% and 15% respectively. Subsequent expenses were :

	A	B	C
Materials	Rs. 10,000	Rs. 7,500	Rs. 2,500
Direct wages	20,000	12,500	5,000
Overheads	15,000	12,500	7,500
	<u>45,000</u>	<u>32,500</u>	<u>15,000</u>
Total sales	Rs. 6,00,000	Rs. 4,00,000	Rs. 2,50,000

Prepare a statement showing the apportionment of the joint expenses of manufacture over the different products. [9]

OR

- Q8)** a) Discuss the distinguishing features of a process cost system? [9]  
b) Prepare process cost accounts from the following data : Production overhead incurred is Rs. 1,60,000 and is recovered on 200% of direct wages. Production during the period was 20,000 units. There was no opening and closing work-in-progress. [9]

Items	Total	Process		
		I	II	III
Direct material	4,40,000	3,60,000	60,000	20,000
Direct wages	80,000	20,000	40,000	20,000
Direct expenses	1,00,000	60,000	-	40,000

### UNIT - V

- Q9) a)** Discuss the uses and assumptions of CVP analysis. Explain its significance to management? [8]
- b)** Profit/ Volume ratio of a company is 50%, while its margin of safety is 40%. If sales volume of the company is Rs. 50 lakhs, find out its break even point and net profit. [8]

OR

- Q10)a)** How do the following reflect on a break even point [9]
- increase in total fixed cost.
  - decrease in variable cost per unit.
  - increase in total physical sales.
- b)** A company has annual fixed costs of Rs. 14,00,000. In 1996 sales amounted to Rs. 60,00,000 as compared with Rs. 45,00,000 in 1995 and profit in 1996 was Rs. 4,20,000 higher than in 1995.
- At what level of sales does the company break-even.
  - Determine profit or loss on a forecast sales volume of Rs. 80,00,000. [7]

### UNIT - VI

- Q11)a)** What is Activity-Based Costing? Why is it needed? [6]
- b)** Prepare Income Statement under marginal costing from the following information relating to the year 2006-07. [10]
- Opening stock = 1000 units valued at Rs. 70,000 including variable cost of Rs. 50 per unit.
- Fixed cost = Rs. 1,20,000.
- Variable cost = Rs. 60 per unit.
- Production = 10,000 units.
- Sales = 7,000 units @ Rs. 100 per unit.
- Stock is valued on the basis of FIFO.

OR

- Q12)a)** Define and explain standard cost and standard costing. What are the advantages and limitations of standard costing? [9]
- b)** What do you mean by marginal costing? Discuss its usefulness and limitations. [7]





Total No. of Questions : 12]

[Total No. of Pages : 4

**P1319**

**[3664] - 296**

**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) 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)*** Design a two cavity two plate mold for component in fig. 1. Draw at least two views with one sectional view to bring out all the details of the feed system, ejection system and cooling system.

Material : HDPE; cavity pressure : 250 kg/cm<sup>2</sup>. total heat content : 171 cal/g.

**[35]**

**OR**

***Q2)*** Design a two cavity three plate mold for the component in fig.2. Draw at least two views with one sectional view to bring out the details of feed system, ejection system and cooling system.

Material : ABS; Cavity pr : 300 kg/cm<sup>2</sup>; heat content = 72 cal/g.

**[35]**

***Q3)*** Calculate the size of core and cavity inserts for the mold designed in Q.1 or Q.2.

**[5]**

**OR**

***Q4)*** Calculate the size of guide pillar for the mold designed in Q.1 or Q.2.

**[5]**

***Q5) a)*** Write a note on angled lifted splits.

**[6]**

***b)*** State the relation between length of finger cam and opening of splits. Also state the same for dog leg cam.

**[4]**

**OR**

***Q6) a)*** With a neat figure, explain any method used for achieving delay in split opening motion.

**[6]**

***P.T.O.***

- b) Explain with neat figures, spring actuation of splits. [4]

### **SECTION - II**

- Q7)** a) Explain the construction of any 3 secondary nozzles used in hot runner molds. [8]  
b) Explain the various heating systems used to raise the temperature of hot runner manifold. [8]

OR

- Q8)** a) Draw a neat sketch of cylindrical hot runner manifold block. Explain its construction in detail. [8]  
b) Write a note on advantages and disadvantages of hot runner molds over unheated molds. [8]
- Q9)** a) Write a process sheet for manufacturing of guide pillar and sprue bush for the mold designed in Q.1 or Q.2. [8]  
b) Explain the process of electro discharge machining with a neat sketch. Bring out any 3 differences between EDM and wire cut EDM. [8]

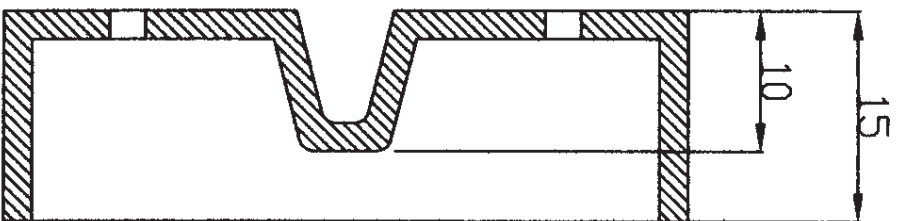
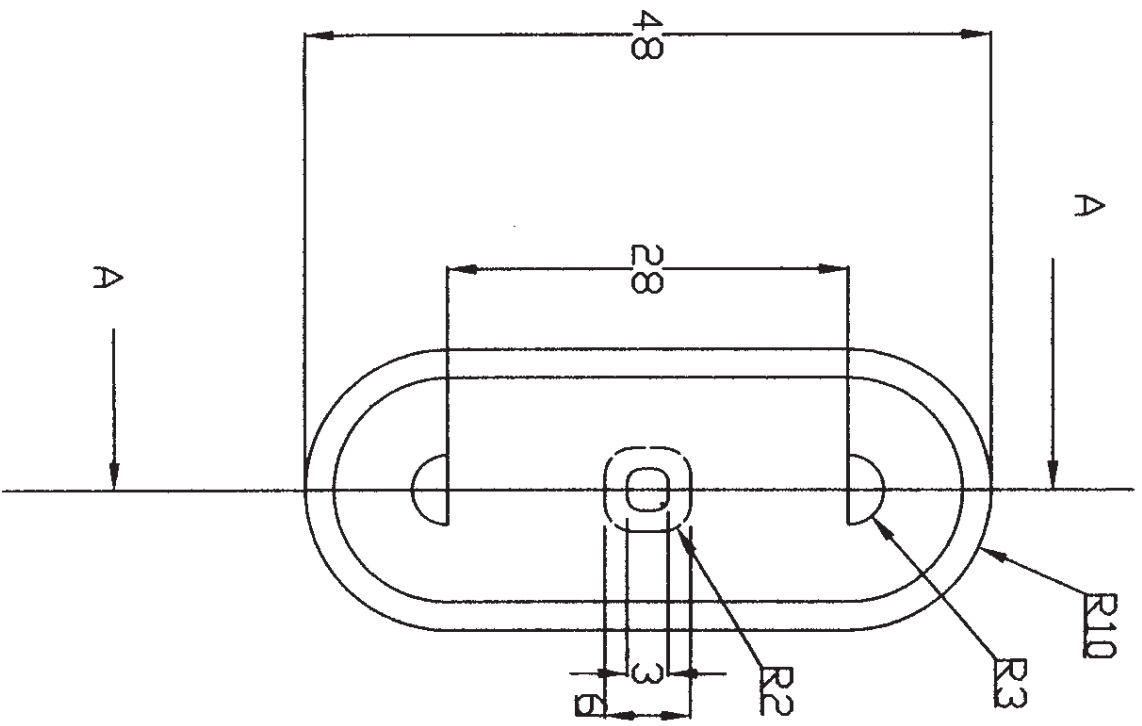
OR

- Q10)** a) Explain the process of costing of injection molds. [8]  
b) Explain up milling and down milling in detail with neat sketches. [8]
- Q11)** a) Draw a proportionate sketch of a blown film die. [8]  
b) Calculate the die gap for a blown film die using the following data :  
Material - LDPE; film thickness : 0.15 mm, lay flat width : 550 mm;  
blow ratio : 2; draw down ratio : 10; linear velocity : 20 mm/sec.  $\tau = 2.4 \times 10^5 \text{ N/m}^2$ ;  $g = 4.2 \times 10^4 \text{ N/m}^2$ ;  $B_{SH} : 2.15$ ;  $B_{SW} : 1.5$ . [10]

OR

- Q12)** a) Draw a neat sketch for a in-line pipe die. [10]  
b) Write down in details, steps involved in determining pressure drop through a rod die. Clearly mention all the formulae used. [8]



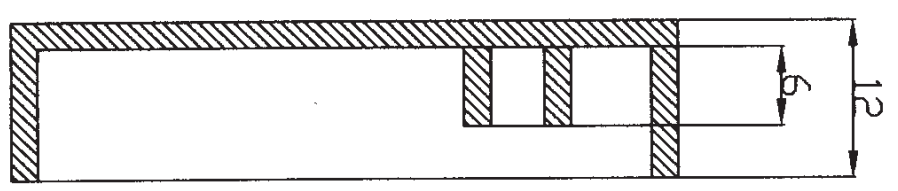


Sec A-A

All dimensions in mm  
overall thk 2 mm

Fig-1

SEC A-A



All dimensions in mm  
overall thk 2 mm

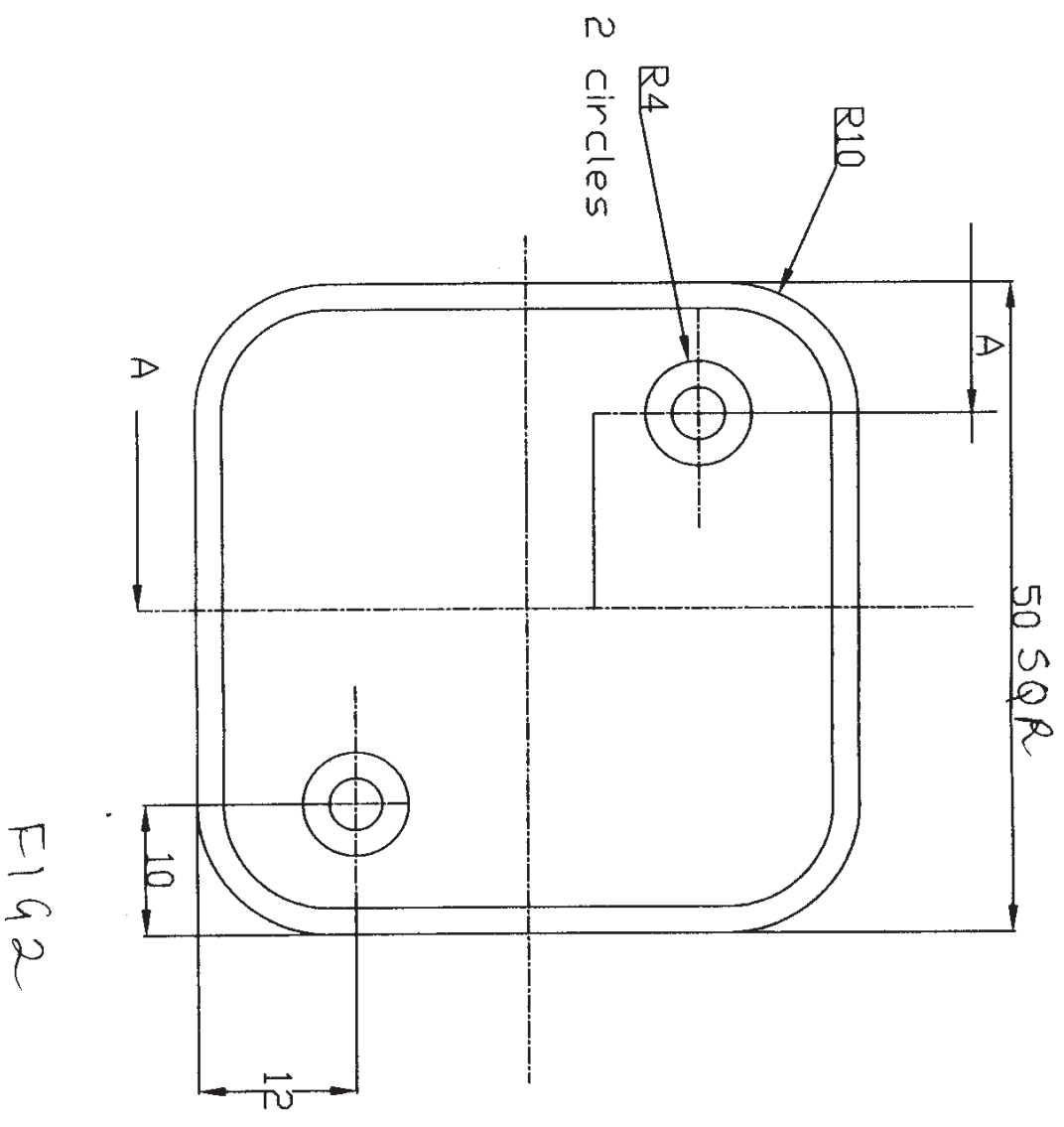


FIG 2

Total No. of Questions : 12]

[Total No. of Pages : 5

P 1320

[3664] - 303

B.E. (Polymer)

INDUSTRIAL MANAGEMENT AND PROCESS

ECONOMICS (IMPE)

(2003 Course) (409370)

Time : 3 Hours]

[Max. Marks : 100

*Instructions to the candidates:*

- 1) *In Sec.I attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6. In Sec.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 organization? Explain its need.[8]  
b) The following information is obtained from the accounts of Leela Private Limited company -

	<u>Rs.</u>
Direct material cost	10,000
Direct wages	6,000
Direct Expenses	200
Factory overheads	3,000
Administration overheads	1,000
Selling and distribution overheads	1,800
Sales	25,000

Prepare a statement of cost and profit under absorption method showing prime cost, works cost, cost of production, total cost and profits. [9]

OR

- Q2)** a) Explain [9]  
i) Direct and Indirect cost.  
ii) Marginal costing.

P.T.O.

- b) For a product A, sales and profits are given for two different periods :
- | Period    | Sales (Rs.) | Profit (Rs.) |
|-----------|-------------|--------------|
| Period I  | 2,00,000    | 20,000       |
| Period II | 3,00,000    | 40,000       |
- Calculate contribution, variable cost and breakeven sales for each period. [8]

- Q3)** a) What is discounted pay back period? Explain. [6]  
 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 discounted pay back assuming the discounting rate of 15%.
- b) Explain the difference between equity shares and preference shares. [6]
- c) What are the limitations of Capital Budgeting? [5]

OR

- Q4)** a) What are the factors taken into consideration for computing cash-outflow and cash-inflow? [6]
- b) 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 Rs. 90,000. [6]
- c) Explain the term working capital. [5]
- Q5)** a) Describe the aims of budgeting. [6]
- b) What are main causes for depreciation? Explain. [6]
- c) Calculate the amount of depreciation for the following data using straight line method. [4]  
 Cost of Asset : Rs. 5,00,000.  
 Estimated Scrap value : Rs. 25,000.  
 Estimated life : 15 years.

OR

- Q6)** a) Explain the written down value method for depreciation. [5]
- b) What are the merits of budgetary control? [6]
- c) The following data has been obtained for a machine X : [5]  
 Cost of machine - Rs. 1,10,000.  
 Estimated scrap value - Rs. 10,000.  
 Estimated number of units to be produced during the life of the machine - 50,000  
 Calculate the depreciation amount using production unit method, if in a particular year 7,000 units are produced.

## SECTION - II

**Q7) a)** Solve the following LP problem by using Simplex technique [9]

Maximize  $Z = 3x_1 + 2x_2 + 5x_3$ ,

Subject to the constraints

$$x_1 + 2x_2 + x_3 \leq 430$$

$$3x_1 + 2x_3 \leq 460$$

$$x_1 + 4x_2 \leq 420$$

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

b) A car hire company has one car at each of five depots a, b, c, d and e. A customer requires a car in each town, namely A, B, C, D and E. Distance (in kms) between depots (origins) and towns (destinations) are given in the following matrix. [8]

	a	b	c	d	e
A	160	130	175	190	200
B	135	120	130	160	175
C	140	110	155	170	185
D	50	50	80	80	110
E	55	35	70	80	105

How should cars be assigned to customers so as to minimize the distance travelled?

OR

**Q8) a)** Solve the following transportation problem : [9]

		Destination				
		A	B	C	D	
Source	I	21	16	25	13	11
	II	17	18	14	23	13
	III	32	27	18	41	19
Requirement		6	10	12	15	43

Availability

b) Following table shows the machine time (in hours) for 5 jobs to be processed on two different machines [8]

Job :	1	2	3	4	5
Machine A :	3	7	4	5	7
Machine B :	6	2	7	3	4

Passing is not allowed. Find the optimal sequence in which jobs should be processed.

**Q9) a)** The following pay-off table is given [9]

Acts	Event			
	$E_1$	$E_2$	$E_3$	$E_4$
$A_1$	40	200	-200	100
$A_2$	200	0	200	0
$A_3$	0	100	0	150
$A_4$	-50	400	100	0

Suppose that the probability of the events of this table are  $P(E_1) = 0.20$ ,  $P(E_2) = 0.15$ ,  $P(E_3) = 0.40$ ,  $P(E_4) = 0.25$ , Calculate the expected pay-off and the expected loss of each action.

b) Find the saddle point (or points) and hence solve the following game

		B				
		I	II	III	IV	V
A	I	9	3	1	8	0
	II	6	5	4	6	7
	III	2	4	4	3	8
	IV	5	6	2	2	1

[8]

OR

**Q10)a)** A project has the following time schedule [9]

Activity	Time in months	Activity	Time in months
(1 - 2)	2	(4 - 6)	3
(1 - 3)	2	(5 - 8)	1
(1 - 4)	1	(6 - 9)	5
(2 - 5)	4	(7 - 8)	4
(3 - 6)	8	(8 - 9)	3
(3 - 7)	5		

construct PERT network and compute

- Total float for each activity.
  - Critical path and its duration.
- b) A glass factory specializing in crystal is developing a substantial backlog and the firm's management is considering three courses of action : ( $s_1$ ) arrange for subcontracting ( $s_2$ ) begin overtime ( $s_3$ ) construct new facilities. The correct choice depends largely upon future demand which may be low, medium or high. By consensus, management ranks the respective probabilities as 0.10, 0.50 and 0.40. A cost analysis reveals the effect upon the profits that is shown in the table below.



Profit (Rs.'000) if demand is	Courses of action		
	$s_1$ (subcontracting)	$s_2$ (over time)	$s_3$ (construct new facilities)
low ( $p = 0.10$ )	10	-20	-150
medium ( $p=0.50$ )	50	60	20
high ( $p = 0.40$ )	50	100	200

Show this decision situation in the form of a decision tree and indicate the most preferred decision and corresponding expected value. [8]

**Q11)a)** The demand of an item is uniform at a rate of 25 units per month. The fixed cost is Rs. 15, each time a production run is made. The production cost is Re. 1 per item, and the inventory carrying cost is Re. 0.30 per item per month. If the shortage cost is Rs. 1.50 per item per month, determine how often to make a production run and of what size it should be? [8]

b) The annual demand for a product is 64,000 units (or 1280 units per week). The buying cost per order is Rs. 10 and the estimated cost of carrying one unit in stock for a year is 20%. The normal price of the product is Rs. 10 per unit. However, the supplier offers a quantity discount of 2% on an order of atleast 1000 units at a time and discount of 5% if the order is for atleast 5,000 units. Estimate the most economic purchase quantity per order. [8]

OR

**Q12)a)** Find the optimum order quantity for a product for which the price breaks are as follows : [9]

Quantity	Unit cost (Rs.)
$0 \leq q_1 < 3000$	10.00
$3000 \leq q_2$	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. 100.

b) Explain in details 'Always Better Control (ABC) Analysis. [7]



Total No. of Questions : 12]

[Total No. of Pages : 2

**P 1324**

**[3664] - 320**

**B.E. (Petroleum)  
DEEPWATER TECHNOLOGY  
(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 answer books.**
- 3) Neat diagrams must be drawn wherever necessary.**
- 4) Figures to the right indicate full marks.**
- 5) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.**
- 6) Assume suitable data, if necessary.**

**SECTION - I**

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

- i) Ballast control.
- ii) Structural casing.

**b) Discuss various types of floating drilling rigs in detail. [8]**

**OR**

**Q2) a) Write notes on [10]**

- i) Center of gravity.
- ii) Effect of adding weight to buoyancy.

**b) Discuss different parameters to design fixed offshore structures. [8]**

**Q3) Discuss different components of riser system in brief with suitable sketch.[16]**

**OR**

**Q4) a) Discuss in detail spread mooring system in detail. [8]**

**b) Discuss difference between permanent & temporary mooring system.[8]**

**Q5) Write notes on : [16]**

- a) Formation integrity test.
- b) Penetration test.

**OR**

**P.T.O.**

**Q6)** Discuss procedure of lowering temporary guide base and drilling of 36" hole. [16]

**SECTION - II**

- Q7)** a) Discuss different well control problems in deepwater wells. [9]  
b) Discuss vertical and horizontal subsea tree in detail. [9]

OR

- Q8)** a) Describe production testing methods for an offshore well. [9]  
b) Explain different problems in cementation of a deep water well. [9]

**Q9)** Compare vertical and horizontal separators from the point of advantages, disadvantages and working principle with suitable sketch. [16]

OR

- Q10)** Write notes on [16]  
a) Subsea production system.  
b) EOR methods.

**Q11)** Describe in detail design considerations for production processing and transportation of oil & gas. [16]

OR

- Q12)** Write short notes on [16]  
a) Production monitoring and control system.  
b) Offshore storage of oil & gas.



Total No. of Questions : 8]

[Total No. of Pages : 2

**P 1326**

**[3664] - 331**

**B.E. (Petrochemical)**

**CATALYSIS TECHNOLOGY & FLUIDIZATION 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 answer books.**
- 3) Neat diagrams must be drawn wherever necessary.**
- 4) Figures to the right indicate full marks.**
- 5) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.**
- 6) Assume suitable data, if necessary.**

**SECTION - I**

- Q1)** a) Differentiate between physical adsorption and chemisorption. [6]  
b) With help of neat diagram explain how catalyst changes reaction pathways. [6]  
c) Write a short note on hetero - homogeneous catalysis. [4]
- Q2)** a) Derive Langmuir Adsorption Theorem after stating important assumptions. [6]  
b) What is coke formation? How can we get - rid of it. [4]  
c) Highlight difference between LH model and Ridel model for catalytic reactions. [6]
- Q3)** a) What are the desired properties of an industrial catalyst - explain in brief. [6]  
b) Explain various characterization methods of catalysts. [6]  
c) What are promoters? Discuss its importance in catalysis. [4]
- Q4)** a) With help of neat sketch discuss manufacture of ammonia - highlight on the reactor and catalysts involved. [8]  
b) Catalysts is very important to refineries and petrochemical industries - explain with help of suitable examples. [6]  
c) Write short note on Zeolites and highlight its stereo-selectivity. [4]

**P.T.O.**

## **SECTION - II**

- Q5)** a) What are advantages of fluidization? Explain your answer with a special emphasis to reaction engineering and heat transfer. [6]  
b) Define : Superficial Velocity, Particulate fluidization. [4]  
c) What are various types of fluidized particles? Highlight the importance of Geldart classification in this context. [6]
- Q6)** a) With help of neat sketch explain Kunni-Levenspiel Model for performance of Fluidized bed reactor. [6]  
b) With help of suitable diagram explain the different phenomena and regimes occurring in a fluidized bed with increase in gas velocity. [6]  
c) Briefly explain concept of Davidson Cloud model. [4]
- Q7)** a) With help of neat sketch explain operational principle of modern FCC unit. Highlight its catalyst properties and operating conditions. [8]  
b) With help of suitable figure explain different types of fluidized bed dryers and highlight their relative advantages and disadvantages. [8]
- Q8)** a) With help of diagram explain the fluidization process and show how void fraction and pressure drop across the bed changes. [6]  
b) Write a short note on Particle Transport with major emphasis on carry-over. [6]  
c) Define and explain : Sintering, Agglomeration, Regeneration. [6]



Total No. of Questions : 11]

[Total No. of Pages : 4

**P 1329**

**[3664] - 351**

**B.E. (IT)**

**SOFTWARE TESTING AND QUALITY ASSURANCE**

**(2003 Course) (414444)**

**Time : 3 Hours]**

**[Max. Marks : 100**

**Instructions to the candidates:**

- 1) Answer question 1 or 2, 3 or 4 and 5 or 6 from Section I and question 7 or 8, 9 or 10 from Section II.**
- 2) Question 11 is 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) Assume suitable data, if necessary.**

**SECTION - I**

- Q1) a) Explain the difference between the following : [10]**
- i) Verification and validation.
  - ii) Load and stress testing.
  - iii) Test plan and test strategy.
  - iv) Defect severity and defect priority.
  - v) Integration testing and incremental integration testing.
- b) What defect types are most likely to be detected during integration tests of a software system? Describe your choices in terms of both the nature of integration test and the nature of the defect types you select. [8]**

**OR**

- Q2) a) An air traffic control system can have one or many users. It interfaces with many hardware devices such as displays, radar detectors and communication devices. This system can occur in a variety of configurations. Describe how you would carry out configuration test on this system. [10]**
- b) Product requirements are incomplete and ambiguous. What are the other sources of information you will use to understand requirements better?[8]**
- Q3) a) Considering online and / or catalog shopping. Develop a use case to describe an user purchasing a television set with a credit card from an online vendor using web-based software, With the aid of your use case, design a set of tests you could use during system test to evaluate the software. [6]**

**P.T.O.**

- b) GOLFSCORE is a program which calculates the scores of the participants in a golf tournament which is based on the following assumptions and scoring rules : [10]

Assumptions :

- i) The number of courses played can be from 1 to 8.
- ii) The number of participating golfers can be from 2 to 400.
- iii) Each golfer plays each course once.
- iv) A golfer's tournament score is the sum of his/her scores on each course.
- v) Each golf course has 18 holes, and par for each hole is 3, 4 or 5.

Scoring rules for each hole :

Strokes	Score
Over par	0
Par	1
1 under par	2
2 under par	4
>2 under par	6

### Input

Input to GOLFSCORE is a formatted text file containing the following records in sequence :

- i) Course records. One record for each golf course. Each record contains the name of the course and the par for each of its 18 holes.  
Column 1 : Blank  
Columns 2 - 19 : Course Name  
Columns 21 - 38 : Par for holes 1 - 18 (par is an integer 3, 4, or 5)
- ii) Delimiter record. Denotes the end of the course records.  
Column 1 : Non-blank  
Columns 2 - 60 : Blank
- iii) Golfer records. One record per golfer per course (in any order). Each record contains the name of the golfer, the name of the course, and the actual number of strokes taken for each of the 18 holes.  
Column 1 : Blank  
Columns 2 - 19 : Course name  
Columns 22 - 39 : Golfer name  
Columns 41 - 58 : Number of strokes taken for holes 1 - 18 (per hole, number of strokes in a single, non-zero digit).
- iv) Delimiter record. Denotes the end of the golfer records.  
Column 1 : Non-blank  
Columns 2 - 60 : Blank

### Output

GOLFSCORE produces the following output reports, showing :

- i) The names of the golfers, their scores for each course, their total scores, and their final rank in the tournament, sorted in descending order of total score.

- ii) The same as report (1), but sorted alphabetically by golfer name.
- iii) Per course, the same as report (1), but sorted in descending order of score on that course.

Each report contains one output record per golfer.

**Now, complete the following worksheet with the above data :**

External input condition	Valid equivalence classes	Invalid equivalence classes

OR

**Q4) a)** Answer the following in short : **[8]**

- i) You see a failure/defect in terms of system behaviour once, but don't know how to get it again. This is called a non reproducible bug. Will you report it? Why?
- ii) You're reporting a bug which is similar to another bug reported already. Will you cross reference them or report a new bug? Give reasons in each case.
- iii) A bug report requires you to run multiple tests to check whether the bug is fixed. In this case, report them as different bugs. True or False?
- iv) What is a bug triage meeting?

**b)** Based on the following procedure, identify two test conditions for each of the following : **[8]**

- i) Statement coverage.
- ii) Decision coverage.
- iii) Condition coverage.
- iv) Multiple condition coverage.

Procedure liability (age, gender, married, premium)

begin

    premium :=500;

        if ((age<25) and (gender = male) and (not married)) then

            premium := premium + 1500;

        else if ((married or (gender = female)) then

            Premium := premium - 200;

        if((age>45) and (age<65)) then

            Premium := premium - 100;)

end;



- Q5) a)** Explain in short the following metrics used in software testing : [8]  
i) Test coverage. ii) Test Execution status.  
iii) Defect density. iv) Defect leakage.  
**b)** Explain GQM technique in detail. Draw a GQM tree for the quality goal of achieving better software usability. [8]

OR

- Q6) a)** Explain the differences between external and internal attributes with examples from different entities like project, product and resources. [8]  
**b)** How do you calculate defect density and defect removal rate? Discuss ways to improve these rates for a better quality product. [8]

### **SECTION - II**

- Q7) a)** Explain the objectives and elements of software reviews and inspections. [8]  
**b)** Enlist the key items you will include in a requirements verification checklist. [8]

OR

- Q8) a)** Explain any four Ishikawa's basic quality tools. [8]  
**b)** Explain the following software reliability quality attributes in short : [8]  
i) Usability. ii) Portability.  
iii) Maintainability. iv) Interoperability.

- Q9) a)** Explain the goals and activities performed in the following KPA's [8]  
i) Software project tracking and oversight.  
ii) Organization process definition.  
**b)** List all the requirements of ISO 9000 and ISO 9001. [8]

OR

- Q10) a)** What is six sigma? Explain the terms DMAIC and DMADV with reference to six sigma. [8]  
**b)** How is defect prevention and process change management brought into practice? [8]

- Q11) a)** What do you mean by network testing? Explain different types of network security testing? [6]  
**b)** Write short notes on any two of the following : [12]  
i) Web-based software security testing (2 tier / 3 tier applications).  
ii) Testing of OOD Models.  
iii) Website testing checklist.



Total No. of Questions : 10]

[Total No. of Pages : 2

**P 1338**

**[3664] - 26**

**B.E. (E & TC)**

**RADIATION & MICROWAVE TECHNIQUES**

**(1997 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) Assume suitable data, if necessary.**

**SECTION - I**

- Q1)** a) What are the advantages of waveguide over coaxial cable at microwave frequency? Explain the method to excite dominant mode in the waveguide from microwave source. [8]
- b) An air filled rectangular waveguide of inside dimensions (7 x 3.5)cm operates in the dominant mode  $TE_{10}$  [8]
- i) Find the cut-off frequency.
  - ii) Determine phase velocity of wave in the guide at 3.5 GHz.
  - iii) Find guided wavelength at 3.5 GHz.
  - iv) Calculate group velocity at same frequency.
- Q2)** a) Why S parameters are preferred at microwave frequency? Explain two hole directional coupler and give 'S' parameters of it. [8]
- b) Explain principle of ferrite rotation. Explain isolator & give its S parameters. [8]
- Q3)** a) Explain principle of working of a cavity Magnetron. [8]
- b) Explain velocity modulation & electron bunching in Klystron amplifier. [8]
- Q4)** a) Explain working of circulator using Magic Tee. Give scattering matrix of three port circulator. [8]
- b) Explain the role of directional coupler in a typical laboratory microwave bench. Define coupling factor, directivity & isolation for the same. [8]

**P.T.O.**

- Q5)** Explain following microwave measurements. [18]
- a) V.S.W.R.
  - b) Microwave frequency.
  - c) Microwave unknown impedance.

### **SECTION - II**

- Q6)** a) Explain LSA mode of Gunn diode compare between Gunn diode & IMPATT diode. [10]  
b) Explain how a PIN diode acts as a modulator. [6]
- Q7)** a) Derive Radar Range equation. Explain the factors, those affect maximum Range of Radar. [8]  
b) Explain the A scope and plan position indicator system of Radar. [8]
- Q8)** a) Discuss power frequency limitations of a microwave bijunction transistor. [8]  
b) Explain the working of parametric amplifier. [8]
- Q9)** a) What are different feed mechanisms used for a parabolic reflector antenna? [8]  
b) Calculate the beamwidth between first nulls and the beamwidth half power points of 3 m paraboloid used in the S band at 3 GHz. Determine gain of the antenna in dBs. [8]
- Q10)** Write short notes on (Any Three) : [18]
- a) Microstriplines.
  - b) Microwave Heating.
  - c) Doppler effect.



Total No. of Questions : 10]

[Total No. of Pages : 3

P 1340

[3664] - 51

B.E. (Electronics)

DIGITAL SIGNAL PROCESSING & APPLICATIONS

(1997 Course) (404203)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Answer any three questions from each section.
- 2) Answers to the two 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) Determine the cross correlation sequence  $Y_{xy}(1)$  of the following sequences : [10]

$$x(n) = \left\{ \dots\dots 0, 0, -1, 2, 0, 3, -1, 0, 0, \dots\dots \right\}$$

$$y(n) = \left\{ -1, 2, 0.5, 0, 0, \dots\dots \right\}$$

Also find normalized cross correlation sequence  $p_{xy(1)}$ .

- b) Explain terms : [8]
- i) Cross correlation,
  - ii) Auto correlation.

**Q2)** a) State and explain autocorrelation properties. [4]

b) Explain sampling theorem. [2]

c) The DT-LTI system is characterized by the difference equation : [10]

$$y(n) = 3x(n) - 4x(n-1) + 7/2y(n-1) - 3/2y(n-2)$$

Determine the impulse response of the system for :

- i) The stable system.
- ii) The causal system.

Realize the system in direct - 2 form.

**Q3)** a) If  $x(n) = u(n) - u(n-2)$ , find the DC component of this signal. Justify your answer. [8]

P.T.O.

- b) Using first order sections, obtain cascade realization for [8]

$$H(z) = \frac{\left(1 + \frac{1}{2}z^{-1}\right)\left(1 + \frac{1}{4}z^{-1}\right)}{\left(1 - \frac{1}{2}z^{-1}\right)\left(1 - \frac{1}{4}z^{-1}\right)\left(1 - \frac{1}{8}z^{-1}\right)}$$

- Q4) a)** Compute the Z.T. and plot the ROC of :

i)  $x(n) = n^2 u(n)$  [2]

ii)  $x(n) = Ar^n \cos(w_0 n + \Phi) u(n)$ . [4]

- b) Given  $X(Z) = Z/(Z-1)^2$  and  $H(Z) = 1/(Z-1)$ . Find IZT of both  $x(n)$  and  $h(n)$  and then using convolution sum  $y(n) = x(n) * h(n)$ , find  $y(n)$ . [6]

- c) Determine the time-domain signal for all possible cases if [4]

$$H(z) = \frac{2z^2 + 5z + 6}{(z+1)^3} + \frac{4z}{(z+1)^2} + \frac{5}{(z+1)}$$

- Q5) a)** Draw clearly with all notations Butterfly diagram for the following :

i) 8 point FFT with DIT.

ii) 8 point FFT with DIF. [8]

- b) Develop a decimation-in time FFT algorithm using 4-point DFTS for the case  $N = 4^v$ . Compare the number of multiplications with the algorithms using 2-point DFTS with  $N = 2^{2v}$ . [8]

## SECTION - II

- Q6) a)** Design a digital Butterworth filter satisfying the constraints [12]

$$1/\sqrt{2} \leq |H(e^{jw})| \leq 1 \quad \text{for } 0 \leq w \leq \pi/2$$

$$|H(e^{jw})| \leq 0.2 \quad \text{for } 3\pi/4 \leq w \leq \pi$$

with a  $T = 1$  sec using the bilinear transformation. Realize the filter using the most convenient realization form.

- b) Draw and explain the Direct Form - II structure for IIR system. [6]

- Q7) a)** Explain the no of memory locations and computation required in each case above. Given the desired transfer function of LPF as [10]

$$|H_d(w)| = 1 \quad \text{for } -\pi/2 \leq w \leq \pi/2$$

$$= 0 \quad \text{elsewhere}$$

Find corresponding  $h_d(n)$  and using Hamming and Hanning window find out  $h(n)$ . The length of the window is 11.

- b) Compare FIR filters and IIR filters. [4]
  - c) Why is it not possible to realize the Ideal Low Pass Filter practically? [2]
- Q8)** a) What do you understand by the term ‘Adaptive Filter’? [2]
- b) Compare different window functions used in FIR filter design. State the mathematical function of each window function. [8]
  - c) Write a short note on application of FFT. [6]
- Q9)** a) Discuss salient features of architecture for TMS 320 XX/ADSP 21XX series DSP processor and functional blocks. [8]
- b) What is circular buffering? Why is it desired in typical DSP computations? Write a sequence of instructions to ensure circular buffering for an array of length 10. [8]
- Q10)** a) Explain in detail Image Processing with at least one actual application. [8]
- b) Explain the role of DSP in speech signal processing briefly. [8]



Total No. of Questions : 12]

[Total No. of Pages : 3

**P 1344**

**[3664] - 164**

**B.E. (Production Engg.)**

**ROBOTICS**

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

**Time : 3 Hours]**

**[Max. Marks : 100**

**Instructions to the candidates:**

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 from Section I 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) Define Robot. Explain with time period the development process in each robot generation. [8]
- b) Find the worst spatial resolution of a spherical robot with 600 mm arm length. The robot is equipped with three encoders emitting 1200 pulses per revolution. The linear axis is actuated with the aid of 200 mm pitch lead screw having the encoder mounted on it. [8]

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

$i$	$\alpha_{i-1}$	$a_{i-1}$	$d_i$	$\theta_i$
1	0	0	0	$30^\circ$
2	-90	0	2	$0^\circ$
3	0	5	0	$90^\circ$

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 :

$i$	$\alpha_{i-1}$	$a_{i-1}$	$d_i$	$\theta_i$
1	0	0	0	$45^\circ$
2	$-90^\circ$	0	2	$-90^\circ$
3	0	3	0	$60^\circ$

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 Proximity and Range 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 8 X 8 array of pixel. Each element in array indicates the gray level of pixel.

10	17	19	17	19	17	19	12
13	17	19	18	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	19	18	20	11
12	19	19	18	19	20	22	12

Convert it into black and white image. [10]

## SECTION - II

- Q7) a)** Explain the lead through programming method used in robots. [8]

- b) How intelligence can be incorporated in robots. [8]

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) Arc welding.  
ii) Machine loading and unloading.

OR

- Q10)** a) What is handshaking? Explain hardware handshaking of robot. [8]  
b) What do you understand from robot economics? [8]

- Q11)** Write a note on : [18]  
a) Walking robots.  
b) Distance controlled robots.

OR

- Q12)** Write a note on : [18]  
a) Underwater robots.  
b) Robots used in mines.



Total No. of Questions : 12]

[Total No. of Pages : 3

**P 1345**

**[3664] - 182**

**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.**
- 7) All questions are compulsory.**

**SECTION - I**

**Q1) Write a note on [16]**

- a) History of robotics.
- b) Robot like devices.

**OR**

**Q2) a) Describe different components of a typical robot system explaining their function with the help of a block diagram. [10]**

- b) Compare CNC machines with robots. [6]

**Q3) a) Explain in details, classification of robots according to the form of motion. Discuss example of each class in brief. [9]**

- b) Discuss selection criteria for drive technology in robot. Hence compare hydraulic and electric drive technology stating their applications. [9]

**OR**

**Q4) a) With the help of neat diagram, explain the concept of roll, pitch and yaw. [5]**

- b) Explain the concept of degree of freedom with suitable example. [5]
- c) Compare servo controlled and non-servo controlled robots. [8]

**Q5) a) Explain how Lagrangian analysis can be applied for a single prismatic joint working against gravity. [8]**

- b) What are the different types of end effectors? With the help of a neat diagram, explain any two end effectors. [8]

**OR**

**P.T.O.**

- Q6)** Explain different methods of motion conversion for rotary to rotary and rotary to linear motion. [16]

### SECTION - II

- Q7)** a) A point P in space is defined as  ${}^B P = [5 \ 3 \ 4]^T$  relative to frame B and is attached to the origin of the reference frame A and is parallel to it. Apply the following transformations to frame B and find  ${}^A P$ .
- Rotate  $90^\circ$  about the x axis.
  - Then translate 3 units about the y axis and 6 units @ the z axis and 5 units @ x axis.
  - Then rotate  $90^\circ$  @ the z axis. [8]
- b) Draw a neat diagram of PUMA robot explaining its degrees of freedom. Also show all the co-ordinate frames attached to the robot. [10]

OR

- Q8)** a) Explain the concept of hand matrix with the effect of pre and post multiplication of a hand matrix by basic matrix operators. [8]
- b) The link parameter table of a 3 axis articulated robot arm with 3 revolute joints is given below.

Joint	$\theta$	d	a	$\alpha$
1	$\theta_1$	0	0	$-90$
2	$\theta_2$	14.91	43.18	0
3	$\theta_3$	0	-2.03	90

Determine co-ordinates of the tool-centre point w.r.t. base co-ordinate frame if  $\theta_1 = 90^\circ$ ,  $\theta_2 = 0^\circ$  &  $\theta_3 = 90^\circ$  [10]

- Q9)** a) Compare algebraic method with geometric method for solution of inverse kinematics problem. [6]
- b) The link parameter table of a  $\theta - R$  manipulator working in a horizontal plane with its  $\theta$  axis parallel to the phase of the paper is given below.

Joint	$\theta$	d	a	$\alpha$
1	180	$d_1$	$0^\circ$	$90^\circ$
2	0	R	$0^\circ$	$0^\circ$

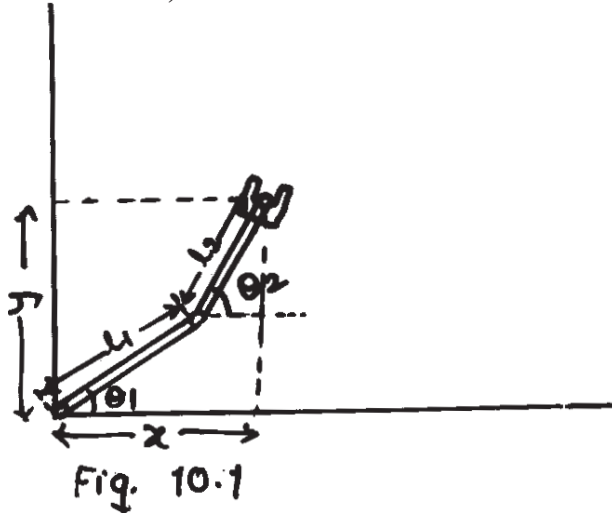
$\theta_1$  = Rotary joint variable, R = Prismatic joint variable.

- Draw the diagram showing link co-ordinate systems and joint parameters.
- Write the 'A' matrices for the manipulator and hence determine its inverse solution. [10]

OR

- Q10)a)** Derive forward kinematics and hence inverse kinematics solution for a planar manipulator shown in figure 10.1, where the joint parameters are  $\theta_1$  &  $\theta_2$  and link parameters are  $l_1$  &  $l_2$ .

(Hint : Find the tool point (x, y) in terms of  $l_1, l_2, \theta_1, \theta_2$  for forward kinematics) [8]



- b) Write a note on use of robot in the following industrial applications [8]
- Nuclear and fossile fuel power plants.
  - Spray painting.

- Q11)a)** Describe the role of inverse kinematics in resolved motion position control (RMPC) of robotic joint. Illustrate your answer by drawing the block diagram of the RMPC scheme. [8]

- b) The hand matrix of a manipulator is given by

$$T = \begin{bmatrix} 0 & 0 & 1 & 2 \\ 1 & 0 & 0 & 4 \\ 0 & 1 & 0 & 3 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

Determine the change in the hand matrix due to a differential rotation of 0.1 radian about the approach vector followed by a differential translation  $[0.1 \ 0.3 \ 0.2]^T$  w.r.t. the tool point. [8]

OR

- Q12)** Write a note on [16]

- Classification of robot specific languages.
- Teach pendant.



Total No. of Questions : 12]

[Total No. of Pages : 3

P 1346

[3664] - 196

B.E. (E & TC)

ELECTRONIC PRODUCT DESIGN

(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) 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) Discuss in details different stages of an electronic product development. Explain importance of each stage in detail. [10]
- b) What is need of slowing down the rise/fall time of high frequency clock. Find amount of rise time offered by simple RC low pass circuit with  $R = 56 \Omega$ ,  $C = 47 \text{ PF}$  to 20 MHz clock. [8]

OR

- Q2)** a) With the help of a practical example of data acquisition system, establish the technocommercial feasibility of product. [8]
- b) Explain in detail how the power supply requirement for an electronic product containing 4 x 4 matrix keyboard, 16 x 2 LCD display, a micro controller, few CMOS digital ICS, OP AMP and ADC TS estimated. What is safety margin kept between calculated and actual power supply capacity. [10]
- Q3)** a) A micro controller system is to be operated at 300 MHz clock frequency. What are the PCB design considerations for such a system. What type of PCB will be used to implement circuit. Justify. [8]
- b) Two tracks on PCB having laminate thickness of 3.5 mm and  $\epsilon_r = 4.7$  have an overlap area of 8 cm<sup>2</sup>. What will be the capacitance between two tracks. [4]
- c) Calculate resistance of 30 cm long copper track with 2.00 mm width on standard 70 micron copper clad laminate.  $\rho = 4\mu - \text{ohm} - \text{cm}$  for copper. [4]

OR

P.T.O.

- Q4)** a) Explain in brief the recommendations for placing following components on PCB. [8]  
 i) Electromagnetic relay.  
 ii) IGBT with heat sink.  
 iii) 40 pin FRC connector.  
 iv) 555 timer IC.  
 b) Different logic family circuits should not be mixed together. Justify. [4]  
 c) Explain different termination schemes for high speed circuits. [4]
- Q5)** a) Draw the circuit diagram of pushpull class B amplifier and explain how can be applied DC or operating point analysis and transient analysis. [8]  
 b) Explain how simultaneous state and timing mode of Logic Analyser helps in fault finding of high speed digital designs. [8]

OR

- Q6)** a) Explain advantages and limitations of  
 i) Analog Real time oscilloscope.  
 ii) Digital storage oscilloscope. Also explain where mixed signal oscilloscope will find applications. [8]  
 b) What are advantages of DPO over DSO? Give typical application of DPO with procedure for measurement. [8]

## **SECTION - II**

- Q7)** What are desirable features of Assemblers and cross compilers? Explain use of each in testing software with the help of practical example. [18]

OR

- Q8)** Write notes on [18]  
 a) Modular programming.  
 b) Steps from coding to generation of executable code when using a combination of Assembly language and C language programs.  
 c) Real time softwares.  
 d) In circuit Emulator.
- Q9)** a) Explain types of temperature tests to be carried out on an industrial product. [8]  
 b) Specify with justification the choice of environmental tests to be carried out on following products. [8]  
 i) UPS.  
 ii) TV receiver.  
 iii) ECG machine.

OR

**Q10)**For each of the products listed below : **[16]**

- a) Classify according to their electromagnetic compatibility.
- b) Whether emission or susceptible test of EMI is necessary.
- c) Which of four generic types of EMI/EMC tests should be conducted on them?
- d) Identify the mechanism by which the product becomes a case of EMI/EMC.

Products :

- i) Mobile telephone.
- ii) MRI machine.
- iii) Stepper motor drive.
- iv) Relay operated on/off controller.

**Q11)**In product documentation, explain importance and typical contents of following documents. **[16]**

- a) Front panel.
- b) Schematic diagram.
- c) Interconnection diagram.
- d) Bill of material.
- e) PCB assembly.

OR

**Q12)**For a PLC setup what should be contents of **[16]**

- a) User manual.
- b) Service manual.

Explain how each section of these manuals is to be used by concerned persons.



Total No. of Questions : 6]

[Total No. of Pages : 2

**P 1349**

**[3664] - 244**

**B.E. (Instrumentation)**

**PROJECT ENGINEERING AND MANAGEMENT**

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

**SECTION - I**

- Q1) a)** Explain the following terms. **[8]**
- i) Assignable Instrument.
  - ii) Manual Loading Station.
  - iii) Shared Display or Controller.
  - iv) Pilot Light.
- b)** Explain the Tagging procedure in brief. Also give the meaning of following Tags. **[8]**
- i) FQSH - 100
  - ii) KSHL - 101
  - iii) PDRT - 100
  - iv) TDIT - 201

**OR**

- a)** Draw the symbols for **[8]**
- i) Panel mounted patch board 21.
  - ii) Restriction orifice - 22 in process line.
  - iii) Fail to Open Two-way valve.
  - iv) Gauge glass mounted on tank.
- b)** What is organization structure? Draw organization structure for general industrial organization. **[8]**
- Q2) a)** What is PFD & P&ID? Elaborate the clear differences between them. **[10]**
- b)** Draw a flow control loop using standard symbols? Give Naming conventions as per ISA standard for
- i) The Loop.
  - ii) For the Instruments. **[8]**

**OR**

**P.T.O.**



- a) Enlist & explain various steps involved in project planning. [10]
- b) Draw a Pressure control loop using standard Symbols? Give Naming convention as per ISA standard for;
  - i) The Loop.
  - ii) For the Instruments. [8]

- Q3)**
- a) Draw the installation drawing for DP cell used for sensing the pressure of dry gas. [8]
  - b) Draw the typical installation sketch for thermocouple. [8]

OR

- a) Draw the level control loop using standard symbols? [6]
- b) Draw the loop wiring diagram for Lop you have drawn. [10]

### **SECTION - II**

- Q4)**
- a) Explain the detailed procedure for CAT. State its importance. [9]
  - b) Explain the process of procurement of material. Also draw the sample PO. [9]

OR

- a) Explain the detailed procedure for FAT. State its importance. [9]
- b) Explain the procedure for finalizing bidders list. [9]

- Q5)**
- a) Enlist Various Types of Panels. Explain Semi Graphic Panel with neat Sketch. [8]
  - b) Explain in Detail the Inspection procedure of a control Panel. [8]

OR

- a) What is meant by Networking? What are various Network Topologies? Explain in detail. [8]
- b) Classify various cables used in networking & Explain the advantages, disadvantages and uses of it. [8]

- Q6)**
- a) What is Life Cycle Phase? What are the life cycle phases for R & D Project? Explain in detail. [10]
  - b) What is WBS? Explain WBS in Brief by taking Suitable example. [6]

OR

- a) Compare & Contrast between the PERT & CPM. [10]
- b) Enlist the various Network Techniques developed so far for the evaluation of a project. [6]



Total No. of Questions : 8]

[Total No. of Pages : 3

P 1353

[3664] - 323

B.E. (Petrochemical)

REACTION ENGINEERING - II

Time : 3 Hours]

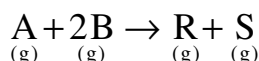
[Max. Marks : 100

Instructions to the candidates:

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

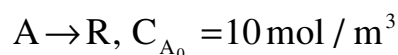
**SECTION - I**

- Q1) a) Explain what you mean by Langmuir - Hinshelwood kinetics? [4]  
b) Derive rate expression for the following catalytic reaction assuming surface reaction controls the overall rate [6]



- c) State (only) the rate expressions for the reaction in (b), assuming  
(i) Adsorption of B controls  
(ii) Desorption of R controls. (Useful form of rate expressions for kinetic data fitting only is expected without proof). [6]

- Q2) A small experimental packed bed reactor ( $w = 1$  kg) using very large recycle of product stream gives the following kinetic data :



$C_A, \text{ mol/m}^3$	1	2	3	6	9
$v_0, \text{ lit/hr}$	5	20	65	133	540

Find the amount of catalyst needed for 75% conversion for a flow rate of 1000 mol A/hr with  $C_{A_0} = 8 \text{ mol/m}^3$ . Using

- a) Packed Bed Reactor with no recycle.
- b) Fluidized Bed Reactor. [16]

P.T.O.

- Q3)** a) Define effectiveness factor. Discuss its utility in kinetic studies and reactor design. [4]
- b) Reaction  $A \rightarrow R$  is to take place on a porous catalyst pellet ( $d_p = 6$  mm,  $D = 10^{-6}$  m<sup>2</sup>/m cat.s) How much is the rate slowed by pore diffusional resistance if the concentration of reactant bathing the particle is 100 mol/m<sup>3</sup> and the diffusion free kinetics are given by
- $$-r_A''' = 0.1 C_A^2 \text{ mol/m}^3 \text{ cat. s.} \quad [8]$$
- c) State how within - particle  $\Delta T$  and film  $\Delta T$  can be estimated for a given catalyst pellet using laboratory test. [4]
- Q4)** a) Discuss factors affecting the activity of a catalyst. [4]
- b) Derive concentration - time relationship in case of first order reaction, first order deactivation taking place in batch-solids batch fluid mode. [10]
- c) First order reaction carried out in a batch reactor takes place on a catalyst that deactivates by first order kinetics. Reaction is irreversible, having rate constant as 0.2 m<sup>3</sup>. kgcat<sup>-1</sup> s<sup>-1</sup>. Conversion obtained after waiting for a long time is 60%. Catalyst loading per unit reaction volume is 1.20 kg/m<sup>3</sup>. Calculate the rate constant for catalyst deactivation. [4]

## SECTION - II

- Q5)** a) Describe four kinetic regimes usually obtained in gas liquid reactions. [6]
- b) Write the design equation used for gas liquid contact in packed bed reactor. [3]
- c) State the criterion for a gas-liquid reaction to take place at gas-liquid interface. How is the overall rate expressed in such a case? [4]
- d) State various types of gas liquid contactors. [3]
- Q6)** Uniform sized spherical particles  $UO_3$  are reduced to  $UO_2$  in a uniform environment with the following results. [16]
- |       |       |       |       |       |       |
|-------|-------|-------|-------|-------|-------|
| t hr  | 0.180 | 0.347 | 0.453 | 0.567 | 0.733 |
| $X_B$ | 0.43  | 0.68  | 0.80  | 0.95  | 0.98  |
- Assuming that shrinking core model holds. Find the controlling mechanism and a rate equation for the reduction.

**Q7)** a) Discuss what you mean by Residence Time Distribution (RTD). How does RTD account for deviations from ideal flow? [6]

b) Response of a reaction vessel to pulse input is given below.

Time t, min	C <sub>Pulse</sub> , gm/lit
0	0
5	3
10	5
15	5
20	4
25	2
30	1
35	0

Calculate

- Mean residence time of fluid in the vessel.
- Fraction of the exiting fluid that has spent time between 10 min and 20 min. [12]

**Q8)** Write notes [16]

- Hatta Number and its significance.
- Merits and demerits of fluidized bed reactor.
- Reactors used in crude oil Refining.
- Kinetic Lumping.



Total No. of Questions : 10]

[Total No. of Pages : 2

**P 1354**

**[3664] - 325**

**B.E. (Petrochemical)**  
**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 logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 6) Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) Discuss 'The Biosphere' in detail. [6]  
b) Elaborate on 'The Hydrologic Cycle'. (Diagram is necessary). [6]  
c) Describe 'The Carbon Cycle' in detail. (Diagram is not necessary). [6]
- Q2)** a) Give the typical classification of solid waste. Also, explain each class in brief. [10]  
b) Elaborate on 'Treatment of Biomedical Waste'. [6]
- Q3)** a) Describe 'sanitary landfilling operation for disposal of solid waste' in detail. (Diagram is necessary). [10]  
b) Elaborate on 'Source correction methods for air pollution control'. [6]
- Q4)** a) Enlist at least three basic mechanisms of removing particulate matter from gas streams. Enlist also the three T's of combustion. [6]  
b) With the help of neat sketch, describe catalytic oxidation method for air pollution control. [10]
- Q5)** Write a short notes on each of the following : [16]  
a) Control of  $\text{NO}_x$  in a complex fertilizer plant.  
b) Removal of hydrogen sulphide from sour gas in a petroleum industry.  
c) Fabric filter systems.  
d) Fixed bed adsorber.

**P.T.O.**

## **SECTION - II**

- Q6)** a) Elaborate on 'Origin of Wastewater'. [6]  
b) Write a note on 'Dissolved Oxygen in the water'. [6]  
c) Describe 'Plant Nutrients' as water pollutants in detail. [6]
- Q7)** a) Elaborate on 'Total Solids content of wastewater'. [8]  
b) Write a detailed note on 'Basic Processes of Wastewater Treatment'. (Diagrams are not expected). [8]
- Q8)** a) The 5-day 20°C BOD of a wastewater is 250 mg/L. What will be the 10-day demand? If the bottle had been incubated at 25°C and 30°C, what would the 5-day BOD have been?  
Data :  
Reaction rate constant (k) (base e, 20°C) = 0.23 per day  
 $\theta = 1.053$ . [8]  
b) Define the term 'Sludge Volume Index' and give the formula to calculate the same. Also, give the values for good as well as poor sludge. [4]  
c) Compare trickling filters with activated sludge systems. (At least four points are expected.). [4]
- Q9)** a) With the help of neat sketch, describe anaerobic sludge digester. [6]  
b) With the help of diagram, discuss facultative pond system. [6]  
c) Define the term 'Coagulation' and give its significance in advanced wastewater treatment. Also enlist two coagulants. [4]
- Q10)** Write short notes on each of the following : [16]  
a) Microstraining.  
b) Role of adsorption in advanced wastewater treatment.  
c) Treatment of liquid effluent from a complex fertilizer plant.  
d) Treatment of liquid effluents from petrochemical industries.



Total No. of Questions : 8]

[Total No. of Pages : 2

**P 1355**

**[3664] - 327**

**B.E. (Petrochemical)**  
**INTERFACE & COLLOID SCIENCE**  
**(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 surface tension as excess surface free energy. [6]  
b) Calculate the minimum work required to be done in order to produce a spray of water of droplet diameter 1000 nm from 50 lit of water at 25°C. Assume all droplets to be of same size. (Surface tension of water = 0.072 Nm<sup>-1</sup>) [6]  
c) Discuss industrially important applications for the following interfaces :  
i) Solid-vapour.  
ii) Liquid - Liquid. [4]
- Q2)** a) Discuss how surfactants are classified. Give two examples from each class. [6]  
b) Explain how dodecane is converted into a useful surface active molecule. [6]  
c) Discuss thumb rules for biodegradability of any given surfactant. [4]
- Q3)** Explain in detail : [16]  
a) London - Vanderwaal forces.  
b) Electrical Double Layer.
- Q4)** Write notes : [18]  
a) Electro phoresis.  
b) Sources of interfacial charge.  
c) Principle of Surface Tensiometer.

**P.T.O.**

## SECTION - II

- Q5)** a) Explain why clay suspensions are stable and how an electrolyte addition affect their stability. Give examples. [6]  
b) Briefly discuss relevance of colloidal stability in use of drilling mud in crude oil production. [4]  
c) Discuss main features of DVGO theory. [6]

- Q6)** a) Explain Gibbs Adsorption equation and its significance. [6]  
b) An aqueous solute adsorbs at a surface according to the Langmuir equation :

$$\frac{x}{x_m} = \frac{bc}{1 + bc}$$

Where  $x_m$  is the maximum possible amount adsorbed. Assume  $x/x_m = 0.4$  at  $c = 0.1$  M. Estimate the value of interfacial tension for  $c = 0.1$  M solution at the surface. Assume molecular area of solute as  $0.2 \text{ nm}^2$  and operating temperature as  $30^\circ\text{C}$ . [10]

- Q7)** a) Explain the role of surfactant flooding in enhanced oil recovery. [6]  
b) Discuss the possible reasons behind thermodynamic stability of micro emulsions. [6]  
c) Explain the principles involved in detergency action. [6]

- Q8)** Write notes (Any Four) : [16]  
a) Emulsion polymerization.  
b) Significance of HLB.  
c) BET method for determining area of porous catalyst.  
d) Chemisorption and Heterogeneous catalysis.  
e) Laplace Young Equation.





Total No. of Questions : 12]

[Total No. of Pages : 3

**P 1365**

**[3664] - 335**

**B.E. (Computer Engineering)**

**OPERATING SYSTEMS**

**(2003 Course) (410442)**

**Time : 3 Hours]**

**[Max. Marks : 100**

**Instructions to the candidates:**

- 1) Answer all 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**

- Q1) a)** What is busy waiting with respect to process synchronization? Explain how semaphore reduces the severity of this problem. Also define with examples
- i) General semaphores.
  - ii) Binary semaphores.
  - iii) Strong semaphores.
  - iv) Weak semaphores. **[8]**
- b) What is bounded buffer Producer/Consumer problem? Write a solution using monitors. **[8]**

**OR**

- Q2) a)** Jurassic Park consists of a dinosaur museum and a park for safari riding. There are m passengers and n single passenger cars. Passengers wander around the museum for a while, then line up to take a ride in a safari car. When a car is available, it loads the one passenger it can hold and rides around the park for a random amount of time. If the n cars are all riding passengers around, then a passenger who wants to ride waits; if a car is ready to load but there are no waiting passengers, then the car waits. Use semaphores to synchronize the m passenger processes and the n car processes. **[8]**
- b) What is basic requirement for execution of concurrent processes? Explain how concurrency is achieved in uniprocessor system. What is distinction between competing and cooperating processes? **[8]**

**P.T.O.**

- Q3)** a) State and explain different methods used for implementing access matrix. Why access matrix is required? [8]  
 b) Apply the deadlock detection algorithm to the following data and show the results. [8]

Available = ( 2 1 0 0 )

	2	0	0	1		0	0	1	0
Request =	1	0	1	0	Allocation =	2	0	0	1
	2	1	0	0		0	1	2	0

Also state advantages and disadvantages of the algorithm.

OR

- Q4)** a) What is deadlock? Explain and compare various techniques to handle deadlock? [8]  
 b) Describe two approaches to intrusion detection. What does an audit record contains? [8]

- Q5)** a) Explain with neat diagram UNIX file system structure and its characteristics. [6]  
 b) Define system response time as the average time it takes to complete a system call. Define system throughput as the number of processes the system can execute in a given time period. Describe how the buffer cache can help response time. Does it necessarily help system throughput. [6]  
 c) Explain with neat diagram structure of a buffer pool. [6]

OR

- Q6)** a) Explain various UNIX kernel components, their responsibilities and their inter relationship with each other. [10]  
 b) Describe with example various building block primitives of UNIX system. [4]  
 c) Write an algorithm for bwrite. [4]

## **SECTION - II**

- Q7)** a) Write and explain algorithm for mount system call. Also state the mount table entries. [10]  
 b) When opening a named pipe for reading a process sleeps in the open until another process opens the pipe for writing. Why? [4]

- c) Compare the access permissions a process must have for following operations and comment -
- i) Creating a new file requires write permission in a directory.
  - ii) Unlinking a file requires write permission in the directory, not on a file. [4]

OR

- Q8)** a) Write and explain the algorithm to convert a pathname to an inode. [8]  
b) Explain the structure of a regular file in UNIX. [4]  
c) What are the link files? What are the types of links? Compare between them. [6]

- Q9)** a) Explain the following process concepts with suitable example - [8]  
i) Signals.  
ii) User ids of a process.  
b) What is context of a process explain in detail? [8]

OR

- Q10)** a) What is kernel profiling explain in brief? [4]  
b) Explain with example process scheduling. [6]  
c) List out various kernel level data structure used in process subsystem with its fields and inter relationship. [6]

- Q11)** a) Explain how stream provide greater modularity and flexibility for the I/O subsystem. [6]  
b) Explain page stealer process in UNIX. [4]  
c) Explain allocation of swap space in UNIX. [6]

OR

- Q12)** a) How page faults are handled in UNIX? [6]  
b) Why is it advantageous to schedule the child process before the parent after a fork call if copy on write bits are set on shared pages? How can kernel force the child to run first? [4]  
c) Write a note on terminal drivers. [6]



Total No. of Questions : 12]

[Total No. of Pages : 3

**P 1366**

**[3664] - 246**

**B.E. (Instrumentation & Control)**

**BIOMEDICAL INSTRUMENTATION**

**(1997 & 2003 Course) (406264) (Elective - I) (Sem. - I)**

**Time : 3 Hours]**

**[Max. Marks : 100**

**Instructions to the candidates:**

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

**SECTION - I**

- Q1)** a) Define bio electrode. Name various types of basic bioelectrodes used for bioelectric potential measurements. Explain the necessity of microelectrode, Micropipette electrode. [8]
- b) Draw and explain electrical equivalent circuit of electrode jelly and Tissue. Specify the importance of use of jelly at electrode electrolyte interface. [8]

OR

- Q2)** a) Why silver-silver chloride electrode is suitable in biomedical applications? State the properties possess by bio-electrodes. [8]
- b) Define and discuss the term “Biosensors”. [4]
- c) What are the voltage range, frequency range, and electrode used for ECG and EEG signals? [4]
- Q3)** a) Explain different Chambers of heart. Explain an Electrical conduction system of heart and the process of ECG genesis. [8]
- b) Discuss the various ECG leads configuration in detail. [8]

OR

- Q4)** a) Enlist various preamplifiers used in bio signal conditioning? What are limitations of differential amplifier and explain how it overcomes with improved version of the same. [10]
- b) Draw and explain Heart Rate meter. [6]

**P.T.O.**

- Q5) a)** What is systolic and diastolic pressure? Enlist two important techniques that plays important role in sphygmomanometric BP measurement. Explain the same method of BP measurement along with its advantages and disadvantages. [10]
- b)** Explain the Dye dilution method of cardiac output measurement. And calculate the cardiac output for heart rate of 90 beats/min. and stroke volume of 56 ml. [8]

OR

- Q6) a)** Enlist various blood flow measurement techniques? What are the problems faced by magnetic blood flow meters if they using permanent magnets or DC excitation. [8]
- b)** Discuss Doppler shift Ultrasonic blood flow measurement along with neat diagram. [8]
- c)** List out the microphones used in phonocardiograph. [2]

## **SECTION - II**

- Q7) a)** What is EEG? Explain the 10-20 Electrode placements. [10]
- b)** Explain the various types of EEG Electrodes. [6]

OR

- Q8) a)** Explain the functions of various lobes of cerebrum. Define cranium Nerves and enlist them. [8]
- b)** Draw and explain the brain stem along with function of each part of it.[6]
- c)** Define Evoked response? [2]

- Q9) a)** Explain the principles involved in intraocular pressure measurement of indentation and applanation tonometer. [10]
- b)** Explain various errors in vision and their method of correction. [4]
- c)** Suggest suitable devices that are used to recover the percentage losses in EAR or EYE, if some residual capacity has been remain with these organs. [2]

OR

- Q10)a)** Define a “Hearing threshold”. Explain the Bekesy audiometer with the help of suitable block diagram. [10]

- b) What are three main sections of Human auditory system? Explain the function performed by each section in human hearing phenomenon. [6]

**Q11)a)** What is Spiro gram? Draw & explain Wedge Spiro meter for respiratory measurement. [10]

- b) Draw and explain Infrared gas analyzer. [8]

OR

**Q12)a)** Define the followings : [10]

Gross shock,

Micro current shock,

Let go Current,

Hold on current,

Lung Compliance.

- b) Explain the various methods of accident prevention in medical equipments. [8]



Total No. of Questions : 12]

[Total No. of Pages : 3

P 1372

[3664] - 107

B.E. (Civil)

FINITE ELEMENT METHOD

(2003 Course) (Elective - I)

Time : 3 Hours]

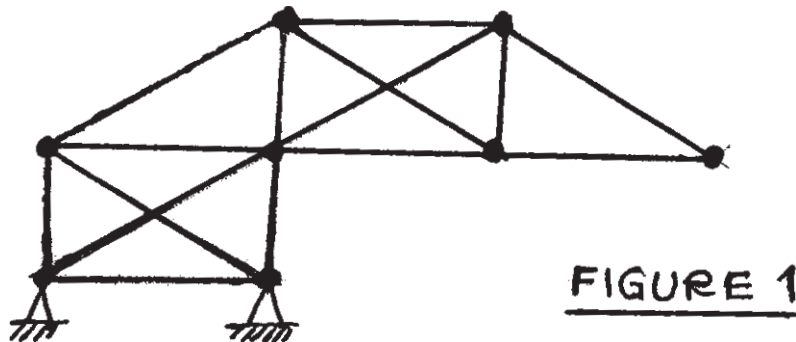
[Max. Marks : 100

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 books.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Use of electronic calculator is allowed.
- 5) Figures to the right indicate full marks.

SECTION - I

- Q1) a) Explain properties of element stiffness matrix & overall matrix. [4]  
b) Using any three different schemes of node numbering justify one which is effective. Refer figure no. 1 for truss application. [12]

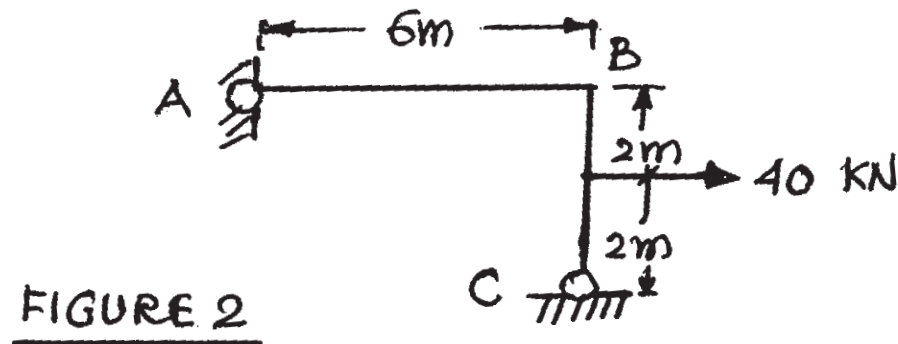


OR

- Q2) A propped cantilever AB is of uniform EI. It is subjected to point load 'P' at midspan of length AB if 'A' is fixed, using only one element as member AB show that fixing moment at A is  $3 Pl/16$ . [16]
- Q3) a) Explain member approach & structure approach used for portal frame analysis. [4]

P.T.O.

- b) Develop matrix equation to solve for unknown DOFs for portal frame loaded & supported as shown in figure 2. EI is uniform. Solution is not expected. [12]



OR

- Q4) a) In which circumstances you need transformation of stiffness matrix from local to global axes. Prove necessary equation. [8]
- b) Orthogonal grid is in plane XY. It consists of two prismatic members having same EI & GJ as well as length L. Develop stiffness matrix of grid. [8]
- Q5) Express polynomial displacement function for beam element of length 'l' & EI. Obtain shape functions from first principles. [18]

OR

- Q6) a) Explain plane stress & plane strain problems. State [D] in case of plane stress problem. [8]
- b) Stating polynomial displacement functions explain CST & LST elements used for plane stress problems. Why LST is preferred? [10]

### SECTION - II

- Q7) A two noded bar element is subjected to axial displacement 'u' at each end node. Develop [K] for element using polynomial displacement function. [16]

OR

- Q8) Write step by step procedure in using finite element technique for two dimensional elasticity problem. Explain significance of boundary conditions. Take a suitable 2D example & show mesh using triangular element. [16]



**Q9)** Explain concept of isoparametric element consider four noded quadrilateral element. Write only Jacobian matrix. [18]

OR

**Q10)** Explain various factors affecting solution of finite element technique. Draw neat sketches wherever required. What do you mean by convergence? [18]

**Q11)** In which circumstances you need 3D finite element technique. Draw different 3D elements. Write step by step procedure in deriving [K] for element of tetrahedron for 3D analysis. Write all necessary matrices. [16]

OR

**Q12)** For Hexahedron element derive shape functions for any two nodes using natural coordinate system. Draw a neat sketch of element with node numbers. Write [D] matrix for 3D elasticity problem. [16]



Total No. of Questions : 12]

[Total No. of Pages : 3

**P 1373**

**[3664] - 184**

**B.E. (Electrical)**

**ILLUMINATION ENGINEERING**

**(2003 Course) (403143)**

**Time : 3 Hours]**

**[Max. Marks : 100**

**Instructions to the candidates:**

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

**SECTION - I**

- Q1)** a) State and explain the laws of illumination. [6]  
b) What is 'photometer'? Explain Bench photometer with a neat sketch. [6]  
c) If a lamp of 250 C.P. is placed one meter below a plane mirror which reflects 95% of the light falling on it, determine the illumination at a point three meter away from the foot of the lamp which is suspended at a height of 4 meters above ground. [6]

**OR**

- Q2)** a) Define the following terms : [6]  
i) M.H.C.P.  
ii) M.S.C.P.  
iii) Luminous intensity.  
iv) Illumination.  
v) Efficacy.  
vi) Reflection factor.  
b) What are the various methods of controlling natural light? [6]  
c) Enlist the properties of light. [6]

- Q3)** a) Write short note on High pressure sodium vapour lamp. [6]  
b) What is stroboscopic effect? How it can be avoided? [6]  
c) Write short note on LASER. [6]

**OR**

**P.T.O.**

- Q4)** Explain any three with sketch : [18]
- a) SOX Lamp.
  - b) C.F.L.
  - c) Metal Halide Lamps.
  - d) L.E.D's.

- Q5)** a) Explain with neat sketch the starting ballast for [8]
- i) Sodium vapour lamp.
  - ii) Mercury vapour lamp.
- b) Define and explain Snell's law of specular reflection. Also explain mixed & diffused reflection with sketches. [6]

OR

- Q6)** a) Discuss the various types of lighting fillings according to the level of luminous flux. [6]
- b) Enlist the material used for reflectors and explain each in brief. [8]

## **SECTION - II**

- Q7)** a) What is polar curve? Describe its type. How it is helpful to an illumination engineer. [8]
- b) Explain C.O.U. (Coefficient of utilization) in lighting scheme design with example. [8]

OR

- Q8)** a) Discuss the factors of good lighting design in detail. [8]
- b) Write short note on : [8]
- i) Street lighting.
  - ii) Flood lighting.

- Q9)** a) What is energy efficient lighting? Discuss its advantages & difficulties. [8]
- b) Give the comparison between different types of light sources with reference to their lumens per watt and life. [8]

OR

- Q10)** a) The front of building 60 m x 15 m is to be illuminated by flood lighting situated 25 m away. If illumination is 100 lux, C.O.U is 0.5, depreciation factor 1.5, waste light factor 1.2 estimate number & size of projectors. Sketch layout. [8]

- b) Explain the term with example : [8]  
i) Life cycle costing.  
ii) Payback calculation.

- Q11)**a) Define Day light factor. Discuss the components of daylight factor, with neat sketches. [6]  
b) Explain the concept of cold lighting. [6]  
c) Write short note on photovoltaic lighting. [6]

OR

- Q12)**a) Explain Emergency Lighting scheme with neat block diagram. In case of  
of  
i) Central System.  
ii) Stand alone system. [10]  
b) Write short note on : [8]  
i) Switching control for light.  
ii) O.F.C.



Total No. of Questions : 12]

[Total No. of Pages : 4

P 1374

[3664] - 275

B.E. (Chemical)

PROCESS EQUIPMENT DESIGN - II

(Revised 2003 Course)

Time : 3 Hours]

[Max. Marks : 100

*Instructions to the candidates:*

- 1) Answer 3 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) Toluene is continuously nitrated to mononitrotoluene in a cast iron vessel, 1 m diameter, fitted with propeller agitator 0.3 m diameter rotating at 2.5 Hz. The temp. is maintained at 310 K by circulating 0.5 kg/s cooling water through a stainless steel coil 25 mm O.D. and 22 mm I.D. wound in the form of helix, 0.8 m in diameter. The conditions are such that the reacting material may be considered to have same physical properties as 75% H<sub>2</sub>SO<sub>4</sub>. If mean water temperature is 290 K, what is the overall heat transfer coefficient for the desired heat transfer?

Data : properties : Thermal conductivity = 0.59 W/mK,  $C_p = 4180$  J/kg K  
Viscosity = 1.08 mN.s/m<sup>2</sup>, density = 998 kg/m<sup>3</sup>.

Properties at 75% H<sub>2</sub>SO<sub>4</sub> : Thermal conductivity = 0.4 W/mK.  
 $C_p = 1.88 \times 10^3$  J/kgK, viscosity = 6.5 mN.s/m<sup>2</sup>, Density = 1666 kg/m<sup>3</sup>,  
viscosity at the surface =  $8.6 \times 10^{-3}$  at 300 K,

Thermal conductivity of stainless steel is 15.9 W/mK

Dirt resistance at inside and outside surfaces are 0.0002 and 0.0004 m<sup>2</sup>K/W respectively. [12]

b) Give classification and selection criteria of agitators. [6]

OR

**Q2)** a) Explain jackets and coils for reaction vessels in detail with neat sketches.[8]

b) Calculate the diameter of shaft for the agitator system. The power required for agitation is 3 hP and speed of rotation is 56 rpm. Impeller diameter is 65 cm. Maximum torque is 18900 kg.m. While bending moment is 27700 kg.m. Permissible shear stress = 400 kg/cm<sup>2</sup>. Permissible tensile stress = 600 kg/cm<sup>2</sup>. [10]

P.T.O.

- Q3)** a) Explain the design consideration of fluidized bed dryer. [10]  
 b) Write a note on classification and selection of dryers. [6]

OR

- Q4)** a) Strips of material 10 mm thick are dried under constant drying conditions from 28 to 13% moisture in 25 KS (7 Hrs). If the equilibrium moisture content is 7%, what is the time taken to dry 60 mm planks from 22 to 10 percent moisture under the same conditions assuming no loss from the edges?

All moistures are given on wet basis.

The relation between E, the ratio of the average free moisture content at time t to initial free moisture content and the parameter J is given by

E	1	0.64	0.49	0.38	0.295	0.22	0.14
J	0	0.1	0.2	0.3	0.5	0.6	0.7

and  $J = kt/l^2$  where K is the constant, t is time in KS and 2l the thickness of the sheet material in mm. [10]

- b) Write short note on various types of atomizers used in the spray dryers. [6]

- Q5)** a) Explain the following methods of calculating plate and column efficiencies in detail.  
 i) 'O' connell's correlation.  
 ii) Van Winkle's correlation. [12]  
 b) Write short note on the smoker equations. [4]

OR

- Q6)** a) Acetone is to be recovered from aqueous waste stream by continuous distillation in a sieve plate distillation column. Find the diameter of the column for the following conditions.

Take the minimum feed rate of 70 percent of maximum feed of 13000 kg/hr. Molar feed rate = 672.9 kmol/hr, No. of ideal stages = 16. Slope of bottom operating line = 5.0, slope of top operating line = 0.57. Top composition 94% mol. 98% W/W.

Bottom composition - essentially water, Reflux ratio = 1.35, vapor rate at top = 55.5 kmol/hr, vapor rate at bottom = 162.3 kmol/hr.

At Bottom,  $\rho_v = 0.72 \text{ kg/m}^3$ ,  $\rho_L = 954 \text{ kg/m}^3$ , Bottom pressure = 1.26 Bar liquid surface tension =  $57 \times 10^{-3} \text{ N/m}$ .

At Top,  $\rho_v = 2.05 \text{ kg/m}^3$ ,  $\rho_L = 753 \text{ kg/m}^3$ , Top pressure = 1 atm, surface tension =  $23 \times 10^{-3} \text{ N/m}$ .

Take tray spacing as 0.5 m.

At bottom  $k_1 = 7.5 \times 10^{-2}$  & at top  $k_1 = 9.0 \times 10^{-2}$ . [12]

- b) Explain the typical performance diagram for a sieve plate. [4]

## SECTION - II

- Q7) a) Explain Onda's method for the prediction of height of transfer unit. [8]

- b) Using Onda's method, find  $H_{OG}$  for packed bed absorption column, with the help of following data

Temperature of operation =  $20^\circ\text{C}$ ,  $R = 0.08314 \text{ bar m}^3/\text{kmol} \cdot \text{K}$ ,

Pressure = 1.0132 bar, Total concentration =  $C_T = 55.6 \text{ kmol/m}^3$ .

Molar gas flow rate per unit c/s area =  $0.027 \text{ kmol/s.m}^2 \cdot \text{bar}$

Molar liquid flow rate per unit c/s area =  $0.93 \text{ kmol/s.m}^2 \cdot \text{bar}$

Packings : 38 mm intalox saddle,  $a = 194 \text{ m}^2/\text{m}^3$ .

Surface tension  $\sigma_c = 61 \times 10^{-3} \text{ N/m}$ . for packing

Surface tension of liq.  $\sigma_L = 70 \times 10^{-3} \text{ N/m}$ , viscosity  $\mu_L = 1 \times 10^{-3} \text{ N.s/m}^2$ .

$\mu_v = 0.018 \times 10^{-3} \text{ N.s/m}^2$ , Density  $\rho_L = 1000 \text{ kg/m}^3$ ,  $\rho_v = 1.21 \text{ kg/m}^3$

Diffusivity  $D_L = 1.7 \times 10^{-9} \text{ m}^2/\text{s}$ ,  $D_v = 1.45 \times 10^{-9} \text{ m}^2/\text{s}$   $L_w^* = 17.6 \text{ kg/m}^2 \cdot \text{s}$   
 $V_w^* = 0.79 \text{ kg/m}^2 \cdot \text{s}$  [10]

OR

- Q8) a) A feed containing 45% mol volatile component enter a packed bed. The distillate from the packed bed contains 95% more volatile component and bottom product contains 10% m.v.c. Relative volatility of the mixture is 3.0. A total condensor is used and the tower is operated with reflux ratio of 1.25 times the minimum reflux ratio. The HTU for the rectifying section are  $H_y = 0.5$  and  $H_x = 1.0$ . Mass transfer coefficient is constant across the column. Determine the flowrates, steam consumption and packing height required to achieve the separation. [12]

- b) Write a note on the following : [6]

i) Liquid distributor.

ii) Packing support used in packed bed column.

- Q9) a) Write a note on reflux drum with a neat sketch. [6]

- b) Design a decantor to separate a light oil from water. The oil is dispersed phase.

Oil - flowrate = 1000 kg/hr, density = 900 kg/m<sup>3</sup>, viscosity = 3 mNs/m<sup>2</sup>

Water - flowrate = 5000 kg/hr, density = 1000 kg/m<sup>3</sup>, viscosity = 1 mNs/m<sup>2</sup>

Droplet diameter = 150  $\mu$  m. [10]

OR

- Q10)a)** A liquid - liquid gravity separator is to be designed to handle two phase liquid stream of 0.4 m<sup>3</sup>/min. The feed contains 40% by volume of light phase and 60% by volume of heavy phase.

Density of light phase = 900 kg/m<sup>3</sup>.

Density of heavy phase = 1100 kg/m<sup>3</sup>.

required setting time for light phase is 5 minutes while the setting time for heavy phase is 4 minutes. [10]

- b) Write short note on [6]

i) Gravity separator.

ii) Oil-water separator.

- Q11)a)** Explain the pipeline design for transportation of crude oil [10]

- b) Water is to flow through a pipeline at a rate of 1 kg/sec to a distance of 1.5 km. The impressed head of water is 9.8 m.

Density of water = 1000 kg/m<sup>3</sup>.

Viscosity = 1 mNs/m<sup>2</sup>. [6]

OR

- Q12)a)** Explain various types of piping supports used for pipelines. [8]

- b) Discuss various factors considered for design of pipeline for natural gas. [8]





Total No. of Questions : 12]

[Total No. of Pages : 3

**P 1375**

**[3664] - 300**

**B.E. (Polymer)**

**ADVANCED POLYMER RHEOLOGY**

**(2003 Course)**

**Time : 3 Hours]**

**[Max. Marks : 100**

**Instructions to the candidates:**

- 1) All questions from Section I & II are compulsory.**
- 2) Marks given on R.H.S.**
- 3) Use of calculator allowed.**
- 4) If any data is missing, assume any suitable data.**

**SECTION - I**

- Q1)** a) Give egs. by which the normal stress generated in polymers can be understood. [4]
- b) Explain either continuity or Cauchy's equation. [6]
- c) Give the shear rate & shear stress formulas for flow through circular, slit & annular c/s. [3]
- d) Give the velocity profile for Turbulent as well as laminar flow & explain the reason for their flat or parabolic profile. [5]

**OR**

- Q2)** a) Explain Navier Stokes equation & its significance. [6]
- b) Explain how tensors are useful to understand Rheology. Also explain in short with eg. stress tensors and strain tensors. [8]
- c) Give classification of fluids and what are the parameters which are used to study these fluids. [4]

- Q3)** a) What is meant by Reynolds number and what is its significance. Derive the equation giving relation between  $Z_{max}$  and Reynolds no. [8]
- b) Give equation for Ellis model and explain all the terms in its equation. [8]

**OR**

- Q4)** a) For a flow described by Ellis model,  $\tau_w = 20 \text{ N/m}^2$ . Calculate the velocity at the centre for the flow through a 10 mm diameter tube, zero shear viscosity and  $\tau_{1/2}$  value.

$$\alpha = 1.707, \phi_0 = 2.89 \text{ m}^2/\text{NS} \text{ \& } \phi_1 = 0.28 \text{ m}^2/\text{NS}. \quad [4]$$

**P.T.O.**

- b) Explain the transition between laminar and turbulent flow given by Ryan & Johnson. [7]
- c) For an LDPE melt, value of  $n = 0.26$ . Find the critical Reynolds number and comment on the type of flow. [5]

- Q5)**
- a) Explain the concept explained in Boltzmann superposition principle. [6]
  - b) What is the role of the two elements used in Maxwell or Voigt model. For both models, explain in which condition do they satisfy the polymeric behaviour. Give all the possible combinations in which the two elements can be attached to give close behaviour like polymers, i.e. viscoelastic. [10]

OR

- Q6)**
- a) Give the limitations of Maxwell & Voigt model. Give the explanation of four element model that goes very close to the behaviour exhibited by polymers. [8]
  - b) What concepts are explained by Doi-Edward theory? [4]
  - c) What molecular theory was developed by Rouse for dilute solutions. Explain the meaning of Reptation. [4]

### SECTION - II

- Q7)**
- a) What is the importance of WLF equation? [6]
  - b) Derive activation energy of flow and state its relation with zero shear viscosity. Explain the method of calculation of activation energy graphically. [6]
  - c) Explain the significance of flow behaviour index 'n'. State its relation with activation energy of flow. [4]

OR

- Q8)**
- a) List various parameters affecting polymer melt viscosity. Describe the effect of MWD in details. [8]
  - b) Discuss the effect of pressure on polymer melt viscosity. Also list all those parameters that have effect on melt viscosity. [8]
- Q9)**
- a) Write down the classification of various rheometers. Explain how melt flow indexer is used to generate a rheogram. [8]
  - b) Derive an expression for apparent viscosity in a cone and plate rheometer. For a Newtonian fluid with viscosity 0.15 Pa-s, find torque experienced if cone angle is  $1^\circ$ , angular velocity is 50 radians/min, and radius of cone as 12 cm. [8]

OR

**Q10)a)** Derive an equation for apparent viscosity in concentric cylinders, when gap between the two cylinders is very small. [8]

b) Derive an equation for shear stress at wall for flow through a capillary rheometer. Explain the constructional features of a capillary rheometer. [8]

**Q11)** Attempt any 3 : [18]

- a) Derive an expression for minimum injection pressure necessary at the gate of a disc cavity which is centre gated.
- b) Derive an expression for compaction force in case of compression molding.
- c) Derive an expression for pressure drop for melt flow through calender rolls stating clearly the assumptions made.
- d) Derive an expression for flow length of power law fluid injected at constant pressure in a rectangular channel assuming non isothermal flow.

OR

**Q12)a)** Derive an expression to find the thickness of a blow molded container when die dimension are known. A blow molding die has outside diameter of 40 mm and die gap of 2 mm. It is used to produce a bottle of 70 mm diameter. If swelling ratio of melt in thickness direction is 1.8, estimate the parison dimensions, thickness of bottle and suitable inflation pressure if melt fracture occurs at stress of 10 mN/m<sup>2</sup>. [9]

b) In a plunger type injection molding machine, the torpedo has a length of 30 mm and diameter 23 mm. If during injection, the plunger moves forward at 50 mm/s, estimate the pressure drop along the torpedo. Barrel diameter is 25 mm; &  $n = 0.33$ . [4]

c) Calculate the pressure drop for melt flow through a quadratic section with length of side as 2.8 mm and channel length as 50 mm.

Data :  $\eta_a = ke^{-\beta T} \cdot \dot{\gamma}^{n-1}$

$k = 135900$ ,  $n = 0.326$  &  $\beta = 0.00863$

mass flow rate = 0.01 g/s.

melt temperature = 200°C.

melt density = 0.7 g/cm<sup>3</sup>. [5]



Total No. of Questions : 12]

[Total No. of Pages : 3

P 1383

[3664] - 278

**B.E. (Chemical) I**  
**ENERGY CONSERVATION**  
**(2003 Course) (Elective - I)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any 3 questions from each section.*
- 2) *Neat diagrams must be drawn wherever necessary.*

**SECTION - I**

- Q1)** a) Explain different non-conventional sources of energy and discuss their advantages and disadvantages. [8]
- b) Explain the principle and applications of the following energy sources :
- i) Geothermal Energy.
  - ii) Wave and tidal energy. [10]

OR

- Q2)** a) Calculate the useful gain, exit fluid temperature and collection efficiency for a cylindrical parabolic concentrator system of 2m width and 8m length. The absorbing cylinder has a diameter of 6cm and the transparent cover has a diameter of 9cm and optical properties are estimated as,  
 $\rho = 0.85$ ,  $(\tau \cdot \alpha) = 0.77$ ,  $\gamma = 0.94$   
Heat transfer coefficient from fluid inside to surroundings,  
 $U_0 = 6.04 \text{ W/m}^2 \text{ }^\circ\text{C}$   
Heat transfer coefficient from absorber cover surface to surroundings  
 $U_L = 6.98 \text{ W/m}^2 \text{ }^\circ\text{C}$   
The incident beam radiation on the aperture of the collector is  $698 \text{ W/m}^2$  and the ambient temperature is  $25^\circ\text{C}$ . The collector is designed to heat a fluid entering the absorber at  $150^\circ\text{C}$ , at a flowrate of 400 kg/hr. The fluid has  $C_p = 1.256 \text{ kJ/kg}^\circ\text{C}$ . [10]
- b) Explain the principle and working of solar ponds with neat sketch. [8]
- Q3)** a) Wind at 1 standard atmospheric pressure and  $15^\circ\text{C}$  has a velocity of 15 m/s Calculate : [8]
- i) The total power density in the wind stream.
  - ii) The maximum obtainable power density.
  - iii) A seasonally obtainable power density.

**P.T.O.**

- iv) The total power.
- v) The torque and axial thrust.

Given : Turbine diameter : 120 m, and turbine operating speed = 40 rpm at maximum efficiency. Propeller type wind turbine is considered.

- b) Discuss the importance of nuclear option for electricity generation in India. Give the reactions involved in nuclear fusion. [8]

OR

- Q4)** a) Enlist the factors considered for optimization of biogas plant and discuss the working of biogas plant. [8]
- b) What are the different methods for hydrogen storage? Describe their advantages and disadvantages. [8]

- Q5)** a) Distinguish between Waste heat recovery boiler and Economizer. [4]
- b) Explain the principle of heat pipe with suitable diagram? List out the applications of heat pipe. [6]
- c) Explain in detail the efficient use of steam condensate in chemical plant. [6]

OR

- Q6)** a) Incineration is the last resource in waste management. Discuss the incinerator is a energy recycle device. [8]
- b) Define heat regeneration. Explain the principle of heat regeneration with suitable example. [8]

### **SECTION - II**

- Q7)** a) Explain the concept of cogeneration and their types with neat diagram. Discuss it's significance in sugar industry. [10]
- b) Justify that fluidized bed combustion of coal is efficient method of combustion. [8]

OR

- Q8)** a) Explain the energy performance assessment of heat exchanger. [10]
- b) Justify that "Steam trap" and "Pressure Reducing Valves" (PRV) are energy conservation devices. [8]
- Q9)** a) Enlist the energy consumption units in Petrochemical industries. Discuss how energy can be conserved and give your recommendation. [10]
- b) Explain the energy conservation policy of State & Central Government. [6]

OR

- Q10)** a) Explain the energy conservation act of Govt. of India. [10]  
b) Enlist different energy consuming unit operations along with type of energy needed in manufacturing of Portland cement. [6]

- Q11)** a) Distinguish between 'Preliminary Audit' and 'Detailed Audit' Explain sankey diagram and it's use. [10]  
b) Explain cost - benefit analysis of energy recovery system. [6]

OR

- Q12)** Explain the following (Any four) : [16]  
a) Various methods of using biomass as source of energy.  
b) Energy Audit Instruments.  
c) Benchmarking and Energy Performance.  
d) Energy conservation in paper and pulp industry.  
e) Role of Insulation in energy conservation.



**Total No. of Questions : 12]**

**[Total No. of Pages : 2**

**P 1364**

**[3664] - 289**

**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) Draw a neat sketch of ingredients of successful safety program and discuss in detail. **[8]**

b) Explain about the dermal absorption. **[8]**

**OR**

***Q2)*** Describe in detail about : **[16]**

a) OSHA incidence rate.

b) Relative toxicity.

***Q3)*** a) Discuss the importance of Industrial Hygiene in Chemical Industries. **[8]**

b) Discuss the evaluation of worker's exposure to noise. **[8]**

**OR**

***Q4)*** Discuss the evaluation of worker's exposure to **[16]**

a) Dust.

b) Toxic vapors.

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

a) Fire Triangle.

b) Distinction between fires & Explosion.

**OR**

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

a) BLEVE.

b) MOC.

***P.T.O.***

## **SECTION - II**

**Q7)** Explain about the design to prevent fires & explosions and discuss about the explosion proof equipments & instruments. [16]

OR

**Q8)** Give the details of miscellaneous design to prevent fires & explosions. [16]

**Q9)** Discuss in detail about : [16]

- a) HAZOP study.
- b) Risk assessment.

OR

**Q10)** Discuss in detail about : [16]

- a) Process Hazard Checklist.
- 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) Role of computers in safety.
- b) Safety Audit.





Total No. of Questions : 12]

[Total No. of Pages : 3

P 928

[3664] - 101

B.E. (Civil)

## HYDROLOGY AND IRRIGATION

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

### SECTION - I

- Q1)** a) In a catchment area of 100 km<sup>2</sup>, the average annual precipitation at five rain gauge stations is as under -

Station	1	2	3	4	5
Precipitation (mm)	750	1000	900	650	500

Find number of additional rain gauge stations if permissible error is 10%.  
Also, find rain gauge density. [8]

- b) What is Probable Maximum Precipitation (PMP)? Explain how it is estimated? [8]

OR

- Q2)** a) Explain with graph the “Intensity - Duration - Frequency” relationship. [8]  
b) Describe Radar measurement of rainfall. Also, state names of any four methods of measurement of rainfall. [8]

- Q3)** a) Differentiate between evaporation and evapotranspiration. Also, state Dalton’s equation & explain different terms of it. [8]

- b) The average precipitation during a storm over a catchment area of 10 km<sup>2</sup> is as follows.  
i) 40 mm/hr for 1 hour.  
ii) 60 mm/hr for 1 hour.  
iii) 30 mm/hr for 1 hour.

If the area of hydrograph plotted with scale 1 cm = 1 hr on x axis and 1 cm = 10 m<sup>3</sup>/sec on y axis observed as 30 cm<sup>2</sup>, find  $\phi$  index of infiltration. [8]

P.T.O.

OR

- Q4)** a) Explain the current meter method of determining the discharge flowing through open channel. Also, state the equation of current meter. [8]
- b) The annual yield in  $\text{mm}^3$  from a catchment for 20 years is -  
240, 350, 680, 400, 290, 160, 110, 105, 300, 600, 800, 540, 280, 130, 320, 810, 740, 220, 190 and 480.  
Find  
i) 80% dependable yield.  
ii) % dependability of the yield of 540  $\text{mm}^3$ .  
Also, plot the flow duration curve. [8]

- Q5)** a) Define unit hydrograph. State any four assumptions in deriving unit hydrograph. Also, explain base flow separation with help of sketch. [8]
- b) The ordinates of 6 hour hydrograph are -

Time (Hr)	0	6	12	18	24	30	36	42	48	54	60	66
Q ( $\text{m}^3/\text{sec}$ )	0	20	50	150	120	90	70	50	30	20	10	0

If two storms, each of unit rainfall excess in 6 Hr. duration reach the catchment in succession, derive the hydrograph resulting from these two storms. The stream may be assumed to have a uniform base flow. [10]

OR

- Q6)** a) A catchment area of  $80\text{km}^2$  receives maximum precipitation of 4 cm/hr. Find maximum flood discharge by using -  
i) Dicken's formula ( $C = 22$ )  
ii) Inglis formula.  
iii) Ali Nawaz Jung Bahadur formula ( $C = 50$ ) &  
iv) Rational formula ( $C = 0.35$ ). [8]
- b) Explain concept of synthetic hydrograph and state step by step procedure of Snyder's study. [10]

### **SECTION - II**

- Q7)** a) Find duration in days between two waterings if -  
i) Field capacity of soil = 30%.  
ii) Apparent density of soil = 1.5.  
iii) Permanent wilting point = 15%.  
iv) Effect depth of root zone = 75 cm.  
v) Daily consumptive use of water for the crop = 10 mm. [8]

- b) State salient features of national water policy. [8]

OR

- Q8)** a) Define “Duty”. State any six factors affecting duty. Also state any four methods to improve duty. [8]  
b) Determine the capacity of a reservoir if its culturable area is 1,00,000 ha. Following are details of crop pattern.

Crop	Base Period (Days)	Duty (ha/cumec)	Irrigation Intensity (%)
Sugarcane	330	2500	40
Wheat	120	1500	20
Rice	120	1000	10

Assume reservoir losses as 10% and canal losses as 5%. [8]

- Q9)** a) State any two classifications of land drainage system and explain design aspects of tile drain. [8]  
b) State concept of Participatory Irrigation Management (P.I.M.). Explain role of water users’ cooperative societies in P.L.M. [8]

OR

- Q10)** a) Explain concept and functioning of Globle Water Partnership. [8]  
b) Compare lift irrigation system with canal irrigation system. [8]

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

- a) Application of Remote Sensing in reservoir sedimentation.  
b) Use of G.I.S. in crop pattern.  
c) Warabandi.

OR

- Q12)** a) State Dupuit’s assumptions and derive the equation for discharge from unconfined aquifer under steady state conditions. [8]  
b) What are different irrigation acts? State the main features of Maharashtra Water Resources Controlling Authority Act 2005. [10]



Total No. of Questions : 12]

[Total No. of Pages : 2

**P 933**

**[3664] - 109**

**B.E. (Civil)**

**ARCHITECTURE AND TOWN PLANNING**

**(2003 New Course) (Elective - I)**

**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 answer books.**
- 3) Neat diagrams must be drawn wherever necessary.**
- 4) Use of non programmable pocket calculator, slide rule, log table, steam table is allowed.**
- 5) Assume suitable data, if necessary.**

**SECTION - I**

- Q1) a)** Discuss the arrangement of spaces in public buildings with reference to their functional requirements. **[9]**
- b)**
- i) Explain : 'Solar passive Architecture'.**
  - ii) Explain : 'Shading Devices'.** **[8]**

**OR**

- Q2) a)** Discuss : Proportion, Symmetry and contrast with reference to aesthetics in building planning. **[9]**
- b)** Explain various stages of building design from concept to finalisation of building plan. **[8]**
- Q3) a)** Explain the planning concepts of neighbourhood unit and elaborate its role as a unit of urban planning. **[9]**
- b)** Explain the concept of Garden City. **[8]**

**OR**

- Q4) a)** Discuss the theory of 'Three magnets' and explain its relevance in modern town planning. **[9]**
- b)** Write short notes on : **[8]**
- i) Patric Gaddes.**
  - ii) Le Corbusier.**
- Q5) a)** Explain various norms and standards for Development Plan as per UDFPI Guidelines. **[8]**
- b)** Enlist and discuss various traffic surveys to be carried out for preparation of Development Plan. **[8]**

**P.T.O.**

OR

**Q6)** Write short notes on : [16]

- a) Land use zoning.
- b) ULC Act.
- c) Regional plan.
- d) MRTP Act 1966.

**SECTION - II**

**Q7)** a) What is Landscaping? Explain its significance in town planning. [8]

b) Compare and contrast between soft and hard Landscape. [9]

OR

**Q8)** a) Explain the role of Landscape designer and the steps involved in designing the land. [9]

b) Explain in detail different Landscaping elements. [8]

**Q9)** a) Mention and explain in detail the stages involved in preparation of D.P. [8]

b) What are the objectives of traffic management? Explain its importance with respect to your own city. [9]

OR

**Q10)a)** Write short notes on [8]

- i) Classification of housing and agencies involved.
- ii) Drainage and water supply in urban areas.

b) Explain the AIMS and OBJECTIVES of D.P. and mention the reports to be prepared. [9]

**Q11)** Write short notes on - [16]

- a) GPS segments.
- b) Remote sensing.
- c) Application of GIS.
- d) Applicability of softwares in planning.

OR

**Q12)a)** Describe in brief the use of satellite imagery and GIS in data collection and analysis. [8]

b) Applications of GIS in traffic transportation. [8]



Total No. of Questions : 12]

[Total No. of Pages : 3

**P 934**

**[3664] - 110**

**B.E. (Civil)**

**ADVANCED ENVIRONMENTAL MANAGEMENT**

**(2003 Course) (Elective - I)**

**Time : 3 Hours]**

**[Max. Marks : 100**

**Instructions to the candidates:**

- 1) Answer any 03 questions from each section.**
- 2) Answers to the two sections should be written in separate books.**
- 3) Neat diagrams must be drawn wherever necessary.**
- 4) Figures to the right indicate full marks.**
- 5) Your answers will be valued as a whole.**
- 6) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.**
- 7) Assume suitable data, if necessary.**

**SECTION - I**

- Q1)** a) What are the advantages of ISO 14000 certification? [6]  
b) Explain Environmental Management Principle. [6]  
c) Define [6]  
i) Environmental Prevention of pollution.  
ii) Environmental documentation.

OR

- Q2)** a) Write about links between ISO 14001 and ISO 9000 in tabular form.[6]  
b) Write short note on ISO 14000 series. [6]  
c) Define [6]  
i) EMS audit.  
ii) Corrective action.

- Q3)** a) State powers and functions of state boards in [6]  
i) Air Act.  
ii) Water Act 1974.  
b) Briefly discuss MSW Rules 2000. [4]  
c) What is the purpose of Air (Prevention and control) Act 1981, Explain in brief how this act helped the state pollution control board to control pollution? [6]

OR

**P.T.O.**

- Q4)** a) Briefly discuss Hazardous Waste Management Handling Act 1989. [6]  
b) Write short note on Constitution of State boards. [4]  
c) Explain the provision made to regulate collection, segregation, transport and disposal of solid waste in MSW Rules. 2000. [6]

- Q5)** a) Write the pollution indices in air monitoring and air quality assessment.[6]  
b) Write National Ambient Air Quality Standards for SPM, SOX, NOX and CO. [6]  
c) Write short note on - Control of SOX by dilution using tall stacks. [4]

OR

- Q6)** a) What are the sources of nitrogen oxides? Explain the following techniques to reduce the emission of NOX. [12]  
i) Modifications in Burner design.  
ii) Two stage combustion.  
iii) Low excess air combustion.  
b) Write short note on SOX control by adsorption. [4]

### **SECTION - II**

- Q7)** a) What is bio-medical waste? Write and explain detailed classification of bio-medical waste. [6]  
b) Write short note on [12]  
i) Incineration  
ii) Composting.  
iii) Sanitary land filling.

OR

- Q8)** a) Explain with reference to hazardous waste [9]  
i) Toxicity.  
ii) Reactivity.  
iii) Corrosivity.  
b) What are the sources of solid waste? Explain classification of solid waste. [6]  
c) Write health hazards of biomedical waste. [3]

- Q9)** a) What are the advantages of removing nutrients from effluent? [4]  
b) What is advanced waste water treatment? Why it is necessary? [4]  
c) Write short note on nitrification and denitrification. [8]

OR

**Q10)** Write short note on

**[16]**

- a) Electrodialysis.
- b) Overland Flow system.
- c) Carbon adsorption.
- d) Wetland Flow system.

**Q11)a)** Write the procedure of EIA.

**[6]**

b) Discuss the role of general public in Environmental clearance. **[4]**

c) Write positive and negative environmental impacts of following projects

i) Water resource project.

ii) Express highway.

**[6]**

OR

**Q12)a)** Explain advantages and disadvantages of EIA.

**[4]**

b) Explain the role of regulatory agencies and control board in Environmental clearance of Project. **[6]**

c) Enlist the projects requiring environmental clearance from the central government. Explain any one in detail. **[6]**





Total No. of Questions : 12]

[Total No. of Pages : 2

**P 935**

**[3664] - 111**

**B.E. (Civil)**

**GEOINFORMATICS**

**(2003 Course) (401005) (Elective - I)**

**Time : 3 Hours]**

**[Max. Marks : 100**

**Instructions to the candidates:**

- 1) Answer any 03 questions from each section.**
- 2) Answers to the two sections should be written in separate books.**
- 3) Neat diagrams must be drawn wherever necessary.**
- 4) Figures to the right indicate full marks.**
- 5) Assume suitable data, if necessary.**

**SECTION - I**

- Q1) a)** Explain Typical Reflectance Spectra of some of Land Cover, like Fresh Snow, Green Vegetation, Dark toned soil, Light toned soil, Clear Water and Turbid Water. **[12]**
- b)** What is Atmospheric Windows and Explain its significance. **[6]**

**OR**

- Q2) a)** Describe briefly the following Radiometric Quantities; **[12]**
- i)** Radiant Energy.
  - ii)** Radiant Flux.
  - iii)** Irradiance.
  - iv)** Radiant Intensity.
- b)** Describe the following types of resolution with sketches; **[6]**
- i)** Spatial Resolution.
  - ii)** Spectral Resolution.
  - iii)** Radiometric Resolution.

- Q3) a)** Explain with algorithm Supervised and Unsupervised method of Image Classification. **[12]**
- b)** What are the different types of Filters? Explain any one in detail. **[4]**

**OR**

- Q4) a)** Enumerate the different types of Vegetation Indices? Explain any two in detail. **[12]**
- b)** Explain Principal Component Analysis. **[4]**

**P.T.O.**

- Q5)** a) Explain Planning a Navigation Route with GPS. [12]  
b) What are the Applications of GPS? [4]

OR

- Q6)** a) What are the different types of errors in GPS observations and explain how to minimize it? [12]  
b) Explain with neat sketches the working of GPS. [4]

## **SECTION - II**

- Q7)** 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]

OR

- Q8)** a) What is GIS? How to represent Spatial Elements in GIS? [12]  
b) State the differences between : [6]  
i) Spatial and Non-Spatial Data.  
ii) Vector and Raster Model.

- Q9)** a) Explain with neat sketches the object oriented GIS model. [12]  
b) State the difference between Primary Key and Foreign Key. [4]

OR

- Q10)** a) Elaborate the concept of Relational Database, The Hybrid and Integrated GIS Data Model. [12]  
b) What are the components of DBMS? [4]

- Q11)** Explain application of GeoInformatics with working Flow Charts in following areas;  
a) Urban land use suitability and Development.  
b) Water Resources Development Action Plan. [16]

OR

- Q12)** Explain application of GeoInformatics with working Flow Charts in following areas : [16]  
a) Soil Erosion Modelling.  
b) Watershed Management and planning.



Total No. of Questions : 12]

[Total No. of Pages : 4

**P936**

**[3664] - 120**

**B.E. (Civil)**

**TRANSPORTATION ENGINEERING - II**

**(2003 Course) (401009)**

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

**SECTION - I**

- Q1)** a) Discuss the necessity of Highway planning and hence explain the various stages involved during the planning survey under highway project. [2+4]
- b) What are the basis on which the Indian roads are classified? State clearly and briefly describe with suitable sketches any 2 types of road patterns. [3+3]
- c) Various traffic control devices are very essential for smooth control of daily routine traffic (vehicular) especially in big cities. Discuss the validity of the statement giving suitable examples. [6]

**OR**

- Q2)** a) Discuss the various steps that are to be followed while determining the road lengths of various categories of roads by 3<sup>rd</sup> 20 year road development plan. [8]
- b) Write short note on “road patterns & their suitability”. [4]
- c) Describe the various Road user and vehicular characteristics. [6]
- Q3)** a) Discuss the basic requirements of an Ideal alignment and also, various obligatory factors which control during the alignment works. [2+3]
- b) Write short note on Highway drainage. [3]
- c) Carryout the analysis of mechanical widening with the help of a neat sketch. [4]
- d) Calculate the minimum sight distance required to avoid a head on collision of 2 cars approaching from the opposite direction, if both the

**P.T.O.**

cars are speeding at 90 kph. Assume a total perception and brake reaction time of 2.5 secs, coefficient of friction of 0.70 and a brake efficiency of 50%. [4]

OR

- Q4)** a) What is superelevation? Why it is necessary? State the minimum and maximum values of super elevation as per Indian Roads Congress. (IRC). [4]
- b) What do you understand by Grade compensation and curve resistance? State clearly. Also state how these are accounted? [5]
- c) Write short note on types of gradients and their specification as per I.R.C. [4]
- d) Explain PIEV theory with the help of a sketch. [3]
- Q5)** a) What do you mean by the term ESWL? State its importance giving an example. [4]
- b) Explain C.B.R method of design of flexible pavements. [4]
- c) Write a neat sketch of an apparatus used to perform crushing strength test on aggregate sample stating the size of the aggregate sample used. [4]
- d) Enlist all the tests that are to be performed on Bituminous material. Also state in general, the importance of such tests to be performed. [4]

OR

- Q6)** a) Distinguish between flexible and Rigid pavements. Also describe the wester gaards analysis of Temperature stresses. [4]
- b) Write an explanatory note on the construction procedure of W.B.M. roads. [4]
- c) Discuss all the factors which affects the pavement design. [4]
- d) Define or explain the following : [1 Each]
- i) Modulus of subgrade reaction.
  - ii) Radius of relative stiffness.
  - iii) Radius of resisting section.
  - iv) Frictional stresses.

## SECTION - II

- Q7)** a) What is an Aircraft? State its characteristics and explain any 2 in brief.[6]  
b) The following data refers to the proposed longitudinal section of runway.

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%

- if one metric chain is of 20 mtr. length, determine the effective gradient of runway. [4]  
c) With the aid of a neat suitable sketch, describe the orientation of Runway by WIND ROSE TYPE - II. [7]

OR

- Q8)** a) Enlist all the Geometric design elements of runway and state their specifications as per ICAO. [7]  
b) Define the following terms [4]  
i) Airport reference temperature.  
ii) Wind Rose.  
iii) Calm period.  
iv) Airport capacity.  
c) With the help of a neat sketch, describe the three controls used to monitor the air craft movements in space. [6]
- Q9)** a) Discuss the various forces coming over bridge pier and also state the conditions of stability. [3]  
b) What is height of afflux? State also its importance and hence calculate the height of afflux from the following particulars. [5]  
i) Normal velocity of flow in a river is 1.50 m/sec.  
ii) The normal and artificial waterway under the bridge and enlarged area upstream of the bridge are respectively 8000 m<sup>2</sup>, 7000 m<sup>2</sup> and 10,000 m<sup>2</sup>. Assume  $g = 9.81 \text{ m/sec}^2$ . Use merriman's formula. Also find increase in velocity.  
c) Give detail classification of bridges stating clearly on which these depend? [4]  
d) Sketch and label the parts of the following : [5]  
i) Solid pier.  
ii) Trestle bent.

OR

- Q10)a)** Make a list of any Eight and briefly discuss any four loads that are acting simultaneously on bridge structure. [6]
- b) Write a note on : [6]
- i) Abutment pier.
  - ii) Preventive measure to minimise the effect of scour.
  - iii) Free board and clearance.
- c) Discuss how the design flood discharge can be estimated by Direct method. [5]

- Q11)a)** Differentiate between : [1 Each]
- i) Fixed and free bearings.
  - ii) Slab culvert and pipe culverts.
  - iii) Deck and through bridges.
  - iv) Culvert and Bridge.
- b) Write a neat labelled sketches of [4]
- i) Stay cabled bridges.
  - ii) Bascule bridges.
- c) Explain the different techniques of erection of bridges. [4]
- d) Write a note on types of bearings. [4]

OR

- Q12)a)** Write an explanatory note on Maintenance of bridges. [4]
- b) Draw a neat sketches of the following & label the parts. [4]
- i) Box culvert.
  - ii) Knuckle bearing.
- c) State the importance of [4]
- i) Cantilever bridges.
  - ii) Suspension bridges.
  - iii) Rigid frame bridges.
  - iv) Movable span bridges.
- d) State various functions of bearings for bridges. [4]



Total No. of Questions : 12]

[Total No. of Pages : 5

P937

[3664] - 156

**B.E. PRODUCTION  
OPERATIONS RESEARCH  
(2003 Course)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates :*

- 1) *Solve one question from every unit in each section.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of logarithmic tables, electronic pocket calculator is allowed.*
- 6) *Assume suitable data, if necessary.*

**SECTION - I**

**UNIT - I**

**Q1) a)** What is the significance of duality theory in L.P.P.? “Dual of a dual is primal”. Explain in brief. **[6]**

**b)** Find the optimal solution by simplex method. **[10]**

$$\text{Minimize } z = x_2 + 3x_3 + 2x_5$$

$$\text{Subject to } 3x_2 - x_3 + 2x_5 \geq 7$$

$$-2x_2 + 4x_3 \geq 12$$

$$-4x_2 + 3x_3 + 8x_5 \geq 10$$

$$x_2, x_3, x_5 \geq 0$$

i) Formulate the dual problem of the primal and solve by simplex method for values of dual variables.

ii) Write the values of the primal variables.

OR

**Q2) a)** What do you understand by the term sensitivity analysis? Discuss briefly the effect of variation of cost coefficients. **[6]**

**b)** A firm produces three items A, B and C and requires two types of resources - man hours and raw material as given below in the table. Determine the optimum production schedule that maximizes profit.

*P.T.O.*

	Resources	Products			Available
		A	B	C	
i)	Man hours	6	3	5	45
ii)	Raw material	3	4	5	30
	Profit/unit Rs.	3	1	5	

Also find the range on the unit profit of product A. What is the effect if profit / unit of A is Rs. 4? [10]

## UNIT - II

- Q3)** a) Explain the similarities and differences between the transportation problem and transshipment problem. [6]
- b) In a flood situation, military have to supply the food in flood affected zone. Three aircrafts are available to drop the food to five villages. Find the number of trips each aircraft should make to each village so as to maximize total quantity of food. [10]

Aircraft	Villages					Trips / day
	1	2	3	4	5	
A <sub>1</sub>	10	8	6	9	12	75
A <sub>2</sub>	5	3	8	4	10	135
A <sub>3</sub>	7	9	6	20	4	90
Trips/day to village	100	80	70	40	20	

OR

- Q4)** a) Discuss assignment model. Indicate a method of solving a travelling salesman problem. [6]
- b) A department has four subordinates and four tasks are to be performed. The estimates of the profit in rupees each man would earn is given in the effectiveness matrix. How should the tasks be allocated one to each man, so as to maximize the total earnings? [10]

		Tasks			
Subordinate		A	B	C	D
	1	5	40	20	5
	2	25	35	30	25
	3	15	25	20	10
	4	15	5	30	15



### UNIT - III

**Q5) a)** State the Bellman's principle of optimality and explain how it is used for solving dynamic programming problem. [8]

b) A confectioner sells the confectionery items of which past data of demand per week in kg is : [10]

Demand /week :	0	5	10	15	20	25
Frequency :	2	11	8	21	5	3

Using the following sequence of random numbers, generate the demand for next 15 weeks. Also find out the average demand per week. Use random numbers : 35, 52, 90, 13, 23, 73, 34, 83, 94, 57, 35, 56, 67, 66, 60.

OR

**Q6) a)** Write a note on - [8]

i) Parametric programming.

ii) Nonlinear programming.

b) Solve the following problem by branch and bound method. [10]

Maximize  $z = x_1 + x_2$

Subject to  $3x_1 + 2x_2 \leq 20$

$6x_1 + 5x_2 \leq 25$

$x_1 + 3x_2 \leq 10$

$x_1$  and  $x_2$  are non-negative integers.

### SECTION - II

### UNIT - IV

**Q7) a)** Write a note on goal programming. [6]

b) The following mortality rates have been observed for a certain type of fuses : [10]

End of week	1	2	3	4	5
% of failing to	5	15	35	75	100

There are 1000 fuses in use and it costs Rs. 5 to replace an individual fuse. If all the fuses were replaced simultaneously, it would cost Rs. 1.25 per fuse. It is now proposed to replace all the fuses at fixed intervals of time irrespective of their state and to continue replacing burnt out fuses as they fail. At what intervals group replacement should be made?

OR

- Q8) a)** Explain the concept of geometric programming. [6]
- b)** A firm is thinking of replacing a particular machine whose cost price is Rs. 12,200. The scrap price of this machine is only Rs. 200. The maintenance costs are found to be as follows : [10]

Year	1	2	3	4	5	6	7	8
Maintenance Cost Rs.	220	500	800	1200	1800	2500	3200	4000

Determine when the firm should go for m/c replacement.

### UNIT - V

- Q9) a)** Explain in brief the characteristics of queuing models. [6]
- b)** Two items of worth Rs. 100 and Rs. 150 each are to be auctioned at a public sale. There are only two bidders A and B. Bidder A has Rs. 125 and the bidder B has Rs. 155 with him. If each bidder wants to maximize his own return, what should be his strategy? [10]

OR

- Q10) a)** Explain the Kendal's notation for representing queuing models. [6]
- b)** Consider a game having the following payoff. [10]

		Player B	
		B <sub>1</sub>	B <sub>2</sub>
Player A	A <sub>1</sub>	2	6
	A <sub>2</sub>	-2	$\lambda$

- i) Show that whatever the value of  $\lambda$  may be, the game is strictly deterministic.
- ii) Solve the game.

### UNIT - VI

- Q11) a)** Explain the following terms in networks. [8]
- Earliest time
  - Latest time
  - Slack
  - Event.
- b)** Table below shows jobs, normal and crash time and cost for a project. Indirect cost for project is Rs. 300 per day.

Job $i - j$	Normal		Crash	
	Time (days)	Cost (Rs.)	Time (days)	Cost (Rs.)
1 - 2	6	1400	4	1900
1 - 3	8	2000	5	2800
2 - 3	4	1100	2	1500
2 - 4	3	800	2	1400
3 - 4	Dummy	-	-	-
2 - 5	6	900	3	1600
4 - 6	10	2500	6	3500
5 - 6	3	500	2	800

- Draw network of the project.
- What is the normal duration and cost of the project?
- If all activities are crashed, what will be the cost? [10]

OR

**Q12)a)** Define the physical meaning of the terms : total float, free float and independent float. [6]

- A small project consists of seven activities, whose time estimates are given below. [12]

Activity :	1 - 2	1 - 3	1 - 4	2 - 5	3 - 5	4 - 6	5 - 6
$t_o$ :	3	2	2	2	1	4	1
$t_m$ :	6	5	4	3	3	6	5
$t_p$ :	9	8	6	10	11	8	15

Where  $t_o$  is time optimistic,  $t_m$  is time most likely and  $t_p$  is time pessimistic.

- Draw the network diagram for the project.
- Determine the critical path.
- Calculate the variance and standard deviation.
- What is the probability that the project will be completed by 14 weeks.

$z$ :	0	0.5	1.0	1.5	2.0
Probability :	0.5	0.692	0.841	0.933	0.977



Total No. of Questions : 12]

[Total No. of Pages : 3

P 946

[3664] - 209

B.E. (E & TC)

**AUDIO - VIDEO ENGINEERING**  
**(2003 Course) (404225) (Elective - II)**

*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) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 5) Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) What do you understand by interlaced scanning? How interlace scanning reduces flicker and conserves bandwidth? [6]
- b) Describe basic principle of a colour camera with the help of suitable diagram. Explain why dichroic mirrors are used in camera optics. [6]
- c) Explain the meaning of brightness and contrast with respect to black and white pictures. What is the optimum distance for viewing television pictures. [6]

OR

- Q2)** a) What do you understand by vertical and horizontal resolution? Why is the total number of lines kept odd in all television system. [6]
- b) Explain the working of precision-in-line picture tube. State its merits over delta gun picture tube. [6]
- c) State advantages of using AM for video signals, AMSC for colour signals and FM for audio signals in TV system. [6]

- Q3)** a) Compare NTSC, PAL and SECAM with respect to scanning specifications, video bandwidth, video modulation, audio modulation, intercarrier frequency, colour system, sub-carrier and chroma modulation. [8]
- b) Explain with block diagram High Level modulated TV Transmitter. [8]

OR

*P.T.O.*

- Q4)** a) Explain use of wobuloscope in colour T.V. fault finding. [8]  
b) Draw block diagram of an NTSC colour receiver and describe how does it produce R, G and B signals. [8]

- Q5)** a) Draw and explain functional block diagram of a digital colour receiver. [8]  
b) With timing diagram explain MAC technology in detail. State advantages of MAC signal. [8]

OR

- Q6)** a) Write short notes on following digitization formats [9]  
i) 4 : 2 : 2  
ii) 4 : 2 : 0  
iii) 4 : 1 : 1  
b) Compare digital standards for ATSC, DVB and ISDB. [7]

### **SECTION - II**

- Q7)** a) How is 'DTH' TV system different from basic digital transmission reception system. What are its merits and limitations. [8]  
b) Describe the working of closed circuit TV system. Why CCTV is a wired system? Why audio is not transmitted generally in CCTV system? State advantages of CCTV system. [10]

OR

- Q8)** a) With the block diagram of equipment set up explain a TV coverage plan for a Football match. [10]  
b) Describe with the help of block diagram the working of High Definition TV Transmitter. [8]

- Q9)** a) Explain in detail 5.1 surround sound system. State its advantages. [8]  
b) Draw and explain the block diagram of a CD player. Write important specifications of CD. [8]

OR

- Q10)**a) Classify different sound recording techniques. Explain relation between wavelength and speed of tape. [8]

- b) Draw and explain the block diagram of a DVD player. Write important specifications of DVD. [8]

**Q11)**a) Explain concept of Reverberation and echo. Mention typical reverberation periods. [8]

- b) Draw and explain block diagram of a typical wireless PA system. [8]

OR

**Q12)**a) Explain different Acoustical design aspects of an Auditorium. [8]

- b) With the help of block diagram explain basic satellite radio system. [8]



Total No. of Questions : 12]

[Total No. of Pages : 4

**P 951**

**[3664] - 330**

**B.E. (Petrochemical Engg.)**

**PROCESS ECONOMICS AND PROJECT ENGINEERING**

**(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 answer books.**
- 3) Neat diagrams must be drawn wherever necessary.**
- 4) Figures to the right indicate full marks.**
- 5) Use of logarithmic tables, Mollier charts, electronic pocket calculator and steam tables is allowed.**

**SECTION - I**

**Q1) Solve any four from the following : [18]**

- a) What are the limitations of breakeven analysis?
- b) List down the various financial Institutions available in India to meet the requirements of industry for long-term finance.
- c) What is meant by capitalized cost? Where is it used?
- d) A storage tank was priced at Rs. 1,25,000 in 2007 when the cost index was 560. What is its value today when the cost index is 800?
- e) List the factors to be considered in the evaluation of capital requirements for a process plant.

**OR**

**Q2) a) The annual production costs for a plant are Rs. 36.5 lakhs, while the sum of annual fixed charges; overhead charges and general expenses are Rs. 26 lakhs. Determine the break-even point, in units of production per year if the total annual sales are Rs. 72.8 lakhs and the product sells at Rs. 520 per unit. [9]**

**b) A process plant has an initial investment of Rs. 50 lakhs. The estimated salvage value is Rs. 2 lakhs. It has a life of 8 years. Estimate the book value of the plant after 5 years by [9]**

- i) Straight line depreciation method.
- ii) Declining balance method and
- iii) Sinking fund method with a sinking fund interest rate of 10%.

**P.T.O.**

- Q3) a)** A pump installation costing Rs. 95,000 has a salvage value of Rs. 5,000. It requires Rs. 3,000 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. [8]
- b)** Discuss in brief the various components of a balance sheet and Profit and loss account statements. State the economic ratios and their significance in brief. [8]

OR

- Q4)** An existing plant has been operating in such a way that a large amount of heat is being lost in waste gases. It has been proposed to save money by recovering heat now being lost. Four different heat exchangers have been designed to recover the heat and all prices. Saving has been calculated for each of the design is given in the following table. The plant manager wants at least 16% annual return on initial investment.

Data :

Item	Design I	Design II	Design III	Design IV
Initial Installed cost (Rs.)	2,50,000	4,00,000	5,00,000	6,50,000
Operating cost (Rs.)	7,500	7,500	7,500	7,500
Fixed Charges, % of initial cost per year	10%	10%	10%	10%
Value of heat saved Rs/year	1,00,000	1,40,000	1,60,000	2,00,000

Which one of the four designs should recommend to the plant manager? [16]

- Q5)** Write short notes on : [16]
- Taxes and Insurance.
  - Annuity and perpetuity.
  - Capital requirements for process plants.
  - Break even analysis.

OR

- Q6) a)** The following data are available for two reactors from a petrochemical plant :

Item	Reactor (Mild Steel)	Reactor (Stainless Steel)
Installed cost	Rs. 5,00,000/-	Rs. 1,50,000/-
Salvage value	0	0
Service life	3	?
Interest rate (i)	12%	12%

If the capitalized cost is same for both the reactors, estimate service life for stainless steel reactor. [8]



- b) Discuss in brief breakdown of Fixed Capital Investment (FCI) items for a chemical process. [8]

## **SECTION - II**

**Q7) a)** A company purchases a dilute mixture of ethanol (5%) in water, and processes it with simple distillation to recover the ethanol at a high concentration in which form it is then sold for industrial use. The distillation plant comprises : road tanker unloading bay, a raw material storage tank, with pumps, pipe work etc., a distillation column, with condenser, reflux tank for ethanol, pumps etc., a packaged boiler to provide heating to the distillation column reboiler via steam coils, storage tanks and pumps etc for the ethanol product, and road tanker load facilities. There has been an explosion of the distillation column, and after it is required you are asked to conduct an audit to determine whether it would be safe to restart operations.

You realize that you must approach this task systematically, and prepare a list of the general types of topic, which you need, investigation as part of the audit. Then for each type of topic, you prepare a list of specific questions you will ask, and features you will inspect.

- i) List the types of topic you will investigate.
  - ii) For each general type of topic, list several questions you will ask of features you will inspect. [12]
- b) Discuss the anatomy of Chemical Engineering Projects? What are the standard references / resources for chemical engineers working in Projects. [6]

OR

**Q8) a)** Make a Proforma for the specification Shell and tube heat exchanger. [9]  
b) Briefly discuss important utilities required in a typical petrochemical complex / refinery unit. [9]

**Q9)** Discuss in brief the following safety terms : (Any Four) [16]

- a) HAZOP.
- b) Fault tree analysis.
- c) Flammability.
- d) Trip and interlock system.
- e) HAZAN.

OR

**Q10)a)** Discuss in brief Bar Chart, Milestone chart and Gantt Chart for Petrochemical Engineering project analysis. [7]  
b) Explain Plant shutdown and emergency procedure. [9]

**Q11)** Write short notes on **[16]**

- a) Engineering flow diagram and Piping and Instrumentation Diagram.
- b) Color coding for pipe line systems.
- c) Steam generation and distribution in CPI.

OR

**Q12)** Description of various activities is listed below to set up a refinery in one of the MIDC area near Mumbai.

- a) Decide the sequence of operations.
- b) Draw the network and determine the critical path.
- c) Calculate the earliest expected time and latest allowable time to complete the given refinery project.

Data :

	Description of activity	Time duration in weeks
1	Detailed Engineering layout	4
2	Basic process design	3
3	Inspection and Testing	10
4	Procurement of pressure vessels and equipment	20
5	Procurement of material related to pipeline and structure	12
6	Procurement of controls and electric goods	16
7	Civil and structural works	10
8	Welding	6
9	Dummy	0
10	Electrifications	3
11	Trials and Inspections	1
12	Inspections and Testing	10

**[16]**



Total No. of Questions : 12]

[Total No. of Pages : 3

**P965**

**[3664]-119**

**B.E. (Civil)**

**DAMS & HYDRAULIC STRUCTURE**

**(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) Answer any 3 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 data required to be collected before the construction of a dam. [6]
- b) Explain – Maintenance & strengthening of dams. (Give example) [6]
- c) Write short notes on : [6]
- i) Rockfill dams.
  - ii) I.S. Guide lines for dam safety.

OR

- Q2)** a) Discuss the various factors which govern the selection of type of dam.
- b) Write short notes on any two:
- i) Application of remote sensing & GIS to watershed management.
  - ii) Dam instruments – Stress meter, Strain meter.
  - iii) Factors affecting the selection of site for a dam.

**[18]**

**P.T.O.**

- Q3)** a) Following data were obtained from the stability analysis of a gravity dam. Calculate maximum & minimum vertical stress, maximum principal stress. [6]

Total resisting moments @ toe =  $1.5 \times 10^5$  t.m.

Total overturning moments @ toe = 1 t.m.

Total vertical force above base =  $5 \times 10^3$  t

Base width of dam = 50 m

Slope of d/s face of the dam = 0.7 H : 1 V

- b) Discuss in brief various investigations required for reservoir planning. [7]  
c) Differentiate between low & high gravity dam. [3]

OR

- Q4)** a) Explain with sketch how you will find the uplift pressure on a gravity dam with drainage gallery. [6]  
b) Discuss the zone method of design of a gravity dam. [6]  
c) Explain – various measures adopted to reduce reservoir losses. [4]

- Q5)** a) Explain with sketches measures to control seepage through the foundation of earth dam. [6]

- b) Following data were recorded from an ogee spillway:

Maximum reservoir level = 251 m

Bed level of river = 229 m

Highest flood level d/s = 234 m

Maximum discharge =  $5000 \text{ m}^3/\text{s}$

Effective length of spillway = 405 m

Coeff. of discharge C = 2.2

Determine RL of crest of spillway.

What type of energy dissipater will you suggest? [10]

OR

- Q6)** Write short notes on (any four): [16]

- a) Tainter gate.  
b) Bucket type of energy dissipaters.  
c) Syphon Spillway.  
d) Criteria for safe design of earth dam.  
e) Critical conditions for stability of side slopes of an earth dam.

## **SECTION - II**

- Q7)** a) What are effects of construction of a weir on the river regime? What is a barrage? How does a barrage differ from a weir? [8]  
b) Discuss Bligh's creep theory for the design of weir on permeable foundation. [8]

OR

- Q8)** a) Explain – Purposes served by a diversion head works. [5]  
b) Explain – Selection of site for location of canal head works. [5]  
c) Explain – Lane's weighted creep theory. [6]
- Q9)** a) Differentiate between aqueduct & syphon aqueduct. State the factors affecting suitability of aqueduct. [8]  
b) What are the requirements of canal lining? Explain any one canal lining. [8]

OR

- Q10)** a) Describe the various considerations made in the alignment of canal. [8]  
b) Describe with the help of neat sketches any two types of cross drainage works. [8]
- Q11)** a) What are the different river training works used for flood protection? Explain any one in detail. [6]  
b) Draw & explain – Layout of a high head hydro-electric development scheme. [8]  
c) Explain – Meandering of rivers. [4]

OR

- Q12)** Write short notes on : (any four) [18]  
a) Different types of hydropower plant & salient features of each.  
b) Levees-river training works.  
c) Different types of turbines, their main features & choice.  
d) Groyne's - river training works.  
e) Objectives of river training.

□□□□

Total No. of Questions : 12]

[Total No. of Pages : 4

**P970**

**[3664] - 125**

**B.E. (Mechanical)**

**GAS TURBINE & JET PROPULSION**

**(2003 Course) (402044)**

**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)** What do you understand by the term stagnation state? Give its practical importance. Hence define stagnation enthalpy, pressure & temp. Prove

that stagnation temp.,  $T_0 = T + \frac{C^2}{2.C_p}$ . **[8]**

b) Air enters diffuser at velocity of 150 m/sec at static condition of 1 bar & 15°C. The diffuser efficiency is 95%. Determine the exit stagnation conditions. Assume  $C_p = 1.005$  kJ/kg K.  $\gamma = 1.4$  &  $R = 287$  Nm/kg K. **[8]**

**OR**

**Q2) a)** Explain the following terms related to nozzles **[4]**

- i) Velocity coefficient.
- ii) Discharge coefficient.

b) What do the states on fanno line & Rayleigh line represent? What do the intersection points of these two curves represent? **[4]**

c) A convergent nozzle is to discharge 1 kg/s of gas. The gas enters a nozzle at stagnation conditions of 5 bar & 727°C & it leaves at speed of 500 m/sec. Assuming the flow to be isentropic, determine the pressure & nozzle area at the exit. **[8]**

**UNIT - II**

**Q3) a)** Give comparison between centrifugal compressor & axial flow compressor. **[5]**

**P.T.O.**

- b) Explain the phenomenon of surging. [5]
- c) A rotary air compressor working between 1 bar & 2.5 bar has internal & external diameters of impeller as 300 mm & 600 mm respectively. The vane angle at inlet & outlet are  $30^\circ$  &  $45^\circ$  respectively. If air enters impeller at 15 m/s. Find
- Speed of impeller in r.p.m.
  - Work done by compressor per kg of air. [8]

OR

- Q4)** a) Explain - Degree of reaction. [5]
- b) Explain the phenomenon of stalling of blades in axial flow compressor. [5]
- c) An axial flow compressor having eight stages & with 50% reaction compresses air in pressure ratio of 4 : 1. The air enters compressor at 293 K & flows through it with constant speed of 90 m/sec. The rotating blades of compressor rotate with mean speed of 180 m/sec. Isentropic efficiency of compressor may be taken as 0.82. Calculate
- Work done by the machine.
  - Blade angles. [8]

### UNIT - III

- Q5)** a) How gas turbines are classified? Prove that thermal efficiency of gas turbine is given by  $\eta_{th} = 1 - \frac{1}{(r_p)^{\frac{n-1}{n}}}$ . [6]
- b) A gas turbine set draws in atmospheric air at 1.013 bar &  $15.6^\circ\text{C}$ ; there are two pressure stages with intercooler & the total pressure ratio is 8 : 1. The maximum temperature of the cycle is  $593^\circ\text{C}$  & there is one turbine for expansion. A regenerator is used & recovers 80% of available heat. Determine efficiency of the plant & work ratio. The turbine & compressor efficiencies may be taken as 0.86 & 0.83 respectively. [10]

OR

- Q6)** a) What are advantages and disadvantages of gas turbines over I.C. engine? [6]
- b) A gas turbine plant consists of one turbine for compressor drive & another for output & both are having their own combustion chambers which are served by air diverted from compressor. Air enters compressor at 1 bar &  $15^\circ\text{C}$  & is compressed with isentropic efficiency of 0.76. Gas inlet temperature & pressure in both turbine are  $680^\circ\text{C}$  & 5 bar. The isentropic

efficiency of turbine is 0.86. The mass flow rate of air at compressor inlet is 23 kg/sec. The C.V. of fuel is 42000 kJ/kg. Calculate the output of plant & thermal efficiency assuming  $C_p = 1.005$  &  $r = 1.4$  for air.  $C_p = 1.128$  &  $r = 1.34$  for gas. [10]

## SECTION - II

### UNIT - IV

- Q7)** a) Explain the working of a single impulse stage of a Gas Turbine. Draw the velocity  $\Delta s$ . Derive expression for maximum utilization factor. What is velocity compounding and pressure compounding? Explain with a diagram. [10]
- b) Discuss the performance graphs of a Gas Turbine. [6]

OR

- Q8)** a) Explain the working of general reaction stage of a Gas Turbine with the help of schematic and enthalpy - entropy diagrams. Show the isentropic expansion and actual expansion. Define degree of reaction and show a 50% reaction stage on enthalpy - entropy diagram. [8]
- b) The following data refers to a single stage impulse gas turbine. [8]
- i) Nozzles are inclined at  $20^\circ$  to the plane of rotation and discharge the gas at 750 m/s.
  - ii) Mass flow rate of gas = 100 kg/s.
  - iii) RPM = 20000.
  - iv) Mean diameter of the wheel = 31.5 cm.
  - v) Blade velocity coefficient = 0.92.
  - vi) Outlet blade angle =  $25^\circ$ .
- Calculate
- 1) Power developed by the turbine.
  - 2) Utilization factor.

### UNIT - V

- Q9)** a) Discuss the combustion theory applied to gas turbine combustor. [6]
- b) Explain the combustion intensity and combustion efficiency. List the factors affecting the combustion chamber design. [6]
- c) Discuss the working of a typical gas - turbine combustion chamber with a neat sketch. [6]

OR



**Q10)** Write notes on :

**[18]**

- a) Fuels for gas turbines and pollution problems.
- b) Fuel injection and ignition systems for Gas Turbines.
- c) Materials for Gas Turbine components.

**UNIT - VI**

**Q11)a)** Discuss the basic theory of Rocket propulsion. Derive expressions for thrust, thrust power and propulsive efficiency. **[8]**

- b) Determine the thrust of a rocket motor in which the propellant flow rate = 10 kg/S. The exit area of nozzle is 400 cm<sup>2</sup> and absolute exhaust velocity = 2000 m/s : Ambient pressure = 1 bar. **[4]**

- c) List the applications of rockets. **[4]**

OR

**Q12)** Explain the working of the following with neat sketches :

**[16]**

- a) Turbofan engine.
- b) Pulse - jet engine.
- c) Nuclear Rocket engines.
- d) Magneto plasma rocket engines.



Total No. of Questions : 12]

[Total No. of Pages : 5

P 973

[3664] - 134

B.E. (Mechanical)

INDUSTRIAL FLUID POWER

(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 and Q.11 or Q.12 from Section II.
- 2) Answers to the two sections should be written in separate answer books.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Figures to the right indicate full marks.
- 5) Use of electronic pocket calculator is allowed.
- 6) Assume suitable data, if necessary.

**SECTION - I**

- Q1)** a) What are the factors considered while selecting Hydraulic fluids? [6]  
b) What are the effects of contaminants on different components of hydraulic systems? [6]  
c) What are the different dynamic seals used in hydraulic components? What are the typical locations where they are used? [6]

OR

- Q2)** a) What are the different materials used for seals? Compare their characteristics. [8]  
b) What is the effect of temperature and pressure on the properties of hydraulic fluids? [4]  
c) What are the locations where filters are typically installed in hydraulic circuits? What are their advantages? [6]

- Q3)** a) Draw a neat sketch and explain working of a fixed delivery axial piston pump. [10]  
b) What are the different accessories used in hydraulic systems? What are their functions? [6]

OR

- Q4)** a) What are the applications of accumulators in hydraulic circuits? [4]  
b) Compare characteristics, advantages and applications of gear pumps, vane pumps, axial piston pumps and radial piston pumps. [8]  
c) What are the functions of different parts of a typical reservoir assembly? [4]

P.T.O.

- Q5)** a) Write in brief on 'Cartridge valves'. [6]  
 b) Draw a neat sketch and explain working of a typical pressure and temperature compensated flow control valve. [10]

OR

- Q6)** a) Draw a neat sketch and explain working of a sequence valve. [8]  
 b) Classify different direction control valves. [4]  
 c) What is the purpose of providing pilot operated check valve in hydraulic circuits? Explain in short a typical application of pilot operated check valve. [4]

### SECTION - II

- Q7)** a) Classify different hydraulic actuators. [6]  
 b) Analyse the circuit shown in figure 1. [10]

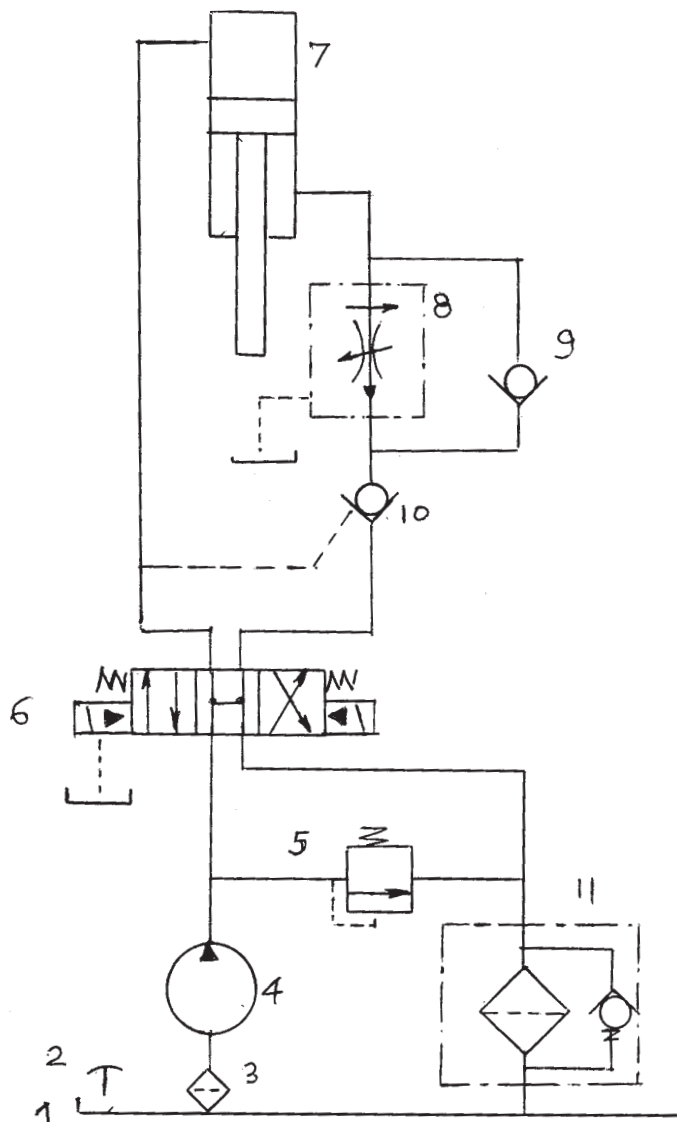


Fig No 1, Q. No 7Cb)

OR

- Q8)** a) What is the purpose of providing cushioning in cylinders? With the help of a neat sketch explain how it is achieved? [8]  
b) Analyse the circuit shown in figure 2. [8]

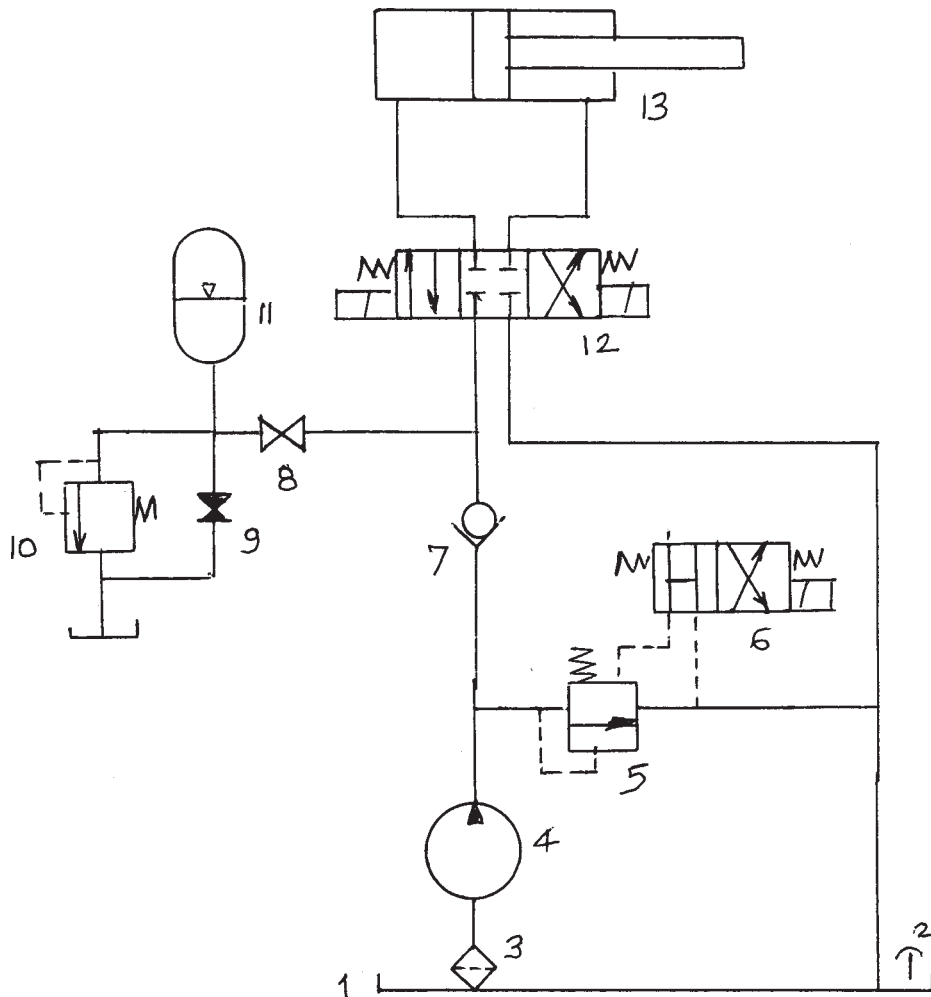


Fig.No. 2 , Q.No. 8(b)

- Q9)** a) Compare characteristics of Hydraulic & Pneumatic systems. [6]  
b) Draw a neat sketch and explain working of a typical 5 way 2 position solenoid operated direction control valve used in pneumatic circuits. [8]  
c) What is the purpose of providing 'Regulator' in pneumatic systems?[4]

OR

- Q10)** a) What is the purpose of providing Filter, Lubricator, mufflers and driers in pneumatic systems? [8]  
b) Explain working of a typical air motor. [5]  
c) Draw typical circuits of different speed regulating methods used in pneumatic circuits. [5]

- Q11)**a) A double acting hydraulic cylinder has a reciprocating motion. The forward motion is obtained using a regenerative circuit. The load during the forward stroke is 12 kN. The total stroke of 50 cm is to be completed in about 5 seconds. The return speed is to be as fast as possible. Draw a circuit to achieve above. 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. [10]
- b) A pneumatic cylinder is to be continuously moved to and fro. The motion is to be started by operating knob of a direction control valve. The continuous motion is interrupted by operating knob of another direction control valve. The cylinder should stop immediately after pressing this knob. Develop a suitable pneumatic circuit for this application using standard symbols. [6]

OR

- Q12)**A hydraulic cylinder used to operate a machine has the following requirements.
- During the initial movement of 300 mm it has a load of 30 kN and it should complete this distance in about 6 seconds.
  - This is followed by a slow working stroke of 100 mm against a load of 50 kN which should be completed in 3 to 6 seconds. The time required is to be adjustable.
  - The return motion of 400 mm is against a load of 40 kN which should be completed in about 7 seconds time.
- Facility is required to hold the cylinder anywhere in between the entire stroke. Solenoid operated valves are used in the circuit. 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. [16]



## DATA

### 1. Suction Strainer :

Model	Flow Capacity (/pm)
S <sub>1</sub>	38
S <sub>2</sub>	76
S <sub>3</sub>	152

### 2. Pressure Gauge :

Model	Range (bar)
PG <sub>1</sub>	0 - 25
PG <sub>2</sub>	0 - 40
PG <sub>3</sub>	0 - 100
PG <sub>4</sub>	0 - 160

### 3. Vane Pump :

Model	Delivery in / pm		
	at 0 bar	at 35 bar	at 70 bar
P <sub>1</sub>	8.5	7.1	5.3
P <sub>2</sub>	12.9	11.4	9.5
P <sub>3</sub>	17.6	16.1	14.3
P <sub>4</sub>	25.1	23.8	22.4
P <sub>5</sub>	39.0	37.5	35.6

### 4. Relief Valve :

Model	Flow capacity (/ pm)	Max Working Pressure & bar
R <sub>1</sub>	11.4	70
R <sub>2</sub>	19	210
R <sub>3</sub>	30.4	70
R <sub>4</sub>	57	105

### 5. Flow control Valve :

Model	Working Pressure (bar)	Flow Range (/pm)
F <sub>1</sub>	70	0-4.1
F <sub>2</sub>	105	0-4.9
F <sub>3</sub>	105	0-16.3
F <sub>4</sub>	70	0-24.6

### 6. Directional Control Valve :

Model	Max working Pressure (bar)	Flow Capacity (/pm)
D <sub>1</sub>	350	19
D <sub>2</sub>	210	38
D <sub>3</sub>	210	76

### 7. Check Valve :

Model	Max working Pressure (bar)	Flow Capacity (/pm)
C <sub>1</sub>	210	15.2
C <sub>2</sub>	210	30.4
C <sub>3</sub>	210	76

### 8. Pilot Operated Check Valve :

Model	Max working Pressure (bar)	Flow Capacity (/pm)
PO <sub>1</sub>	210	19
PO <sub>2</sub>	210	38
PO <sub>3</sub>	210	76

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

Model	Bore dia. (mm.)	Rod dia (mm)
A <sub>1</sub>	25	12.5
A <sub>2</sub>	40	16
A <sub>3</sub>	50	35
A <sub>4</sub>	75	45
A <sub>5</sub>	100	50

### 10. Oil Reservoirs :

Model	Capacity (litres)
T <sub>1</sub>	40
T <sub>2</sub>	100
T <sub>3</sub>	250
T <sub>4</sub>	400
T <sub>5</sub>	600

Total No. of Questions : 11]

[Total No. of Pages : 4

**P976**

**[3664] - 157**

**B.E. (Production Sandwich)**  
**RELIABILITY ENGINEERING**  
**(411122) (Elective - I) (Revised 2003)**

*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)** Explain the following : **[8]**

- i) Reliability.
- ii) Hazard rate.
- iii) Mean time to failure (MTTF).
- iv) Probability density functions of failure.

b) Following table shows the results of life tests carried out on 100 components simultaneously.

Operating Time (hours)	0	10	20	30	40	50	60	70	80	90	100
Number of surviving Components	100	90	81	73	66	60	55	50	45	41	37

Evaluate hazard rate, failure density function and reliability and plot these functions to scale against time. **[8]**

OR

**Q2) a)** Following table shows the results of life tests carried out on 100 components simultaneously.

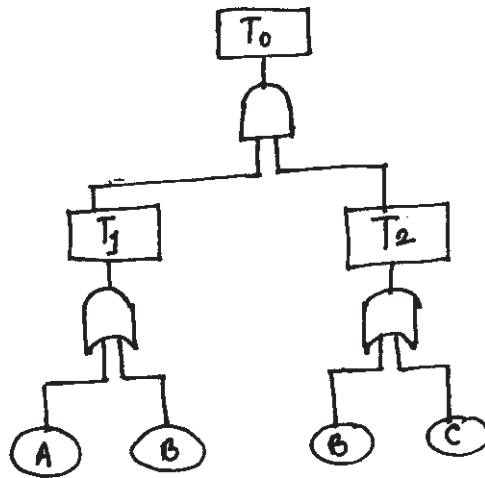
Operating Time (hours)	0	1	2	3	4	5	6	7	8	9	10
Number of failures	50	30	80	70	90	80	30	50	15	05	

Evaluate hazard rate, failure density function and reliability and plot these functions to scale against time. **[8]**

b) Prove that  $MTTF = \frac{1}{N} \sum f_{dk} (k\Delta t)$ . **[8]**

**P.T.O.**

- Q3) a)** A logic gate diagram for FMEA study has been shown in figure. The basic failure modes of A, B and C have failure 0.001, 0.003 and 0.002 per hour respectively. Find out the system failure rate of  $T_0$ . Assume mission time of 100 hours. [8]

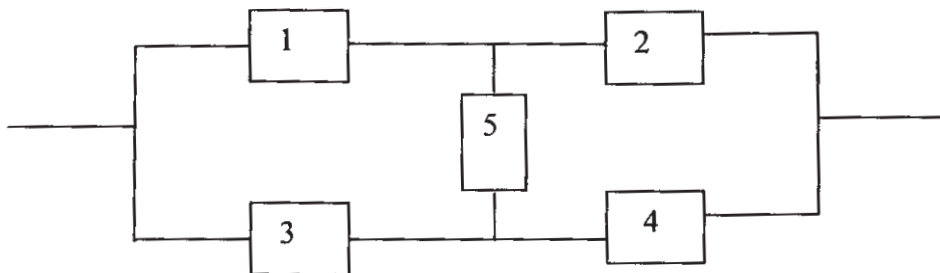


- b) Explain the methodology of constructing Fault tree diagram. What are the various gates commonly used in a logic diagram leading to FMEA? [8]

OR

- Q4) a)** What is meant by FMEA and FMECA? What are the specific advantages that could be derived from an FMEA diagram in minimizing potential failures? [8]
- b) How Boolean Algebraic principles can helping simplifying the FMEA diagram, so that the estimation of overall failure probability becomes easier? [8]

- Q5) a)** What is meant by 'Tie sets & Cut sets'? State their application in determining the reliability of a system shown in the figure below. [10]

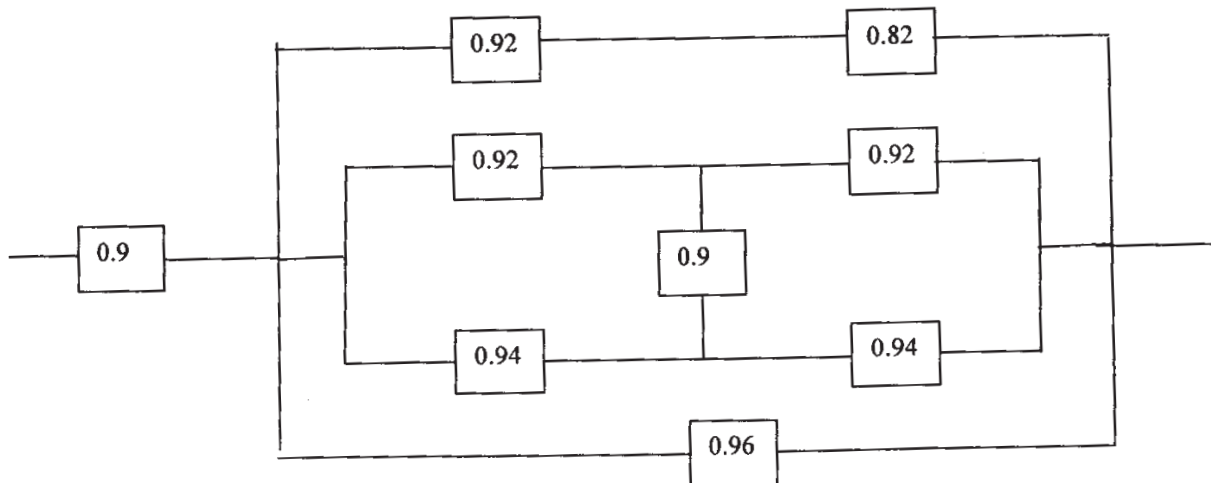


- b) Explain with example : Matrix Method of estimating system reliability. [8]

OR



- Q6) a)** Evaluate reliability using conditional Method for the given system shown in the figure. [12]



- b) Explain :  
 i) Active  
 ii) Passive &  
 iii) Partially active redundancy. [6]

## SECTION - II

- Q7) a)** What is meant by “Reliability Effort function”? Explain its significance in Life Cycle Costing. [8]  
 b) A system consists of 6 sub-systems connected in series. The system reliability goal is 0.998 for a period of 20 hours operation. The necessary information for the sub-system is given below :

Sub-system	Number of Modules (Ni)	Importance factor (Wi)	Operating time 't' hours
1	30	1.00	20
2	75	0.98	18
3	40	1.00	20
4	50	0.95	16
5	60	0.93	14
6	70	1.00	20

Compute the reliability goal for each sub-system using ‘AGREE’ method of allocation. State any assumptions made. [8]

OR

- Q8) a)** Explain “Bath-Tub” Curve with reference to failure modes. [8]  
 b) The following data refers to a certain test of equipment

Failure No.	1	2	3	4	5	6	7	8
Operating time to failure (Hrs)	18	12	8	22	26	35	30	40

Find out the reliability by

- Mean Method and
- Median Method and compare the two by plotting.

[8]

- Q9)** a) Define : availability and maintainability. How “Operational availability” is different from “inherent availability”? [6]
- b) If the inherent availability of a system is 0.92 when the MTBF is 220 hours, what if the maximum value of MTTR? Assuming logistic time for administrative support is 30% of the total down time, find out the operational availability. [6]
- c) Explain the significance of “safety margin” in engineering design reliability. [4]

OR

- Q10)** a) What is meant by “Reliability Centered Maintenance? Explain the part played by “CBM” (condition based monitoring) is assuming specific level of reliability. [8]
- b) Distinguish between Breakdown Maintenance and Preventive Maintenance. State any quantitative method of decision making in regarding suitability of Breakdown Maintenance and Preventive Maintenance. [8]

**Q11)** Write short notes on (any three) : [18]

- Risk Priority Number.
- MTTR & MTBF.
- Total Productive Maintenance.
- Accelerated Life Testing.
- DTMC & CTMS models.



Total No. of Questions : 12]

[Total No. of Pages : 3

P 979

[3664] - 161

**B.E. (Production)**

**MATERIALS AND FINANCIAL MANAGEMENT**

**(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 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 P-system and Q-system of replenishment state operating parameters and salient features of each system. [8]
- b) A dealer has observed the distribution of demand during lead time in respect of certain brand of washing machine as given below

DDLT (in units)	Frequency
4	8
5	19
6	27
7	25
8	18
9	3

Carrying washing machine unsold during lead time is known to cost Rs. 50. The stockout cost in the form of loss of profit etc is estimated Rs. 200.

Determine safety stock level that would involve minimum expected cost. [10]

OR

- Q2)** a) Explain 'Fixed Order Quantity system' and 'Fixed Order Interval System' in detail. [8]

*P.T.O.*

- b) Explain the following with suitable example. [10]  
i) Movement inventories.  
ii) Buffer inventories.  
iii) Anticipation inventories.  
iv) Decoupling inventories.  
v) Cycle inventories.

- Q3)** a) Explain echeloned and direct structured logistic system. [8]  
b) Explain the common obstacles observed when creating supply chain relationships. [8]

OR

- Q4)** a) Explain various factors are to be considered while designing multi-echelon system of SCM. [8]  
b) Explain the factors increasing likelihood of supply chain relationship success. [8]

- Q5)** a) Explain the importance of value analysis in purchasing. [8]  
b) What is obsolete stock? Why is it caused? What steps will you take to eliminate or minimise obsolescence in the organisation. [8]

OR

- Q6)** a) Define value analysis. What are the types of values? Explain the importance of VA technique in the competitive industrial situation. [8]  
b) What is 'Surplus Stock'? How it differ from 'Obsolete' stock? Why surplus stocks are created? [8]

## **SECTION - II**

- Q7)** a) Explain executive and routine functions of financial management. [8]  
b) What are two major issues in formulating working capital policy? [8]

OR

- Q8)** a) Explain the important factors which should be considered while determining working capital. [8]  
b) What is the importance of ratio analysis? Explain the importance of following accounting ratios.  
i) Liquidity ratio.  
ii) Debt-Equity ratio.  
iii) Ratio of debtors to turnover. [8]

- Q9)** a) What do you mean by labour turnover? What are the costs associated with it. Enlist the methods to calculate labour turnover. [8]  
b) Lathe was purchased for Rs. 40,000. It's useful life was estimated as ten years and the salvage value as Rs. 10,000. Calculate the depreciation ratio (%). Also calculate the depreciation fund at the end of two years.[8]

OR

- Q10)**a) Explain the following methods of depreciation with illustrations - [8]  
i) Sum of the years digit method.  
ii) Production unit method.  
b) What are the requirements of good wage payment system? State to what extent Halsey and Rowan plans fulfills the above requirement. [8]

- Q11)**a) XYZ company Ltd. has budgeted the following sales for the month[15]

A - 900 units at Rs. 50 per unit.  
B - 650 units at Rs. 100 per unit.  
C - 1200 units at Rs. 75 per unit.

The actual sales were :

A - 950 units at Rs. 58 per unit.  
B - 700 units at Rs. 90 per unit.  
C - 1200 units at Rs. 80 per unit.

Costs per unit of A, B and C were Rs. 40, Rs. 88 and Rs. 60 respectively.  
Calculate

- i) Total sales margin variance.  
ii) Sales margin price variance.  
iii) Sales margin volume variance.  
iv) Sales margin mix variance.  
v) Sales margin quantity variance.  
b) Enlist and briefly explain the methods to calculate labour turnover. [3]

OR

- Q12)**a) Explain the concept of absorption of factory overheads. [6]  
b) Define and explain the concept of standard cost and standard costing.[6]  
c) Explain 'Break Even Analysis'. Enumerate its uses. [6]



Total No. of Questions : 12]

[Total No. of Pages : 2

P 983

[3664] - 185

B.E. (Electrical)

PROJECT MANAGEMENT

(2003 Course) (403143)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Answers to the two sections should be written in separate answer books.
- 2) Figures to the right indicate maximum marks allotted for the question.
- 3) Use of scientific calculator is permitted.

**SECTION - I**

- Q1) a) Explain various phases of project Life cycle. [8]  
b) Explain the significance of project management. [8]

OR

- Q2) a) What are the ways of appraising a project? [8]  
b) Explain various forms of project organisation. [8]

- Q3) a) How will you estimate cost of a project? [8]  
b) Point out the reasons of project failures. [8]

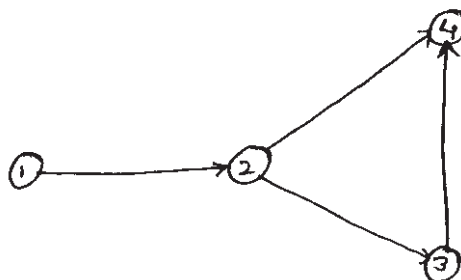
OR

- Q4) How projects are evaluated financially? Also point out how budgets are allocated? [16]

- Q5) Write short notes on : [18]  
a) Resource allocation.  
b) Line of Balancing.  
c) GERT.

OR

- Q6) Using the data given below in the table, find out the least cost schedule. The network is as under. [18]



P.T.O.

Activity	Normal Time (weeks)	Crash Time (weeks)	Cost of crashing (Rs. per week)
1 - 2	9	4	300
2 - 3	5	2	400
2 - 4	7	3	200
3 - 4	4	2	200

Time related overhead expenses for the project is Rs. 250/- per week.

## **SECTION - II**

- Q7)** a) Explain the significance of Material requirement planning. Point out how it is carried out. [8]  
b) Write a detailed note on vendor development and rating. [8]

OR

- Q8)** a) What is Tendering? Point out the types of Tender. [8]  
b) Explain Legal aspects involved in purchasing. [8]

- Q9)** a) Explain the EOQ model. Point out various components which constitute ordering cost and carrying cost. [10]  
b) Explain the functions of store. [6]

OR

- Q10)** a) What is ABC analysis? How is it carried out? [8]  
b) Explain various aspects of stores system. [8]

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

- a) Adjusted discount rate method.
- b) Certainty equivalent method.
- c) Computer aided project management.

OR

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

- a) Capital Asset Pricing Model.
- b) Portfolio risks.
- c) Diversible and non-diversible risks.



**P996**

**[3664]-213**

**B.E. (Electronics)**

**ADVANCED POWER ELECTRONICS**

**(2003 Course)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates :*

- 1) *Answer Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4, Q. No. 5 or Q. No. 6 from Section - I and Q. No. 7 or Q. No. 8, Q. No. 9 or Q. No. 10, Q. No. 11 or Q. No. 12 from Section - II.*
- 2) *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) Draw the diagram of 3-phase fully controlled converter operating with a highly inductive load and explain operation with following waveforms for  $\alpha = 60^\circ$ . **[10]**
- i) Load voltage.
  - ii) Load current.
  - iii) Current through SCR. (any one)
- b) Discuss the effect of source inductance on the performance of a single phase full converter indicating clearly the conduction of various thyristors during one cycle derive expressions for output voltage in terms of **[8]**
- i) Maximum Voltage ( $V_m$ ).
  - ii) Firing angle ( $\alpha$ ). &
  - iii) Overlap angle ( $\mu$ ).

OR

- Q2)** a) Explain how two 3- $\phi$  full converter can be connected back to back to form a circulating current type of dual converter. **[10]**
- i) Discuss its operation with the help of voltage waveforms across (1) each converter (2) load (3) reactor.

**P.T.O.**



- ii) If one of the two converter is loaded, sketch the waveforms of their load currents.
  - b) Explain the necessity of series and parallel connection of power devices. [4]
  - c) Define 'String efficiency' and state its significance in connection with series and parallel operation of power devices. [4]
- Q3)** a) With an appropriate power diagram, discuss the principle of working of 3-phase inverter. Draw phase and line voltage waveforms on the assumption that each thyristor conducts for  $120^\circ$  and the resistive load is star connected. [8]
- b) A 3 phase bridge inverter is operating with d.c. supply of V volts. The load is star connected and it is purely resistive. The load resistance per phase is R ohms. Calculate the device utilization factor (DUF) for  $180^\circ$  and  $120^\circ$  mode and comment on result. [8]

OR

- Q4)** a) With the help of circuit diagram explain the circuit of Boost inverter circuit with analysis. [8]
- b) Explain the necessity of voltage control and harmonic reduction in inverters. [4]
- c) Write note on Space Vector Modulation. [4]
- Q5)** Explain the concept of power factor on which parameters does the power factor depend? Enlist various power factor improvement techniques for line commutated converters. Explain any one method of power factor improvement in details. Compare it with other techniques. [16]

OR

- Q6)** a) With the help of neat circuit diagram and associated waveforms, explain the operation of class E resonant inverters. [8]
- b) How will you measure? [8]
- i) Sinusoidal voltage and current.
  - ii) Non-sinusoidal voltage and current.

## SECTION - II

- Q7)** a) Draw and explain the power circuit of 1- $\phi$  semiconverter feeding a separately excited d.c. motor. Explain with typical voltage and current waveforms, the operation in both continuous armature current and discontinuous armature current mode. [10]
- b) What are the effect of discontinuous armature current for d.c. motor drive? [6]

OR

- Q8)** a) The speed of a separately excited motor is controlled by a single-phase semiconverter. The field current, which is also controlled by semiconverter, is set to the maximum possible value. The ac supply voltage to the armature and field converters is one phase 208V, 60Hz. The armature resistance  $R_a = 0.25\Omega$ , the field resistance is  $R_f = 147\Omega$  and the motor voltage constant is  $K_v = 0.7032 \text{ V/A rad/sec}$ . The load torque is  $T_L = 45 \text{ Nm}$  at 1000 rpm. The viscous friction and no-load losses are negligible. The inductances of the armature and field circuits are sufficient enough to make the armature and field currents continuous and ripple free. [10]
- Determine :
- The field currents.
  - The delay angle of converter in armature circuit  $\alpha_a$  and
  - The input power factor (PF) of the armature circuit converter.
- b) Draw the circuit diagram and explain the working of Chopper drive (unipolar) for stepper motor. [6]
- Q9)** a) Draw and explain the operation of three-phase brushless d.c. motor drive. Also explain the related waveforms. [8]
- b) Draw the torque-speed characteristics of the polyphase induction motor. Also explain the following operating regions. [6]
- Motoring region.
  - Generating region.
  - Braking region.
- c) Justify “The speed range of an induction motor is restricted to about 30% of full range while operating with slip power regulation system. [4]

OR

- Q10)** a) Explain field failure and under voltage protections for d.c. motors. [4]  
b) Explain operation of V/f control for induction motor. [8]  
c) Explain briefly the following methods of braking d.c. motor. [6]  
i) Regenerative braking.  
ii) Dynamic braking.  
iii) Plugging.

- Q11)** a) What is energy audit? Explain types of energy audit. [8]  
b) Define the term voltage sag. Explain different sources of sags and interruptions. [8]

OR

- Q12)** a) What is power quality? Why it is required? Explain different types of power line disturbance. [8]  
b) Explain probable preventive solutions to control the factors contributing the power quality distortions. [8]

□□□□

Total No. of Questions : 12]

[Total No. of Pages : 2

**P997**

**[3664]-214**

**B.E. (Electronics)**

**VLSI DESIGN**

**(New 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)** Write VHDL Code for mux 8 : 1 using any two modelings and also write test bench for it. **[16]**

OR

**Q2)** a) Explain VLSI Design Flow. **[8]**

b) Write VHDL Code for Decoder 2 : 4. **[8]**

**Q3)** Draw SM chart and write VHDL code for VART Transmitter. **[16]**

OR

**Q4)** By considering suitable examples, explain different techniques of state minimization. **[16]**

**Q5)** Draw block diagram and explain detail architecture of CPLD. **[18]**

OR

**Q6)** Draw block diagram and explain detail architecture of FPGA. **[18]**

**P.T.O.**

## **SECTION - II**

**Q7)** Explain different types of memory. [16]

OR

**Q8)** Explain different types of power distribution and optimization techniques in CMOS VLSI circuits. [16]

**Q9)** What is Scaling, what are different scaling parameters? Explain constant field and constant voltage scaling. [16]

OR

**Q10)** With respect to VTC explain the operation of CMOS Inverter. Also derive for CMOS Inverter. [16]

$$[W/L]_p = 2 [W/L]_n$$

**Q11)** a) What is fault coverage, explain with examples different stuck faults. [9]

b) Explain with block diagram full and partial scan. [9]

OR

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

a) TAP controller.

b) DFT.

c) BIST

□□□□

Total No. of Questions : 12]

[Total No. of Pages : 4

P998

[3664]-217

B.E. (Electronics)

**ADVANCED DIGITAL SIGNAL PROCESSING**

**(404205) (2003 Course)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates :*

- 1) *Answer Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4, Q. No. 5 or Q. No. 6 from Section - I and Q. No. 7 or Q. No. 8, Q. No. 9 or Q. No. 10, Q. No. 11 or Q. No. 12 from Section - II.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Use of electronic pocket calculator is allowed.*
- 5) *Figures to the right indicate full marks.*
- 6) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) Explain the following : **[4]**
- i) Deterministic signals.
  - ii) Random signals.
- b) Explain the term power spectral density. Explain the properties of PSD. **[10]**
- c) What do you mean by the term random process? **[2]**

OR

- Q2)** a) Design one stage and two stage interpolators to meet the following specifications : **[10]**

$$I = 20$$

Input sampling rate : 10,000 Hz

Passband :  $0 \leq F \leq 90$

Transition band :  $90 \leq F \leq 100$

Ripple :  $\delta_1 = 10^{-2}, \delta_2 = 10^{-3}$

**P.T.O.**

b) Explain sampling rate conversion by a rational factor I/D. [6]

**Q3)** a) Explain the basic architecture of adaptive filter and explain the situation in which adaptive filters are used. [8]

b) Explain LMS adaptive filtering with the help of flowchart. [4]

c) Explain the practical limitations of basic LMS algorithm. [4]

OR

**Q4)** a) Explain how adaptive filters can be used in Telephone echo cancellation. [8]

b) Explain RLS (Recursive Least Square Algorithm) and their practical limitations. [8]

**Q5)** a) Explain how the Levinson - Durbin algorithm can be used for the solution of normal equations. [10]

b) Explain Forward and Backward linear prediction with the help of block diagram. [8]

OR

**Q6)** a) The power density spectrum of an AR process  $[x(n)]$  is given as

$$\tau_{xx}(w) = \frac{\sigma_w^2}{|A(w)|^2} = \frac{25}{\left|1 - e^{-jw} + \frac{1}{2}e^{-j2w}\right|^2}$$

Where  $\sigma_w^2$  is the variance of the input sequence.

i) Determine the difference equation for generating the AR process, when the excitation is white noise.

ii) Determine the system function for the whitening filter.

[9]

b) Explain ARMA processes and Lattice ladder filters. [9]

## SECTION - II

**Q7)** a) Explain any two non-parametric methods of power spectrum estimation. [12]

b) Determine the mean & the autocorrelation of the sequence  $x(n)$  generated by the MA(2) process described by the difference equation.

$$x(n) = w(n) - 2w(n-1) + w(n-2)$$

Where  $w(n)$  is a white noise process with variance  $\sigma_w^2$ . [6]

OR

**Q8)** a) Explain the ARMA model of power spectrum estimation. [6]

b) Compare parametric and non-parametric method of power spectrum estimation. [6]

c) Explain how DFT can be used for power spectrum estimation. [6]

**Q9)** a) Explain how FIR filtering can be implemented on general purpose DSP processor. [8]

b) Explain the criteria for selecting digital signal processor for an application. [6]

c) Explain what is floating point DSP. [2]

OR

**Q10)** a) Draw and explain the block diagram of fixed point DSP processor. TMS320C10. [8]

b) Explain the following terms w.r.t. DSP architecture. [8]

i) SIMD (Single instruction, Multiple data)

ii) VLIW (Very long instruction word)

iii) Static superscalar processing.

**Q11)** a) Draw the schematic diagram of the human speech production mechanism and explain its operation. [8]

b) Define and explain the characteristics of the following : [4]

i) Vowels.

ii) Consonants.



- c) Explain how short time spectrum analysis can be used for analysis of speech. [4]

OR

- Q12)** a) Define the following : [6]
- i) Voiced sound.
  - ii) Unvoiced sound.
  - iii) Pitch.
- b) Draw the block diagram of pitch period estimation algorithm and explain the same. [10]

□□□□

Total No. of Questions : 12]

[Total No. of Pages : 2

**P999**

**[3664]-218**

**B.E. (Electronics)**

**ADVANCED COMMUNICATION ENGINEERING**

**(404205) (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.*

**SECTION - I**

- Q1)** a) Draw a neat sketch of E-plane tee, H-plane tee, and magic tee. Write 'S' parameter matrix of each. [8]
- b) Draw a neat sketch of 'Directional Coupler'. State the spacing between the centers of two holes of two hole directional coupler. Explain how the wave energy is propagating through it. [8]

OR

- Q2)** a) State and explain the principle of operation of two-cavity Klystron amplifier. [8]
- b) State and explain the principle of operation of helix traveling wave tubes (TWT). [8]

OR

- Q3)** a) What is 'Gunn Effect'? State the microwave generation and amplification using Gunn diode. [8]
- b) State the physical structures and principle of operation of microwave transistors. [8]
- Q4)** a) State the characteristics of IMPATT Diodes. What do you understand the term 'Negative resistance'? [8]
- b) With the help of voltage and current waveforms explain the principle of operation of TRAPATT diodes. [8]

**P.T.O.**

- Q5)** a) Derive the Radar Range Equation. [9]  
b) Write a short note on 'System Losses' in radar. [9]

OR

- Q6)** a) With the help of block diagram explain the working of 'Pulsed Radar System'. [9]  
b) Write a short note on 'Plan-Position Indicator' (PPI). [9]

## **SECTION - II**

- Q7)** a) Derive the equation of 'Numerical Aperture'. [8]  
b) With the help of block diagram explain the OFC link. [8]

OR

- Q8)** a) Write a short note on modes and types of optical fibers. [8]  
b) State and explain different types losses in optical fiber communication. [8]

- Q9)** a) What is meant by cell splitting? How it is used to increase cellular system capacity? Explain with suitable example. [8]  
b) What is the difference between handoff and roaming? [8]

OR

- Q10)** a) What is the basic difference between CDMA and other mobile communication techniques? [8]  
b) State the advantages and disadvantages of DS-SS and FH-SS systems. [8]

- Q11)** a) Explain the terms 'Synchronous Orbit', 'Polar Orbits', 'Inclined Orbits'. [9]  
b) Draw the block diagram of earth station receiver. Sketch the Noise Temperature equivalent of the receiver. Derive the equation for system noise temperature. [9]

OR

- Q12)** a) Describe 'Satellite System Power Budget'. [9]  
b) Discuss the main effects of the troposphere and the ionosphere with reference to signal propagation in satellite communication. [9]

□□□□