

Total No of Questions: [10]

SEAT NO. :

[4758] - 526

[Total No. of Pages : 2]

***T.E. Mechanical (Sandwich) - 2012 Course
Materials and Manufacturing Engineering [302066]***

Time: 3 Hours

Max. Marks : 100

Instructions to the candidates:

- 1) Solve Q1 or 2, Q3 or 4, Q5 or 6, Q7 or 8, Q9 or 10, Q11 or 12.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Use of Calculator, heat transfer data book, steam table is allowed.
- 5) Assume Suitable data if necessary

SECTION - I

- | | | | |
|-----|----|---|---|
| Q1) | a | State Classification & characteristics of polymers and Types of polymerization. | 8 |
| | b | What is Metal matrix composite, Ceramic matrix composite? | 8 |
| Q2) | a | State processing and applications of ceramic materials - WC, TIC, Al ₂ O ₃ . | 8 |
| | b | What is Fiber Reinforced plastic? State its properties and engineering applications. | 8 |
| Q3) | a. | What are Ceramic and Polymeric implant materials? Explain. | 8 |
| | b. | What is Soft & Hard Ferrites? State principle of Piezo electric and ferro electric materials and their applications | 8 |
| Q4) | a. | State concepts of Nano science and use of technology. State technological advantages of Nano materials. | 8 |
| | b. | What is Shape memory alloys? State its properties with examples. | 8 |
| Q5) | a | State classification of corrosion. | 9 |
| | b | How corrosion can be prevented by improvement in design. | 9 |
| Q6) | a | Explain : Internal & External coating, Cathodic & Anodic protection. | 9 |
| | b | Describe Impingement, and Cavitation corrosion. | 9 |

Total No. of Questions : 12]

SEAT No. :

[Total No. of Pages :6

P2246

[4758] - 1

T.E. (Civil)

STRUCTURAL ANALYSIS - II

(2008 Course) (Semester - I)

Time : 3 Hours]

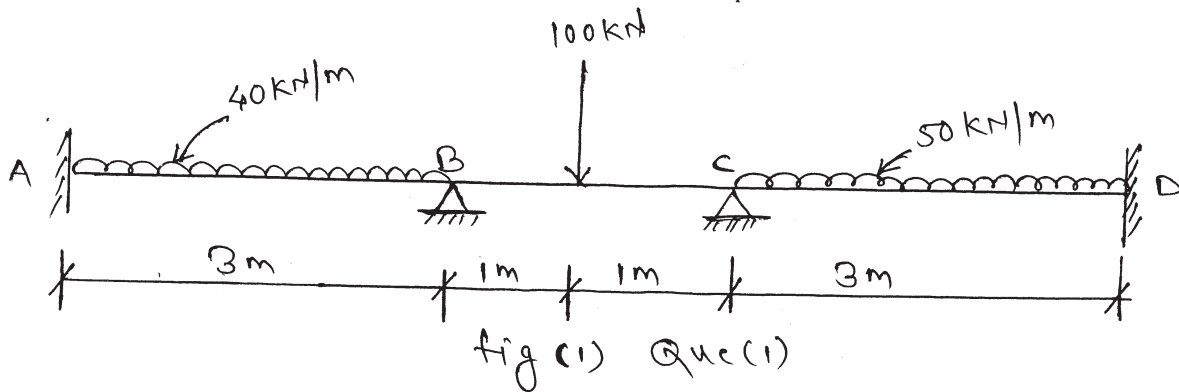
[Max. Marks : 100

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Que. 3 or Que. 4, Q.5 or Q.6 from Section I.
- 2) Answer Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q. 12 from Section II
- 3) Answers to the two sections should be written separately.
- 4) Neat diagrams must be drawn wherever necessary.
- 5) Figures to the right indicate full marks.
- 6) Assume suitable data, wherever necessary.
- 7) Use of Non-Programmable electronic Scientific calculator is allowed.

SECTION - I

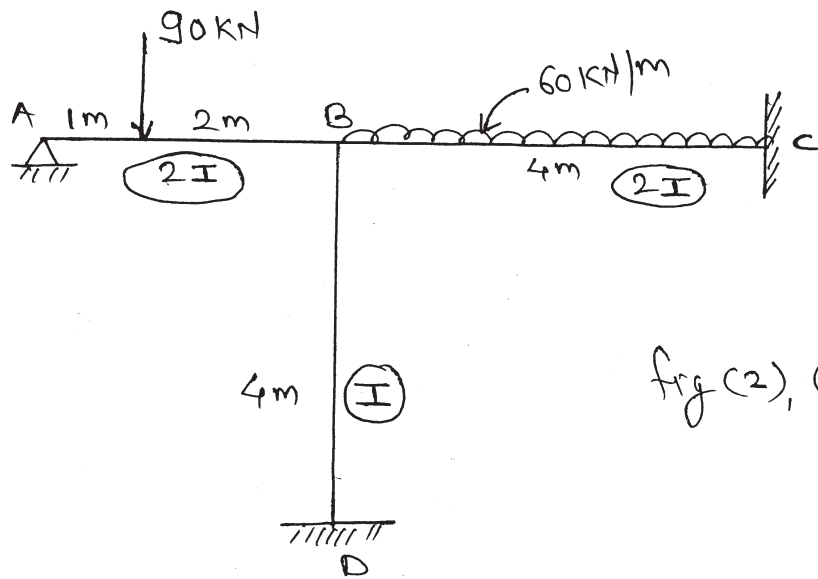
Q1) Determine the support moment for the continuous girder shown in fig (1), if the support B sink by 2.5mm, for the member $I = 3.50 \times 10^7 \text{ mm}^4$ and $E = 200 \text{ kN/mm}^2$ using slope Deflection Method. **[16]**



OR

Q2) Analyse the frame shown in fig (2) by using slope Deflection Method and Draw B.M.D. for the frame. **[16]**

P.T.O.



Q3) Analyse the continuous beam shown in Fig (3) by

a) Using Moment Distribution Method and draw B.M.D. [9]

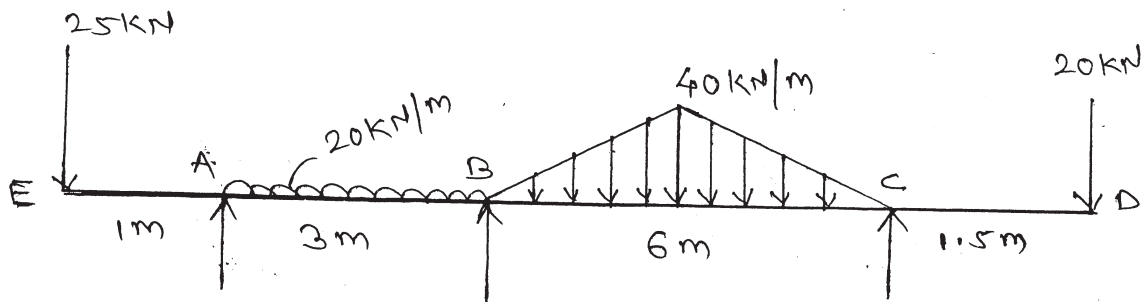


Fig (3) Que. 3(a)

b) Analyse the continuous beam shown in fig (4) by using Moment Distribution Method if support B and C sink by 3mm and 5mm respectively take $E = 200 \text{ kN/mm}^2$ and $I = 4 \times 10^7 \text{ mm}^4$. Draw B.M.D. [9]

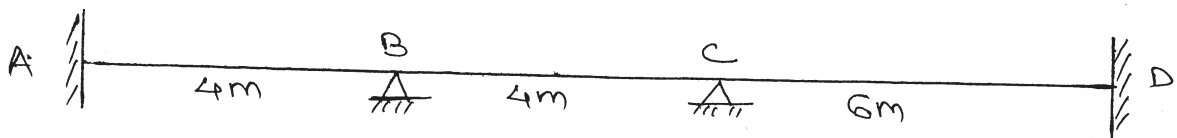
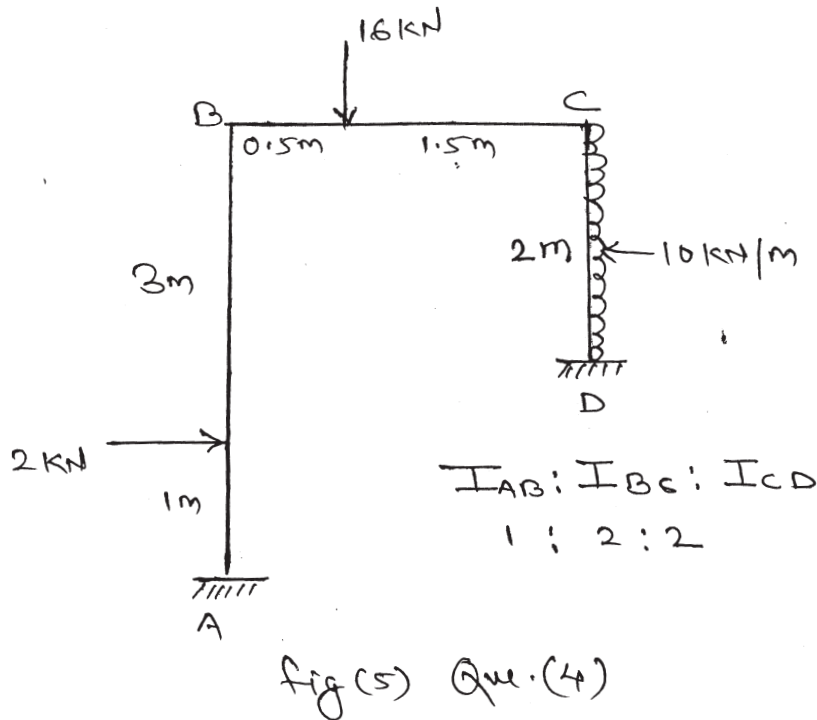


fig (4) Que. 3(b)

OR

Q4) Analyse the Frame shown in fig (5) by using Moment Distribution Method and Draw B.M.D. [18]



- Q5) a)** A two - hinged Semi-Circular Arch of radius R carries a concentrated load W at the crown show that the horizontal thrust at each support is W/π assume uniform flexural rigidity. [8]
- b)** A two hinged parabolic Arch of span 18m and rise 3.60m carries two concentrated loads of 25 kN each at the crown and at the left quarter span section find horizontal thrust at each support and the Bending Moment at the loaded section. [8]

OR

- Q6) a)** A three hinged parabolic arch of Span L has its abutments A and B at depth h_1 and h_2 below the crown C , the arch carries a concentrated load W at the crown, find the horizontal thrust at each support. [8]
- b)** A three hinge parabolic Arch ACB of span 30 met. has its supports at depth 4m and 16m below the crown hinge C , the Arch carries a point load of 60 kN at distance 5m from C , on left side and point load of 120 kN at a distance 10m from C on right side find the reactions at support and B.M under the loads. [8]

SECTION - II

Q7) Analyse the truss supported and loaded as shown in fig. 7. Assume that the Elastic modulus and area of cross-section for all members are the same.

[16]

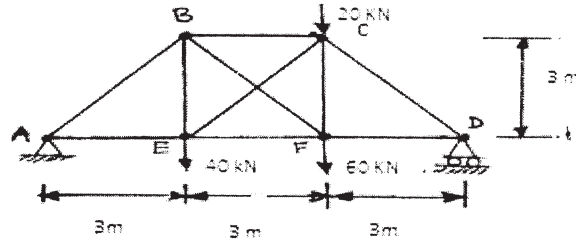


Fig. 7

OR

Q8) Analyse the rigid jointed plane frame supported and loaded as shown in fig. 8, by flexibility method. Draw B.M.D. and elastic curve.

[16]

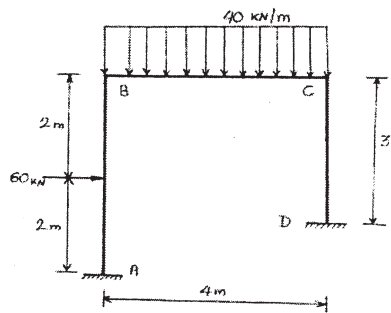


Fig. 8

Q9) Analyse the beam as shown in fig. 9 by stiffness method. Draw B.M.D. and elastic curve. Take $EI = \text{constant}$.

[16]

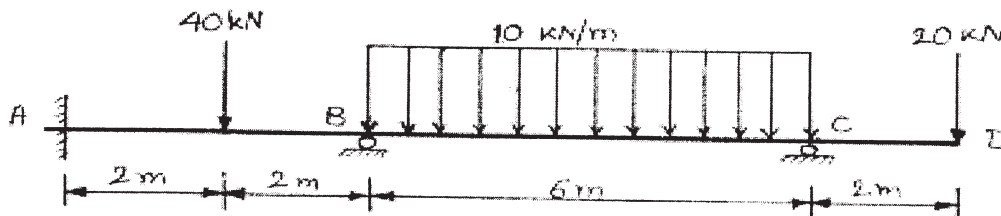


Fig. 9

OR

Q10) Analyse the rigid jointed plane frame supported and loaded as shown in fig. 10 by stiffness method. Draw B.M.D. and elastic curve. Take $EI = \text{constant}$. [16]

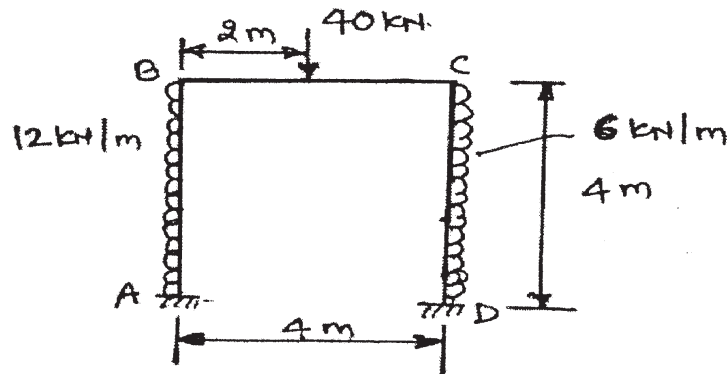


Fig. 10

Q11)a) Using finite difference method, determine the displacement at centre of simple Supported beam, AB of span 6m subjected to udl of 10 kN/m over the half span. Assume the interval as 1m and constant EI for beam AB. [8]

b) Determine the approximate values of moment, shear, and axial force in each member of frame loaded and supported as shown in fig. 11. Draw B.M.D. Use portal method. [10]

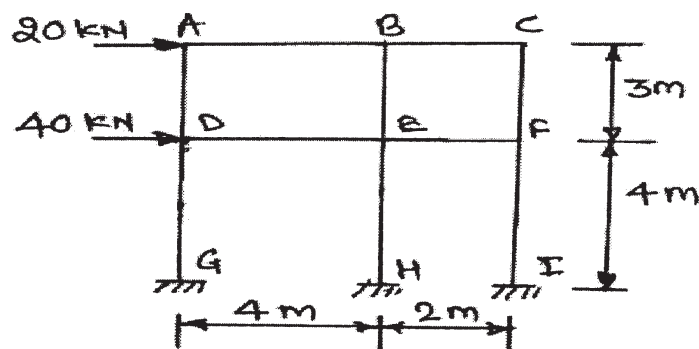


Fig. 11

OR

- Q12)a) Using finite difference method, determine the displacement at the centre of simple supported beam AB of span 4m subjected to concentric point load of 50 kN at 1m from support A. Assume 1m interval and EI for AO and OB is EI:2EI. Point 'O' is the midpoint of span AB. [8]
- b) Determine the approximate values of Bending moment, shear force and axial force in the plane frame loaded as shown in Fig. 12 using cantilever method. Assume same area for all columns and draw B.M.D. [10]

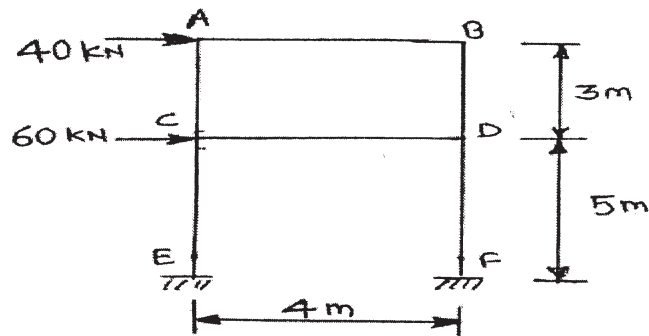


Fig. 12



Total No. of Questions : 12]

SEAT No. :

P2253

[4758]-10

[Total No. of Pages : 4

T.E. (Civil)

PROJECT MANAGEMENT & ENGINEERING ECONOMICS

(2008 Pattern) (Semester-II) (301007)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Figures to the right indicate full marks.*
- 2) *Solve any three questions from section-I and from section-II.*

SECTION-I

- Q1)** a) Write a note on project categories and what are the causes of project failures. **[8]**
- b) Explain matrix type of organisation with the help of example. **[4]**
- c) Differentiate CPM and PERT networking methods. **[4]**

OR

Q2) Listed below are the activities of a small project along their durations.

Activity	1-2	1-3	2-4	3-4	4-5	4-6	5-6	6-7
Duration (Days) →	6	7	5	6	dummy	8	7	2

- i) Draw CPM network and calculate the total project duration. Highlight critical path. **[6]**
- ii) Calculate EST, EFT, LST, LFT, Total Float, Free Float. Write in tabular form with sample calculation. **[10]**
- Q3)** Draw the network diag. find cost slopes and all crash solutions. What would be the decrease in time and increase in cost due to all crash solution? The indirect cost is Rs. 250 per day. **[18]**

P.T.O.

Activity	Time		Cost	
	Normal	Crash	Normal	Crash
1-2	6	4	5000	5500
2-3	8	5	7500	7800
2-4	5	4	8000	8400
2-5	9	6	4000	4450
3-4	0	0	0	0
4-6	7	5	2000	2400
5-6	8	4	3000	4000

OR

- Q4)** a) Draw the network diag. from given data mark critical path and what would be the expected duration of project.
- b) Find out standard deviation and variance of all activities.
- c) What is the probability of completing project in 17-66 days?

Activity	1-2	1-3	2-4	2-5	3-4	4-7	5-6
to	3	3	1	2	5	3	2
tm	4	4	2	3	6	5	4
tp	5	6	3	4	7	7	6

[18]

- Q5)** a) If you are a store keeper how you segregate different items present in your store? [4]
- b) Define EOQ and list out assumptions made in EOQ. [4]
- c) Define safety stock. What is its necessity, list out factors affecting on safety stock. [4]
- d) Yearly requirement of cement for a firm 'Borade Associates' is 20,000 bags. The cost of a bag of cement is Rs. 300/- ordering cost Rs. 150/- per order and annual inventory carrying cost is 30% of average inventory find EOQ. [4]

OR

Q6) a) Define inventory. Explain the costs associated with inventory problems with sketch. [6]

b) Segregate the items as per their annual usage and plot A-B-C curve. [10]

Sr. No.	Items	Annual consumption	Rate per unit
1	A4 paper rim	481 rim	160
2	Registers (100 pages)	105 nos.	53
3	Registers (200 pages)	11 nos.	103
4	Drawing sheets	2200 nos.	10
5	White chalk	70 box	45
6	Colour chalk	20 box	55

SECTION-II

Q7) a) What are the various causes of accidents that may takes places while excavating in sandy soil? Write safety measures to avoid it. [6]

b) Write the important functions of safety manager on a construction site. [4]

c) What are the effects of accident on site? [6]

OR

Q8) a) For the site you have visited, write down points considered to make site layout & draw a typical site layout. [6]

b) What are the various personal protective equipment used on construction sites. [4]

c) “Good site layout increases efficiency of work avoids accidents”, comment. [6]

Q9) a) Write a note on Law of diminishing marginal utility & law of substitution. [8]

- b) 'Nirmiti' associates has following details [10]
- fixed cost = Rs. 50 lakh.
- Variable cost per unit = Rs. 200
- Selling price per unit = Rs. 400
- Find:
- i) Break equal quantity.
 - ii) Break even sales.
 - iii) Contribution if actual production quantity is 80,000.
 - iv) Represent graphically BEU and sales costs.

OR

- Q10)a)** Explain in brief demand and supply curve. [6]
- b) Define engineering economics. Explain its importance in civil engineering. [6]
- c) Explain with the help of example cost, price and value. [6]
- Q11)a)** Write short note on Any Two: [8]
- i) Annuity and its type.
 - ii) Capital and types.
 - iii) Technical appraisal
- b) What are the different methods of capital budgeting? Explain any one with the help of example. [8]

OR

- Q12)a)** Write a short note on: [8]
- i) Pay back period method.
 - ii) Accounting rate of return method.
- b) What do you understand by NPV method? The cost of project is Rs. 80,000 it has cash in flow of Rs. 30,000 for a period 4 yrs. What is NPV if the firm expects 12% per annum? [8]



Total No. of Questions : 12]

SEAT No. :

P2359

[4758]-100

[Total No. of Pages : 3

T.E. (I.T)

SOFTWARE ENGINEERING

(2008 Course) (Semester-I) (310253)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION-I

- Q1)** a) Define software engineering. What are the software characteristics? What are the various categories of software? [10]
- b) State and explain customer's myths. [4]
- c) Explain in detail software crises. [4]

OR

- Q2)** a) What is software process model? Explain the incremental process model. [8]
- b) Explain in detail process pattern. [6]
- c) What are the management myths? [4]

- Q3)** a) Explain the scenario based elements of analysis model in detail. [8]
- b) Explain in detail requirement engineering task. [8]

OR

- Q4)** a) What are the characteristics that requirement must meet? [6]
- b) Draw and explain the traceability table for requirement management. [6]
- c) Describe two real time situation in which the customer and the end-user is same. Describe two situation in which they are different. [4]

P.T.O.

- Q5)** a) What are the design quality guidelines? [8]
b) What are the elements in data design? What are the guidelines for the data design? [8]

OR

- Q6)** a) Explain the Web Application Architecture. [8]
b) What are the interface design principles and guidelines? [8]

SECTION-II

- Q7)** a) What is importance of testing practices? What are the principles of testing practices? [8]
b) Explain in detail: [8]
i) Top-down integration testing.
ii) Bottom-up testing.

OR

- Q8)** a) What is cyclomatic complexity? How is it determined for a flow graph? Illustrate with example. [8]
b) Explain following testing types: [8]
i) Validation testing.
ii) Acceptance testing.
iii) Smoke testing process.

- Q9)** a) What are the categories of stakeholders? What are the characteristics of effective project manager? [8]
b) What are the attributes of effective software metrics? Explain in detail Defect Removal Efficiency. [8]

OR

- Q10)**a) How do you measure software quality in terms of maintainability and integrity? [6]
- b) What is Object Oriented metric? [6]
- c) Explain size oriented metric? What data should we collect to derive size oriented metrics? [4]

- Q11)**a) What are the software quality factors? Explain any four. [12]
- b) What are the types of risks? Explain in brief. [6]

OR

- Q12)**a) What is configuration audit? What is status reporting? [8]
- b) Write short note on: [10]
- i) RMMM.
- ii) Change control process.



Total No. of Questions : 12]

SEAT No. :

P2282

[4758] - 101

[Total No. of Pages :3

T.E. (IT)

COMPUTER NETWORK TECHNOLOGY

(2008 Course) (Semester - I)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answers to the two sections should be written in separate answer books.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Use of Calculator is allowed.*
- 5) *Assume suitable data if necessary.*

SECTION - I

- Q1)** a) What is packet switching? Write advantages and disadvantages of packet switching. **[10]**
- b) Explain load shedding. How it is useful? Discuss its packet discard policies. **[8]**

OR

- Q2)** a) What is fragmentation? Why it is required? List factors of fragmentation. Explain Transparent fragmentation and Non-Transparent fragmentation. **[10]**
- b) Write difference between static routing and dynamic routing. **[8]**

- Q3)** a) Explain DHCP client server communication with help of diagram. **[8]**
- b) For a given class - B network IP 175.165.0.0. with default subnet mask, how you can divide network in 10 small networks. How many hosts can be accommodated in each sub-network? **[8]**

OR

- Q4)** a) With the help of diagrams explain IPv4 header format in details. **[8]**
- b) Define subnetting and super netting? A company is granted the site address 201.70.64.0 (class C). The company needs six subnets. Give the range IP in each subnet. **[8]**

P.T.O.

- Q5)** a) What is a socket? What are types of socket? Explain socket and bind primitives used in TCP client server communication. [8]
- b) What is mean by half-open connection? Explain transport layer connection release scenarios. [8]

OR

- Q6)** a) Write difference between TCP and UDP. [8]
- b) What is silly window syndrome? Explain solution for this. [8]

SECTION - II

- Q7)** a) Explain in details persistence and non-persistence connection of HTTP. [8]
- b) Explain the types of web documents. [8]

OR

- Q8)** a) Explain why DNS is required? Explain DNS resolution methods. [8]
- b) What is FTP? Which port no are used for data and control connection? [8]

- Q9)** a) Write difference between SIP and H.323. [8]
- b) Why multimedia networking is important? Explain with help of end-to-end delay and delay jitter. [8]

OR

- Q10)**a) Explain functions of media player in details? [8]
- b) Explain Accessing Audio and Video from a Streaming Server to Helper Application. [8]

Q11)a) Explain Fast Ethernet in detail. [8]

b) With help of diagram explain functions ATM layers and also explain cell format of ATM. [10]

OR

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

a) Bluetooth protocol stack.

b) B-ISDN.

c) Frame relay Vs X.25.

d) Gigabit Ethernet.



Total No. of Questions : 12]

SEAT No. :

P2283

[4758]-102

[Total No. of Pages : 4

T.E. (IT)

OPERATING SYSTEM

(2008 Course) (Semester - I) (314441)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Neat diagram will get full marks.*

SECTION - I

Q1) a) Describe operating system as a resource manager. **[8]**

b) List a explain system calls for process management in Unix O.S. **[8]**

OR

Q2) a) Expalin the following type of O.S. with strengths & limitations. **[8]**

i) Distributed O.S.

ii) Real time O.S.

b) List the command line arguments in shell script & explain with example. **[8]**

Q3) a) Consider the following snapshot. **[8]**

Process	AT	BT
P1	0	3
P2	1	1
P3	5	2
P4	6	3
P5	7	5

P.T.O.

- i) Draw Gantt chart to show execution of shortest remaining time next, RR($tq = 2$).
 - ii) Calculate Avg. Turn around time & waiting time.
 - iii) What is ideal state?
- b) What is granularity in multiprocessor scheduling. Explain in brief different categories. [8]

OR

Q4) a) Differentiate between process & program. Explain with neat diagram contents of process control block. [8]

b) Describe Real time scheduling. [8]

Q5) a) Explain following terms: [10]

i) Critical section.

ii) Race condition.

iii) Semaphore.

iv) Muley.

b) Explain deadlock detection algorithm with example. [8]

OR

Q6) a) What is reader writer problem? Write a semaphore solution for reader writer problem explain how critical section problem is resolved. [10]

b) What is mutual exclusion & list the requirements of mutual exclusion. [8]

SECTION - II

Q7) a) Explain internal and external fragmentation. [8]

- b) Free memory holes of sizes 100K, 500K, 200K, 300K, and 600K are available. The processes of size 200K, 417K, 112K and 426K are to be allocated. How processes are to be placed in [8]
- i) First Fit
 - ii) Best Fit
 - iii) Worst Fit
 - iv) Next Fit
- c) What is thrashing? [2]

OR

- Q8)** a) A process contains following virtual pages on disk and is assigned a fixed allocation of three frames in main memory. Show successive pages residing in the three frames using FIFO, LRU, and Optimal. Reference string: 7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2, 1, 2, 0, 1, 7, 0, 1. [8]
- b) Explain segmentation in detail with suitable diagram. [6]
- c) Describe the following term in brief: [4]
- i) Principle of locality
 - ii) Belady's anomaly?
- Q9)** a) Assume the disk head is initially positioned over track 53. For the disk track request 98, 183, 37, 122, 14, 124, 65, 67 show head movement of cylinders using FCFS, SSTF, SCAN. [8]
- b) What are the different buffering ways in I/O buffering? [8]

OR

- Q10)** a) What is RAID? Explain the advantages and disadvantages of RAID. Also explain seven RAID levels in brief. [10]
- b) Draw and explain UNIX I/O structure and explain in detail role and implementation of buffer cache in UNIX I/O subsystem. [6]

- Q11)**a) What is the difference between passive and active security threats? [6]
- b) Describe two approaches to intrusion detection. What does audit record contain? [6]
- c) Write note on Protection Domain. [4]

OR

- Q12)**a) Explain with the diagram the taxonomy of malicious programs. [8]
- b) Explain protection policy and mechanism in details. [8]

EEE

Total No. of Questions : 12]

SEAT No. :

P2284

[4758] - 103

[Total No. of Pages :4

T.E. (I.T.)

THEORY OF COMPUTATION

(2008 Course) (Semester - I) (314442)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

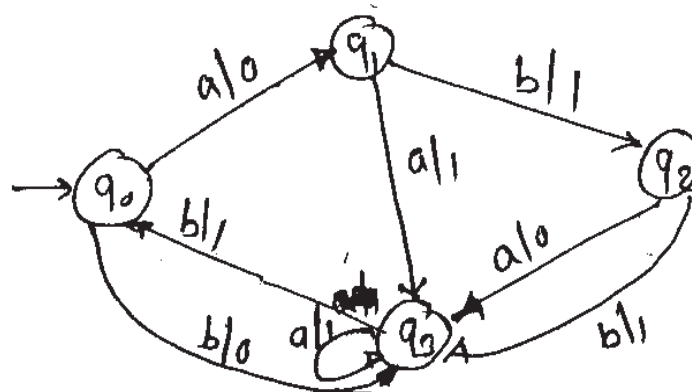
SECTION - I

Q1) a) Design FA that rear strings made up of letters in the word CHARIOT and accept those string that contain 'CAT' as a substring. [9]

b) Find Mealy and Moore m/c for following: For I/P $\Sigma = \{0,1,2\}$, print the residue modulo 5 of the i/p treated as a ternary no. [9]

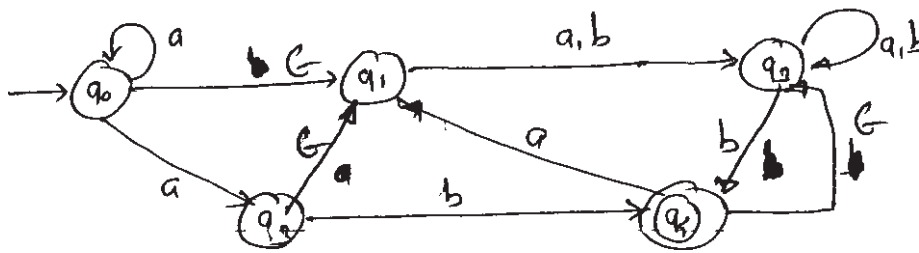
OR

Q2) a) Design Moore m/c from given mealy m/c [9]



P.T.O.

b) Convert given NFA- ϵ to its equivalents DFA. [9]



Q3) a) Write RE for the following [8]

- i) $\Sigma = \{a,b\}$, Set of all strings that have at least one a & at least one b.
- ii) $\Sigma = \{0,1\}$, Set of all strings in which every 0 followed by immediately 11.
- iii) $\Sigma = \{0,1\}$, Set of Strings begin or end with 00 or 11
- iv) $\Sigma = \{a,b\}$, Set of strings, such that all the string do not have substring 'ab'.

b) Describe English language for following RE: [8]

$$(1+ 01+ 001)^* . (\epsilon +0+00)$$

OR

Q4) a) Give RE and FA for [7]

$$L = L_1 \cap L_2 \quad \Sigma = \{0,1\}$$

Where $L_1 =$ All the string of even length

$L_2 =$ All the starting with b

b) Give the limitation of FA and Application of RE, FA. [3]

c) Find DFA from given RE $(1.1 +0)^* . 1^*$. [6]

Q5) a) Application of CFG: Explain the detail with an example [4]

- b) Give CFG for following languages [12]
- i) All strings with at least two a's on them
 - ii) Matching parenthesis $\Sigma = \{(,)\}$
 - iii) All string without substring 'aaa' $\Sigma = \{a,b\}$.
 - iv) $R = bba * bb + bb$

OR

- Q6)** a) Test whether the following grammars is ambiguous or not, if it is ambiguous then remove ambiguity [8]

$S \rightarrow Ab, A \rightarrow a, B \rightarrow C|b, C \rightarrow D, D \rightarrow E, E \rightarrow a.$

- b) Find CNF for the given grammar: [8]

$S \rightarrow ABAB$

$A \rightarrow aA | \epsilon$

$B \rightarrow bA | \epsilon$

SECTION - II

- Q7)** a) Convert following right linear grammar to left linear grammar stepwise [8]

$S \rightarrow 0A | 1B$

$A \rightarrow 0C | 1A | 0$

$B \rightarrow 1B | 1A | 1$

$C \rightarrow 0 | 0A$

- b) Show that the context free languages are closed under union, concatenation and kleen closure operations. [8]

OR

- Q8)** a) Convert following Regular expression to Regular Grammar [8]

$(ab + a)^* (aa + b)$

- b) Is the language $L = \{a^n b^m \mid n \neq m\}$ context free? If yes write CFG defining the above language. If no, prove it. [8]

- Q9) a)** Construct PDA for accepting language of following CFG: [9]

$$S \rightarrow bA \mid aB,$$

$$A \rightarrow bAA \mid aS \mid a,$$

$$B \rightarrow aBB \mid bS \mid b$$

- b) Design a PDA accepting by empty store/stack of the following language:
 $L = \{a^m b^m c^n \mid m, n \geq 1\}$ [9]

OR

- Q10)a)** Construct a CFG for following PDA: [10]

$$M = \{[q_0, q_1], [a, b], [Z_0, Z], \delta, q_0, Z_0, \theta\} \quad \delta \text{ is given by}$$

$$\delta(q_0, b, Z_0) = \{(q_0, Z, Z_0)\} \quad \delta(q_0, \epsilon, Z_0) = \{(q_0, \epsilon)\}$$

$$\delta(q_0, b, Z) = \{(q_0, ZZ)\} \quad \delta(q_0, a, Z_0) = \{(q_1, Z)\}$$

$$\delta(q_1, b, Z) = \{(q_1, \epsilon)\} \quad \delta(q_1, a, Z_0) = \{(q_0, Z_0)\}$$

- b) Design a PDA accepting by empty store/stack of the following language:
 $L = \{a^n b^{2n} \mid n \geq 1\}$. [8]

- Q11)a)** Construct TM to that can compute proper subtraction, i.e. $m - n$, where m and n are positive integers $m - n$ is defined as $m - n$ if $m > n$ and 0 if $m \leq n$. [8]

- b) Explain in detail Halting problem of Turing m/c. [8]

OR

- Q12)a)** Design a TM for to copy the string, $\Sigma = \{a, b\}$. [8]

- b) Give the short note on following: [8]

i) UTM

ii) Application and limitation of TM.



Total No. of Questions : 12]

SEAT No. :

P2285

[4758] - 104

[Total No. of Pages :3

T.E. (I.T.)

SYSTEM SOFTWARE PROGRAMMING

(2008 Course) (Semester - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answers Q1 or Q2, Q3 or Q4, Q5 or Q6 from Section I and Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12 from section II.*
- 2) *Answer to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Assume Suitable data if necessary.*

SECTION - I

- Q1) a)** For the following assembly code generate Literal table, Symbol Table, Pool Table, Intermediate Code, Assume size of instruction is equal to one byte. **[12]**

```
START 200
MOVER AREG, = '5'
MOVEM AREG, A
LOOP:    MOVER AREG, A
        MOVER CREG, B
        ADD AREG, = '2'
        LTORG
NEXT1:   SUB AREG, = '1'
        ORIGIN LOOP+6
        ADD BREG, A
        A      DS 2
        B      DC 3
NEXT2:   EQU LOOP
        END
```

P.T.O.

- b) Explain the following: [6]
- i) Compiler
 - ii) Assembler
 - iii) Interpreter
 - iv) Linker

OR

- Q2)** a) Write an algorithm for Pass - II of two pass Assembler and explain with suitable example. [12]
- b) Write short note on Single Pass Assembler. [6]
- Q3)** a) Describe an algorithm for Pass - I of two pass Macro Processor also show the contents of different tables created during Pass - I for suitable example. [8]
- b) Explain following Macro facilities with example. [8]
- i) Expansion time loops
 - ii) Change of flow during Macro expansion.

OR

- Q4)** a) Write an algorithm for Pass - II of two pass Macro Processor with suitable example. [8]
- b) Write short note on C-Preprocessor. [4]
- c) Describe conditional macro calls with suitable example. [4]
- Q5)** a) List and explain the working of various phases of compiler for the statement $X = Y + Z * 10$ (where X, Y, Z are float type). [8]
- b) Explain Shift Reduce Parser with example also enlist what are the major problems with Shift Reduce Parser. [8]

OR

- Q6)** a) Enlist various tables used and created by Lexical Analyzer? Show the contents of tables with suitable example. [10]
- b) Differentiate between Top down parser and Bottom up Parser. [6]

SECTION - II

- Q7)** a) Explain Machine Independent code optimization technique by taking appropriate example. [12]
b) Explain the importance of intermediate code generation in compiler. [4]

OR

- Q8)** a) For the statement given below, generate intermediate code in the format. [8]
i) Quadruple
ii) Triple
iii) Postfix
iv) Parse Tree
$$A = (-C + D) / (-P * (-Q + R))$$

b) Describe and explain the issues in code generation. [8]

- Q9)** a) Explain BSS loading scheme with the help of an example. Also discuss how four basic functions of loader are performed in BSS loading scheme. [10]
b) Describe ESD and RLD cards with the help of suitable example. [8]

OR

- Q10)** a) Explain the following: [6]
i) Overlay Structure
ii) Linkage editor.
b) What is loader? Enlist basic functions of a loader? [6]
c) Compare: [6]
Dynamic loading Vs Dynamic linking.

- Q11)** a) Describe various types of editors? Explain with the help of the block diagram of Typical Editor structure. [12]
b) Differentiate between Line and Screen editor. [4]

OR

- Q12)** Write a short note on: [16]
a) Debug Monitor.
b) LEX and YACC.
c) Programming Environment.
d) User Interfaces.



Total No. of Questions : 12]

SEAT No. :

P2286

[4758] - 105

[Total No. of Pages :3

T.E. (Information Technology)
PROGRAMMING PARADIGMS
(2008 Pattern) (Semester -II) (314450)

Time :3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answers Question1 or Q2, Q3 or Q4, Q5 or Q6 from Section I and Question 7 or Q8, Q9 or Q10, Q11 or Q12 from Section II.*
- 2) *Answers to the two sections should be written in separate answer -books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) What do you mean by Dynamic Type Checking? Enlist advantages and disadvantages of Dynamic Type Checking. **[8]**

b) What are the attributes of Good Programming Language? **[8]**

OR

Q2) a) Define the term “Binding” with suitable example. **[8]**

b) Explain the concept of coercion with suitable example. **[8]**

Q3) a) What are different problems occurred at the time of expression evaluation? Explain it with suitable example. **[10]**

b) Explain co-routines and its implementation. **[8]**

OR

P.T.O.

- Q4) a)** Explain following terms with suitable examples. [10]
- i) Exception and Exception handler
 - ii) Build in Exception
- b) State and explain referencing environment with suitable example. [8]

- Q5) a)** Explain concept of inheritance with respect to JAVA and C++ in details. [8]
- b) Explain Applet life cycle. [8]

OR

- Q6) a)** Explain the concept of multithreading with suitable examples. [8]
- b) Differentiate Procedure Oriented Programming Language and Object Oriented Programming Language. [8]

SECTION- II

- Q7) a)** Explain concept of recursion in PROLOG with suitable example. [8]
- b) What do you mean by function languages? What are the applications of function languages? [8]

OR

- Q8) a)** What are the applications of logic programming? Explain facility and deficiencies provided by PROLOG. [8]
- b) Compare: Unification and Backtracking. [8]

- Q9) a)** What do you mean by parallel programming? Why do use parallel programming? [8]
- b) Explain different classification of Computer Architecture. [8]

OR

- Q10)a)** What is the role of compilers in parallel programming? [8]
- b) Explain the concepts of mapping with their types. [8]

Q11)a) Explain concept of data definition language and data manipulation language. [8]

b) Write short notes on: [10]

- i) Windows Programming using Visual Basic
- ii) Socket Programming using JAVA.

OR

Q12)a) Write short notes on: [10]

- i) Links in HTML
- ii) Components of URL

b) Explain Database Programming design principles. [8]



Total No. of Questions : 12]

SEAT No. :

P3645

[4758]-106

[Total No. of Pages : 3

T.E. (Information Technology)
HUMAN COMPUTER INTERACTION AND USABILITY
(2008 Pattern) (Semester-II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION-I

Q1) a) Human memory plays an important role in how well people deal with an interface. Describe two important differences between Short-Term Memory and Long-Term Memory. **[8]**

b) Discuss general principles and goals of user interface design. **[8]**

OR

Q2) a) Define Ergonomics. Explain with example. **[8]**

b) What is reasoning? Discuss with example Inductive versus Deductive Reasoning. **[8]**

Q3) a) Describe how HCI affects use of Library Management system with respect to: **[10]**

i) The aim of the program (what it is used for)

ii) Describe its interface (picture of the screen)

iii) Describe its interaction (how it is used)

b) Express your opinion - "A design should be User-Centric". **[8]**

OR

P.T.O.

Q4) a) Discuss how social environment influences the interactions with the computer. What effect does the organization (commercial or academic) to which you belong have on the interaction? [10]

b) Describe briefly four different interactions styles used to accommodate the dialog between user and computer. Specify advantages and disadvantages of each interaction style. [8]

Q5) a) A practical usability engineering process that can be incorporated into the software product development process to ensure the usability of interactive computer products is presented. Explain your view regarding usability engineering life cycle for online hospital management system. [8]

b) Evaluate Microsoft Word interface using the “Eight golden rules of interface design”. [8]

OR

Q6) a) Why is context important in selecting and applying guidelines and principles for interface design? Illustrate your answer with examples. [8]

b) A practical usability engineering process that can be incorporated into the software product development process to ensure the usability of interactive computer product is presented. Explain your view regarding usability engineering life cycle for online hostel booking management system. [8]

SECTION-II

Q7) a) What is DECIDE? List and explain unique phases of DECIDE framework. [10]

b) Compare: Formative Evaluation versus Summative Evaluation. [8]

OR

Q8) a) Discuss the characteristics, guidelines and principles of good web page design. [10]

b) Explain in brief Hutch World Case Study evaluation framework. [8]

Q9) a) Hierarchical Task Analysis (HTA) is used to describe the interactions between a user and a software system. Draw and explain HTA to online bus reservation system. [8]

b) Give any two diagrammatic or textual notations used to design dialogs in effective user interface. Justify your notations with respective examples. [8]

OR

Q10)a) What is Cognitive Model? Discuss with example. [8]

b) What is Dialog? Explain different diagrammatic dialog design notations. [8]

Q11)a) Compare - Augmented Reality versus Virtual Reality. [8]

b) Discuss Augmented reality use for Aircraft. [8]

OR

Q12) Write a short note on: [16]

a) Information and data visualization.

b) Synchronous and asynchronous groupware applications.



Total No. of Questions : 12]

SEAT No. :

P2287

[4758]-107

[Total No. of Pages : 3

T.E. (Information Technology)
MANAGEMENT INFORMATION SYSTEMS
(2008 Course) (Semester - II)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Why do we need information systems? Describe the components and resources of an information system. **[9]**
- b) Explain various types of information systems. **[9]**

OR

- Q2)** a) What are the functions that a manager performs for an organization? **[9]**
- b) Explain how a company can use information system to improve its core competencies. **[9]**
- Q3)** a) Explain the concept and benefits of decision support system. **[8]**
- b) Which are the different decision making tools? Explain any three in details. **[8]**

OR

- Q4)** a) Which are the different analytical modeling techniques used by DSS? **[8]**
- b) Explain the concept of data warehousing. Discuss the need of data warehousing in modern business. **[8]**

P.T.O.

- Q5)** a) Explain e-commerce systems. Explain different models of e-commerce. [8]
- b) Explain importance and need of m-commerce. [8]

OR

- Q6)** a) Write the challenges of CRM. [8]
- b) What are the trends in supply chain management? [8]

SECTION - II

- Q7)** a) Explain the applications of MIS in manufacturing sector with its approach to the application development. [9]
- b) Explain various stages in providing services to customer. What are features of services? [9]

OR

- Q8)** a) How transaction processing system works for business organization? Write features of TPS. [9]
- b) Explain cross functional enterprise systems architecture in detail. [9]
- Q9)** a) MIS plays a crucial role in enterprise management system. Explain. [8]
- b) Write features and benefits of ERP. [8]

OR

- Q10)**a) Explain IT enabled services in details. [8]
- b) Write in detail classification of call centers. [8]

- Q11)a)** What is software piracy? What steps will you take to stop this piracy?[8]
- b) What is hacking? List different hacking tactics. [8]

OR

- Q12)a)** Why contingency management needed? What is contingency planning?[8]
- b) Explain global management of information technology. [8]

EEE

Total No. of Questions : 12]

SEAT No. :

P4284

[4758] -108

[Total No. of Pages :3

T.E. (I.T.)

DESIGN AND ANALYSIS OF ALGORITHMS

(2008 Course) (Semester -II) (314455)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

Q1) a) Prove by induction $1 + 2 + 3 + \dots + n = n(n + 1)/2$. [8]

b) Write an algorithm for searching an element in an array of size n . Calculate complexity of this algorithm. [8]

OR

Q2) a) Explain O , Θ and Ω notations. Give examples. [8]

b) Prove by contraposition-if x is odd, $x+8$ is odd. [8]

Q3) a) Explain convex hull problem with example. [8]

b) What is MST? Distinguish between prim's and Kruskal's algorithm. [10]

OR

Q4) a) Explain Masters theorem. [8]

b) Why Huffman code is called prefix free code? Construct a Huffman tree for the following data: [10]

Character	A	B	C	D	'-'
Probability	0.35	0.1	0.2	0.2	0.15

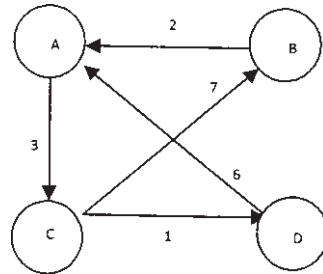
Find codes of A,B, C, D and '-'. [10]

P.T.O.

Q5) Explain Warshall's algorithm with example. **[16]**

OR

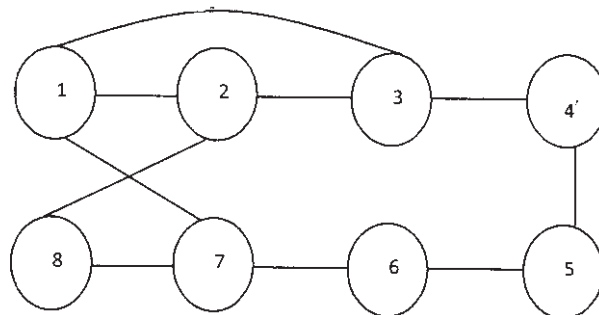
Q6) Solve using Floyd's algorithm for all pairs shortest paths. **[16]**



SECTION - II

Q7) a) What is backtracking technique? Find one solution for 4-Queen's problem. Show all the steps and explain why you need to backtrack. **[8]**

b) Find Hamiltonian Cycle for **[10]**



OR

Q8) a) A Solve the following knapsack problem using backtracking **[10]**

i	p_i	w_i
1	24	15
2	15	10
3	25	18

For $n = 3$ and $m = 20$.

b) Explain the following terms: Live nodes, expanding nodes, bounding function and solution space. **[8]**

Q9) a) Explain the terms: **[8]**
Branch and Bound, LC, LIFO and Bounding function. How are LIFO and LC techniques different?

- b) Explain for Branch and Bound- **[8]**
- i) LIFO search
 - ii) FIFO search
 - iii) LC Search

OR

Q10) Solve the following TSP using LCBB. Find total cost and sequence of nodes travelled. **[16]**

Nodes	1	2	3	4	5
1	Inf	20	30	10	11
2	15	inf	16	4	2
3	3	5	inf	2	4
4	19	6	18	inf	3
5	16	4	7	16	inf

Q11)a) Explain deterministic and non-deterministic algorithms. Illustrate with an example. **[8]**

- b) Prove that: A clique problem is NP-complete. **[8]**

OR

Q12)a) Write a note on Satisfiability problem. **[8]**

- b) Explain: NP-complete, NP-Hard, Decision Problem and Polynomial Time Algorithm. **[8]**



Total No. of Questions : 6]

SEAT No. :

P3345

[Total No. of Pages : 3

[4758] - 109

T.E. (Printing)

OFFSET MACHINES - I

(2008 Course)

Time : 3 Hours]

[Max. Marks : 100

Instructions :

- 1) *All questions are compulsory.*
- 2) *Answers to two sections should be written in separate books.*

SECTION - I

- Q1)** a) Printing and non-printing areas in offset process are on the same plane. Explain. [8]
- b) Explain any one type of perfecting system on sheet-fed machines with neat diagram. [8]

OR

- Q1)** Explain the following [16]
- a) Circumferential speed of the printing cylinders
 - b) Cylinder Packing material and requirements
 - c) Cylinder Configuration
 - d) Pitch circle diameter

- Q2)** a) Explain the difference between negative and positive platemaking process. [8]
- b) Explain polyester based waterless offset plate. [8]

P.T.O.

OR

Q2) a) Explain the various metals and materials used for printing plates. [8]

b) Explain exposure and development procedure of P.S. plate. [8]

Q3) a) Explain the different methods of setting rollers in sheet fed offset inking unit. [9]

b) Explain process of ink film splitting . What is the role of hard and soft rollers in ink splitting. [9]

OR

Q3) a) Explain the function of ductor, distributors and oscillators in inking system. [9]

b) List down various parts of multiroller inking system and explain in ink water balance. [9]

SECTION -II

Q4) Explain importance of buffers, preservative and IPA in F.S. Why pH is maintained between 4.5-5.5 of F.S. [18]

OR

Q4) a) With help of Diagram explain combination continuous flow dampening system. [9]

b) State disadvantages of a cloth dampening system. [9]

Q5) a) What is an IR dryer? How does ink dry by an IR mechanism. [8]

b) Explain sheet alignment on offset press. Explain swing arm gripper. [8]

OR

Q5)a) Explain various parts in UV curing system of offset machine. [8]

b) Explain sequence of operation in single sheet feeder. [8]

Q6) a) Explain steps involved in makeready of a 2 color job on a single color press. [8]

b) Explain waste generated in inking unit and measures to reduce them. [8]

OR

Q6) Explain in brief the importance of quality control aids used for plate production. [16]



Total No. of Questions : 12]

SEAT No. :

P2254

[4758] -11

[Total No. of Pages :5

T.E. (Mechanical Engineering)
MACHINE DESIGN -I
(2008 Course) (Semester -I) (302041)

Time : 4 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION -I

- Q1) a)** Draw neat sketch of Kennedy key and clearly mark the area under shear and the area under crushing. Explain the design procedure of Kennedy key. **[4]**
- b) A shaft is supported by two bearing placed 1100mm apart. A pulley of diameter 620 mm is keyed at 400mm to the right from left hand bearing and this drives a pulley directly below it with a maximum tension of 2.75KN. Another pulley of diameter 400mm is placed 200mm to the left of right bearing and is driven with a motor placed horizontally to the right. The angle of contact of pulley is 180° and the coefficient of friction between belt and the pulley is 0.3. Find the diameter of the shaft. Assume $K_b = 3$, $K_t = 2.5$, $S_{yt} = 190\text{MPa}$, $S_{ut} = 300\text{MPa}$. Also find the dimensions of a hollow shaft, having outer diameter of 80mm, for the same data. Compare the weight of the solid shaft to hollow shaft. **[14]**

OR

- Q2) a)** A counter shaft with the bearings 800mm apart receives 20KW power at 500rpm through a pulley 300mm in diameter and mounted at an overhung of 200mm. A 360 mm diameter pulley mounted midway between the bearings transmits the torque to a shaft located below it. Both the pulleys have vertical belt tensions and the coefficient of friction between the belt and pulley is 0.3. If the required safety margin is 3, design the shaft using

P.T.O.

maximum shear stress theory. Use the following properties for shaft material - $S_{ult} = 700$ MPa, $S_{yt} = 460$ MPa. If the above shaft is made hollow with the ratio of inner diameter to outer diameter as 0.6, calculate the ratio of weights of hollow shaft to solid shaft. [14]

- b) Compare Flexible Coupling with Rigid Coupling & state applications of both. [4]

Q3) a) State what type of screw threads will you select for following applications giving reasons and also show the thread form [6]

- i) Lathe lead screw
- ii) Screw Jack
- iii) Machine vice

- b) A power screw having double start square threads of 25mm nominal diameter and 5mm pitch is acted upon by an axial load of 10KN. The outer and inner diameters of screw collar are 50mm and 20mm respectively. The coefficient of thread friction and collar friction may be assumed as 0.2 and 0.15 respectively. The screw rotates at 12rpm. Assuming uniform wear condition at the collar and allowable thread bearing pressure of 5.77N/mm^2 , find: [10]

- i) The torque required to rotate the screw
- ii) The stresses in screw, and
- iii) The height of nut

OR

Q4) a) How does the helix angle influence the efficiency of square threaded screw? What are the various types of screw threads used for power screws? [6]

- b) In a machine tool application the tool holder is pulled by means of an operating nut, mounted on screw. The tool holder travels at a speed 6m/min. The screw has single start acme threads of 48mm nominal diameter and 8mm pitch. The operating nut exerts a force of 600N to drive the tool holder. the mean radius of the collar is 40mm and the coefficient of friction at thread as well as at the collar surface is 0.2. Calculate, [10]

- i) Power required to drive the screw
- ii) The efficiency of the mechanism.

- Q5) a)** What are the advantages and limitations of welded joints? [4]
- b) A solid rectangular bar of cross-section 80mm (horizontal) by 50mm (vertical) is welded by a 5mm fillet weld on all sides to a flat plate, with axis perpendicular to the plate surface. Find the maximum torque that can be applied to the bar, if the shear stress in the weld is not to exceed 85N/mm². [12]

OR

- Q6)** A bracket is bolted to column by 6 bolts of equal size as shown in fig.1. It carries a load of 50kN at the distance of 150mm from the centre of column. If the maximum stress in the bolts is to be limited to 150N/mm². Determine the core diameter of bolts. [16]

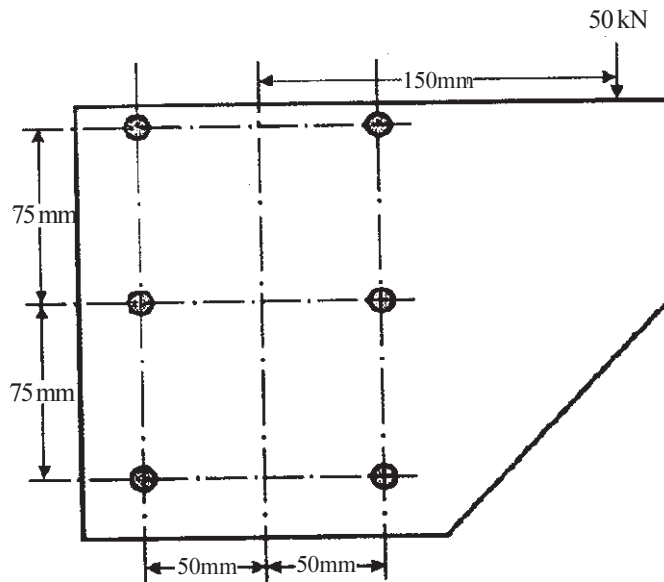


Fig.1

SECTION - II

- Q7)** A machine with a constant resisting torque is driven by an I.C. engine. The torque developed by the engine is given by expression: $T = 4000 + 1500\sin\theta + 4000\sin 2\theta$ Nm. A rimmed flywheel made of grey cast iron FG 150 ($\rho = 7000\text{kg/m}^3$) is used to maintain speed of the engine between 200 rpm and 210 rpm. The rim contributes 90% of the required mass moment of inertia. A maximum diameter of the flywheel is limited to 2.1m. If the factor of safety is 7.5. Design the flywheel. Neglect the effect of restraint of arm on the flywheel rim. [18]

OR

Q8) A punching machine with a capacity of punch 30 holes of 20mm diameter per minute in a steel plate of 15mm thickness and having ultimate shear stress of 250N/mm^2 is powered by a flywheel through a gear reducer having a reduction ratio of 10:1. The actual punching operation last for $1/5$ of the angular rotation of the punching machine crank shaft. Design a rimmed flywheel made of grey cast iron with a following data: **[18]**

Mechanical efficiency of a punching machine = 85%

Maximum permissible fluctuation of flywheel speed = 10% of mean speed

Maximum permissible diameter of the flywheel = 1.0m

Contribution of the rim to the flywheel effect = 90%

Flywheel rim width to thickness ratio = 2.0

Number of arms = 6

Permissible tensile stress for the flywheel = 7N/mm^2

Mass density of the flywheel material = 7200 kg/m^3

Also find the required power of electric motor to drive the punching machine, if the mechanical efficiency of transmission system is 90%.

Q9) It is required to design a valve spring of IC Engine with following details:**[16]**

Spring load = 80N, When valve is closed

Spring load = 100N, When valve is open

Space constraints for spring fitment are:

Inside guide bush diameter = 24 mm

Outside recess diameter = 36mm.

Valve lift = 5mm

Spring steel has following properties:

Ultimate tensile strength = 710 N/mm^2

Modulus of rigidity = $8.0 \times 10^4\text{ N/mm}^2$

Spring ends are square and ground. Permissible shear stress for spring wire = $0.5 S_{ut}$. Determine: Wire diameter, Spring index, Total number of coils, Solid length, Free length, Pitch of the coil when additional 15% of working deflection is used to avoid complete closing of coil.

OR

Q10)a) A torsional helical spring is made from a music wire with wire diameter of 1.37 mm and mean coil diameter 22mm. The spring has 400 turns. If the material of the spring has ultimate tensile strength of 2076MPa and Yield point stress = $0.60 S_{ult}$ with factor of safety of 2 based on yield point, compute maximum stress on the inside of the helix. Take modulus of elasticity of spring material as 210 GPa. Consider the effect due to stress concentration and due to curvature. Find the torque that spring can exert after unwinding 12 revolutions from the most highly stressed condition. **[12]**

b) Explain whether following statements are true or false giving reasons:**[4]**

- i) Helical torsion spring is subjected to torsional shear stresses.
- ii) Helical compression spring is subjected to compressive stress.

Q11)A flat belt drive is used to transmit 15KW power from a pulley running at 1440 rpm to another pulley running at 480rpm. The centre distance between pulleys is twice the diameter of larger pulley. The belt velocity is approximately 20.35 m/s. The maximum allowable stress in the belt is 2.25MPa. The density of belt material is 0.95 gm/cc, coefficient of friction is 0.35. The thickness of belt is 5mm. Calculate: **[16]**

- a) Diameter of both the pulleys
- b) Length and width of the belt
- c) Belt tensions.

OR

Q12)A V-belt drive is used for speed reduction between two shafts. Groove angle for the pulley is 40° . Mass of belt is 0.75kg/m. The coefficient of friction is 0.1025. Assuming angle of wrap as 210° , plot a graph of power transmitted by the belt as a function of belt speed. Assume allowable tension in the belt as 900N. Determine optimum belt speed, maximum power transmission. Also find speed of belt at which no power will be transmitted. **[16]**



Total No. of Questions : 12]

SEAT No. :

P2288

[4758]-110

[Total No. of Pages : 2

T.E. (Printing)

PRINTING NETWORK TECHNOLOGY AND

OPTO ELECTRONICS

(2008 Course) (Semester-I) (308282)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION-I

Q1) a) Draw and explain block diagram of communication system. Explain necessity of modulation. **[10]**

b) State "Sampling Theorem". Explain pulse width modulation (PWM). **[8]**

OR

Q2) Write short notes on (Any Three): **[18]**

- a) Quantization.
- b) Multiplexing technique.
- c) Pulse coded modulation.
- d) Amplitude modulation.

Q3) a) Explain data frequency division multiplexing FDM and Time Division Multiplexing TDM. **[8]**

b) Explain the losses in fiber optic cable with suitable diagrams. **[8]**

OR

Q4) a) Draw and explain block diagram of basic fiber optic communication system. **[8]**

b) Explain different types of in fiber optic cables. **[8]**

P.T.O.

- Q5)** a) Explain application of RFID in field of printing. [8]
b) Explain different types of RFID. [8]

OR

- Q6)** a) Explain Wi-Fi technology. [10]
b) Explain any one application of optoelectronics in printing. [6]

SECTION-II

- Q7)** a) Explain different types operating system (OS). [10]
b) Explain any four UNIX commands. [8]

OR

- Q8)** Write short notes on (Any three): [18]
a) MAC operating system.
b) Design issues of operating system.
c) Windows NT.
d) Directory structure of UNIX.

- Q9)** Explain following protocols (Any Two): [16]
a) POP3
b) FTP
c) SMTP

OR

- Q10)**a) Explain TCP/IP reference model. [8]
b) Explain different types of local area network (LAN). [8]

- Q11)**a) Explain what is ISDN. [8]
b) Explain Bridges and routers. [8]

OR

- Q12)**a) Explain modems and hubs. [8]
b) Explain VPN and VSAT. [8]



Total No. of Questions : 6]

SEAT No. :

P3646

[4758] - 111

[Total No. of Pages :2

T.E. (Printing)

COLOUR MANAGEMENT AND STANDARDIZATION

(2008 Pattern) (Semester - I) (308283)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer to the two sections should be written in separate books*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

SECTION - I

Q1) Answer any two.

[18]

- a) Explain how the printing sequence affects the color reproduction.
- b) Explain Hue error and gray error.
- c) Printing is a combination of both additive and subtractive theory, explain.

Q2) Solve any two.

[16]

- a) Explain the red and green cone deficiencies of Human vision.
- b) Explain CIE Standard Illuminant-D65, D50, C and A.
- c) Explain Metameric match and spectral match.

Q3) Answer any two.

[16]

- a) Explain any one colour mixing system with their two advantages and two disadvantages.

P.T.O.

- b) Calculate chromaticity co-ordinates for A and C Illuminants.
- c) Explain CIE xyY color system based on Color Perception.

SECTION - II

Q4) Answer any One. **[16]**

- a) Explain Instrumental color measurement.
- b) Explain the color tolerance ellipse for CIE 2000 equation.

Q5) Explain any two. **[16]**

- a) Device dependent and independent workflow.
- b) Types of profiles.
- c) Explain the printer test chart and printer profiling.

Q6) Explain any two. **[18]**

- a) 4c's of color management.
- b) Quality control aids used for color reproduction.
- c) Calculate L, a,b for given sample

Sample 1 : $X = 30, Y = 80, Z = 90$ and

Sample 2 : $X = 20, Y = 70, Z = 80$.



Total No. of Questions : 6]

SEAT No. :

P3912

[Total No. of Pages : 2

[4758]- 112

**T.E. (Printing Engg. & Graphics Communication)
DESIGN OF PRINTING MACHINE COMPONENTS
(2008 Pattern)**

Time : 3 Hours]

[Max Marks :100

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Assume suitable data if necessary.*

SECTION - I

- Q1)** a) Explain the step by step procedure for design of shaft on the basis of ASME code procedure. [8]
- b) Explain in short creativity in design. [8]

OR

- a) Explain the type of fit using at least three examples. [8]
- b) Explain the BIS system of designation of steel. [8]

- Q2)** a) What is the importance of limits, fits in the machine elements? What are different types of tolerances? Show how to give such tolerance of machine element. [8]
- b) A shaft supported on two bearing's at the end carries the load of 10000 N at the middle of the shaft. The length of shaft is 150mm. The power is transmitted to the shaft by gear drive. The power transmitted is 10 kW at 1440 rpm. The material used for shaft has ultimate strength of 620 N/mm² and yield strength 480 N/mm². The factor of safety is 1.5. Design the shaft using ASME code. [8]

OR

- a) Explain the step by step procedure of design of knuckle joint. [8]
- b) State the procedure of designing a shaft as per following approaches.[8]
 - i) Equivalent bending moment approach
 - ii) Rigidity approach

P.T.O.

Q3) a) Explain the Requirements of couplings and explain how couplings are classified. [6]

b) Design a cotter joint to transmit a load of 90 kN in tension or compression. Assume the following stress for socket, Spigot and cotter. [12]

Allowable tensile stress = 90 mpa.

Allowable crushing stress = 120 mpa.

Allowable shear stress = 60 mpa.

OR

a) What are the differences between the properties of brittle & ductile materials? [6]

b) A protected type rigid flange coupling is used to transmit 25kW power at 500 rpm from an engine to a machine. Design a coupling for an overload capacity of 25% [12]

Assume following stresses of coupling.

Allowable Stress	C.I Flange	M.S (Shafts Key)	Plain carbon Steel (bolt)
Tensile	20	60	60
Shear	12	35	28
Compressive	60	60	60

SECTION - II

Q4) a) What are the different types of stresses induced in power screw? [8]

b) Prove that maximum efficiency of square threaded screw can be given by

$$\eta_{\max} = \frac{1 - \sin \theta}{1 + \sin \theta}$$

Where θ is pressure angle. [8]

OR

a) Explain construction and application of recirculating ball screws. [8]

b) Derive the Relation for torque required to Raise load on square threaded screw. [8]

- Q5)** a) Compare bolted with welded joints . **[8]**
- b) A 50 mm diameter solid shaft is welded to a flat plate by 10mm fillet weld find maximum torque that the welded joint can sustain if the maximum shear stress intensity in the weld material is not to exceed 80 mpa. **[8]**

OR

- a) What are the advantages & Limitations of welded joints?
- b) Explain welded symbol's.

Q6) Write short notes on (any three) **[18]**

- a) Classification of spring's.
- b) Stresses induced in helical spring.
- c) Spring nomenclature.
- d) Types of spring.



Total No. of Questions : 6]

SEAT No. :

P3647

[4758] - 113

[Total No. of Pages :3

T.E. (Printing)

MANAGEMENT INFORMATION SYSTEM & COST ESTIMATION

(2008 Course) (Semester -I)

Time : 3Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Assume suitable data, if necessary.*
- 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.*

SECTION - I

Q1) List down the various types of business organizations and explain any two types in detail with suitable examples. **[16]**

OR

Explain the difference between the elements of Competitive Environment for the Manufacturing industry and Service industry with suitable examples.

Q2) Explain the role of MIS in the process of deciding the strategy for the printing industry with suitable examples. **[16]**

OR

Draw the workflow of CIP3 and CIP4 technology.

Q3) Explain the structure of Decision Support System with suitable examples. **[18]**

OR

Explain the structure of Group Decision Support System with suitable examples.

P.T.O.

SECTION - II

Q4) Write short notes on (Any 4). **[16]**

- a) Data Definition language
- b) Data Manipulation Language
- c) Data Dictionary
- d) Data warehouse
- e) Data mining
- f) Data Base Management System

Q5) Prepare the cost sheet with reference to the following data. **[16]**

Direct material: 27300

Direct labor: 15600

Direct expenses 6420

Factory overheads are charged at 75% on labor cost.

Administration overheads are charged at 25% on factory cost.

Selling and Distribution overheads are 40% on total cost.

Profit 10% of the cost of sales.

OR

Write short note on (Any 4). **[16]**

- a) Direct cost
- b) Indirect cost
- c) Material cost
- d) Labor cost
- e) Overhead cost
- f) Fixed cost
- g) Variable cost

- Q6)** a) Estimate the cloth roll of 60cms wide and 40 meter in length will be required for making 5000 books in A4 size and with 25mm spine. [9]
- b) How many boards of 20'' ×30'' size will be required for making cases for 10,000 books in Demy 1/4 size? [9]

OR

Explain in detail with suitable example the difference between Order Qualifier and Order Winner. Suitable examples. [18]



Total No. of Questions : 6]

SEAT No. :

P3346

[Total No. of Pages : 2

[4758] - 114

T.E. (Printing)

OFFSET MACHINES - II

(2008 Pattern)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Answer to two sections should be written in separate books.*

SECTION - I

Q1) Explain the following related to roll to web processing : **[16]**

- a) Different parts of reel
- b) Main tasks of Reel stands
- c) Main task of Festoon
- d) Function of Dancer roller

OR

Explain the following :

- a) What is web threading in to the machine How is it done. **[8]**
- b) Explain the significance of the following : **[8]**
 - i) Clamp truck
 - ii) V shaped pattern
 - iii) Pressure arm
 - iv) Acceleration belts

Q2) a) Explain the problem of incorrect ink transfer. State causes for the problem. **[8]**

b) Describe anilox offset inking system. **[8]**

OR

Explain different cylinder configurations used in newspaper printing. **[16]**

P.T.O.

Q3) Explain the purpose of positioning of nozzles in the hot air dryer. What are air knives used for in the dryer. [18]

OR

- a) Explain former folding mechanism and its use in newspaper printing. [10]
- b) Write significance of Tucker blades and jaws in jaw folding. [8]

SECTION - II

Q4) State effects on web tension due to paper moisture content on press and due to excess water intake during printing in web. [18]

OR

Explain various tension zones in the web press.

Q5) Draw a neat diagram of 4 rolls chill roll system. How temperature control is done for the web on heatset press. [16]

OR

Explain : [16]

- a) Use of Web Preconditioner
- b) Web Preheaters
- c) Remoisturizer unit
- d) pH and Conductivity meters are used

Q6) Explain following troubles : [16]

- a) Wavy edges
- b) Blistering
- c) Poor print contrast
- d) Poor drying of ink

OR

Explain problems occurring due to following defects :

- a) Damaged end
- b) Soft end and baggy end
- c) Telescoped roll
- d) Water damage



Total No. of Questions : 6]

SEAT No. :

P3347

[Total No. of Pages : 3

[4758] - 115
T.E. (Printing)
STATISTICAL PROCESS CONTROL
(2008 Pattern)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

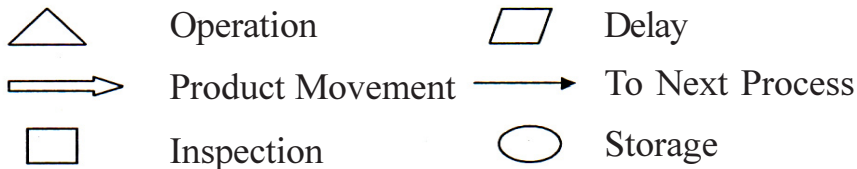
- 1) *All questions are compulsory.*
- 2) *Assume suitable data, if necessary.*
- 3) *Answer to the two sections should be written in separate books.*
- 4) *Neat diagrams must be drawn wherever necessary.*
- 5) *Figures to the right indicate full marks.*
- 6) *Use of logarithmic tables slide rule, Mollier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

SECTION - I

- Q1)** a) Explain different tools used in SPC. [8]
b) Explain the concept Quality and TQM with suitable examples. [8]

OR

With following symbols, prepare a flowchart for the process of 'Pre make ready Operations on single color offset machine'. [16]



- Q2)** a) Explain Histogram in short? [4]
b) With suitable examples, explain the different shapes of Histogram. [12]

OR

From the given data, arrange the data, prepare frequency distribution table and draw the Histogram on the graph paper. [16]

0.912	0.910	0.904	0.905	0.910	0.911
0.914	0.912	0.910	0.913	0.908	0.914
0.907	0.909	0.913	0.912	0.909	0.913
0.902	0.906	0.909	0.907	0.906	0.908
0.915	0.909	0.910	0.911	0.912	0.909
0.910	0.909	0.908	0.910	0.909	0.907

Note : From G chart, the recommended number of groups should be 7 for number of measurements between 30 to 40.

P.T.O.

- Q3) a)** Explain process variation concept. And also types of variations with diagram and suitable examples. **[18]**

OR

Explain the following : **[18]**

- a) Measures of Accuracy or Centering.
- b) Measures of Precision or Spread.
- c) Normal Distribution.

SECTION - II

- Q4) a)** Prepare X bar R chart from the given data on graph paper. **[16]**

Sample No.	1	2	3	4	5	6	7	8	9	10
Measurements	933	911	889	882	903	890	892	908	895	916
	897	898	915	913	930	940	912	920	920	890
	885	900	905	930	890	895	895	896	922	891
	900	905	902	900	890	909	896	894	928	920
	879	862	873	871	900	915	902	906	926	915

Note : Take fractional values only up to two digits

$$\text{Shewhart's Constants : } A_2 = 0.577$$

$$D_3 = 0$$

$$D_4 = 2.114$$

OR

Prepare X bar S chart from the given data on graph paper. **[16]**

Sample No.	1	2	3	4	5	6	7	8	9	10
Measurements	933	911	889	882	903	890	892	908	895	916
	897	898	915	913	930	940	912	920	920	890
	885	900	905	930	890	895	895	896	922	891
	900	905	902	900	890	909	896	894	928	920
	879	862	873	871	900	915	902	906	926	915

Note : Take fractional values only up to two digits

$$\text{Shewhart's Constants : } A_3 = 1.427$$

$$B_3 = 0$$

$$B_4 = 2.089$$

- Q5)** a) Explain what is pareto chart. [4]
 b) Prepare the Pareto chart on the graph paper from the given data, also show the cumulative percentage chart on the same on the graph. [12]

Sr. No.	Defect Category	Number of Shirts
1	Loose threads	2300
2	Hemming wrong	1650
3	Material flaw	300
4	Collar wrong	250
5	Cuffs wrong	200
6	Buttons	100
7	Stitching	100
8	Button holes	50
9	Material tear	50
	TOTAL	5000

OR

Comment on the following : [16]

- a) Cause and Effect Analysis.
 b) Scatter diagram.

- Q6)** a) Explain DOE with suitable examples from printing industry. [9]
 b) Define Six Sigma and its benefits. [9]

OR

Explain in detail Cp and Cpk Analysis with suitable diagrams. [18]



Total No. of Questions : 6]

SEAT No. :

P3648

[4758]-116

[Total No. of Pages : 3

T.E. (Printing)

DIGITAL WORKFLOW AND IMAGE SETTING

(2008 Course) (Semester-II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Draw diagrams wherever necessary.*

SECTION-I

- Q1)** a) What is workflow? What is difference between workflow and jobflow? Give example of each.
- b) Draw the workflow for news paper work and explain the same.

[16]

OR

- a) Write short notes on:
- i) Apr and OPI Server.
 - ii) Imposition: conventional Vs Digital.
- b) Explain the following:
- i) Trapping.
 - ii) Pre-flight checking.
- Q2)** a) What is job ticket? Write in details its purpose and need.
- b) Draw a workflow for complete magazine work and also explain the same.

[16]

OR

P.T.O.

- a) What is the difference between conventional and digital workflow. State merits of digital over conventional workflow.
- b) What is job archiving? Explain in details. State any case where job archiving is very significant.

Q3) Write notes on:

[18]

- a) Font emulation.
- b) PJTF.
- c) Image setter resolution.
- d) Postscript as a output format.

OR

What are the different types of PDF exclusive for printing? Explain in details.

SECTION-II

Q4) a) Explain the following modules:

[18]

- i) Management module.
- ii) Production module.
- b) What is JDF? What are its feature and advantages?

OR

a) Explain the following:

- i) Job administration module.
- ii) Job archiving module.
- b) How is PDF file said to make the workflow more efficient? Explain in details.

Q5) What are different types of proofs? Which type of proof is termed as contract proof? Why it is termed so? **[16]**

OR

Explain any type of digital proofing technology with neat principle diagram of working.

Q6) Explain in details types of lossless image compression. **[16]**

OR

Explain with neat workflow diagram fundamental steps and elements of digital image processing.



Total No. of Questions :[6]

SEAT No. :

P3649

[4758]-117

[Total No. of Pages :1

T.E(Printing)

TECHNOLOGY OF FLEXOGRAPHY

(2008Course) (Semester-II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answers to two sections should be written in separately.*
- 2) *Neat diagrams must be drawn wherever necessary.*

SECTION-I

Q1) a) Explain the features of photopolymer plate over rubber plate. **[18]**

OR

b) Explain in detail flexo plate properties.

Q2) a) Explain the stages of Flexographic plate reproduction. **[16]**

OR

b) Calculate % shortening and new negative length for 2.84 mm plate thickness having printed length of 30 cm.

Q3) a) Explain in detail the process of making a photopolymer plate. **[16]**

OR

b) Explain standardization test for Main Exposure.

SECTION-II

Q4) a) Explain the making of digital flexo plate. **[16]**

OR

b) Explain in detail effect wash-out on plate reproduction.

Q5) a) Explain the unit configuration of Flexography process. **[18]**

OR

b) Describe in detail CI flexo press.

Q6) a) Explain in detail role of Anilox Roller in Flexography. **[16]**

OR

b) Explain in detail Fountain Roll Inking system.

P.T.O.



Total No. of Questions : 12]

SEAT No. :

P2289

[4758]-118

[Total No. of Pages : 6

T.E. (Printing Engg.)

THEORY OF PRINTING MACHINES AND MACHINE DESIGN

(2008 Pattern) (Semester - II) (302290)

Time : 4 Hours]

[Max. Marks :100

Instructions to the candidates:

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

SECTION - I

- Q1) a)** Explain following terminology related to spur gear with a neat and labelled sketch **[8]**
- i) Pitch Circle.
 - ii) Pitch Point.
 - iii) Addendum Circle.
 - iv) Dedendum.
- b) Two involute gears in mesh have 20° pressure angle. The gear ratio is 3 and the number of teeth on the pinion is 24. The teeth have a module of 6mm. The pitch line velocity is 1.5 m/s and addendum equal to one module. Determine the angle of action of pinion and maximum velocity of sliding. **[10]**

OR

P.T.O.

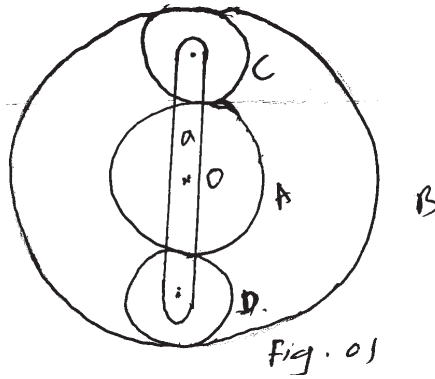
- Q2) a)** Define the following terms related to worm gearing [6]
- i) Axial Pitch.
 - ii) Lead.
 - iii) Lead angle.
- b) State applications of the following gears in various industries. [6]
- c) Define pitch cone angle and derive its geometrical relationship.
- i) Spur gear,
 - ii) Helical gear,
 - iii) Internal gear. [6]

Q3) A gear wheel 'A' having 44 teeth is rigidly mounted on the driving shaft. It gears compound wheel C - D. Wheel 'C' has 22 teeth and wheel 'D' has 26 teeth. 'C' gears with 'A' and 'D' gears with internal wheel 'B'. The compound wheel revolves freely on a pin which projects from an arm rigidly mounted on the driven shaft. The internal wheel B is fixed and module of all the gears is same. The driving and driven shafts and the internal wheel are co - axial. Driving shaft rotates at 300 r.p.m. and transmits 2.5 kW power. [16]

- a) Sketch the arrangement.
- b) Find the speed of driven shaft.
- c) Find the torque transmitted by the driven shaft.
- d) Fixing torque, neglect the losses.

OR

- Q4) a)** Define gear train. What are the different types of gear trains? [4]
- b) Write the advantages and application of epicyclic gear train. [4]
- c) An epicyclic gear train shown in fig.1. The numbers of teeth on A and B are 80 and 200. Determine the speed of the arm a 1 - if A rotates at 100 rpm clockwise and B at 50 rpm counter-clockwise-2-if A rotates 100 rpm clockwise and B is stationary. [8]



- Q5)** a) Explain with the help of velocity and acceleration diagrams why cycloidal profile is preferred over S.H.M. profile for cams used in high speed applications? [6]
- b) Draw and explain the displacement velocity and acceleration diagrams for Uniform Velocity and for Uniform Acceleration and Retardation follower motions. [6]
- c) What are various types of Cams with specified contours? In actual practice why we used cam with specified contours? [4]

OR

- Q6)** A cam operates a flat faced follower which moves with cycloidal motion during ascent and descent. [16]

The further specifications are:

- Minimum radius of the cam = 30mm
- Lift of the follower = 40mm
- Diameter of the roller = 10mm
- Angle of ascent = 120°
- Angle of dwell = 60°
- Angle of descent = 90°
- Speed of the cam = 300 rpm

Draw the cam profile and find the maximum velocity and acceleration of the follower during ascent and descent.

SECTION - II

- Q7)** a) What is Stress Concentration? How will you account for Stress concentration in design of Printing Machine Parts? [6]
- b) What is low - cycle fatigue and high - cycle fatigue? Give any two practical examples of low-cycle and high - cycle fatigue. [6]
- c) What is Endurance limit? What are the factors that affect Endurance limit of a machine part? [4]

OR

- Q8)** a) A transmission shaft made of cold drawn steel 30C8 ($S_{ut} = 500 \text{ N/mm}^2$ and $S_{yt} = 300 \text{ N/mm}^2$) is subjected to a fluctuating torque. Which varies from 400 N-m to 100 N-m anticlockwise. The surface finish factor is 0.8. The expected reliability is 90% for which reliability factor is 0.897. If the factor of safety is 2, determine the diameter of the shaft. Use the distortion energy theory of failure. Refer following data for the size factor: [12]

Size.mm	Size factor (K_b)
$d \leq 7.5$	1.00
$7.5 \leq d \leq 50$	0.85
$d \geq 50$	0.75

- b) What is repeated and reversed stresses? Draw a Stress - Time curve for repeated and reversed stresses. [4]
- Q9)** The following data is given for a steel spur gear pair transmitting 5 k W power from a shaft rotating at 3000 r.p.m. to another parallel shaft rotating at 1500 r.p.m. [18]
- Module = 4mm.

- Number of teeth on pinion = 18.
- Ultimate tensile strength for pinion and gear = 630 N/mm².
- Face width = 10 X module.
- Surface hardness = 400 BHN.
- Tooth System = 20° full -depth involute.
- Combined teeth factor = 15 microns.
- Deformation factor = 11400 e,N/mm.

Assuming the dynamic load is accounted by the Buckingham's equation, calculate

- The factor of safety against bending failure: and
- The factor of safety against pitting failure

Take $Y = 0.484 - (2.87/Z)$.

$K = 0.16[BHN/100]^2$.

$K_a = 1$ & $K_m = 1$.

OR

- Q10)a)** A pair of helical gears consists of 20 teeth pinion meshing with 100 teeth gear. The pinion rotates at 720 rpm. The normal pressure angle is 20°, while the helix angle is 25°. The face width is 40mm and normal module is 4mm. The pinion is made up of plain carbon steel 55C8 ($S_{ut} = 720$ Nmm²) while the gear is made of plain carbon steel 40C8 ($S_{ut} = 580$ N/mm²). The pinion and gear are heat treated to a surface hardness of 350 BHN and 300 BHN respectively. The service factor and factor of safety are 1.5 and 2.0 respectively. Assuming the velocity factor accounts for dynamic load, calculate the power transmitting capacity of helical gear pair. **[10]**

Use following data:

Velocity factor $K_v = 5.6 / (5.6 + \text{sq. root } V)$

- Derive an expression for beam strength of helical gear tooth. **[4]**
- Enlist any four purposes of gear lubrication used in printing machines. **[4]**

Q11)a) Derive an expression for equivalent dynamic load in case of bearing subjected to cyclic load. [6]

b) A shaft of length 1.2 m is supported on two identical single-row deep-groove ball bearings. The shaft is fixed with a gear at its centre which is rotating at 720 rpm. The tangential and radial force components for the gear are: 1 kN and 0.8 kN respectively. The expected life of the bearings is 15000 hours with a reliability of 80%. Neglecting the effect of the axial force (if any) calculate the dynamic load rating for the bearings so that they can directly be selected from the manufacturer's catalogue. Assume load factor as 1.25. [10]

OR

Q12)a) 10 kW, 1720 r.p.m. electric motor is directly coupled to a shaft of 25 mm diameter, which is supported by two cylindrical roller bearings. The shaft transmits power to another line shaft through the flat pulley of 250 mm diameter which is placed mid-way between the two bearings. The coefficient of friction between the belt and pulley is 0.3, while angle of lap is 180°. The belt is vertical. The over load factor is 1.75. If the expected life of bearing is 76,000 hours. Select the bearing. [8]

Use the following data:

Bearing No.	NU 2205	NU 2305
Basic dynamic Capacity 'C' kN	15.99	31.39

b) Explain the metallic and non-metallic gaskets. Sketch any one typical gasket. [8]

EEE

Total No. of Questions : 12]

SEAT No. :

P2290

[4758] - 119

[Total No. of Pages : 7

T.E. (Petrochemical)

NUMERICAL AND STATISTICAL METHODS

(2008 Pattern) (Semester - I) (312401)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Attempt Q1 or Q2, Q3 or Q4, Q5 or Q6 from Section -I and Q7 or Q8, Q9 or Q10, Q11 or Q12 from Section -II.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Use of non programmable electronic pocket calculator is allowed.*
- 5) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) Find all basic solution to the following system of equations: **[6]**

$$x_1 + 2x_2 + x_3 = 4$$

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

Find out which are basic feasible solutions.

b) Solve the following Linear programming problem using simplex method: **[10]**

$$\text{Maximize } Z = x_1 - x_2 + 3x_3$$

Subject to the constraints:

$$x_1 + x_2 + x_3 \leq 10$$

$$2x_1 - x_3 \leq 2$$

$$2x_1 - 2x_2 + 3x_3 \leq 0$$

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

OR

P.T.O.

Q2) a) Write the dual of the following problem: **[6]**

$$\text{Maximize } Z = 3x_1 + x_2 + 4x_3 + x_4$$

Subject to the constraints:

$$4x_1 - 5x_2 - 9x_3 + x_4 \leq 6$$

$$2x_1 + 3x_2 + 4x_3 - 5x_4 \leq 9$$

$$x_1 + x_2 - 5x_3 - 7x_4 \leq 10$$

$$x_1, x_2, x_3, x_4 \geq 0.$$

b) Use principle of duality to solve the following LPP. **[10]**

$$\text{Maximize } Z = 3x_1 - 2x_2$$

Subject to the constraints:

$$x_1 + x_2 \leq 5$$

$$x_1 \leq 4$$

$$1 \leq x_2 \leq 6$$

$$x_1, x_2 \geq 0$$

Q3) a) A Company has three sources which store a given product. These sources supply these products to four dealers. The capacity of sources are 150, 40 and 80 units at S_1, S_2, S_3 respectively. The demands of the dealers D_1, D_2, D_3, D_4 are 90, 70, 50 and 60 units respectively. The cost of transporting one unit of product from various sources to various dealers is shown below: **[10]**

	D_1	D_2	D_3	D_4
S_1	27	23	31	69
S_2	10	45	40	32
S_3	30	54	35	57

Find out the optimal solution for transporting the products at a minimum cost.

- b) Solve the following assignment problem for minimum assignment cost. The assignment costs are given as follows (in Rs.) [6]

		Jobs				
		1	2	3	4	5
Machines	A	10	5	13	15	16
	B	3	9	18	13	6
	C	10	7	2	2	2
	D	5	11	9	7	12
	E	7	9	10	4	12

OR

- Q4) a) Solve the following transportation problem for minimum cost. Use Vogel's Approximation method for initial basic feasible solution. [10]

		To				Availability
		I	II	III	IV	
From	A	15	10	17	18	2
	B	16	13	12	13	6
	C	12	17	20	11	7
Demand		3	3	4	5	

- b) A department has five employees and five jobs are to be performed. The time each man will take to perform each job is given below. How should the jobs be assigned, so that the total man-hours is minimum? [6]

		Employee				
		I	II	III	IV	V
Jobs	A	11	17	8	16	20
	B	9	7	12	6	15
	C	13	16	15	12	16
	D	21	24	17	28	26
	E	14	10	12	11	15

- Q5) a)** In an experiment to determine the relationship between force on a wire and the resulting extension, the following data is obtained: [7]

Force (N):	10	20	30	40	50	60	70
Extension (mm):	0.22	0.40	0.61	0.85	1.20	1.45	1.70

Find the coefficient of correlation for data.

- b) Probability of man aged 60 years will live for 70 years is $\frac{1}{10}$. Find the probability of five men selected at random, two will live for 70 years. [5]
- c) In a certain examination test, 2000 students appeared in a subject of Mathematics. Average marks obtained were 50% with standard deviation 5%. How many students are expected to get more than 60% of marks, supposing that marks are distributed normally. Given $Z = 2$, area = 0.4772. [6]

OR

- Q6) a)** Obtain regression line for y on x for the following data and hence estimate y when $x = 6$. [7]

$x :$	2	3	5	7	9	10	12	15
$y :$	2	5	8	10	12	14	15	16

- b) Number of road accidents on a highway during a month follows a Poisson distribution-with mean 5. Find the probability that in a certain month number of accidents on the highway will be less than three. [5]
- c) A set of five similar coins is tossed 210 times and the result is [6]

No. of heads:	0	1	2	3	4	5
Frequency:	2	5	20	60	100	31

Test the hypothesis that the data follows a binomial distribution.

Given $\chi_{5,0.05}^2 = 11.070$.

SECTION - II

Q7) a) With usual notations establish the following. **[9]**

i) $D = \frac{1}{h} \log E$

ii) $\delta = \Delta(1 + \Delta)^{-1/2}$

iii) $\mu^2 = 1 + \frac{\delta^2}{4}$.

b) Compute $I = \int_0^{0.5} \frac{x}{\sin x} dx$, using Simpson's rule with $h = \frac{1}{8}$ and also

$h = \frac{1}{16}$. **[8]**

OR

Q8) a) $y(10) = 35.3, y(15) = 32.4, y(20) = 29.2, y(25) = 26.1, y(30) = 23.2$ and $y(35) = 20.5$. Find $y(12)$ using **[9]**

i) Newton's forward interpolation formula and

ii) Newton's backward interpolation formula

b) Apply Lagrange's interpolation formula to find $f(x)$, if $f(1) = 2, f(2) = 4, f(3) = 8, f(4) = 16$ and $f(7) = 128$. Hence find $f(5)$. **[8]**

Q9) a) Find the root of the equation $e^x = 2x + 1$ correct to 4 decimal places, using Newton-Raphson method. [The root lies between 1 and 2]. **[8]**

b) Solve the following system of equations by Gauss elimination method: **[8]**

$$x + 2y + 3z + 4t = 10$$

$$7x + 10y + 5z + 2t = 40$$

$$13x + 6y + 2z - 3t = 34$$

$$11x + 14y + 8z - t = 64$$

OR

Q10)a) Solve the following system of equations, by Gauss Seidel's method. [8]

$$1.02x_1 - 0.05x_2 - 0.10x_3 = 0.795$$

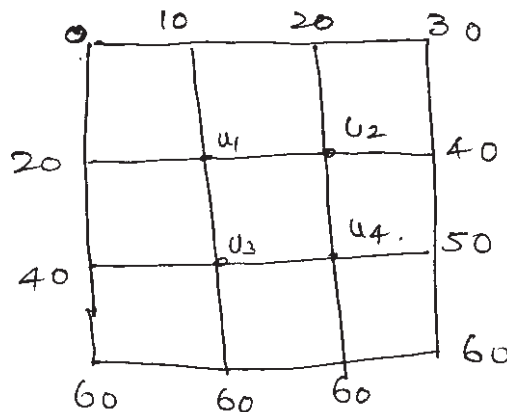
$$-0.11x_1 + 1.03x_2 - 0.05x_3 = 0.849$$

$$-0.11x_1 - 0.12x_2 + 1.04x_3 = 1.398$$

b) Fit a straight line to the following data by method of least squares: [8]

$x:$	3.4	4.3	5.4	6.7	8.7	10.6
$y:$	4.5	5.8	6.8	8.1	10.5	12.7

Q11)a) Solve $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ for the square mesh given below. [8]

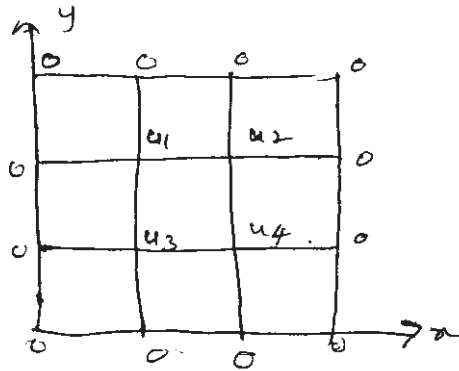


b) Given $\frac{dy}{dx} = y + x^2$, $y(0) = 1$, find $y(0.02)$ and $y(0.04)$ by Euler modified method. [9]

OR

Q12)a) Given $\frac{dy}{dx} = x^2 - y$, $y(0) = 1$, find $y(0.1)$ and $y(0.2)$ by Runge-Kutta Fourth order method. [9]

- b) Solve the Poisson equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = -4(x^2 + y^2)$ over the square mesh given below with sides $x = 0, y = 0, x = 3$ and $y = 3$ and with $u = 0$ on the boundary and mesh length 1. [8]



Total No. of Questions : 12]

SEAT No. :

P2255

[4758]-12

[Total No. of Pages : 3

T.E. (Mechanical and Automobile Engineering)
COMPUTER ORIENTED NUMERICAL METHODS
(2008 Course) (Semester-I) (302045)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION-I

Q1) a) Draw Flow chart for 'Modified Newton Raphson's' Method. [8]

b) Apply the Simpson's 1/3rd rule to evaluate the integral, $I = \int_{0.5}^{0.7} \sqrt{x}e^x dx$. [8]

OR

Q2) a) Draw Flow chart for 'Gauss Quadrature 3 Point Formula'. [8]

b) Apply Newton Raphson Method to determine the root of equation $f(x) = \cos x - xe^x = 0$ to an accuracy of 0.0001, take $x_1 = 0.3$. [8]

Q3) a) Draw flowchart for 'Newton's Forward Difference' Interpolation. [8]

b) Determine y' and y'' at $x = 0$ for following data [8]

x	0	1	2	3	4
y	2	5	10	22	34

OR

Q4) a) Explain Interpolation, Inverse Interpolation and Extrapolation. [6]

b) Find $f(9)$ using Lagrange's Interpolation [10]

x	5	7	11	13	17
$F(x)$	150	392	1452	2366	5202

P.T.O.

Q5) a) Explain partial pivoting with example. [6]

b) Solve following set of equations using Gauss Elimination Method. [12]

$$3X + 6Y + Z = 16$$

$$2X + 4Y + 3Z = 13$$

$$X + 3Y + 2Z = 9$$

OR

Q6) a) Draw Flow Chart for finding values of unknown variables by Back Substitution in Gauss - Elimination method, when the coefficient matrix is available in upper triangular format. [6]

b) Using Gauss Siedel method, solve the following set of simultaneous equations up to two decimal place accuracy. Do Partial Pivoting. [12]

$$5X + Y - Z = 4.7$$

$$X + 8Y + 2Z = 15.7$$

$$2X + 3Y + 10Z = 27.1$$

SECTION-II

Q7) a) Explain the following with suitable example [6]

i) Significant Digit.

ii) Inherent Error.

iii) Rounding Error.

iv) Truncation Error.

b) Fit a straight line through following set of points [10]

x	10	15	20	25	30
y	0.750	0.935	1.100	1.200	1.300

OR

Q8) a) Explain Least Square Method and derive equation to fit a straight line through a set of points. [4]

- b) Draw flow chart to fit an equation $y = ax^b$ using Least Square Method. [4]
- c) The value of u is given by equation, $u = 3v^7 - 6v$. Find the absolute error, relative error and percentage error in u at $v = 1$ if the error in $v = 0.05$. [8]

- Q9)** a) Draw flow chart to solve Ordinary differential equations using Euler's method. [8]
- b) Given $\frac{dy}{dx} = 3x + \frac{y}{2}$. With initial condition as $y(0) = 1$, find $y(1)$ with step size of 0.5. Use RungeKutta 4th order method. [8]

OR

- Q10)** a) Draw flow chart to solve simultaneous first order differential equations using RK4 method. [8]
- b) Solve the equation $\frac{dy}{dx} = \frac{(y+xy)}{x}$. Given the initial condition $y(1) = 2.718$, find $y(1.2)$ taking step size of 0.1 and accuracy of 0.001 using Modified Euler's formula. [8]

- Q11)** a) Draw flow chart to solve Parabolic Equation by Explicit Method. [8]
- b) Solve the partial differential equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = -10(x^2 + y^2 + 10)$ over the square with $x = y = 0$ and $x = y = 3$, with $u = 0$ on the boundary and mesh length 1. [10]

OR

- Q12)** a) Draw flow chart to solve Laplace Equation. [8]
- b) Evaluate the pivotal values of the following equation taking $h = 1$ and upto one half of the period of vibration,

$$16 \frac{\partial^2 u}{\partial x^2} = \frac{\partial^2 u}{\partial t^2}$$

Given that $u(0, t) = u(5, t) = 0$; $u(x, 0) = x^2(5 - x)$ and $\frac{\partial u}{\partial t}(x, 0) = 0$. [10]

Total No. of Questions : 12]

SEAT No. :

P2291

[4758]-120

[Total No. of Pages : 3

T.E. (Petrochemical Engineering)
APPLIED HYDROCARBON THERMODYNAMICS
(2008 Course) (Semester-I) (312402)

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 Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6, Q. 7 or Q. 8, Q. 9 or Q. 10, Q. 11 or Q. 12.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of calculator is allowed.*
- 6) *Assume suitable data, if necessary.*

SECTION-I

- Q1)** a) Explain the Joule's experiment. What is the significance of Joule's experiment in the formulation of the first law of thermodynamics? [8]
- b) Explain the Carnot principle. [8]

OR

- Q2)** a) Calculate ΔU and ΔH in kJ for 1 kmol water, as it is vaporized at the constant temperature of 373 K and constant pressure of 101.3 kPa. The specific volumes of liquid and vapour at these conditions are 1.04×10^{-3} and $1.675 \text{ m}^3/\text{kmol}$ respectively. 1030 kJ of heat is added to water for this change. [6]
- b) Explain why is C_p greater than C_v . [4]
- c) Write a note on the Joule Thomson coefficient. [6]

- Q3)** a) What do you mean by acentric factor? Explain its significance. Discuss the Peng-Robinson equation of state. [8]
- b) With the help of neat diagrams, discuss the PVT behaviour of pure fluids. [8]

OR

P.T.O.

Q4) Assuming that ammonia obeys van der Waals equation of state, calculate the molar volume of ammonia vapour at 1.95×10^6 Pa and 321.55 K. The van der Waals constants 'a' and 'b' for ammonia are 422.546×10^{-3} Pa (m³/mol)² and 37×10^{-6} m³/mol respectively. [16]

- Q5)** a) Define fugacity. Show that the fugacity and pressure are identical for ideal gases. What is the standard state for fugacity for a real gas? [9]
- b) Define Gibbs free energy and show that at constant temperature and pressure the decrease in the Gibbs free energy measures the maximum net work available from a given change of state. [9]

OR

Q6) Calculate the fugacity of CO at 50 bar and 400 bar, if the following data are applicable at 273 K. [18]

P, bar	25	50	100	200	400	800	1000
Z	0.9890	0.9792	0.9741	1.0196	1.2482	1.8057	2.0819

SECTION-II

- Q7)** a) Discuss the procedure of obtaining a boiling point diagram and an equilibrium diagram for a binary system. [9]
- b) What is vaporization equilibrium constant? Give the significance of DePriester's charts. [9]

OR

Q8) The vapour pressures of two components A and B can be evaluated by Antoine equations [18]

$$\ln P_A^S = 14.54 - \frac{2940.46}{T - 35.93}$$

$$\ln P_B^S = 14.27 - \frac{2945.47}{T - 49.15}$$

Where T is in K, and P is in kPa. Assuming that the solutions formed by these are ideal, calculate

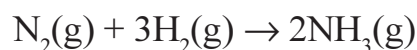
- a) x_A and y_A at 327 K and 65 kPa.
- b) T and y_A at 65 and $x_A = 0.4$
- c) P and y_A at 327 K and $x_A = 0.4$

- Q9)** a) Write a short note on the phase rule. [8]
b) Give the methods of determining partial molar properties (analytical, graphical and tangent intercept method). [8]

OR

Q10) From vapour liquid equilibrium measurements for ethanol-benzene system at 318 K and 40.25 kPa it is found that the vapour in equilibrium with liquid containing 38.4% (mol) benzene contained 56.6% (mol) benzene. The system forms an azeotrope at 318 K. At this temperature, the vapour pressures of ethanol and benzene are 22.9 and 29.6 kPa respectively. Determine the composition and total pressure of the azeotrope. Assume that van Laar equation is applicable to the system. [16]

Q11) The standard heat of formation and standard free energy of formation of ammonia at 298 K are $-46,100 \text{ J/mol}$ and $-16,500 \text{ J/mol}$ respectively. Calculate the equilibrium constant for the reaction



At 500 K assuming that the standard heat of reaction is constant in the temperature range 298 to 500 K. [16]

OR

- Q12)** a) What do you mean by extent of reaction? How is extent of reaction related to mole fraction of the species in the reaction mixture? [8]
b) What is the effect of temperature on the equilibrium constant? [8]



Total No. of Questions : 8]

SEAT No. :

P3650

[4758] - 121

[Total No. of Pages :4

**T.E. (Petrochemical)
MASS TRANSFER - I
(2008 Pattern) (Semester -I)**

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Attempt any three questions from each section.*
- 2) *Answer to the two sections should be written in two separate answer books.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data where ever necessary.*
- 5) *Use of steam tables and electronic calculator is allowed.*

SECTION - I

Q1) Answer the following questions in brief

[16]

- a) Describe in brief the apparatus for gas diffusivity measurement.
- b) Explain relation between eddy diffusion and convective mass transfer.
- c) State Fick's first and second laws of diffusion.

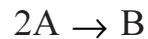
Q2) In absorption of component A from flue gas into an aqueous solvent, at a particular point in the column, the partial pressure of A on gas side is $P_{AG} = 0.01\text{atm}$ and concentration of A on liquid side is $C_{AL} = 0.04\text{mol/m}^3$. The Henry's constant for A in the solvent is $50\text{atm.cm}^3/\text{mol}$. The overall gas side mass transfer coefficient is given as $8 \times 10^{-6}\text{gmol/cm}^2.\text{sec.atm}$. It is also given that 40% of the total resistance to mass transfer lies in the liquid film. **[18]**

Determine:

- a) Which way the driving force is available
- b) Molar flux of A across the interface.

P.T.O.

Q3) In a catalytic reaction, gaseous A is diffusing across a film at catalyst surface where it reacts instantaneously and irreversibly as follows [16]



B is obtained in gaseous state only. Reaction rate at the catalyst surface is solely decided by mass transfer of A to the surface. Calculate local reaction rate in Kmol A per hr per m² surface area of the catalyst.

DATA: Gas side contains 80% A and the rest inerts. Pressure and temperature: 400 kPa and 120 C respectively. Assume film thickness to be 2×10^{-4} m and diffusivity of A through the film to be 2×10^{-9} m²/s.

- Q4)** a) Discuss graphical method for solving liquid-liquid extraction problems involving cascaded stages of cross-flow contact between two phases.
- b) Define volumetric mass transfer coefficient and state its significance in process design.

[16]

SECTION - II

Q5) A stream of air with a bulk velocity of 20m/sec at 150 kPa pressure and 320 K is flowing on the top surface of a thin flat sheet of solid naphthalene of length 0.25m and width of 0.01m. Calculate [16]

- a) The mass transfer coefficient
- b) The rate of loss of naphthalene from the surface

Data:-

Kinematic viscosity of air = 1.8×10^{-5} m²/s

Mass diffusivity of naphthalene vapour in air = 5.5×10^{-6} m²/sec

Vapor pressure of naphthalene at 320K = 0.15 mm Hg

Q6) A batch of solids is to be dried from 35% on wet basis to the moisture content that is 5% higher than the equilibrium moisture. The initial weight of the wet solids is 200kg and the drying surface is reported to be 0.45m² per 50 kg of dry weight. The critical moisture content is 15% wet basis and constant drying rate is 0.25kg/hr.m². For the falling rate period data available are given in the table below. **[16]**

x	25	22	19	16	13.6	11	8.2	7.5	6.4
N	0.3	0.27	0.24	0.21	0.18	0.15	0.07	0.044	0.025

x is % moisture content on dry basis and N is drying rate in kg/m².hr. Calculate the batch time required for given drying duty.

Q7) Answer the following by using humidity chart for air-water system with reference to the air having dry bulb temperature of 65C and wet bulb temperature of 30C. **[18]**

- a) Report relative saturation
- b) Report dew point temperature of dry air
- c) Calculate heat to be added per kg of dry air under 1 atm pressure so as to decrease the relative saturation by 20%.

Q8) Write notes. **[16]**

- a) Cooling tower
- b) Tray vs. Rotary dryer.
- c) Spray Column
- d) Flooding and weeping of plate column.

Total No. of Questions : 8]

SEAT No. :

P3651

[4758] - 122

[Total No. of Pages :2

T.E. (Petrochemical)
PETROCHEMICAL PROCESSES - I
(2008 Course) (Semester -I)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Attempt any three questions from each section.*
- 2) Answer to the two sections should be written in two separate answer books.*
- 3) Figures to the right indicate full marks.*
- 4) Assume suitable data where ever necessary.*
- 5) Use of steam tables and electronic calculator is allowed.*

SECTION - I

Q1) Discuss in the uses and potential growth of the following important petrochemicals at global and national level: **[16]**

- a) Polyethylene
- b) Polypropylene
- c) Linear alkyl Benzene
- d) Polyvinyl Chloride

Q2) Discuss the main engineering challenges involved in the process of benzene nitration. **[16]**

Q3) Discuss pertinent properties, consumption pattern, method of production and engineering problems therein for **[16]**

- a) Aniline
- b) Ethanol

P.T.O.

- Q4)** a) Write a brief note on reactive distillation.
b) Explain engineering challenges involved in alkylation of benzene.

[18]

SECTION - II

- Q5)** a) Discuss how the so-called petrochemicals can be produced from biomass.
b) Describe in brief lactic acid production from whey.

[16]

- Q6)** a) Explain in detail emulsion polymerization.
b) Discuss in detail how molecular weight distribution can affect the properties of polymers.

[16]

- Q7)** a) Explain in brief properties and synthesis of carbon nanotubes (CNT).
b) Write a note on possible applications of CNT.

[18]

- Q8)** Write notes [16]
- a) Bioreactor
 - b) Catalyst in Polymer Manufacture
 - c) Uses of Polystyrene
 - d) Ethylene Oxide process



Total No. of Questions : 12]

SEAT No. :

P3652

[4758] - 123

[Total No. of Pages :3

T.E. (Petrochemical)

INSTRUMENTATION AND INSTRUMENTAL ANALYSIS

(2008 Course) (Semester - I)

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, Q.11 or Q.12.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of electronic calculators, steam table is allowed.*
- 4) *Draw neat sketch wherever necessary.*

SECTION - I

- Q1) a)** Explain the types of measurement uncertainties in detail **[8]**
- b) Define: Accuracy, Precision, Repeatability, Reproducibility, Hysteresis, Drift, Fidelity, Dead zone. **[8]**

OR

- Q2) a)** Give the classification of the measuring instruments. **[8]**
- b) Explain hierarchy of standards and calibration. **[8]**

- Q3) a)** Explain the principle, construction and working of a radiation pyrometer. **[8]**

- b) Explain pressure measurement using different types of manometers. **[8]**

OR

- Q4) a)** Explain the various types of level indicators using magnetic properties. **[8]**
- b) Write a note on electromagnetic flow meter. **[8]**

P.T.O.

- Q5)** a) Explain the use of psychrometric chart. [6]
b) What do you mean by 'inherent characteristics' of control valves? [6]
c) Write a note on the programmable logic controller. [6]

OR

- Q6)** a) Write a note on hygrometer. [6]
b) What are the factors to be considered while selecting a control valve? [6]
c) Explain feed back control loop in automatic process control. [6]

SECTION - II

- Q7)** a) Give the principle and working of HPLC. [8]
b) Describe types of detectors used in gas chromatography. [8]

OR

- Q8)** a) Explain composition analysis using refractive index method. [8]
b) Describe the various sampling techniques. [8]

- Q9)** a) Why is the internal standard procedure seldom used in atomic absorption procedures? Give the Procedure. [10]
b) How will you determine lead in petrol using Atomic Absorption Spectroscopy. [8]

OR

Q10)a) Write a note on X ray diffraction method used for composition analysis. [8]

b) What is the principle and applications of NMR? Define Chemical Shift; Spin Spin coupling; equivalent hydrogen; integral curve. [10]

Q11)a) Discuss total hydrocarbon analysis. [8]

b) Explain the method of analysis using thermal conductivity. [8]

OR

Q12)a) Describe briefly the characteristics of an optically active substance. [8]

b) Write a note on the mass spectrometer. [8]



Total No. of Questions : 12]

SEAT No. :

P2292

[4758] - 124

[Total No. of Pages :2

**T.E. (Petrochemical Engineering)
PETROCHEMICAL PROCESSES - II
(2008 Course) (312410) (Semester - II)**

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer to the two sections should be written in separate answer books.*
- 2) *Answer Q1 or Q2, Q3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of Calculator is allowed.*
- 6) *Assume suitable data if necessary.*

SECTION - I

- Q1)** a) What do you mean by ASTM distillation? Describe it in brief and give its significance. [8]
b) Write a short note on the composition of petroleum. [8]
OR
- Q2)** a) Write a note on the various types of octane numbers. [8]
b) What are the various low boiling products from a refinery? [8]
- Q3)** a) Explain the electrostatic process for desalting of crude. [9]
b) Discuss the process of propane deasphalting for the manufacture of lube oil base stock. [9]
OR
- Q4)** a) Enlist the various crude distillation products. [6]
b) Explain the sulphuric acid alkylation process. [8]
c) What are dewaxing aids? Give their importance. [4]
- Q5)** a) Draw a neat labeled diagram of a typical FCC unit. Discuss the role of regenerator. [8]
b) Write a note on the types of petroleum coke. Also give the uses of petroleum coke. [8]

OR

P.T.O.

- Q6)** a) Discuss the once through Claus process for the sulphur recovery from refinery gases. [8]
b) Give the need for air blowing of bitumen and explain the process for the same. [8]

SECTION - II

- Q7)** a) What is catalytic reforming? Give its significance. What are the typical feedstocks to the reformer? [9]
b) Write a note on xylene isomerization. [9]

OR

- Q8)** a) Explain the semi-regenerative process for catalytic reforming. [9]
b) Give the various steps in the production of hydrogen by steam. [9]

- Q9)** a) Describe the process for the manufacture of polystyrene by bulk polymerization. [8]
b) Describe the Borstar process for the manufacture of polyethylene. [8]

OR

- Q10)**a) Describe the Union carbide process for the manufacture of polypropylene. [8]
b) Describe the method of manufacture of melamine formaldehyde resin. [8]

- Q11)**a) Give the process steps involved in the manufacture of nylon - 66. [8]
b) Draw a neat labeled flow sheet for the manufacture of dimethyl terephthalate (DMT) clearly showing all raw materials, intermediate products and final products. [8]

OR

- Q12)**a) Give the manufacturing process for polyester from purified terephthalic acid (PTA). [8]
b) Discuss the various routes for the manufacture of caprolactum. [8]



Total No. of Questions : 8]

SEAT No. :

P3653

[4758]-125

[Total No. of Pages : 3

T.E. (Petrochemical)
MASS TRANSFER - II
(2008 Course) (Semester - II)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) *Attempt any three questions from each section.*
- 2) *Answers to the two sections should be written in two separate answer books.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data wherever necessary.*
- 5) *Use of steam tables and electronic calculator is allowed.*

SECTION - I

Q1) Feed to distillation column consists of equimolar mixture of benzene and toluene. The column is supposed to recover bottom and top products at 99% purity each. For 100 Kmol/hr of 30% vaporized feed, **[18]**

- a) Calculate product stream rates,
- b) Assuming relative volatility of benzene as 3.0 with respect to toluene, calculate operating reflux ratio that you will use.
- c) Calculate the number of theoretical plates required and the optimum feed plate location.
- d) Calculate the vapor and liquid flow rates in rectifying and stripping sections in Kmol/hr.

Q2) With reference to single stage distillation, answer the following: **[16]**

- a) Where it is used as a separation strategy?
- b) A feed to flash vessel consists of saturated liquid mixture of A (70 Mol%) and B (30 Mol%) at the flow rate of 1500 Kmol/hr. Temperature and pressure of the flash chamber are such that the feed gets 20% vaporized. Assuming relative volatility of A as 1.36 with respect to B, calculate the vapor and liquid product flow rates and their compositions.

P.T.O.

Q3) With reference to steam distillation, answer the following: [16]

- a) Derive the basic governing equation for calculating temperature.
- b) At the operating steam distillation temperature, vapor pressures of water and the heavy organic (MW 175) are 720 mm Hg and 40 mm Hg respectively. What will be the composition of the distillate?

Q4) Write precise notes (not more than ten lines each): [16]

- a) Theoretical stage
- b) Non-ideal behaviour
- c) Optimum reflux ratio

SECTION - II

Q5) Calculate the number of ideal trays required for the absorber designed for removing organic vapors from a gas. Feed gas flow rate is 10.0 m³/s at NTP and contains 2% by volume organic vapors. Expected recovery is 90%. Solvent (MW 250) fed counter-currently is pure and is fed at the rate of 1.5 times the minimum. Henry's law statement is given as: $y = 0.155 x$, where y is gas side mol fraction of the organic and x is solvent side mol fraction at equilibrium. [18]

Q6) Nicotine in water is to be recovered using pure kerosene as solvent. Distribution law for nicotine in water and kerosene at equilibrium is given by: $y=0.96 x$ where y is kg nicotine /kg kerosene and x is kg nicotine/kg water at equilibrium. Water and kerosene are not miscible with each other. The scheme of extraction is to contact 100 kg of the aqueous solution containing 1 wt% nicotine with 50 kg pure kerosene in a single equilibrium contact. Calculate % recovery of nicotine from the feed solution. Assume kerosene and water are immiscible with each other. [16]

Q7) With reference to adsorption as a unit operation write the following notes: [16]

- a) Langmuir Isotherm.
- b) Desired characteristics of adsorbent.
- c) Pressure Swing Adsorption.

Q8) Component X in water is to be recovered using pure Y as solvent. Distribution law for X in water and Y at equilibrium is given by: $y = 0.95x$ where y is kg X/kg Y and x is kg X/kg water. Water and Y are not miscible with each other. Compare recovery of X using 2 stages with the recovery obtained using single stage option. The ratio of total Y to feed water remains the same at 2:1 in both the cases. In 2 stage option, solvent can be assumed to be evenly distributed over the stages. Solve graphically. **[16]**

EEE

Total No. of Questions : 12]

SEAT No. :

P3654

[4758]-126

[Total No. of Pages : 4

**T.E. (Petrochemical Engineering)
REACTION ENGINEERING-I
(2008 Course) (Semester-II) (312409)**

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer any three questions each from remaining questions from Section-I and Section-II.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn and well commented.*
- 4) *Use of logarithmic tables and 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 effect of temperature on reaction rate according following theories: **[6]**
- i) Arrhenius Theory.
 - ii) Collision Theory.
 - iii) Transition State Theory.
- b) Derive an expression for a second order irreversible reaction taking place in an isothermal variable volume batch reactor. **[8]**
- c) Explain various factors affecting on rate of reaction. **[4]**

OR

- Q2) a)** A certain reaction has a rate given by $-r_A = 0.005 C_A^2$, mol/cm³. min. If the concentration is to be expressed in mol/liter and time in hours, what would be the value and units of the rate constant? **[10]**
- b) Define activation energy. Draw the diagram showing the activation energy for exothermic and endothermic reversible reaction. What is the role of activation energy in a chemical reaction. **[8]**

P.T.O.

Q3) a) In a homogeneous isothermal liquid polymerization, 20% of the monomer disappears in 34 minutes for initial monomer concentration of 0.04 and also for 0.8 mole/liter. What rate equation represents the disappearance of the monomer? [8]

b) Compare Integral method of analysis with differential method of analysis. [8]

OR

Q4) a) Define space time and space velocity. Derive the performance expression for ideal steady state plug flow reactor. [10]

b) How does the concentration level of reactants affect the product distribution in parallel reactions? Explain with suitable examples. [6]

Q5) a) Derive the performance equation for constant volume batch reactor where first order reaction takes place. Give the graphical representation also. [8]

b) For irreversible first order reaction, $A \xrightarrow{k_1} B \xrightarrow{k_2} C$, the values of rate constants k_1 and k_2 are reported as 0.195 min^{-1} and 0.125 min^{-1} respectively. [8]

Calculate:

i) the time at which the concentration of B is maximum.

ii) maximum concentration of B

Date: $C_{A0} = 1.25 \text{ mole/liter}$.

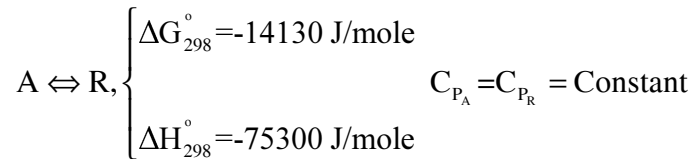
OR

Q6) a) In a batch reactor the conversion of a liquid reactant A is 70% in 13 min. Find the space time required to effect this conversion in a plug flow reactor and a mixed flow reactor. Assume first order kinetics. [8]

b) Discuss equal sized mixed flow reactors in series. [8]

SECTION-II

Q7) Between 0°C and 100°C determine the equilibrium conversion for the elementary aqueous reaction **[18]**



- i) Present the results in the form of a plot of temperature versus conversion.
- ii) What restrictions should be placed on the reactor operating isothermally if we are to obtain a conversion of 75% or higher.

OR

Q8) The tracer output concentration and time data are given below in Table 1 represent a continuous response to a pulse input into a closed vessel which is to be used as a chemical reactor. Calculate the mean residence time of fluid in the vessel t , and tabulate and plot the exit age distribution E . **[18]**

Table 1. Time versus Tracer Output Concentration

Time t , min	Tracer Output Concentration, C_{pulse} , gm/liter fluid
0	0
5	3
10	5
15	5
20	4
25	2
30	1
35	0

Q9) Write short notes:

[16]

- a) E, F and C Curve.
- b) Causes of Nonideal Flow.
- c) Optimum Temperature Progression.

OR

Q10)a) The first order reversible liquid reaction $A = R$, $C_{A0} = 0.5$ mol/lit, $C_{R0} = 0$ takes place in a batch reactor. After 8 minutes, conversion of A is 33.3% while equilibrium conversion is 66.7%. Find the rate equation for this reaction. [8]

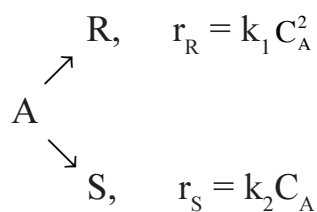
- b) Discuss the effect of temperature on equilibrium conversion as predicted by thermodynamics keeping pressure fixed and discuss optimum temperature progression. [8]

Q11)a) After 8 minutes in a batch reactor, reactant A ($C_{A0} = 1$ mol/lit) is 80% converted. After 18 minutes conversion is 90%. Find the rate of reaction (K and order both). [8]

- b) Explain recycle ratio and derive the performance equation of recycle plug flow reactors. [8]

OR

Q12) Substance A in the liquid phase produces R and S by the following reactions:



The feed ($C_{A0} = 1.0$, $C_{R0} = 0$, $C_{S0} = 0.3$) enters two mixed flow reactors in series ($\tau_1 = 5$ min, $\tau_2 = 15$ min.).

Knowing the composition in the first reactor ($C_{A1} = 0.45$, $C_{R1} = 0.25$, $C_{S1} = 0.65$), find the composition leaving the second reactor. [16]



Total No. of Questions : 12]

SEAT No. :

P3655

[4758] - 127

[Total No. of Pages :4

**T.E. (Petrochemical Engineering)
TRANSPORT PHENOMENA
(Semester - II) (2008 Course) (312407)**

Time : 3Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1) a)** What is analogy? Discuss the analogy among momentum, heat and mass transfer with respect to transport mechanism. **[8]**
- b) With help of neat diagram explain the shear stress shear strain diagram for the Newtonian and non-Newtonian fluids. Provide examples of each. **[8]**

OR

- Q2) a)** Obtain the shear stress τ_{yz} and the velocity gradient or shear rate $\frac{dv_z}{dy}$ in SI unit for ethanol stored in a shallow tank of depth 0.5 cm and the top layer (open to atmosphere) is displaced at constant velocity 10 cm/s. Viscosity of ethanol = 1.77 cP. **[8]**
- b) Derive Reynolds Analogy and highlight all the assumptions clearly. **[8]**
- Q3) a)** With help of neat diagram derive equation of continuity for the Cartesian co-ordinate. **[9]**
- b) A power law fluid having $\rho = 1231 \text{ kg/m}^3$ is flowing through 21.3 m tube with ID = 0.06 m with $v_{avg} = 0.079 \text{ m/s}$. Rheological properties of fluids are $K' = 14.03 \text{ N.s}^{n'}/\text{m}^2$ and $n' = 0.6$. Calculate $\Delta\rho$ and frictional loss. **[9]**

P.T.O.

OR

- Q4)** a) Draw the flow profile of a falling film. Obtain the mathematical expression while mentioning all the important assumptions considered. [8]
b) Prove that velocity profile for Bingham plastic fluids flowing through a pipe of radius R can be represented by the expression. [10]

$$v_x = \left(\frac{p_0 - p_L}{4\mu L} \right) R^2 \left[1 - \left[\frac{r}{R} \right]^2 \right] - \frac{\tau_0}{\mu} R \left[1 - \frac{r}{R} \right]$$

Obtain the expression for overall flow-rate of the fluid flowing through the pipe.

- Q5)** a) What is turbulence? Briefly explain key characteristics of turbulence. [8]
b) Write a short note on Prandtl's mixing length and Eddy thermal diffusivity. [8]

OR

- Q6)** a) What do you mean by Reynolds stresses? State and explain the terms involved in the modified equation of motion for turbulent flow. [8]
b) With help of neat sketches explain following terms and their inter-relations: [8]
i) instantaneous velocity,
ii) fluctuating velocity and
iii) time averaged velocity.

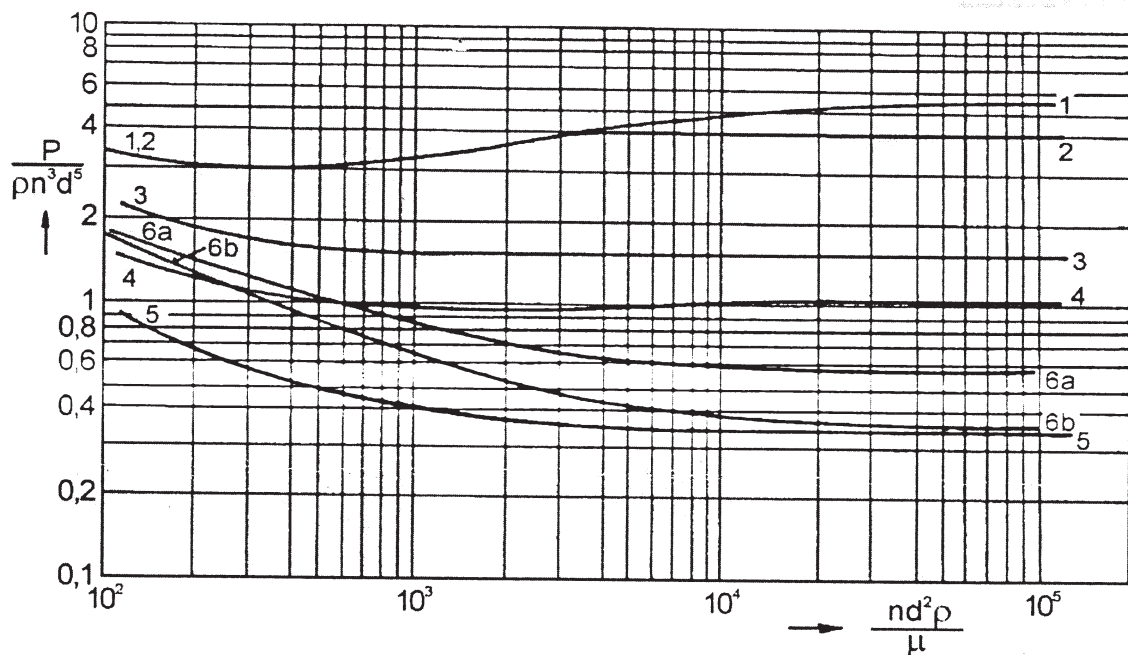
SECTION - II

- Q7)** a) Define and distinguish Agitation and Mixing - Provide relevant example. [8]
b) Explain the standard design of agitated vessel along with the proper dimensions. [8]

OR

- Q8)** a) It is desired to agitate a liquid having viscosity of 2.7×10^{-2} Pa.s and density of 945 kg/m^3 in a tank having a diameter of 2.4 m. The agitator will be a six - blade open turbine of diameter 0.4 m operating at 320 rpm. The tank has four vertical baffles, each with a width J of 0.2m. Calculate the required kW. [8]

Power characteristics of high-speed impellers operated in baffled vessel



- 1 – six-blade turbine with disk (Rushton turbine) (CVS 69 1021), 2 – six-blade open turbine, 3 – pitched six-blade turbine with pitch angle 45 (CVS 69 1020), 4 – Pitched three-blade turbine with pitch angle 45° (CVS 69 1025.3), 5 – propeller (CVS 60 1019), 6a,b – high shear stress impeller (CVS 69 1038.1.2)

- b) Explain how can CFD provide benefits in agitation and mixing. In this context also highlight the scale-up issues. [8]

Q9) a) A slab of material 1.5 m thick is at uniform temperature of 100 °C. The front surface is suddenly exposed to a constant bulk temperature of 0 °C. The convective resistance is zero ($h = \infty$) and back surface of the slab is insulated. Considering thermal diffusivity (α) of 2.0×10^{-5} m²/s. Using five slices of thickness 0.2 m each, calculate the temperature profile at $t = 6000$ s. Schmidt method can be used for the simulation. [10]

- b) Write a detailed note on Prandtl length mixing model in Heat Transfer. [8]

OR

Q10) a) Derive the 1D unsteady state heat conduction equation. Provide neat diagram. [7]

- b) Write down the generalized equation for heat conduction in all the three dimensions. [3]

- c) Name various numerical techniques which can be utilized for solving the above defined problem. Discuss any of these methods in details and provide the temperature profile expected. [4]
- d) Draw and explain thermal boundary layer. [4]

Q11)a) Obtain the mathematical expression for unsteady state diffusive transport in a cube. Write all the assumptions clearly.

Considering steady state condition, obtain the final model expression. [10]

- b) Solve the equation obtained using any numerical technique. Comment on the Boundary Conditions. [6]

OR

Q12)a) Consider steady state simple diffusion of inert component A along z direction, the resultant equation is represented below: [10]

$$\frac{d^2C_A}{dz^2}=0$$

If concentration of component A at the entry port be 50 kmol/m³ and concentration measured at a location 2.0 m from entry port be 20 kmol/m³, obtain the concentration at locations 0.5, 1.0 and 1.5 m distant from the entry port using any suitable numerical technique.

Provide a neat sketch of the problem.

- b) Write a short note on Turbulent Mass Diffusivity. [6]



Total No. of Questions : 12]

SEAT No. :

P2293

[4758]-128

[Total No. of Pages : 4

T.E. (Petrochemical Engg.)

PROCESS EQUIPMENT DESIGN & DRAWING

(2008 Pattern) (Semester - II)

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 in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam table is allowed.*
- 6) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Discuss design fundamentals applied to process equipment. [7]
- b) Discuss the important mechanical properties useful for selection of material of construction. [7]
- c) Enlist 10 process equipment design company names. [2]

OR

- Q2)** a) Discuss the general design procedure applicable in Process Equipment Design. [8]
- b) How codes and standard provides facility to design engineer? Name 8 organizations which create Code and Standards. [8]

Q3) Design a flange coupling to transmit a torque of 250 N-m between two coaxial shafts. The shaft is made of alloy steel, flanges out of cast iron and bolts out of steel. Four bolts are used to couple the flanges. The shafts are keyed to the flange hub. The permissible stresses are given below:

P.T.O.

Shear stress on shaft = 100 MPa

Crushing stress on shaft = 250 MPa

Shear stress on keys = 100 MPa

Bearing stress on keys = 250 MPa

Shearing stress on cast iron = 200 MPa

Shear stress on bolts = 100 MPa

It is also given that the width of key is 10 mm and thickness is 8 mm. [16]

OR

Q4) Write a note on: [16]

- Types of belt drives and their selection criteria.
- Advantages & disadvantages of chain drives over belt drive.
- Different theories of failure. (minimum three).
- Stress concentration and methods to reduce it.

Q5) Design a rubber belt drive a dynamo generating 20 kW at 2250 r.p.m. and fitted with a pulley 200 mm diameter. Assume dynamo efficiency to be 85%. [18]

Allowable stress for belt = 2.1 MPa

Density of rubber = 1000 kg/m³

Angle of contact of dynamo pulleys = 165°

Coefficient of friction between belt and pulleys = 0.3.

OR

Q6) A pressure vessel having outer diameter 1.3 m and height 3.8 m is subjected to an internal pressure of 12 kg/cm². If the vessel is fabricated as class B vessel joint efficiency is 85%; if the vessel is fabricated as class C vessel, with welded joint efficiency is 70% and 50%; if the vessel is provided with a strip all along the longitudinal joint, joint efficiency is 100%. Calculate the vessel thickness under these conditions and find out how much is the % material saving by welding a strip along the longitudinal joint. Allowable stress of the material = 1020 kg/cm² Corrosion allowance is 1mm. [18]

SECTION - II

- Q7)** a) How fouling occurs in Heat Exchangers? Discuss different types of fouling in details. [8]
- b) What are the different criteria used for selection of any heat exchanger for desired operations? [4]
- c) Discuss the method of performance evaluation of any heat exchanger. [4]

OR

- Q8)** a) Explain the classification of heat exchangers and the techniques for performance evaluation. [4]
- b) A heat exchanger with installed heat transfer surface area of 8.1 m^2 is to be used for heating process liquor available at 16.5°C . The heating is to be performed with water available at 93°C from another part of the plant. The Arrangement of the unit is such that the fluids flow in true counter current manner. The flow rates of the process liquor and water are 3.1 kg/sec and 1.1 kg/sec . respectively. Previous experience indicates that an overall heat transfer coefficient of $450 \text{ W/m}^2 \text{ K}$ is suitable. Estimate the exit temperatures of the two fluids and determine the effectiveness of the heat exchanger. [12]
- Q9)** a) Discuss the various types of losses in storage vessels. [8]
- b) Discuss the importance of bottom plate and different thickness course needed to build the storage tank. [8]

OR

- Q10)**a) Draw various types of roofs used in storage vessel along with conditions in which it is used. [8]
- b) How are the optimum proportion of a storage tank determined when the shell thickness is independent of diameter and height and when the shell thickness is dependent on diameter and height? [8]

Q11) Design a Shell of Pressure vessel with following data

[18]

Shell Data:

Internal diameter (Approx)	= 1400mm
Material	= Stainless Steel
Permissible stress at 150°	= 140 N/mm ²
Internal pressure	= 0.35 N/mm ²
Weight	= 38000 N
Joint efficiency	= 0.85
Torque Offset piping	= 500 N-m

OR

Q12) Write Short Notes on (Any four):

[18]

- Importance of study of PEDD for Chemical Engineers.
- Pipeline color codes for different pipe lines.
- IS Code for design of equipment.
- Pipeline Design considerations.
- Classification of Pipe supports.
- Factor of safety and its importance in design.

EEE

Total No. of Questions : 12]

SEAT No. :

P2294

[4758] - 129

[Total No. of Pages : 6

T.E. (Petroleum Engg.)

NUMERICAL METHODS AND GEO-STATISTICS

(2008 Pattern) (Semester - I)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6 from Section -I and Q7 or Q8, Q9 or Q10, Q11 or Q12 from Section -II.
- 2) Answers to the two sections should be written in separate answer books.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Figures to the right side indicate full marks.
- 5) Use of logarithmic books, electronic pocket calculator is allowed.
- 6) Assume suitable data, if necessary.

SECTION - I

Q1) a) Determine the analytic function whose real part is $e^{2x} (x \cos 2y - y \sin 2y)$. [6]

b) Evaluate $\oint_C \frac{e^{2z}}{(z+1)^4} dz$, where C is the circle $|z|=2$. [5]

c) Find the bilinear transformation which maps the points $z = 1, i, -1$, into the points $w = i, 0, -i$. [6]

OR

Q2) a) Find the analytic function, $f(z) = u + iv$, where $u = r^3 \cos 3\theta + r \sin \theta$. [6]

b) Evaluate $\oint_C \frac{3z^2 + z}{z^2 - 1} dz$, where C is the circle $|z - 1| = 1$. [5]

c) Show that the map of the real axis of the z -plane on the w -plane by the transformation $w = \frac{1}{z+i}$ is a circle. [6]

P.T.O.

- Q3) a)** Calculate the first four central moments about the mean for the following data. [8]

Variate	1	2	3	4	5	6	7	8	9
Frequency	1	6	13	25	30	22	9	5	2

- b) Find the coefficient of correlations for the following table: [8]

x	10	14	18	22	26	30
y	18	12	24	6	30	36

OR

- Q4) a)** The following data of an analysis of a correlation data is found. Variance of $x = 9$, Regression equations:

$$8x - 10y + 66 = 0$$

$$40x - 18y = 214$$

Find mean of x and y , standard deviation of y and correlation coefficient between x and y . [8]

- b) The following are scores of two batsman A and B in a series of innings. Who is consistent batsman. [8]

A:	12	115	6	73	7	19	119	36	84	29
B:	47	12	16	42	4	51	37	48	43	0

- Q5) a)** If the mean of a binomial distribution is 3 and the variance is $\frac{3}{2}$, find the probability of obtaining at least 4 success. [5]
- b) A certain screw making machine produces on average 2 defective screws out of 100, and they are packed in boxes of 500. Find the probability that a box contains 15 defective screws. [6]
- c) A sample of 100 dry battery cells tested to find the length of life produced the following results: $\bar{x} = 12$ hours. $\sigma = 3$ hours. Assuming the data to be normally distributed what percentage of battery cells are expected to have life between 10 and 14 hours. [Area = 0.2487 when $z = 0.67$]. [6]

OR

- Q6)** a) If a random variable has a Poisson distribution such that $P(1) = P(2)$ find mean of the distribution and $P(4)$. [5]
- b) The probability that a pen manufactured by a company will be defective is $\frac{1}{10}$. If 12 such pens are manufactured find the probability that [6]
- exactly two will be defective
 - none will be defective.
- c) The probability that a book will be favourably reviewed by three independent critics are $\frac{5}{7}, \frac{4}{7}$ and $\frac{3}{7}$ respectively. What is the probability that out the three critics a majority will be favourable. [6]

SECTION - II

- Q7)** a) Establish the following. [9]
- $\Delta = \mu\delta + \frac{1}{2}\delta^2$.
 - $E = 1 + \frac{\delta^2}{2} + \delta \left\{ 1 + \frac{\delta^2}{4} \right\}^{1/2}$
 - $\delta = E^{1/2} \nabla = E^{-1/2} \Delta$.
- b) Calculate the value of π , by using Simpson's $\frac{1}{3}$ rd rule, evaluating a suitable definite integrat. [7]

OR

Q8) a) Find Newton's interpolating polynomial, satisfying the data. [9]

x	0	1	2	3	4
y	-4	-4	0	14	44

b) The speed of a train which starts from rest is given by the following table, the time being recorded in minutes from the start and the speed in kms. per hour. [7]

t	2	4	6	8	10	12	14	16	18	20
$v = \text{speed}$	10	18	25	29	32	20	11	5	2	0

Find approximately the total distance run in 20 minutes.

Q9) a) Obtain one root of the equation $8x^3 - 6x - 1 = 0$, correct to four decimal places using Newton-Raphson method. Take $x_0 = 0.95$. [8]

b) Use method of least squares to fit a parabola of the form $y = ax^2 + bx + c$ to the following data [9]

x	1	2	3	4	5	6	7
y	-5	-2	5	16	31	50	73

OR

Q10) a) Use Gauss-seidal method to solve the system of equations [8]

$$10x_1 + x_2 + x_3 = 12$$

$$2x_1 + 10x_2 + x_3 = 13$$

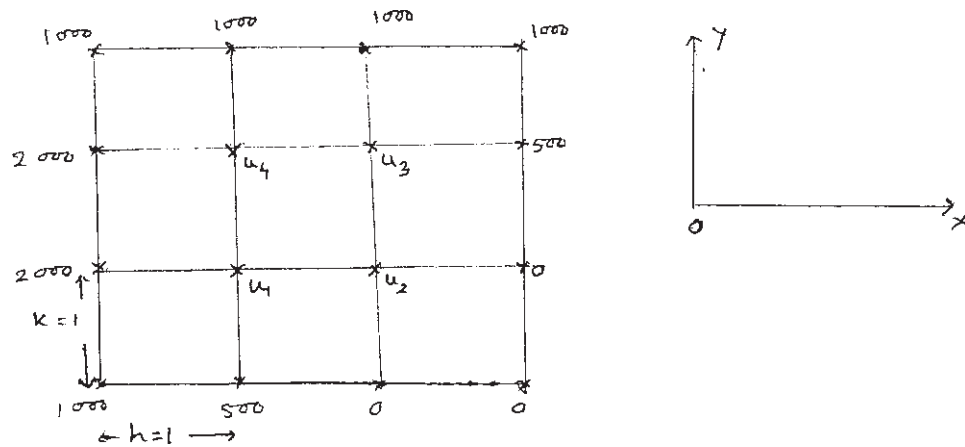
$$2x_1 + 2x_2 + 10x_3 = 14$$

b) Use Runge-Kutta method of fourth order to solve the equation

$$\frac{dy}{dx} = \sqrt{x + y}; \text{ subject to } x = 0, y = 1 \text{ to find } y \text{ at } x = 0.2 \text{ taking } h = 0.1. [9]$$

Q11)a) Solve the equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ with respect to the grid shown below.

[8]



b) Solve the following LPP by simplex method

[9]

$$\text{Minimize } Z = x_1 - 3x_2 + 2x_3$$

$$\text{Subject to: } 3x_1 - x_2 + 3x_3 \leq 7$$

$$-2x_1 + 4x_2 \leq 12$$

$$-4x_1 + 3x_2 + 8x_3 \leq 10$$

$$\text{and } x_1, x_2, x_3 \geq 0.$$

OR

Q12)a) Use Implicit finite difference method to solve the equation $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ with the conditions $u(0,t) = 0, u(1,t) = 0$.

[9]

$$u(x,0) = 2x, \quad 0 \leq x \leq \frac{1}{2}$$

$$= 2(1-x), \quad \frac{1}{2} \leq x \leq 1, \quad \delta x = 0.1, \delta t = 0.01.$$

Find $u(x,t)$ at the nodal points at $t = 0.01$.

b) Solve the following LPP by Simplex method

[8]

$$\text{Maximize } Z = 3x_1 + 2x_2$$

$$\text{Subject to: } x_1 + x_2 \leq 4$$

$$x_1 - x_2 \leq 2$$

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



Total No. of Questions : 12]

SEAT No. :

P2256

[4758] - 13

[Total No. of Pages :5

T.E. (Mechanical) (Common to Mech S/W, Automobile)

HEAT TRANSFER

(2008 Course) (302042)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer 3 questions from Section I and 3 questions from Section II.*
- 2) *Answer to the Two Sections should be written in separate answer books.*
- 3) *Draw Neat diagrams wherever necessary.*
- 4) *Assume suitable data wherever necessary.*
- 5) *Figures to the right indicate full marks.*

SECTION - I

- Q1) a)** Explain the following: **[6]**
- i) Fourier's Law of heat conduction,
 - ii) Newton's Law of cooling
 - iii) Stefan Boltzmann's Law of radiation
- b)** Differentiate between **[8]**
- i) Conduction and Convection
 - ii) Isotropic and anisotropic materials
- c)** A 5 cm diameter steel pipe maintained at a temperature of 60 °C is kept in a large room where the air and wall temperatures are 25 °C. If the surface emissivity of steel is 0.85, calculate the total heat loss per unit length, if the convective heat transfer coefficient is 6.5 W/m² °C, **[4]**

OR

- Q2) a)** A furnace wall lining is made up of a material with $k = 2.5$ W/mK. The temperatures of the inner and outer surfaces of this plane wall lining are 810 °C and 330 °C respectively. the outer surface is exposed to ambient air at 30 °C with convective heat transfer coefficient = 10 W/m²K. **[9]**
- Calculate:
- i) The rate of heat flow per unit area
 - ii) Thickness of lining in given situation.
 - iii) The thickness of lining required if the heat flow rate is to be reduced by 50%.

P.T.O.

- b) Explain Electrical analogy of heat transfer. [5]
- c) Write a note on variation of thermal conductivity for metals. [4]

- Q3)** a) Derive the expression for critical radius of insulation for a cylinder with usual notations. [8]
- b) A steel tube with 5 cm ID and 7cm OD($k = 28 \text{ W/mK}$) is covered with an insulation covering of thickness 15mm ($k = 0.2 \text{ W/m } ^\circ\text{C}$). A hot gas at a temperature of $400 \text{ }^\circ\text{C}$ with convective heat transfer coefficient of $300 \text{ W/m}^2\text{K}$ flows inside the tube. The outer surface of insulation is exposed to cold air at -5°C with $h = 20 \text{ W/m}^2\text{K}$. Calculate the heat flow rate from the pipe and the interface temperature between steel and insulation. [8]

OR

- Q4)** a) Write a note on Thermal contact resistance. [4]
- b) Nichrome having a resistivity of $100 \mu\Omega\text{cm}$ is to be used as a heating element in a 10 kW heater. The nichrome surface temperature should not exceed $1220 \text{ }^\circ\text{C}$. Other design features include, surrounding air temperature as $20 \text{ }^\circ\text{C}$, Outside surface coefficient = $1150 \text{ W/m}^2\text{K}$, thermal conductivity of nichrome as 17 W/mK . Find out the diameter of nichrome wire necessary for a 1 m long heater. Also find the rate of current flow. [8]
- c) Explain why the concept of critical radius is not applicable for plane wall? [4]

- Q5)** a) Starting from the boundary conditions, derive the expressions for temperature distribution along the length and heat flow rate for a very long fin using standard notations. [8]
- b) A centrifugal pump which circulates a hot liquid metal at $500 \text{ }^\circ\text{C}$ is driven by a 3600 rpm electric motor. The motor is coupled to the pump impeller by a horizontal steel shaft 25mm in diameter. If the temperature of the motor is limited to a maximum value of $60 \text{ }^\circ\text{C}$ with the ambient air at $25 \text{ }^\circ\text{C}$, what length of the shaft should be specified between the motor and the pump. Assume $k = 35 \text{ W/mK}$ for shaft material and $h = 15.7 \text{ W/m}^2\text{K}$. Consider insulated tip condition for fin analysis. [8]

OR

- Q6) a)** Derive the expression for Lumped heat capacity with usual notations. [8]
- b) A solid brass sphere 20 cm diameter initially at a temperature of 200 °C is suddenly exposed to air stream at -10 °C with a convection heat transfer coefficient of 50 W/m²K. Find the time required by the sphere to attain the temperature of 0 °C. If the brass sphere is replaced by copper sphere, what percent increase or decrease in time will occur to attain the same temperature of 0 °C. Properties are [8]
- i) Copper : $\rho = 7670 \text{ kg/m}^3$, $C = 372 \text{ J/kg } ^\circ\text{C}$, $k = 370 \text{ W/mK}$
- ii) Brass : $\rho = 8552 \text{ kg/m}^3$, $C = 385 \text{ J/kg } ^\circ\text{C}$, $k = 100 \text{ W/mK}$

SECTION - II

- Q7) a)** Explain in brief following terms: [8]
- i) Black surface,
- ii) Radiation shape factor,
- iii) Intensity of radiation,
- iv) Reflectivity of surface.
- b) Two large parallel plates are maintained at temperatures of 600 °C and 300 °C having their emissivities of 0.9 and 0.4 respectively. A radiation shield having emissivity of 0.02 is inserted in between them.
- Calculate [8]
- i) Heat transfer rate without shield,
- ii) Heat transfer rate with shield and
- iii) Temperature of shield.

OR

- Q8) a)** Write note on Radiation shield. [8]
- b) Consider a black body at a temperature of 2000 K. Calculate its total hemispherical emissive power. Also calculate the wavelength at which the maximum emissive power is available from this body.
- State and explain the laws of radiation which you have used to calculate the above mentioned quantities. [8]

Q9) a) Explain Velocity and Thermal boundary layer. **[8]**

b) Water at 3000 kg/hr is heated from 30 °C to 70 °C by pumping it through a heated pipe. Diameter of tube is 25mm and its surface temperature is 110 °C. Estimate the length of the tube and the rate of heat transfer from tube to water.

$$\text{Use } Nu = 0.023 (Re)^{0.8} (Pr)^{0.4}$$

Thermophysical properties of water at 50 °C are

$$\rho = 972 \text{ kg/m}^3, \mu = 355 \times 10^{-6} \text{ Ns/m}^2, k = 0.667 \text{ W/mK},$$

$$C_p = 4187 \text{ J/kgK}. \quad \text{[8]}$$

OR

Q10)a) Identify the characteristic dimension for following cases in Natural convection. **[4]**

i) Vertical cylinder,

ii) Horizontal cylinder,

iii) Horizontal plate,

iv) Sphere.

b) Define and explain the significance of Prandtl number and Grashof number. **[4]**

c) A horizontal cylinder rod of 4 cm diameter and 60 cm length is initially at a temperature of 124 °C. Calculate the rate of heat loss from it, if it is exposed to still water at 30 °C. **[8]**

$$\text{Use, } Nu = 0.53 Ra^{1/4} \text{ for } 10^4 < Ra < 10^9$$

$$Nu = 0.13 Ra^{1/3} \text{ for } 10^9 < Ra < 10^{12}.$$

Properties of water are $\rho = 937.7 \text{ kg/m}^3$, $\mu = 3.72 \times 10^{-4} \text{ Ns/m}^2$, $k = 0.668 \text{ W/mK}$, $C_p = 4191 \text{ J/kgK}$, $\beta = 6.286 \times 10^{-4} \text{ per K}$

- Q11)a)** A counter flow concentric tube heat exchanger is used to cool engine oil ($C = 2130 \text{ J/kgK}$) from 160°C to 60°C with water ($C = 4186 \text{ J/kgK}$) available at 25°C as the cooling medium. The flow rate of cooling water through the inner tube of 0.5m in diameter is 2 kg/s while the flow rate of oil through the outer annulus O.D. = 0.7 m is also 2 kg/s . If the value of the overall heat transfer coefficient is $250 \text{ W/m}^2\text{K}$, how long must be the heat exchanger to meet its cooling requirement. **[8]**
- b) Derive the expression of LMTD for counter flow heat exchanger with usual notations. **[8]**
- c) Explain significance of NTU. **[2]**

OR

- Q12)a)** Write a note on Regimes of Pool boiling. What is the significance of critical heat flux? **[10]**
- b) A chemical having specific heat of 3.3 kJ/kg K flowing at the rate of $20,000 \text{ kg/hr}$ enters a parallel flow heat exchanger at 120°C . The flow rate of cooling water is $50,000 \text{ kg/hr}$ with an inlet temperature of 20°C . The heat transfer area is 10 m^2 and overall heat transfer coefficient is $1200 \text{ W/m}^2\text{C}$. **[8]**

Taking specific heat of water as 4.186 kJ/kgK , find

- i) Effectiveness of heat exchanger
- ii) Outlet temperature of water and chemical.



Total No. of Questions : 11]

SEAT No. :

P3656

[4758]-130

[Total No. of Pages : 3

T.E. (Petroleum Engineering)
PETROLEUM GEOLOGY - I
(2008 Course) (Semester - I)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) *Answers to the two sections should be written in separate books.*
- 2) *Attempt Q.No.1 or 2, Q.No.3 or 4, Q.No.5 or 6, Q.No.7 or 8, Q.9, Q.10 or Q.11.*
- 3) *Neat diagrams should be drawn wherever necessary.*
- 4) *Figures to the right indicate marks.*

SECTION - I

- Q1) a)** What is a relative abundance of igneous, sedimentary and metamorphic rocks in terms of weight and volume proportion? (Draw a neat sketch)[8]
- b) What are clay minerals? Distinguish between cohesive and in cohesive clay minerals. How are these recognized in the field? Discuss their signification in the sedimentary rocks. [8]

OR

- Q2) a)** Explain the term 'Rock Cycle' with the help of a neat diagram. [8]
- b) Quartz and calcite look alike. What physical properties distinguish them? Explain with the help of a neat sketch, relationship between rate of solubility of quartz and calcite with pH of water. [8]
- Q3) a)** Discuss the characteristics of divergent and convergent plate boundaries with suitable examples. [8]
- b) What are the major units of continental margins? Describe in brief continental shelf, continental slope and continental rise. [8]

OR

P.T.O.

- Q4)** a) Give triangular classification of mass movements based on velocity and moisture content. How are different flow deposit recognized based on moisture content and grain size variation. [8]
- b) How is occurrence of an earthquake discussed on the basis of elastic rebound theory. How to deduce the internal structure of the earth based on occurrence of earthquake waves? [8]
- Q5)** a) Distinguish between plunging and nonplunging folds with suitable diagrams. [5]
- b) Discuss the conditions under which hydraulic fractures develop as extensional and shear fractures. [5]
- c) Explain with suitable diagram, what are normal and reverse faults. How to recognize the occurrence of normal and reverse fault in boreholes?[8]

OR

- Q6)** a) How are faults recognized in field? What are sealing faults/ clay smears? Discuss their behavior and significance. [6]
- b) Describe with the help of neat sketches any one geometric classification of folds. Explain the relation between wavelength and amplitude of folds with increasing or decreasing interlimb angle. [12]

SECTION - II

- Q7)** a) What are bedforms? Explain how ripple marks and dunes are generated in response to velocity of water flow and size of particles? [8]
- b) Discuss the classification of sedimentary rocks based on the triangular diagram of Lime - Sand - clay / Mud. [8]

OR

- Q8)** a) Explain in brief the criteria used in deciding textural maturity of sedimentary rocks. [8]
- b) Statistical representation of grain size data. How is sorting decided on the basis of histogram and percent cumulative graph? [8]

Q9) Write notes on (Any Two):

[16]

- a) Abundance and composition of phytoplankton with increasing depth of marine water.
- b) Evolution of coral reefs.
- c) Use of Trace Fossils in Petroleum Exploration.
- d) Index fossils.

Q10)a) Write Standard Geological Time Scale in a tabular form with important events. **[10]**

b) What are offlap and onlap deposits? Explain with suitable diagram. **[8]**

OR

Q11)a) What is an unconformity? Explain the different types of unconformities with the help of neat sketches. **[10]**

b) Explain in brief with suitable diagrams, geological conditions that promote regression, transgression and aggradation of sediments? **[8]**

EEE

Total No. of Questions : 6]

SEAT No. :

P3862

[4758] - 131

[Total No. of Pages : 1

**T.E. (Petroleum Engineering)
DRILLING OPERATIONS
(2008 Pattern)**

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answers to the two sections must be written in separate answer book.*
- 2) *Figures to the right indicates full marks.*
- 3) *Neat diagram should be drawn wherever necessary.*
- 4) *Use a non programmable calculator.*
- 5) *Assume suitable data if necessary and clearly state it.*

SECTION - I

- Q1)** Discuss different components and systems of Drilling rig. Discuss the functions of each in details. **[18]**
- Q2)** a) Discuss different down hole problems in detail. **[12]**
b) Calculate Mud Gradient for 16ppg and 10ppg. **[2]**
c) Calculate capacity of drill pipe bbl/ft if Internal diameter is 4.26". **[2]**
- Q3)** a) Discuss different types of directional wells. **[8]**
b) Discuss the functions of coring and working of core barrel. **[8]**

SECTION - II

- Q4)** a) Discuss Primary cementation with suitable figure. **[9]**
b) Discuss different types of casings, grades, threads in details. **[9]**
- Q5)** Discuss types of mud, rheological properties and functions of mud in details. **[16]**
- Q6)** Draw mud circulation diagram and discuss importance of hydraulics in details. **[16]**



Total No. of Questions : 12]

SEAT No. :

P2295

[4758]132

[Total No. of Pages : 3

T.E. (Petroleum Engineering)

HYDROCARBON PROPERTIES AND THERMODYNAMICS

(2008 Course) (Semester - I) (312384)

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 Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of calculator is allowed.*
- 6) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Write a note on the Joule Thomson Expansion. [6]
- b) State the first law of thermodynamics and provide its mathematical expression explaining all the terms in it. [6]
- c) Define: State Function, closed system, Enthalpy. [6]

OR

- Q2)** a) Oil at 500 K is to be cooled at a rate of 5000 kg/h in a counter current exchanger using cold water available at 295 K. A temperature approach of 10 K is to be maintained at both ends of the exchanger. The specific heats of oil and water are respectively 3.2 and 4.2 kJ/kg K. Determine the total entropy change in the process. [10]
- b) Describe the Carnot cycle. [8]
- Q3)** a) State the virial Equation and give the significance of virial coefficients. [8]
- b) Draw a typical P-T diagram for a multicomponent system. Explain the terms involved in it. Give the significance of the same. [8]

OR

P.T.O.

Q4) Calculate the volume occupied by one mole of oxygen at 300 K and 100 bar using the [16]

- a) Ideal gas equation.
- b) Van der Waals equation. Take 'a' = 0.1378 Nm⁴/mol² and 'b' = 3.18 x 10⁻⁵ m³/mol.

Q5) a) Write a note on the Clapeyron equation and Clausius Clapeyron equation. [8]

- b) What is fugacity? Explain any one method in detail to estimate fugacity. [8]

OR

Q6) a) If the pressure inside a pressure vessel is 200 kPa, what is the boiling point of water inside it? The normal boiling point of water is 373 K and the latent heat of vaporization of water is 2257 kJ/kg at 373 K. [6]

- b) What are partial molar properties? How will you determine the partial molar properties using the graphical method? [10]

SECTION - II

Q7) a) Explain the phase rule for non-reacting systems. Hence determine the available degrees of freedom for the following systems. [9]

- i) A mixture of methane and air at atmospheric pressure and a specified temperature.
 - ii) Two miscible materials with vapour composition specified.
 - iii) Liquid in equilibrium with a mixture of water vapour and nitrogen.
- b) Draw and explain a typical boiling point diagram. How will you get an equilibrium diagram from it? [9]

OR

Q8) A hydrocarbon mixture consisting mixture contains 25% (mol) propane, 40% (mol) n-butane and 35% (mol) n-pentane at 1450 kPa. Determine the bubble point and the dew point temperature. K-values are given as follows. [18]

	T = 355 K	T = 366 K	T = 377 K	T = 388 K
Propane	2.00	2.30	2.60	2.90
n-butane	0.78	0.90	1.10	1.30
n-pentane	0.33	0.40	0.50	0.61

- Q9)** a) Write a note on the various types of diffusion in porous solids. Hence explain Knudsen Diffusivity. [8]
- b) Define permeability and capillary pressure. Give their significance. [8]

OR

- Q10)**a) Explain with the help of neat diagrams the process of primary drainage, secondary drainage and imbibitions. [8]
- b) State and explain the Darcy's law. Give its significance. [8]
- Q11)**a) Explain the significance of gas hydrates in the field of flow assurance. [8]
- b) Enlist the various thermodynamic models for asphaltene precipitation. Explain any one of them. [8]

OR

- Q12)**a) What are the various factors affecting wax precipitation? [8]
- b) Explain a typical solid liquid equilibrium phase diagram. [8]

EEE

Total No. of Questions : 12]

SEAT No. :

P3913

[Total No. of Pages : 3

[4758] - 133

T.E. (Petroleum)

PETROLEUM PRODUCTION OPERATIONS

(2008 Pattern)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Q. No. 1 or 2, Q. No. 3 or 4, Q. No. 5 or 6 from Section - I and Q. No. 7 or 8, Q. No. 9 or 10, Q. No. 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) *Use of logarithmic tables, slide rule, Mollier charts, calculator is allowed.*
- 6) *Assume suitable data if necessary.*

SECTION - I

- Q1)** a) Draw the neat schematic sketch of a typical christmas tree and indicate all the components and accessories of it. **[10]**
- b) Write the exact sequence of major processes and storage elements involved in a production facility from well head to refinery and write the functions of these processes and storage elements in brief. **[8]**

OR

- Q2)** a) Discuss the general design considerations for a well head assembly, christmas tree and its components. **[12]**
- b) Explain how the production of corrosive gases and solids can affect the performance of surface production equipment and facility. **[6]**
- Q3)** a) Draw the schematic sketch of any one type of bottom hole production equipment used in a well bore and explain its working. **[8]**
- b) How the role of surface choke differ from that of SSV and SSSV? Why it is necessary to control the flow rate of a well bore? Explain. **[8]**

P.T.O

OR

- Q4)** a) List all the bottom hole production equipments that are used in a wellbore and write the functions of any four in brief. [10]
b) Write the various applications of production packers. [6]

- Q5)** a) Draw the schematic of a typical Gilbert chart and explain its application in the selection of production tubing size in brief. [10]
b) Draw and explain typical IPR curves for water drive, gas cap drive and solution gas drive reservoir. [6]

OR

- Q6)** a) Explain choke performance curves. [6]
b) Discuss different multiphase flow regimes and explain any one co-relation of it in brief. [10]

SECTION - II

- Q7)** a) Write the standard procedure of well completion. [8]
b) Discuss horizontal well completion in brief. [10]

OR

- Q8)** a) Explain the method of bullet perforation in brief. [8]
b) Write the general design consideration for well completion program. [10]

- Q9)** a) List various PVT properties and explain any two. [9]
b) Discuss Standing's extension on Vogel's work for damaged or improved wells. Also show that, $J^* = 1.8 q' / \text{average reservoir pressure (P)}$. [7]

OR

- Q10)** a) Define gas formation volume factor and calculate it if, Sp. gravity of dry gas is 0.70, reservoir temperature is 210°F, reservoir pressure is 2000 psig and value of gas compressibility factor is 0.83. [8]
b) Calculate the production rate of the wellbore which drains effectively from 40 acre spacing plan of field development. Given data.
Reservoir pressure = 2000 psia. Permeability = 60 md. Net sand thickness = 30 ft. Oil viscosity = 4 cp. Oil formation volume factor = 1.10. The well is completed in 7 inch production casing. P.I. of the wellbore is 0.30 bbl/day-psi. Bottom hole flowing pressure = 600 psi. Assume: No formation damage. For this vertical wellbore or reservoir flow conditions do not change with time. [8]

Q11) a) With help of neat diagram explain, water and gas coning problem and solution to it. [8]

b) Write any four workover problems and remedy to them. [8]

OR

Q12) a) Write in brief, short notes on : [10]

i) Flow regimes in a solution gas drive operated wells.

ii) Matrix acidization.

b) Draw neat schematic sketch of an open hole gravel pack well completion and write its advantages. Name and indicate all the features of it. [6]

⌚ ⌚ ⌚ ⌚

Total No. of Questions : 10]

SEAT No. :

P3657

[4758] - 134

[Total No. of Pages :3

T.E. (Petroleum)

PETROLEUM GEOLOGY - II

(2008 Course) (Semester - II) (312386)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Answers to the two sections should be written in separate books.*
- 2) Figures to the right indicate full marks.*
- 3) Draw neat diagrams whenever necessary.*

SECTION - I

Q1) Answer any five terms of the following.

[20]

- a) Kerogen
- b) Types of subsurface water
- c) Carbon Preference Index
- d) Stability fields of gas hydrates
- e) Source and Reservoir Rocks
- f) Geothermal Gradient
- g) Abnormal pressure

Q2) Distinguish between primary and secondary migration with the help of neat sketches. **[15]**

OR

Q3) Write in brief important physical-chemical properties of oil.

[15]

P.T.O.

Q4) Draw and explain different Geological conditions giving rise to various traps in sand-shale sequence. **[15]**

OR

Q5) What is a petroleum system? What are different components of Petroleum System? **[15]**

SECTION - II

Q6) Answer any five of the following. **[20]**

- a) Cross sectional view of a sedimentary basin
- b) Porosity permeability in rocks
- c) Carbonate reservoir system
- d) Geological heterogeneities
- e) Distribution of petroleum in time and space
- f) Deepwater deposits
- g) Types of subsurface maps
- h) Importance of diagenesis in sedimentary basin analysis.

Q7) How structure contour maps and Isochore maps provide reliable information on geometry of any formation and thickness-compositional variation within the formation respectively? **[15]**

OR

Q8) Write in brief any three of the following. **[15]**

- a) Non-Conventional hydrocarbon resources
- b) Heat flow analysis in sedimentary basin

- c) Sources of subsurface data
- d) Importance of cutting samples
- e) Seismic stratigraphy
- f) Classification of sedimentary basins.

Q9) Describe Petroleum system of any one of the hydrocarbon producing basins of India. **[15]**

- a) Cambay Basin
- b) Krishna Godavari Basin
- c) Mumbai High Basin

OR

Q10) What are Category I petroliferous basins in India? Comment on their prognostic reserves. What are the potential areas from category II basins? **[15]**



Total No. of Questions : 8]

SEAT No. :

P3658

[4758]-135

[Total No. of Pages : 2

T.E. (Petroleum Engineering)
RESERVOIR ENGINEERING - I
(2008 Course) (Semester - II)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) Answers to the two sections must be written in separate answer books.*
- 2) Question No. 2(two) and 8 (eight) are compulsory.*
- 3) Figures to the right indicate full marks.*
- 4) Answer 3 questions from section I and 3 questions from section II.*
- 5) Neat diagrams should be drawn wherever necessary.*
- 6) Use of non- programmable calculator, log-log, and semi-log paper is allowed.*
- 7) Assume suitable data if necessary.*

SECTION - I

- Q1)** a) What is flash and differential Liberation Process. **[4]**
- b) Derive the equation for radial laminar flow of gas in porous media. **[8]**
- c) A gas reservoir drains 130 acres and is partially pressured by a water aquifer. The reservoir permeability is 10 md, porosity is 12% and average pressure is 3500 psia. Temperature is 140 F and formation thickness is 127 ft. Gas viscosity is 0.012 cp and z is 0.9. If the well is flowing at 3150 psia and r_w is 0.4ft, calculate. **[4]**
- i) The Flow rate
 - ii) BHP if rate is increased to 9.5 MMSCF/D
- Q2)** a) What do you mean by fluid compressibility? Give one example of a slightly compressible fluid and an incompressible fluid and draw an appropriate graph to distinguish the two. **[2]**
- b) Derive the flow equation of a slightly compressible fluid flowing inside a porous media. **[10]**

P.T.O.

- c) A fluid of viscosity 2.5 cp and compressibility $45 \times 10^{-6}/\text{psi}$, flows through a porous media of 250 ft length and a cross sectional area of 45 sq ft of permeability 100 md. Find the flow rate through the system in bbl/day.[6]
- i) If the fluid is incompressible.
 - ii) If the fluid is slightly compressible.

Q3) How are surface tension, capillary pressure and wettability related to each other? Explain with appropriate diagrams. [16]

Q4) Draw phase diagrams of single, two, three and multiphase fluids and explain. [16]

SECTION - II

Q5) What do you mean by OOIP and recovery factor? How are they related to each other? Write appropriate equations for the same. [16]

Q6) Derive an expression for gas in place and explain the p/z and F/E_g graph. [16]

Q7) Explain, compare and contrast drive mechanisms and drive indices for different reservoirs by showing various graphs. Do drive indices change for a reservoir? Explain. [16]

Q8) Derive the generalized material balanced equation. [18]

EEE

Total No. of Questions : 12]

SEAT No. :

P3914

[Total No. of Pages : 3

[4758] - 136

T.E. (Petroleum)

PETROLEUM PRODUCTION ENGINEERING - I

(2008 Pattern) (Semester - IV)

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) Classify different types of artificial lift systems and write the working principle of SRP, PCP, ESP, and Jet pump in brief. **[12]**
b) Draw neat schematic sketch of various stages of continuous gas lifting operation. Indicate all features of it. **[6]**

OR

- Q2)** a) With the help of neat schematic sketch explain the well loading and unloading operation in plunger lifting technique. **[9]**
b) List different types of gas lift valves and discuss working of a Casing pressure operated valve. **[9]**

- Q3)** a) For a continuous flow injection, use the following data and graphically decide depth for point of gas injection. **[10]**
Depth = 8500 ft. Expected rate = 1000 bbls/day (100% oil). Tubing size = $2\frac{3}{8}$ inch. Flowing well head pressure = 150 psig. SBHP = 3000 psig. P.I. = 3.0. Formation GLR = 350. SCF/STB. Sp. Gravity of injection gas = 0.7. S/C operating pressure = 1000 psig. °API = 40. S/C Temp. = 120 °F. B.H. Temp. = 220 °F. 300 psi/1000 ft = flowing gradient of FBHP. 20 psi/1000 ft = casing pressure gradient. Subtract 100 psi from point of balance. Also calculate the daily gas injection rate necessary if, optimum GLR = 600 SCF/STB.
b) Discuss intermittent gas lifting operation in brief. **[6]**

P.T.O

OR

Q4) Describe design procedure for a typical Intermittent gas lift operation having multi-point injection. With the help of a neat schematic sketch and graph show the position of various valves in it. [16]

Q5) a) Explain, how the following well parameters can affect working of ESP pump. [6]
i) Pump setting depth.
ii) Presence of gas and solids.
b) Draw neat schematic sketch of surface and subsurface components of an ESP and indicate them. [16]

OR

Q6) Write the working of following components in case of ESP. [16]
a) Bleeder and drain valve.
b) Centrifugal pump.
c) Electrical Motor.
d) Gas separators.

SECTION - II

Q7) a) Draw neat schematic sketch of surface and subsurface set-up of components of sucker rod pumping system and discuss working of it in brief. [10]
b) Draw and explain the relationship of the RMS current to the average current for various torque loading conditions in SRP applications. [8]

OR

Q8) a) What is dynagraph? Draw typical sketch and explain it in brief. [8]
b) List all the components of SRP system and write functions of any two. [10]

Q9) Draw the typical graphs to demonstrate the following : [16]
a) Reservoir inflow Vs tubing outflow for increasing tubing diameters. Show three tubing sizes. : Natural Flow conditions.
b) Choke performance curves.
c) Pressure drop inside a production tubing Vs production rate at optimum GLR point and for various values of GLR.
d) Effect of no. of perforations on production rate.
e) Production rate Vs tubing diameter to demonstrate liquid loading conditions.

OR

Q10) What is nodal analysis? Describe it in detail using, neat schematic sketch of a typical petroleum production system and inflow outflow expressions. Indicate various feature of the Petroleum Production system and write applications of nodal analysis. [16]

Q11) a) Discuss in brief the general well selection criteria's for hydraulic fracturing job. [8]

b) Write the reaction of 15% HCl solution with dolomite. Calculate the volumetric dissolving power of acid solution and describe the necessary steps if specific gravity of acid is 1.03 and Dolomite density is 150 lbm/ft³. [8]

OR

Q12) a) State and explain the process of hydraulic fracturing in brief. [6]

b) Explain in brief the role of following elements in successful completion of a fracturing job. [10]

i) fracturing fluid.

ii) hydraulics to be maintained.

iii) fracture geometry.

☺ ☺ ☺ ☺

Total No. of Questions : 8]

SEAT No. :

P4701

[Total No. of Pages : 3

[4758] - 137

T.E. (Petroleum Engineering)
NATURAL GAS ENGINEERING
(2008 Pattern)

Time :3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) Attempt three questions from each section*
- 2) Answers to the two sections must be written in separate answer book*
- 3) Figures to the right indicates full marks*
- 4) Neat diagram should be drawn wherever necessary*
- 5) Use a non programmable calculator*
- 6) Assume suitable data if necessary and clearly state it*

SECTION - I

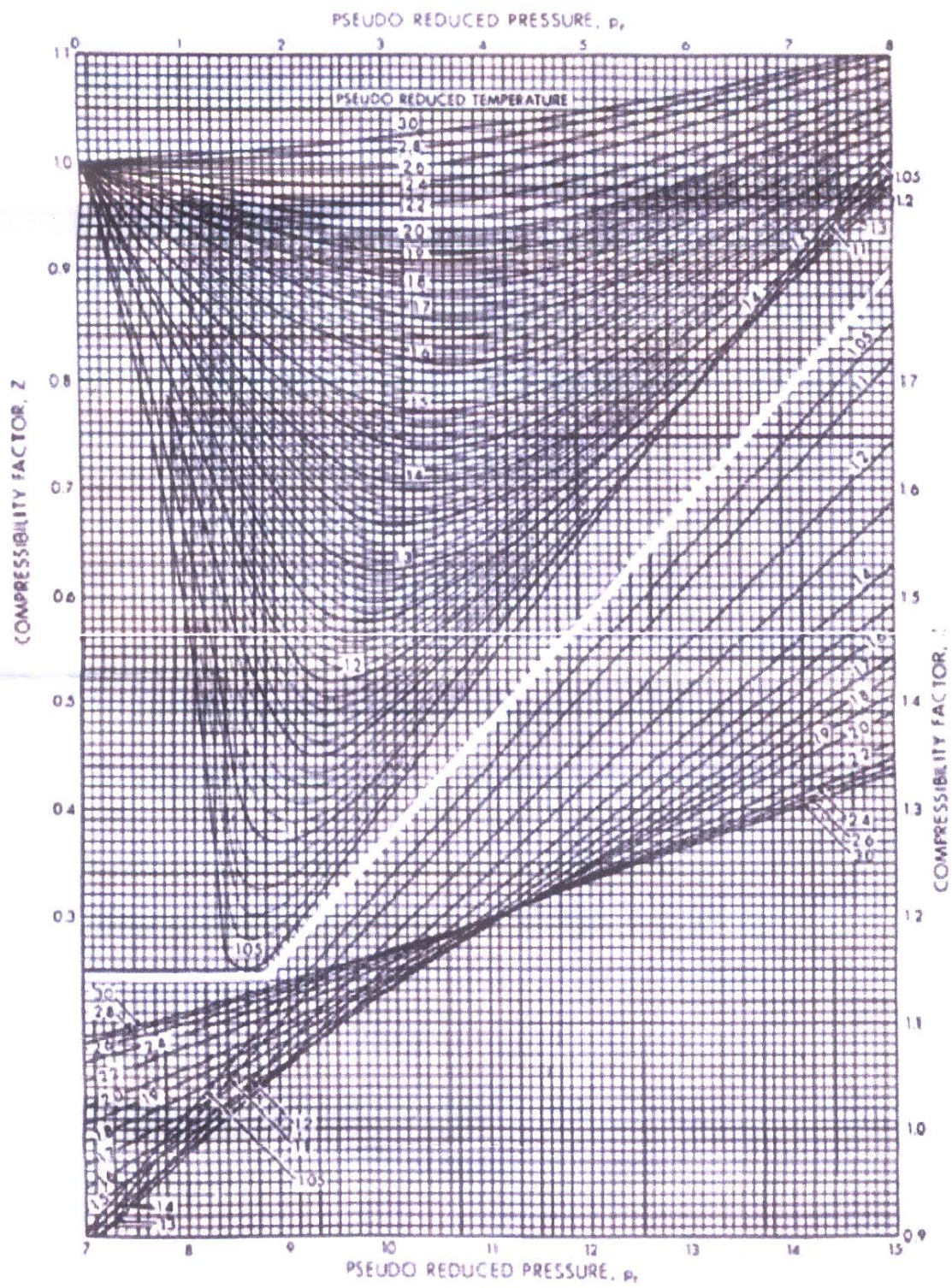
- Q1)** a) Explain different methods to find static and flowing BHP of a gas well. [10]
b) Explain inflow performance curve of a gas well. [8]
- Q2)** a) Draw the graph of B_g and μ_g versus pressure and explain in detail. [8]
b) Write about use of pseudocritical properties and their applications. [8]
- Q3)** a) Define and explain the importance of Pseudo critical & Pseudo reduced gas pressure and temperatures? [8]
b) Explain in detail about Gas well testing. [8]
- Q4)** a) Why is gas flow in porous media different from liquid flow? [4]
b) Explain all the constants in the gas flow meter equation. [12]

P.T.O.

SECTION - II

- Q5)** a) What is the criterion for choosing H₂S and CO₂ removal process?
 b) Draw a process flow diagram showing the removal of H₂S and carbon dioxide and explain the process? **[16]**
- Q6)** Explain with a neat sketch construction, working principle of centrifugal and reciprocating compressor. **[16]**
- Q7)** a) Calculate the gas flow rate in cubic ft / hr through a horizontal pipeline. Data given: D = 12.09, L = 1000 miles, e = 0.0006 in, T = 80 F, Specific gravity of gas = 0.7, T_b = 520 R, P_b = 147 psia, P₁ = 600 psia, P₂ = 200 psia, f = 0.01223, Z = 0.9188, μ = 0.0099 cp. **[8]**
 b) Explain effect of liquid loading in gas wells? **[4]**
 c) Explain Moiller's diagram? **[4]**
- Q8)** Short note on: **[18]**
 a) Sonic and subsonic flow?
 b) Gas compression processes?
 c) Turbine meter?

Compound	Chemical Composition	Symbol (for Calculations)	Molecular Weight	Critical Pressure (psi)	Critical Temp. (R)
Methane	CH ₄	C ₁	16.04	673	344
Ethane	C ₂ H ₆	C ₂	30.07	709	550
Propane	C ₃ H ₈	C ₃	44.09	618	666
iso-Butane	C ₄ H ₁₀	i-C ₄	58.12	530	733
n-Butane	C ₄ H ₁₀	n-C ₄	58.12	551	766
iso-Pentane	C ₅ H ₁₂	i-C ₅	72.15	482	830
n-Pentane	C ₅ H ₁₂	n-C ₅	72.15	485	847
n-Hexane	C ₆ H ₁₄	n-C ₆	86.17	434	915
n-Heptane	C ₇ H ₁₆	n-C ₇	100.2	397	973
n-Octane	C ₈ H ₁₈	n-C ₈	114.2	361	1024
Nitrogen	N ₂	N ₂	28.02	492	227
Carbon Dioxide	CO ₂	CO ₂	44.01	1,072	548
Hydrogen sulfide	H ₂ S	H ₂ S	34.08	1,306	673



Total No. of Questions : 12]

SEAT No. :

P3659

[4758] - 138

[Total No. of Pages :3

T.E. (Petroleum Engineering)
PETROLEUM EQUIPMENT DESIGN AND DRAWING
(2008 Course) (Semester - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer 3 Questions from Section-I and 3 Questions from Section-II.*
- 2) *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 side indicate full marks.*
- 5) *Assume Suitable data if necessary.*

SECTION - I

- Q1)** a) How design fundamentals are applied to petroleum equipment discuss with necessary example. **[9]**
- b) Discuss the following types of keys: **[9]**
- i) Tangent keys
 - ii) Saddle keys
 - iii) Feather key

OR

- Q2)** Design a cast-iron protective type flange coupling to connect shafts in order to transmit 15hp at 500rpm. The following permissible stresses may be used. **[18]**

Shear stress for shaft, bolt & key material = 400 Kg F/Cm²

Crushing stress for bolt and key = 800 KgF/cm²

Shear stress for cast iron =80 KgF/cm²

Width of Key = 12mm & Number of bolts = 3.

P.T.O.

- Q3) a)** Discuss in details about working mechanism of any one type of clutch. [8]
- b) Elaborate on different types of pulley and uses of pulleys on drilling rig. [8]

OR

- Q4)** A cross belt arrangement has center distance between pulleys as 1.5 m. The diameter of bigger and smaller pulleys are 'D' and 'd' respectively. The smaller pulley rotates at 1000 r.p.m. and the bigger pulley at 500 r.p.m. The flat belt is 6mm thick and transmits 7.5kW power at belt speed of 13m/s approximately. The coefficient of belt friction is 0.3 and the density of belt material is 950 kg/m³. If the permissible tensile stress for the belt material is 1.75MPa. Calculate :Diameter of pulleys & Length and width of belt. [16]

- Q5) a)** Write short notes on: [8]
- i) Rupture disc
 - ii) Blow down
 - iii) Rotary compressor
 - iv) Pressure relief valve
- b) What are the different types springs? Discuss compression helical in detail. [8]

OR

- Q6) a)** Discuss different parameters have to be considered to design a pipeline for oil and gas transportation. [8]
- b) Discuss selection of drilling rig mud pump in details. [8]

SECTION - II

- Q7)** A pressure vessel internal diameter 1.25 m is subjected to combine Loading, operates at an internal pressure of 10kg/cm². Material used for fabrication having allowable stress 980 Kg/cm². Weight of vessel with its content is 6500kg. Joint efficiency is 85%, Torque induced is 55kg.cm, Bending movement induced can be neglected. Calculate the various Stresses induced in vessel and verify that the equivalent stress is less than permissible stress. [18]

OR

- Q8)** a) Discuss design consideration of separators. [9]
b) Discuss design criteria of jackets and coil. [9]
- Q9)** a) What are the steps involved in design of pressure vessel? [8]
b) Discuss in details about design of fixed roof cylindrical storage tank along with the design of shell and bottom plate. [8]

OR

- Q10)** Calculate the different stresses which are to be considered while designing half coil jacket with the help of given data, [16]
Coil: Diameter = 120mm, Internal pressure = 0.4 N/mm² (inside the jacket)
Shell: internal pressure in shell = 0.4N/mm², Internal diameter = 2500mm, Thickness of shell = 9mm
Material is same for both shell and jacket having permissible stress value = 100N/mm².

- Q11)**a) Discuss design consideration for mixing. [8]
b) Write shorts notes on, [8]
i) highly volatile HC
ii) sulphur containing fluids

OR

- Q12)**a) Discuss transverse baffles and longitudinal baffles in heat exchanger. [8]
b) Write shorts notes on, [8]
i) Agitators
ii) Liquefied gases



Total No. of Questions : 12]

SEAT No. :

P3348

[4758] - 139

[Total No. of Pages : 3

T.E. (Polymer Engg.)

MASS TRANSFER AND REACTION ENGINEERING

(2008 Pattern)

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) Write a note on Overall Mass transfer Coefficient. [5]

- b) Find the steady state flux of Ethanol (A) - Water (B) solution in the form of a stagnant film of 2 mm thick at 20 °C is in contact with an organic solvent in which A is soluble and B is non diffusing . When the concentration on the opposite sides are 16.8 wt% and 6.8 wt% of ethanol respectively.

Diffusivity of Ethanol is $0.74 \times 10^{-9} \text{m}^2/\text{sec}$.

Density of 16.8 wt% acetic acid = 972 kg/m^3 .

Density of 6.8 wt% acetic acid = 988 kg/m^3 . [8]

- c) Explain the term Mass transfer Operation with two important applications. [5]

OR

Q2) a) Write a note on Analogies between Heat and Mass Transfer. [5]

- b) Explain Fick's law for molecular diffusion and prove that for Equimolar Counter diffusion for binary gas mixture of A and B $D_{AB} = D_{BA}$. [8]

- c) Write a note on Steady state diffusion in Multi-component mixtures. [5]

P.T.O.

- Q3)** a) Write a note on minimum liquid to gas ratio for gas absorber. [8]
b) Write a note on "Choice of Solvent" for gas Absorption. [8]

OR

- Q4)** a) Write a note on [10]
i) Liquid-Liquid extraction.
ii) Simple Distillation.
b) Differentiate between Tray tower and Packed tower. [6]

Q5) Discuss the following terms: Absolute Humidity, Relative Humidity, Saturation Humidity, Percentage Humidity, Humid Heat, Humid Volume, Total Enthalpy of Air-Water Vapour Mixture. Adiabatic Saturation temperature, Dew Point, Wet Bulb and Dry Bulb temperature, Moisture Content. [16]

OR

- Q6)** a) Write a note on Tray Dryer, Drum Dryer and Spray Dryer. [8]
b) Discuss the term Total Drying time. [8]

SECTION - II

- Q7)** a) Write a short note on Classification of chemical reactions useful for the reactor design. [8]
b) Explain in short factors affecting rate of reaction. Explain Elementary and Non-Elementary reaction with example. [10]

OR

- Q8)** a) Explain the following terms : [10]
Conversion, Molecularity of reaction, Order of reaction, Reaction rate constant, First order and Second order reaction.
b) Explain temperature dependency from Collision, Transition and Arrhenius theory. [8]

Q9) a) Discuss the Integral Method of analysis of kinetics of constant volume batch reactor for the irreversible first order, second order, n^{th} order and zero order reaction. [10]

b) Explain half life period for first and second order reaction. [6]

OR

Q10)a) Discuss the term space time and space velocity. [6]

b) Define ideal batch reactor and derive performance equation for ideal batch reactor. [10]

Q11)a) Differentiate between batch reactors, mixed flow reactor, plug flow reactor. [8]

b) Write short note on Best arrangement of ideal reactors for given reaction. [8]

OR

Q12)a) Write a short note on design of polymer reactors. [8]

b) Derive the relation for plug flow reactors in series. [8]



Total No. of Questions : 12]

SEAT No. :

P2257

[4758]-14

[Total No. of Pages : 5

T.E. (Mechanical / Automobile Engg.)

THEORY OF MACHINES - II

(2008 Course) (Semester - I) (302043)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

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

SECTION - I

- Q1) a)** Derive from first principles an expression for the friction moment of a flat collar bearing assuming **[6]**
- i) Uniform pressure, and
 - ii) Uniform wear.
- b) A dry single plate clutch is to be designed for an automotive vehicle whose engine is rated to give 110 kW at 2500 r.p.m. and maximum torque 600 N-m. The outer radius of friction plate is 25% more than the inner radius. The intensity of pressure between the plate is not to exceed 0.07 N/mm². The coefficient of friction may be assumed equal to 0.3. The helical springs required by this clutch to provide axial force necessary to engage the clutch are eight. If each spring has stiffness equal to 40 N/mm, determine the initial compression in the springs and dimensions of the friction plate. **[12]**

OR

- Q2) a)** Explain belt torsion dynamometer with neat sketch. **[6]**

P.T.O.

- b) A band and block brake, having 14 blocks each of which subtends an angle of 15° at the center, is applied to a drum of 1 m effective diameter. The drum and flywheel mounted on the same shaft has a mass of 2000 kg and a combined radius of gyration of 500 mm. The two ends of the band are attached to pins on opposite sides of the brake lever at distances of 30 mm and 120 mm from the fulcrum. If a force of 200 N is applied at a distance of 750 mm from the fulcrum, find: **[12]**
- i) Maximum braking torque,
 - ii) Angular retardation of the drum, and
 - iii) Time taken by the system to come to rest from the rated speed of 360 r.p.m. The coefficient of friction between blocks and drum may be taken as 0.25.

Q3) The following data relate to a cam operating an oscillating roller follower: - Minimum radius of cam = 30 mm, Radius of roller = 10 mm, Length of follower arm = 45 mm, Distance of fulcrum centre from cam centre = 55 mm, Angle of ascent = 90° , Angle of descent = 120° , Angle of dwell between ascent and descent = 60° , Angle of oscillation of follower = 30° . Draw profile of the cam if the follower moves with SHM and returns with uniform acceleration and retardation. **[16]**

OR

- Q4)** a) What do you mean by Advanced Cam Curves? Explain 4-5-6 polynomial curve. **[6]**
- b) Derive expressions for displacement, velocity and acceleration for circular arc cam operating a flat faced follower, when the contact is on the nose. **[10]**

- Q5)** a) Explain the following terms with neat sketch: **[6]**
- i) Precession in Gyroscope,
 - ii) Reactive Gyroscopic couple,
 - iii) Axis of spin,
 - iv) Axis of couple.

- b) An aeroplane makes a complete half circle of 50 metres radius, towards left, when flying at 200 km per hr. The rotary engine and the propeller of the plane has a mass of 400 kg and a radius of gyration of 0.3 m. The engine rotates at 2400 r.p.m. clockwise when viewed from the rear. Find the gyroscopic couple on the aircraft and state its effect on it. [10]

OR

- Q6)** a) State the different types of governors. What is the difference between centrifugal and inertia type governors? Why is the former preferred to the latter? [8]
- b) The arms of a Porter governor are 300 mm long. The upper arms are pivoted on the axis of rotation. The lower arms are attached to a sleeve at a distance of 40 mm from the axis of rotation. The mass of the load on the sleeve is 70 kg and the mass of each ball is 10 kg. Determine the equilibrium speed when the radius of rotation of the balls is 200 mm. If the friction is equivalent to a load of 20 N at the sleeve, what will be the range of speed for this position? [8]

SECTION - II

- Q7)** a) What do you understand by the term 'interference' as applied to gears?[6]
- b) Two gear wheels mesh externally and are to give a velocity ratio of 3 to 1. The teeth are of involute form; module = 6 mm, addendum = one module, pressure angle = 20° . The pinion rotates at 90 r.p.m. Determine:
- The number of teeth on the pinion to avoid interference on it and the corresponding number of teeth on the wheel,
 - The length of path and arc of contact,
 - The number of pairs of teeth in contact, and
 - The maximum velocity of sliding.

[10]

OR

- Q8) a)** Derive an expression for minimum number of teeth on a gear wheel when it is to mesh with a pinion for involute tooth profile. [8]
- b) A pinion of 20 involute teeth and 125 mm pitch circle diameter drives a rack. The addendum of both pinion and rack is 6.25 mm. What is the least pressure angle which can be used to avoid interference? With this pressure angle, find the length of the arc of contact and the minimum number of teeth in contact at a time. [8]
- Q9) a)** Derive an expression for maximum efficiency in case of spiral gears in terms of spiral angle and angle of friction. [6]
- b) In a spiral gear drive connecting two shafts, the approximate center distance is 400 mm and the speed ratio = 3. The angle between the two shafts is 50° and the normal pitch is 18 mm. The spiral angle for the driving and driven wheels are equal. Find: [10]
- i) Number of teeth on each wheel,
 - ii) Exact center distance, and
 - iii) Efficiency of the drive, if friction angle = 6° .

OR

- Q10)a)** A two start worm rotating at 800 rpm drives a 26 teeth worm gear. The worm has a pitch diameter of 54 mm and pitch of 18 mm. If coefficient of friction is 0.06, Find: [8]
- i) The helix angle of the worm.
 - ii) The speed of the worm gear.
 - iii) Centre distance.
 - iv) The lead angle for maximum efficiency.
 - v) The efficiency and maximum efficiency.
- b) A pair of straight bevel gears has velocity ratio 3:1. The pitch circle diameter of pinion is 100 mm at large end of the tooth. A 7.5 kW power is supplied to the pinion which rotates at 1000 rpm. The face width is 30 mm and pressure angle is 20° . Calculate the tangential, radial and axial components of the resultant tooth force acting on pinion. [8]

Q11)a) Explain briefly the differences between simple, compound, and epicyclic gear trains. What are the special advantages of epicyclic gear trains? [8]

b) In the epicyclic gear train, as shown in Fig. 1, the driving gear A rotating in clockwise direction has 14 teeth and the fixed annular gear C has 100 teeth. The ratio of teeth in gears E and D is 98: 41. If 1.85 kW is supplied to the gear A rotating at 1200 r.p.m., find: [10]

- i) The speed and direction of rotation of gear E, and
- ii) The fixing torque required at C, assuming 100 percent efficiency throughout and that all teeth have the same pitch.

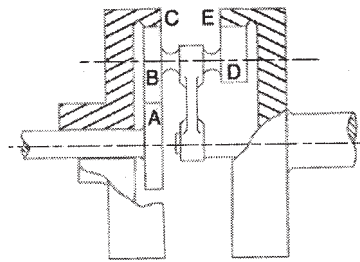


Figure 1

OR

Q12)a) Explain the inertia of geared system. [6]

b) In a gear train, as shown in Fig. 13.23, gear B is connected to the input shaft and gear F is connected to the output shaft. The arm A carrying the compound wheels D and E, turns freely on the output shaft. If the input speed is 1000 r.p.m. counter- clockwise when seen from the right, determine the speed of the output shaft under the following conditions: [12]

- i) When gear C is fixed, and
- ii) When gear C is rotated at 10 r.p.m. counter clockwise.

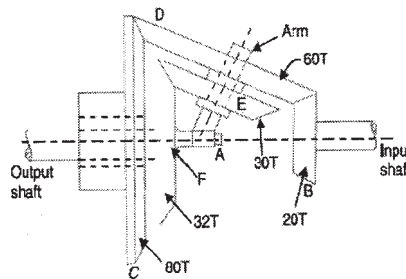


Figure 2

EEE

Total No. of Questions : 12]

SEAT No. :

P2296

[4758]-140

[Total No. of Pages : 3

T.E. (Polymer)

POLYMER CHEMISTRY-I
(2008 Course) (Semester-I) (309361)

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) Define “functionality”. Give four examples each for addition and condensation monomers with different functionality. **[6]**
- b) A polymer sample contains the following chains with molecular weights as follows: **[6]**

No. of chains	Molecular weights
10	500
20	1,000
30	4,000
40	10,000
50	20,000

Calculate \bar{M}_w and \bar{M}_n . Also calculate the polydispersity index.

- c) What do you mean by the terms broad m.w.d and narrow m.w.d. Explain any one method to determine m.w.d in polymers. **[6]**

OR

P.T.O.

- Q2)** a) Classify polymers giving suitable examples in each case. [6]
b) What do you understand by the following terms? [6]
i) Critical micelle concentration.
ii) Inhibitors.
iii) Initiator half life.
c) Given the following data calculate the average functionality of the following reaction mixture. [6]

Glycerol = 94g

Propylene Glycol = 300g

Adipic acid = 874 g

- Q3)** a) Discuss the kinetics of cationic polymerisation. [8]
b) Differentiate between bulk, solution and emulsion polymerisation stating their advantages and disadvantages. [8]

OR

- Q4)** a) Explain interfacial polycondensation for preparation of Nylon 6, 10. [8]
b) What are "Chain Transfer agents". Describe the different chain transfer reactions possible in the course of radical polymerisation. How do they affect the molecular weight of the polymer? [8]

- Q5)** a) State the significance of Carother's equation. Derive it. [8]
b) Discuss the melt polymerization techniques. Give examples. [8]

OR

- Q6)** a) Calculate the extent of reaction at which gelation occurs, if glycerol and pthalic acid are used in 2:3 molar ratio. [8]
b) Discuss the kinetics of step polymerisation. [8]

SECTION-II

Q7) a) What do you mean by monomer reactivity ratios? Discuss the following cases. [9]

i) $r_1 = r_2 = 0$

ii) $r_1 = r_2 = 1$

iii) $r_1 < 1$ and $r_2 > 1$

iv) $r_1 < 1$ and $r_2 < 1$

v) $r_1 > 1$ and $r_2 > 1$

Where r_1 and r_2 are monomer reactivity ratios.

b) Discuss the Q-e scheme of Alfrey and Price and its importance in detail. [9]

OR

Q8) a) Write a note on copolymerisation equation. [9]

b) Define copolymerisation. Discuss the various types of copolymers. [9]

Q9) a) What is meant by polymer degradations. Discuss chain-end degradation and random degradation. Give suitable examples of each type. [8]

b) Write a note on functional group containing polymer reactions [8]

i) Ketonic group.

ii) Hydroxyl group.

OR

Q10) a) What is the need for recycling of plastics? Discuss the process of incineration in detail. [8]

b) Discuss crosslinking reactions in details. [8]

Q11) a) Explain how the properties of polymers are affected due to stereoregularity. [8]

b) What are metallocene catalysts? Explain their mode of action. What are the advantages of metallocene catalysts over traditional catalysts? [8]

OR

Q12) a) Comment on the mechanism of polymerisation using Ziegler-Natta catalyst. [8]

b) What are stereoregular polymers? Discuss the types of isomerisms in polymers. [8]



Total No. of Questions : 12]

SEAT No. :

P2297

[4758] - 141

[Total No. of Pages :4

T.E. (Polymer)

POLYMER MATERIALS - I

(309362) (2008 Pattern) (Semester - I)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Differentiate between commodity, engineering and high performance polymers giving two examples of each type. [6]
- b) Write a short note on compounding of polypropylene. [6]
- c) Polyvinylalcohol is crystalline whereas Polyvinylacetate is amorphous. Explain. [3]
- d) Write a short note on EVA. [3]

OR

- Q2)** a) Discuss the procedure for manufacture of polyvinylalcohol. Why is it not synthesized by the polymerisation of vinylalcohol? [6]
- b) Explain with a neat sketch the process for manufacture of polypropylene film by the downward tubular quench method. [6]
- c) What is LLDPE? How is it prepared? [3]
- d) Differentiate between LDPE and HDPE. [3]

- Q3)** a) What is the significance of calculating the K-value in case of PVC? How is it calculated? What is the range of K-values for commercial polymers? [6]
- b) Polystyrene needs modification. Why? State the modified forms of polystyrene. Give two properties and two applications of each form. [6]

P.T.O.

- c) Discuss processing of PTFE. [4]

OR

- Q4)** a) What is the difference between organosols, plastisols and plastigels in case of PVC? Give recipe for each. [6]
- b) Explain clearly the different steps in the manufacture of expandable Polystyrene. [4]
- c) State the polymers used in the following applications giving reasons (any 3) [6]
- i) Non-stick pans.
 - ii) Rainwear/Beach balls.
 - iii) Disposable coffee cups.
 - iv) Hinges.

- Q5)** a) Explain the process of casting of PMMA sheets. Also discuss why we need to prepare a prepolymer syrup in casting of PMMA sheets. How is the syrup prepared? [6]
- b) What is the effect of degree of substitution on the properties of cellulose Acetate? [6]
- c) What are the features to be borne in mind while processing of polycarbonate. [4]

OR

- Q6)** a) Why is cellulose converted to cellulose Acetate? How is it done? [6]
- b) State two applications of each of the following polymers (any 3): [6]
- i) PTFE
 - ii) PMMA
 - iii) Cellulose acetate
 - iv) Polycarbonate
- c) Discuss different routes for preparation of polycarbonate. [4]

SECTION - II

- Q7)** a) List the various ingredients that go into making of a paint. Give the role of each of the ingredient. [6]
- b) Differentiate between pressure sensitive adhesives and evaporation type of adhesives giving examples. [6]
- c) What are lacquers, varnishes and stains? [4]

OR

- Q8)** a) What is the difference between convertible and non-convertible coatings. Give suitable examples of each. [6]
- b) What are “Primers”? Give examples of the same. [4]
- c) Discuss the role of following w.r.t. paints (any 3) [6]
- i) Thickeners
 - ii) Driers
 - iii) Antiskinning agents
 - iv) Flame retardants

- Q9)** a) What are the molecular requirements for a material to be a rubber? [6]
- b) What is mastication? How is it carried out? Discuss mastication of Natural Rubber. [6]
- c) Discuss the various steps involved in making of latex products. [6]

OR

- Q10)**a) What is vulcanisation w.r.t. rubbers? What are the factors affecting vulcanisation? [6]
- b) Briefly discuss the various steps in raw rubber technology (with the help of a flow chart). [6]
- c) Discuss the role of the following additives w.r.t. rubbers. Give examples (any two): [6]
- i) Tackifiers
 - ii) Peptisers
 - iii) Vulcanising system

- Q11)a)** Differentiate between “Cold SBR” and “hot SBR”. [4]
- b) State the rubber used in the following applications and reason for using the rubber in the given application. [6]
- i) LPG tubes
 - ii) Inner liners of tubeless tyres
 - iii) Passenger car tyres
- c) Write a short note on Thermoplastic Elastomers. [6]

OR

- Q12)a)** Discuss the various steps in the preparation of ribbed smoked sheets of Natural rubber. [6]
- b) Write the structure of the following rubbers. [6]
- i) Polyisoprene.
 - ii) Neoprene rubber
 - iii) Butyl rubber
 - iv) Nitrile rubber
 - v) Natural rubber
 - vi) Silicone rubber
- c) Give two outstanding properties of each of the following rubbers. [4]
- i) Nitrile rubber
 - ii) Natural rubber



Total No. of Questions : 12]

SEAT No. :

P3660

[4758] - 142

[Total No. of Pages :3

T.E. (Polymer)

**POLYMER STRUCTURE PROPERTY RELATIONSHIP
(2008 Course) (Semester - I)**

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answers to the two sections should be written in separate books.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Use of Calculator is allowed.*
- 5) *Assume suitable data if necessary.*

SECTION - I

- Q1)** a) List down all the possible properties any polymer can get affected due to the chemical composition. Explain with suitable egs. [10]
- b) Explain why PP has high melting point but lower density than LDPE. Also how can one elevate the density of PP . [4]
- c) Explain types of bonds carbon atom makes and its effect on properties.[4]

OR

- Q2)** a) Explain what is meant by structure, property and their relationship with atleast 2 egs. [10]
- b) Explain why PS is brittle and how is it modified to get impact strength improved. [4]
- c) Explain types of bonds oxygen atom makes and its effect on properties.[4]

- Q3)** a) What is understood by molecular size and shape and how do they affect polymer properties. [8]
- b) Explain the terms; M.W, M.W.D, P.D.I. How do they affect polymer properties. [8]

OR

P.T.O.

Q4) a) Give any conversion method to show conversion of low to high molecular weight. [8]

b) Explain how to differentiate between engineering, commodity and liquid crystalline polymers. [8]

Q5) a) What is understood by molecular flexibility. Explain with few egs. [8]

b) Explain T_g and T_m phenomena and how does they both play role during processing. Also how can they be measured. [8]

OR

Q6) a) How freedom of rotation of bond is affected. Also explain the role of structure on flexibility. [8]

b) Explain with diagram the growth of spherulite and its effect on polymer properties. [8]

SECTION - II

Q7) a) Explain amorphous and crystalline states and give the internal arrangement for these two states and reason behind the arrangement with egs. [8]

b) Give the kinetic factors that affect rate of crystallization. [8]

OR

Q8) a) List down factors leading to crystallisation and its effect on various properties like processing, mechanical and thermal. [8]

b) Explain the process orientation and how is it different or similar to crystallization. Also give its effect on polymer properties. [8]

Q9) a) Give list of different types of intermolecular bonds and explain induced and permanent dipoles with egs. [8]

b) Explain LDF and explain the role of various factors that influence it. [8]

OR

- Q10)a)** Explain ionic bonding with any one eg. [8]
- b) Give the effect of intermolecular forces on properties like solubility, melting and CED. [8]

- Q11)a)** Give the effect of size and shape of products on properties obtained from same polymer. [8]
- b) Explain what are blends and how their morphology affect their properties. [10]

OR

- Q12)a)** Explain foams and the method used. Also explain what are rigid and flexible foams with their applications. [10]
- b) Explain with any one example chemical microheterogeneity and its effect of properties. [8]



Total No. of Questions : 12]

SEAT No. :

P3349

[Total No. of Pages : 4

[4758] - 143

T.E. (Polymer) (Semester - I)

DESIGN OF EQUIPMENT AND MACHINE ELEMENTS
(2008 Pattern)

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 side indicate full marks.*
- 4) *Use of calculator is allowed.*
- 5) *Assume suitable data if necessary.*

SECTION - I

Q1) a) Write short notes on any 2. [6]

- i) Von Mises failure theory
 - ii) Square keys
 - iii) Types of cast iron
- b) Explain bush-pin type flexible coupling with a neat sketch in details. [6]
- c) A 45 mm diameter shaft is made of steel with yield strength of 400 MPa. A parallel key of size 14 mm wide and 9 mm thick made of steel with yield strength of 340 MPa is to be used. Find the required length of the key if the shaft is loaded to transmit the maximum permissible torque. Use maximum shear stress theory and assume a factor of safety of 2.[6]

OR

Q2) a) Draw a neat sketch of a clamp coupling. Design a clamp coupling to transmit 30KW at 100 rpm. The allowable shear stress for the shaft and key is 40 MPa and the number of bolts connecting the two halves are six. The permissible tensile stress for the bolts is 70 MPa. The coefficient of friction between the muff and shaft surface is taken as 0.3. [10]

- b) Discuss BIS classification for carbon and alloy steel with BIS designation. [8]

P.T.O.

- Q3)** a) Derive an expression for solid shaft subjected to combined torsion and bending loads in addition to axial loads. [8]
- b) A hollow shaft is subjected to a maximum torque of 1.5 kN-m and a maximum bending moment of 3 kN-m. It is subjected at the same time to an axial load of 10kN. Assume that the load is applied gradually and ratio of the inner and outer diameter is 0.5. If the outer diameter of the shaft is 80 mm, find the shear stress induced in the shaft. [8]

OR

- Q4)** a) Compare the weight, strength and stiffness of a hollow shaft of the same external diameter as that of solid shaft. The inside diameter of hollow shaft being half the external diameter. Both shafts have same material and length. [8]
- b) A belt is 110 mm wide and 12 mm thick is transmitting power at 1050 meters/min. The net driving tension is 1.8 times the tension on slack side. If the safe permissible stress on the belt section is 1.8 MPa, calculate the maximum power that can be transmitted at this speed. Assume density of leather as 1000 kg/m³. Calculate the absolute maximum power that can be transmitted by this belt and the speed to which it can be transmitted. [8]

- Q5)** a) Discuss classification of bearings. Write a detailed note on sliding contact bearings. [8]
- b) Discuss involute and cycloidal gears in details. [8]

OR

- Q6)** a) Explain in details various terms used to describe a hydrodynamic journal bearing with a neat figure. [8]
- b) Write short notes on : [8]
- i) Cone and pulley arrangement
 - ii) Wedge film journal bearing
 - iii) Properties of bearing material
 - iv) Bearing characteristic number

SECTION -II

- Q7)** a) Draw a neat sketch of back pressure valve and discuss its functioning. [6]
b) Draw and explain hydraulic circuits for any three [12]
i) Sequencing circuit with speed control
ii) Linear circuit with speed control
iii) Counter balance circuit
iv) Regenerative circuit

OR

- Q8)** a) Write a detailed note on construction and working of a positive displacement pump. [6]
b) Explain with a neat sketch any one type of pressure control valve. [6]
c) Explain with a neat sketch a solenoid operated three position four way valve. [6]

- Q9)** a) Write a detailed note on direct locking hydraulic system. [8]
b) Draw a circuit diagram for plasticizing circuit and back pressure control using conventional hydraulics. [8]

OR

- Q10)** a) Write a detailed note on hydro-mechanical clamping system. [8]
b) Explain the function of intensifiers and accumulators. [8]

- Q11)** a) What are the various stresses induced in the pressure vessel due to combined loading? How is the thickness of such a vessel calculated? [8]
b) List various factors taken into consideration while selecting material for pressure vessels. [4]
c) Give design formulae for shell design of reaction vessel with half coil and design of shell with channel jacket. [4]

OR

- Q12)**a) A hemispherical head with 0.8m diameter is subjected to internal pressure of 200 kg/cm^2 . Assuming welded joint efficiency to be 85% and permissible stress to be 1600 kg/cm^2 , determine head thickness. [6]
- b) Discuss nozzle reinforcement. Explain any one type of nozzle reinforcement method. [6]
- c) Discuss shallow dished head and conical head with the neat sketch. [4]



Total No. of Questions : 12]

SEAT No. :

P2298

[4758] - 144

[Total No. of Pages :6

T.E. (Polymer Engg.)

MATHEMATICAL METHODS FOR POLYMER ENGINEERING

(2008 Pattern) (Semester - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6 from Section I and Q7 or Q8, Q9 or Q10, Q11 or Q12 from section - II.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of electronics non-programmable calculator is allowed.*
- 5) *Assume suitable data if necessary.*

SECTION - I

Q1) a) Show that $\mu^2 = 1 + \frac{\delta^2}{4}$. **[3]**

- b) From the tabulated values of x and y given below, prepare forward difference table. Find the polynomial passing through the points and estimate the value of y , when $x = 1.5$. Also find $\frac{dy}{dx}$ at $x=1.5$. **[8]**

x	0	2	4	6	8
y	5	29	125	341	725

- c) Evaluate $\int_0^{0.8} e^{-x^2} dx$ by Simpson's $\frac{1}{3}$ rule taking $h = 0.2$. **[6]**

OR

- Q2) a)** Following table shows enthalpy at different pressures. Find out the enthalpy at pressure 2.1 by Lagrange's interpolation method. **[6]**

Pressure (Bar)	1.9	2.2	2.4	2.6
Enthalpy (kJ/kg.K)	497.9	517.6	529.6	540.9

P.T.O.

- b) Find value of y for $x = 0.5$ from the following table of x, y values using Newton's difference formula. [5]

x	0	1	2	3	4
y	1	5	25	100	250

- c) Obtain the value of $\log_e 7$ by evaluating the $\int_0^6 \frac{dx}{1+x}$ using Simpson's $\frac{3}{8}$ rule with $h = 2$. [6]

- Q3)** a) Find a positive root of $x^3 - 4x + 1 = 0$ by the method of false position. [6]

- b) Solve the following system of linear equations using Gauss. Seidal method. [6]

$$23x_1 + 13x_2 + 3x_3 = 29$$

$$5x_1 + 23x_2 + 7x_3 = 37$$

$$11x_1 + x_2 + 23x_3 = 43$$

- c) Fit a straight line to the following data: [5]

$x :$	1	2	3	4	6	8
$y :$	2.4	3	3.6	4	5	6

OR

- Q4)** a) Apply Newton-Raphson Method to solve [6]

$$3x - \cos x - 1 = 0$$

- b) Solve by Jacobi's Method. [6]

$$4x + y + 3z = 17$$

$$x + 5y + z = 14$$

$$2x - y + 8z = 12$$

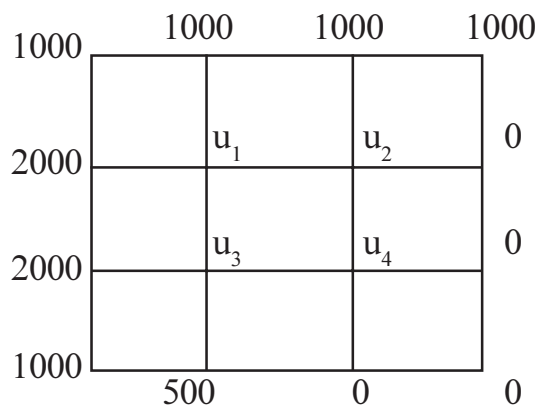
- c) Fit a least square parabola $y = a_0 + a_1x + a_2x^2$, for the data: [5]

$x :$	3	5	7	9	11	13
$y :$	2	3	4	6	5	8

Q5) a) Use modified Euler's method to solve $\frac{dy}{dx} = x - y^2$, $y(0)=1$, calculate $y(0.4)$ taking $h = 0.2$ [8]

b) Given the values of $u(x, y)$ on the boundary of the square in the figure given below, evaluate the function $u(x, y)$ satisfying the Laplace equation [8]

$$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$$



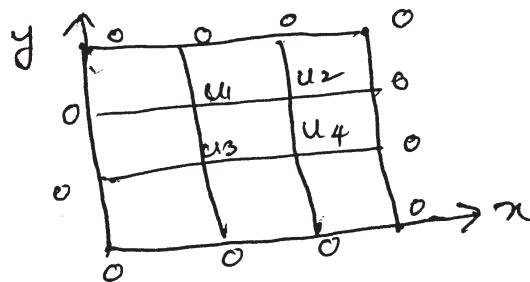
OR

Q6) a) Use Runge-Kutta method of fourth order to obtain the numerical solutions of [8]

$$\frac{dy}{dx} = x^2 + y^2, y(1)=1.5,$$

in the interval $(1, 1.2)$ with $h = 0.1$

b) Solve the Poisson equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = -4(x^2 + y^2)$. Over the square mesh given below with sides $x = 0, y = 0, x = 3$ and $y = 3$ and with $\mu = 0$ on the boundary and mesh length 1. [8]



SECTION - II

Q7) a) Solve the following LPP by using Simplex method **[10]**

Maximize $Z = 3x_1 + 2x_2 + 5x_3$

Subject to $x_1 + 2x_2 + x_3 \leq 430$

$$3x_1 + 2x_3 \leq 460$$

$$x_1 + 4x_2 \leq 420$$

and $x_1, x_2, x_3 \geq 0$

b) Write the dual of the following LPP **[6]**

Minimize $Z = 2x_1 - 3x_2 + 4x_3$

Subject to $x_1 - 2x_3 \leq 4$

$$2x_1 - 3x_2 \leq 5$$

$$x_2 + x_3 \leq 3$$

and $x_1, x_2, x_3 \geq 0$

OR

Q8) a) Solve the following LPP by using Simplex method **[10]**

Maximize $Z = 20x_1 + 10x_2$

Subject to $x_1 + 6x_2 \leq 300$

$$2x_1 + 2x_2 \leq 150$$

$$4x_1 + x_2 \leq 240$$

and $x_1, x_2 \geq 0$

b) Write the dual of the following LPP **[6]**

Minimize $Z = 3x_1 - 4x_2 + 5x_3$

Subject to $x_1 - 2x_2 - 3x_3 \leq 2$

$$-2x_1 + 3x_2 - 4x_3 \leq 4$$

$$x_2 + x_2 - 2x_3 \leq 5$$

and $x_1, x_2, x_3 \geq 0$

Q9) a) The first four moments about the working mean 30.2 of a distribution are 0.255, 6.222, 30.211 and 400.25. Calculate the first four moments about the mean. Also find coefficients of skewness and Kurtosis. [6]

b) Calculate the coefficient of correlation for the following data: [6]

Supply	152	158	169	182	160	166	182
Price	198	178	167	152	180	170	162

c) Probability of man aged 60 years will live for 70 years is $\frac{1}{10}$. Find the probability that out of 5 men selected at random 2 will live for 70 years. [5]

OR

Q10)a) On an average a box containing 10 articles is likely to have 2 defectives. If we consider a consignment of 100 boxes, how many of them are expected to have three or less defectives? [6]

b) The accidents per shift in a factory are given by the table. [6]

Accidents x per shift	0	1	2	3	4	5
Frequency f	142	158	67	27	5	1

Fit a Poisson distribution to the above table and calculate theoretical frequencies.

c) If the two lines of regression are $9x + y - \lambda = 0$ and $4x + y = \mu$ and the means of x and y are 2 and -3 respectively, find the values of λ, μ and the coefficient of correlation between x and y . [5]

Q11)a) If covariant components of a tensor are x^2y, zx, yz^2 in cartesian coordinate system, find its covariant components in spherical polar system. [6]

b) If A_r^{pq} is a tensor, show that A_r^{pr} is a contravariant tensor of rank one. [5]

c) Determine the conjugate metric tensor in [6]

i) Cylindrical and

ii) Spherical coordinates

OR

Q12)a) Show that any inner product of the tensors A_r^p and B_i^{qs} is a tensor of

rank three.

[6]

b) If Covariant components of a tensor are x^2, xy in rectangular system, find their covariant components in polar system. [5]

c) Show that [6]

i) $[pq, r] = [qp, r]$

ii) $\begin{Bmatrix} s \\ pq \end{Bmatrix} = \begin{Bmatrix} s \\ qp \end{Bmatrix}$



Total No. of Questions : 12]

SEAT No. :

P3350

[Total No. of Pages : 2

[4758] - 145

T. E. (Polymer) (Semester - II)

POLYMER CHEMISTRY - II

(2008 Pattern)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Differentiate between the various types of phenolic resins. [9]
b) Write a note on melamine based polymers. [9]

OR

- Q2)** a) Discuss silicone resins w.r.t method of preparation, properties and applications. [9]
b) Write in detail preparation and properties of urea based polymers. [9]

- Q3)** a) What are the raw materials used in the synthesis of unsaturated polyester resins? Enlist their properties and applications. [8]
b) Write a short note on saturated polyester resins. [8]

OR

- Q4)** a) Explain in detail synthesis, properties and applications of vinyl ester resins. [8]
b) How are dough moulding compounds prepared? State its advantages and disadvantages. [8]

P.T.O.

- Q5)** a) What are epoxy value and epoxy equivalent? Explain their significance. [8]
b) Discuss in short flexible and rigid polyurethane foams. [8]

OR

- Q6)** a) Differentiate between amine Hardening systems and acid curing systems w.r.t epoxy resins. [8]
b) Discuss the synthesis of polyurethane resins. [8]

SECTION - II

- Q7)** a) Compare properties of polyacetals and polyamides. [9]
b) What are polyimides? Enlist properties and applications. [9]

OR

- Q8)** a) Write the repeat units of Nylon 6, 6 and Nylon 6, 10 and which one out of the two will be more hygroscopic explain. [9]
b) What are the main points to be borne in mind while processing polyacetals and nylons? [9]

- Q9)** a) What are polysulphones? Discuss its properties, processing & applications. [8]
b) Differentiate between PEK and PEEK on basis of structure, properties and applications. [8]

OR

- Q10)** a) Write a note on PPO w.r.t synthesis, properties and applications. [8]
b) Discuss polyphenylene sulphide in details. [8]

- Q11)** a) Comment on the use of polymers in drug delivery application. [8]
b) Write a short note on liquid crystalline polymers. [8]

OR

- Q12)** a) Discuss polymers in membrane applications. [8]
b) What are conducting polymers? Give examples of the same. Also state its applications. [8]



Total No. of Questions : 12]

SEAT No. :

P3351

[4758] - 146

[Total No. of Pages : 3

T.E. (Polymer Engg.)

INSTRUMENTATION AND PROCESS CONTROL

(2008 Pattern)

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)** An instrument is specified as having range of 0-500 bar and an accuracy of +/- 0.5 bar and sensitivity of 0.3 divisions /bar and resolution of 0.1 % full scale deflection. Find range,sensitivity and accuracy. [6]
- b) What do you understand by the term Calibration? [6]
- c) Explain the terms in brief Range, Static error, Sensitivity, Drift, Precision.[6]

OR

- Q2) a)** Define the following terms and give suitable examples. [9]
- i) Indirect measurement
 - ii) Primary Element
 - iii) Functioning Element
- b) Discuss the followings with one example : Transducer, Signal Conditioner and display element. [9]

P.T.O.

- Q3)** a) Explain with neat diagram, principle, construction, working, merits and demerits of any one instrument used to measure pressure. [10]
b) Write short note on Strain Gauge. [6]

OR

- Q4)** a) Draw the diagram and explain the principle of Photoelectric pyrometers. [10]
b) What is LVDT and explain its construction and working. [6]

- Q5)** a) Explain the importance of viscosity measurement in polymer industry and suggest suitable instruments for doing so. [8]
b) Explain the importance of density measurement in polymer industry and suggest suitable instruments for doing so. [8]

OR

- Q6)** a) Draw the diagram and explain construction, working, advantages and disadvantages of Orifice meter. [8]
b) Discuss the classification of Level Measurement techniques. [8]

SECTION - II

- Q7)** a) Derive the Transfer function of Second order System. [10]
b) Explain the terms : Transfer Function, Block Diagram. [8]

OR

- Q8)** a) A thermometer which is observed to exhibit the first order dynamics with time constant of 15 sec, which is placed in bath at temperature of 50 ° C and after reaching steady state, temperature of bath linearly increases with time at 10 ° C /min. find out the response of same at time=5, 10, 15, 20, 25, 30min. [10]

- b) Explain the following terms : [8]
- i) Set Point
 - ii) Error
 - iii) Time constant
 - iv) dead time
 - v) load

- Q9)** a) Explain the following terms : [8]
- i) Controller
 - ii) Manipulated variable
 - iii) Controlled variable
 - iv) Set point.
- b) Explain with standard block diagram Open loop Transfer function and closed loop Transfer Function. [8]

OR

- Q10)**a) Write a note on Feedback Control Loop. [8]
- b) Explain the importance of negative feedback control system with one example. [8]

- Q11)**a) Write a note on Feed forward, ratio control system. [8]
- b) Discuss with neat diagram the mode of Integral (I) control action. [8]

OR

- Q12)**a) Discuss the importance of advanced process control to polymer processing. [8]
- b) Discuss with neat diagram the mode of Proportional (P) control action. [8]



Total No. of Questions : 12]

SEAT No. :

P3661

[4758] - 147

[Total No. of Pages :3

T.E. (Polymer)

**POLYMER PROCESSING OPERATIONS - I
(2008 Pattern) (309369) (Semester - II)**

Time : 3Hours]

[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.*
- 5) *Use 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 vented extruders in detail. [9]
b) Derive an expression for total output in a single screw extruder. [9]

OR

- Q2)** a) Explain extruder screw and die characteristics. [6]
b) Write a short note on barrier screws. [6]
c) With neat sketches describe various hopper and feed throat designs. [6]

- Q3)** a) Draw a neat sketch of a monolayer blown film plant layout. Explain the need of each constituent in the layout. [8]
b) With the help of a neat sketch explain the wire coating line. [8]

OR

- Q4)** a) Explain the construction of a flat file die with a neat sketch. [6]
b) Explain with sketches the sizing, take - off methods adopted for the production of plastic pipes by extrusion. [10]

P.T.O.

- Q5) a)** Explain the following with reference to injection molding [5]
- i) Plasticising capacity
 - ii) Shot weight
 - iii) Daylight opening
- b) List the various types of switch over techniques. Discuss any one in details. [6]
- c) Discuss processing characteristics for any two thermoplastic materials which can be injection molded. [5]

OR

- Q6) a)** Discuss four different faults that occur in an injection molded product. State reasons and remedies for the same. [8]
- b) Draw a bar chart showing the various operations of injection moulding cycle. Write in short about each operation. [8]

SECTION - II

- Q7) a)** Compare cavity pressure profile in gas injection moulding with conventional injection molding. [6]
- b) Explain the process of injection compression molding. State its merits. [6]
- c) Discuss the dip coating technique in brief. [6]

OR

- Q8) a)** Explain the process of thermoset injection moulding with respect to [8]
- i) Design of screw and barrel
 - ii) Design of nozzle
 - iii) Runner and gate design
 - iv) Barrel temperature control
- b) Write a note on liquid reservoir molding. [6]
- c) Explain various methods of achieving low pressure in low pressure injection molding. [4]

- Q9)** a) Draw a schematic sketch of external calibration with floating plug on chain. Explain application. [8]
- b) With a neat sketch describe the process for manufacture of magnetised plastic strip. [8]

OR

- Q10)**a) With the help of neat sketches, explain any one method to make sandwich panels by extrusion. [8]
- b) Write a note on dies for extrusion of cellular products. [8]

- Q11)**a) State the various preheating methods used for heating the moulding power in compression molding. [8]
- b) Derive an equation for compaction force required during compression molding process. [8]

OR

- Q12)**a) Explain the process of transfer moulding with neat sketches. [8]
- b) Compare the process of compression moulding with transfer moulding in respect of the following: [8]
- i) Moulding materials
 - ii) Loss of material in moulding
 - iii) Cycle time
 - iv) Article shape and size
 - v) Pressure and force required for moulding



Total No. of Questions : 12]

SEAT No. :

P3662

[4758] - 148

[Total No. of Pages :3

T.E. (Polymer)

POLYMER RHEOLOGY

(2008 Course) (Semester -II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answers to the two sections should be written in separate answer books.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Use of Calculator is allowed.*
- 5) *Assume Suitable data if necessary.*

SECTION - I

- Q1)** a) Explain how rheology plays a role during processing. Also explain types of stresses with egs. [4]
- b) Explain what is understood by continuity equation in short. [4]
- c) Define and explain following terms: Pseudoplastic, dilatant, bingham, viscosity, troutonian. [10]

OR

- Q2)** a) Explain how melt fracture occurs and what is done to minimize it. [4]
- b) Explain all time dependent fluids with their egs. [6]
- c) Explain normal stresses and how can they be measured. Also explain with any two egs normal stresses. [8]

- Q3)** a) Explain creep compliance. A sample is elongated from 50mm to 100mm after stress of 150N is applied for 2 hrs. The dimensions of sample after 2 hrs are 4mm×8mm ×30mm. Find creep compliance after 2 hrs. [8]
- b) Explain Maxwell model. [8]

OR

P.T.O.

- Q4)** a) Explain WLF equation. [8]
b) Explain Voigt model. [8]
- Q5)** a) Give the effect of pressure and temperature on viscosity and their role during processing. [8]
b) Explain activation energy and its role on viscosity. [8]

OR

- Q6)** a) Give the effect of M.W and M.W.D on viscosity and thus processing with few egs. [8]
b) Give the effect of plasticizer and filler size and shape on melt viscosity.[8]

SECTION - II

- Q7)** a) Derive viscosity equation for flow through circular cross section. [8]
b) Explain turbulent flow and when and where it occurs. Also explain turbulence dumpling. [8]

OR

- Q8)** a) Derive viscosity equation for flow through slit cross section. [8]
b) Explain Ryan Johnson criteria and its significance. [8]

- Q9)** a) Explain cone and plate viscometer and derive equation for viscosity. Also explain how normal stresses are calculated using cone and plates viscometer. [9]
b) Explain Brookfield viscometer with types of flows generated in it. [9]

OR

Q10)a) Explain Mooney's viscometer and how is it used to find cure time of elastomers. [9]

b) Explain capillary rheometer working. [9]

Q11)a) Explain how rheology parameters are influenced during Injection molding. [8]

b) Explain how viscosity plays a role in following extrusion process; sheet, pipe, film. [8]

OR

Q12)a) Explain compression molding process with its types. [8]

b) Explain transfer molding process with pot type of transfer molding with diagram. [8]



Total No. of Questions : 12]

SEAT No. :

P2299

[4758] - 149

[Total No. of Pages :5

T.E. (Production)

KINEMATICS OF MANUFACTURING MACHINES

(2008 Course) (Semester - I) (311082)

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 side indicate full marks.*
- 5) *Use of electronic pocket calculator is allowed.*
- 6) *Assume suitable data if necessary.*

SECTION - I

- Q1) a)** Explain in detail different mechanisms used in machine tool with suitable sketches. **[8]**
- b) What do you understand by synthesis of mechanisms? Explain **[8]**
- i) Type synthesis
 - ii) Number Synthesis
 - iii) Dimensional Synthesis

OR

- Q2) a)** Explain kinematic analysis of any thread making machine. **[8]**
- b) Design a slider crank mechanism to co-ordinate three positions of input and output links as follows:- **[8]**

$$\theta_1 = 20^\circ$$

$$\theta_2 = 35^\circ$$

$$\theta_3 = 50^\circ$$

$$S_1 = 80\text{mm}$$

$$S_2 = 60\text{mm}$$

$$S_3 = 30\text{mm}$$

- Q3) a)** State law of gearing. Derive an expression for constant angular velocity ratio between two gears. **[8]**

P.T.O.

- b) Two 20° involute spur gear have module of 8mm. Gear ratio 2.5, speed of gear wheel 120 rpm. Number of teeth on gear wheel 80. The addendum is such that the path of approach and path of recess on each side are 40% of maximum possible length each. Determine the addendum for pinion and wheel. Also determine the length of arc of contact. Does the interference occur? [10]

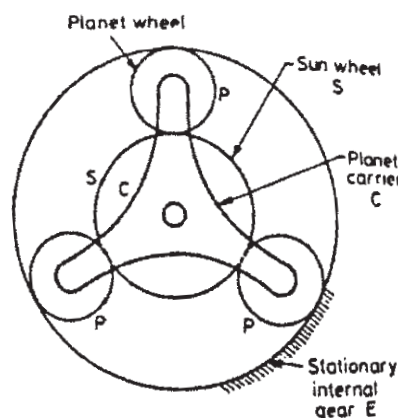
OR

Q4) a) Explain the following terms for spur gear [8]

- i) Pressure angle
- ii) Circular pitch
- iii) Backlash
- iv) Module

- b) An epicyclic gear train is shown in below given fig consist of sun wheel S, a stationary internal gear E and three identical planet wheels P carried on a star shaped planet carrier C. The sizes of different toothed wheels are such that the planet wheel C rotate at $1/5$ of the speed of sun wheel S. The number of teeth on sun wheel is 16. The driving torque on sun wheel is 100Nm. Determine [10]

- i) number of teeth on different wheels of train
- ii) torque necessary to keep the internal gear stationary



- Q5) a)** Derive an equation for maximum fluctuation of energy (ΔE). [6]

$$\Delta E = mv^2 C_s$$

Where m-mass of fly wheel

v - Linear velocity of rim flywheel at mean radius

C_s - Co-efficient of fluctuation of speed

- b) A punching machine carried out 8 holes per minute. Each hole of 30mm diameter and 25mm thick plate requires 6Nm of energy per square mm of sheared area. The punch has stroke 100mm. Find power of motor required if the mean speed of flywheel is 18m/s. If total fluctuation of speed is not to exceed 2.5% of the mean speed, determine the mass of flywheel. [10]

OR

- Q6) a)** Explain turning moment diagram for single cylinder double acting steam engine. [6]

- b) A single cylinder, single acting, four stroke gas engine develops 20Kw at 300 rpm. The work done by the gases during the expansion stroke is three times the work done on the gases during the compression stroke, the work done during suction and exhaust strokes being negligible. If the total fluctuation of speed is not to exceed $\pm 2\%$ of mean speed and the turning moment diagram during compression and expansion is assumed to be triangular in shape, find mass moment of inertia of flywheel. [10]

SECTION - II

- Q7) a)** Explain with neat sketches various types of follower. [6]

- b) Following data relate to a cam profile, in which the follower moves with SHM during the lift and returning it with uniform acceleration and deceleration, acceleration being half the deceleration.

The minimum cam radius = 50 mm

The diameter of a roller = 20 mm

Lift of roller follower = 45 mm

Offset of follower axis = 12mm towards right

Angle of ascent = 70°

Angle of descent = 120°

Angle of dwell between ascent and descent = 45°

Cam speed = 200 rpm. Draw cam profile. [10]

OR

Q8) a) What are the different types of motions with which a follower can move for machine tool application? [6]

b) The following data refers a cam profile used to lift a knife edge follower through 25mm. The follower gets lifted to its maximum position for 60° of cam rotation. Then it remains in lifted position for the next 45° of cam rotation and returns its original position during next 75° of the cam rotation. Follower is required to be lifted with uniform acceleration and retardation whereas during return, it is expected to follow SHM. Minimum cam radius is 30mm and follower axis is offset by 6mm. Draw cam profile. [10]

Q9) a) Explain partially primary balancing of reciprocating masses in I C engine mechanism. [6]

b) Four cylinder vertical engine has cranks 300mm long. The planes of rotation of the first, third and fourth cranks are 750mm, 1050mm, 1650mm respectively from that of the second crank and their reciprocating masses are 150kg, 400kg, 250kg respectively. Find the mass of reciprocating parts for the second cylinder and the relative angular positions of the cranks in order that the engine may be in complete balance. [10]

OR

Q10) a) A mass is attached to a shaft which is rotating at an angular speed ω rad/sec. Describe the procedure of balancing this mass by two masses in different planes. [6]

- b) A radial engine has three cylinders whose axes are spaced at angular interval of 120° . The three connecting rods are coupled directly to a single crank. The stroke is 120mm and the length of each connecting rod is 180mm. The mass of the reciprocating parts per cylinder is 2kg. Find the resultant primary and secondary forces acting on frame of the engine when running at 2100 rpm. [10]

Q11)a) Derive frequency equation for spring mass system. [8]

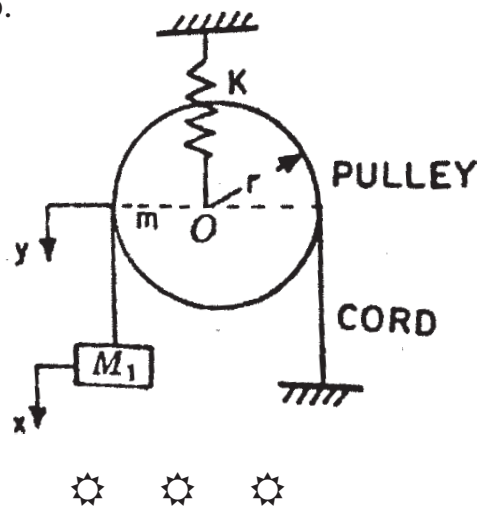
- b) A vibrating system consists of a mass of 25kg, a spring of stiffness 15KN/m and damper. The damping provided is only 15% of critical value. Determine [10]

- i) critical damping coefficient
- ii) damping factor
- iii) natural frequency of damped vibration
- iv) logarithmic decrement
- v) ratio of two consecutive amplitudes

OR

Q12)a) Explain various vibration measuring instruments. [8]

- b) Determine natural frequency of vibration of system shown in below given fig. The cord may be assumed inextensible in the spring mass pulley system and no slip. [10]



Total No. of Questions : 12]

SEAT No. :

P2258

[4758] -15

[Total No. of Pages : 3

T.E. (Mechanical)

**INDUSTRIAL ENGINEERING AND TECHNOLOGY MANAGEMENT
(2008 Course) (Semester - I)**

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answers to the two sections should be written in separate 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.*

SECTION - I

Q1) a) What is meant by scientific management? Explain in brief various functions of management. **[8]**

b) Define material handling. Explain the role of material handling principles in improving the productivity of a firm. **[8]**

OR

Q2) a) Define the plant layout & plant location. What are various factors Involved in selection of site for good plant? **[8]**

b) Briefly discuss various leadership styles adopted in industry. **[8]**

Q3) a) Define and explain what do you understand by industrial engineering? What is its importance? **[8]**

b) Discuss the two handed process chart in industrial engineering. **[4]**

c) What are therbligs? Give any six therbligs with symbols. **[4]**

OR

P.T.O.

- Q4)** a) Define method study. Explain the procedure for method study. [8]
b) Explain productivity improvement methods for organization. [4]
c) Write a note on SIMO chart. [4]

- Q5)** a) A manufacturing company requires 9500 units per year. Ordering cost is Rs. 125 per order and carrying cost is 20%. Purchase price per unit is Rs. 45. [6]

Determine:

- i) EOQ
ii) Optimum number of orders
iii) Total cost including acquisition of material
- b) What do you understand by Break-even analysis? Explain. [6]
c) Give the purpose of inventory control. [6]

OR

- Q6)** Write notes on (Any Three). [18]
a) Zero based Budgeting.
b) SIMO Chart.
c) Aggregate Planning.
d) ABC Analysis.

SECTION - II

- Q7)** a) What is the difference between Engineering & Technology? (Write only 3 points). Also write a note on Technology Management. [8]
b) Differentiate between product technology & process technology. [8]

OR

- Q8)** a) Explain the role of Government in Management and development of Technology. [8]
b) Every coin has two sides-explain this with the help of Technology development. Hence write whether it is good or bad for the progress?[8]

- Q9)** a) With the help of proper example. explain Quality Function Deployment (QFD). [8]
b) Write a note on Innovation and creativity with suitable examples. [8]

OR

- Q10)**a) How invention is different than innovation? [4]
b) Write a note on Technology monitoring in the industry. [4]
c) What is Technology Forecasting? Explain any two methods of the same with an example. [8]

- Q11)**a) For you as an engineer, write your SWOT Analysis. [4]
b) Write a note on Technology strategy and Technology Transfer. [6]
c) Write a note on [8]
Technology Absorption and Technology Diffusion.

OR

Q12) Write notes on following. (Any three). [18]

- a) IPR (Intellectual Property Right)
- b) Growth curve.
- c) Extrapolation
- d) Morphological Analysis
- e) Mission flow diagram.



Total No. of Questions : 12]

SEAT No. :

P3663

[4758]-150

[Total No. of Pages : 3

T.E. (Production Engineering)

METROLOGY & MECHANICAL MEASUREMENTS

(2008 Pattern) (Semester - I)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *Figures to the right indicate full marks.*
- 3) *Assume suitable data, wherever necessary.*

SECTION - I

- Q1)** a) State the Abbes' principle of alignment and explain the sine and cosine errors with neat sketch. **[9]**
- b) Describe with neat sketch and principal working of Johansons microkator and state its application. **[9]**

OR

- Q2)** a) Describe with neat sketch and principal working of Angle Dekkor and state its application. **[9]**
- b) Write a short note with neat sketch sine bar and sine center. **[9]**

- Q3)** Describe Taylor's principal in design of limit gauges. **[16]**

Design a workshop type GO and NO GO ring gauge for inspection of 30f8 shaft. Use the following data with usual notations:

- a) $i = 0.45 \sqrt[3]{D} + 0.001D$
- b) The standard tolerance for grade IT8=25i.
- c) Fundamental deviation for F shaft = -5.5 D^{0.41}.

OR

P.T.O.

- Q4) a)** A shaft and hole assembly is designated by 65H7m6 find actual dimension of shaft and hole and the class of fit and sketch. Given that [10]
- i) 65mm lies between diameter steps of 50-80mm
 - ii) FD for fit 'm' is given by $FD = + (IT7-IT6)$ for relevant range of diameter.
- b) Explain Hole basis and shaft basis system with neat sketch. [6]

- Q5) a)** Explain the Principle of measurement by light, wave interference method. Sketch optical arrangement of NPL gauge length interferometer. [8]
- b) Explain with neat sketch working principle of Taylor Hobson Talysurf surface tester. [8]

OR

- Q6) a)** Derive the relation for calculating the chord length & depth of gear by using constant chord method.
- Calculate chord length and its distance below tooth tip for a gear module 3mm and pressure angle 20° . [10]
- b) What is surface roughness and different methods of surface evaluation? [6]

SECTION - II

- Q7) a)** Draw generalized block diagram of measurement system and explain function of each elements in it. [10]
- b) Explain different types of calibration. [8]

OR

- Q8) a)** What is measurement and explain different method of it. [10]
- b) Describe the selection criteria used for Transducer for particular applications. [8]

Q9) a) Discuss the criteria for selection of a flow meter & explain differential pressure flow meter. [8]

b) Describe the construction and working of any one type of bourdon tube gauge. [8]

OR

Q10)a) Explain Rotameter with sketch. [8]

b) Explain with neat sketches diaphragm and bellow gauges. [8]

Q11)a) Discuss torque measurement method of rotating shaft. [8]

b) Discuss vibration measurement using accelerometer. [8]

OR

Q12)a) Explain the working of Pony brake with its advantages and dis-advantages. [8]

b) What are dynamometers? How are they classified? Explain working of any one. [8]

EEE

Total No. of Questions : 12]

SEAT No. :

P2300

[4758] - 151

[Total No. of Pages :4

T.E. (Production)

PRODUCTION MANAGEMENT

(311084) (2008 Course) (Semester - I)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer 3 questions from Section I and 3 questions from Section II.*
- 2) *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) Discuss the scope and objectives of Production Management. [9]
- b) Explain the relationship of Production with other functional departments. [9]

OR

- Q2)** a) Define Operation Management and discuss the history of Operation Management. [9]
- b) What are the different types of Production Systems? Explain any two with their merits and demerits. [9]

- Q3)** a) Explain the concept of Product Design and Product Cost. [8]
- b) With the help of figure explain stages in Product Life Cycle. [8]

OR

- Q4)** a) Explain with block diagram functions of Production Planning and Control. [8]
- b) Explain the concept of Concurrent Engineering. [8]

P.T.O.

Q5) a) Explain different types of material handling equipments with its applications. [8]

b) A company is engaged in the assembly of an engine on a continuously moving conveyor, 24 engine assemblies are required per shift of 8 hours. The other information is given below regarding assembly steps and precedence relationship. [8]

Operation Number	Immediate Precedence Task	Duration (Min)
1	---	5
2	1	3
3	1	7
4	1	5
5	3	6
6	3, 4	3
7	2	4
8	5, 6	6
9	4	12
10	7, 8, 9	9

- i) Draw the precedence diagram.
- ii) What is the desired cycle time?
- iii) What is the theoretical number of work stations?
- iv) What is the efficiency and balance delay of the solution obtained?

OR

Q6) a) Define plant layout. What are the objectives of good plant layout? [8]

b) Explain any two types of computerized plant layout. [8]

SECTION - II

- Q7)** a) Define sales forecasting. How sales forecasting methods are classified? [9]
- b) The demand for a product is given below. The forecast for the August was 250 units. Forecast the demand for the month of November taking the value of $\alpha = 0.4$. [9]

Month	August	September	October
Demand	220	280	330

OR

- Q8)** a) Explain why an organization has to go for Forecasting? [9]
- b) Find the coefficient of correlation between cost of production and the sales price for which data is as: [9]

Period	1	2	3	4	5	6
Cost	100	118	130	142	160	175
Price	125	140	152	164	188	198

- Q9)** a) Define the following: [8]
- i) Forward and Backward Scheduling
 - ii) Finite Loading
 - iii) Critical Ratio Scheduling
- b) There are seven jobs, each of which has to go through the machines A and B in the order of BA. Processing times in hours are given as: [8]

Job	1	2	3	4	5	6	7
Machine A	9	11	11	7	13	2	4
Machine B	4	13	16	7	11	12	10

OR

Q10)a) Explain in brief sequencing rules. **[8]**

b) A project consists of eight activities, Precedence relation and activity times are given. Draw the network diagram and compute the critical path for the activities. **[8]**

Activity	Immediate Predecessor	Activity Time (week)
A	--	12
B	--	20
C	--	28
D	C	12
E	A, B	28
F	E, D	12
G	D	8
H	F, G	8

Q11) Write short note on: **[16]**

- a) Concept of Waste Management.
- b) Lean Manufacturing.
- c) Concept of World Class Manufacturing.
- d) Just in Time.

OR

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

- a) Energy Conservation.
- b) Energy Audit.
- c) Advanced Manufacturing Philosophies.
- d) Computerized Production Management.



Total No. of Questions : 12]

SEAT No. :

P2301

[4758]-152

[Total No. of Pages : 4

T.E. (Production Engineering)

CUTTING TOOL ENGINEERING

(2008 Course) (Semester - I) (311085)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) *Solve Q-1 or Q-2, Q-3 or Q-4, Q-5 or Q-6, Q-7 or Q-8, Q-9 or Q-10, Q-11 or Q-12.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume suitable data, if necessary.*
- 5) *Use of logarithmic tables, slide rules, Mollier charts, electronic pocket calculator and steam table is allowed.*

SECTION - I

- Q1)** a) Draw Merchant force circle. State assumptions, limitations and write important relation between different forces from force circle diagram. **[10]**
- b) In an orthogonal cutting, the cutting velocity is 25 m/min and chip velocity is 10 m/min. the rake angle of tool is 10° , cutting force is 700 N and feed force is 300 N, cutting chip thickness is 0.5 mm, uncut chip thickness is 0.2 mm. **[10]**
- i) Chip thickness ratio,
 - ii) Shear plane angle,
 - iii) Shear force,
 - iv) Coefficient of friction,
 - v) Shear velocity.

OR

P.T.O.

- Q2) a)** A tubing of 60 mm outside diameter is turned on a lathe at a cutting speed of 25 m/min and feed 0.5 mm/rev, the rake angle of tool is 20 degree, the cutting force is 600 N and feed force 200 N, the length of continuous chip in one revolution is 60mm-calculate-chip thickness ratio, chip thickness, shear plane angle, coefficient of friction, velocity of chip along face, power for cutting. **[10]**
- b) Differentiate with neat sketch orthogonal cutting and oblique cutting. Why orthogonal cutting conditions are used in experimental work on cutting? **[10]**
- Q3) a)** What is meant by negative rake tool? Distinguish between solid tool and tipped cutting tool? Explain why cemented carbide tool are provided with negative rake angle in machining high strength and hard materials. **[7]**
- b) What is the use of chip breakers? Sketch various types of chip breakers and explain how a chip breakers breaks up a chip. **[8]**

OR

- Q4) a)** Enumerate the essential requirements of a tool material. What is the role of chromium, molybdenum, vanadium in tool material? **[7]**
- b) State some of the important characteristics of following tool materials. **[8]**
- i) High speed steel,
 - ii) Carbide,
 - iii) Ceramic,
 - iv) Stellite
- Q5) a)** State the experimental methods of determination of tool temperature and describe any one of them. **[5]**
- b) Write a short note on **[10]**
- i) Tool life and factors affecting on tool life,
 - ii) Economics of tooling.

OR

- Q6) a)** Find out optimum cutting speed and corresponding tool life for minimum cost for machining of mild steel work piece with HSS tool from following data. When the cutting speed was 25 m/min the tool life was 170 minutes and when the speed was increased to 40 m/min, the tool life was dropped to 50 minutes. Operating cost is 25 paise/min, Tool cost/cutting edge/tool failure is Rs.2 and tool changing time = 1.5 min. [8]
- b) Explain different types of tool wear and mechanism of tool wear. [7]

SECTION - II

- Q7) a)** Calculate the cross section of a straight shank single point turning tool made of HSS. Data given are, allowable bending stress of HSS = 200 MPa, Young's modulus of HSS = 2×10^5 MPa, Main cutting force = 1200N, Permissible deflection of tool tip = 0.05 mm. Also draw the tool geometry of the tool by assuming angles. [8]
- b) Explain the various design aspect of a milling cutter. [7]

OR

- Q8) a)** A key way is to be broached in the bore of an alloy steel gear. Design a broach with following data- [8]
- i) Bore diameter = 36 mm,
 - ii) Bore length = 40 mm,
 - iii) Width of key way = 5mm,
 - iv) Depth of key way = 3mm.
- b) Explain the various design aspect for circular form tool. [7]
- Q9) a)** What is an indexing jig? Describe various indexing devices commonly used with suitable sketch. [8]
- b) Explain with neat sketches different methods for mounting of bushes on jig plate. [7]

OR

Q10)a) What is locater? Describe various locater with sketches. [8]

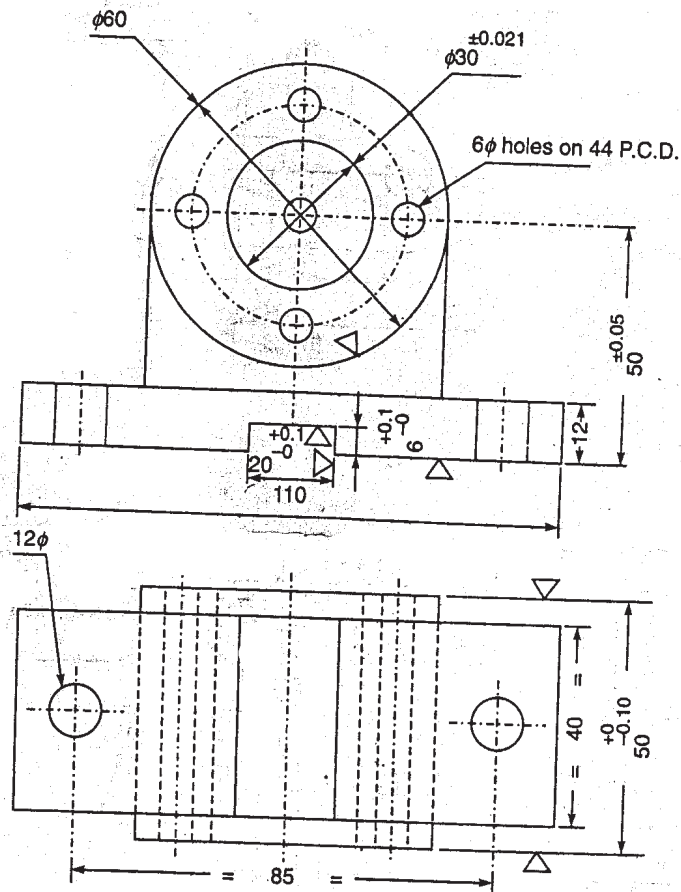
b) Describe criteria for selection of clamping devices. [7]

Q11) Design a jig for drilling $\phi 6$ mm holes on 44 PCD for a component shown in fig. no. 1 [20]

OR

Q12) Design a milling fixture to mill a slot 110X40 for a component shown in fig. no.1. Draw minimum two views of your design, show the component in position, name all important elements in drawing, write a part list of your design and draw detail view for locating, clamping, and bushing. [20]

Fig. NO. 1



EEE

Total No. of Questions : 12]

SEAT No. :

P2302

[4758] - 153

[Total No. of Pages :3

**T.E. (Production)
MATERIAL FORMING
(2008 Course) (Semester - I) (311083)**

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written 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 and differentiate between hot and cold forming. [8]
b) Explain camplastometer with neat sketch. [8]

OR

- Q2)** a) Enlist methods used for the analysis of forming processes. Explain the Slab method. [8]
b) Explain the effect of temperature, strain rate and friction on metal forming process. [8]

- Q3)** a) Explain machine forging with neat sketch. [6]
b) Explain briefly the following with neat sketch. [12]
i) Orbital forging
ii) Board drop hammer

OR

P.T.O.

Q4) Write short note

- a) Stock calculation in closed die forging [6]
- b) Friction screw press [6]
- c) Factors considered in selection of parting line. [6]

Q5) Derive an equation for the total drawing stress (σ_d) in wire drawing operation considering friction at die land. [16]

OR

Q6) Tube of 25mm external diameter and 1.25mm thickness is reduced to 22mm external diameter and 0.75mm thickness. The die angle is 34° and plug angle is 24° . The coefficients of friction at die and tube interface and tube and plug (mandrel) interface is 0.4. The flow stress of tube material is 430N/mm^2 . The tube drawing is carried at a speed of 0.7m/s. Calculate and compares the drawing stress, drawing load and power required if the tube drawing operation is carried out using

- a) Fixed plug, [6]
- b) Floating plug [6]
- c) Moving cylindrical Mandrel [4]

SECTION - II

- Q7)** a) Explain Automatic gauge control system in rolling. [8]
- b) Explain various methods of rolling to form seamless tubes. [8]

OR

- Q8)** a) Explain Tandem mill and planetary rolling mill with neat sketch. [8]
- b) Explain twenty high rolling mill with neat sketch. State the advantages, limitations and applications. [8]

- Q9)** a) Explain Impact extrusion with neat sketch. State the applications. [8]
b) Derive an equation for work done in extrusion. [8]

OR

- Q10)** a) Explain hydrostatic extrusion. State advantages and disadvantages. [8]
b) Explain the methods of manufacturing of tubes by extrusion. [8]

Q11) Write short note on

- a) High velocity forming [6]
b) Explosive forming [6]
c) Petro-forging forming [6]

OR

- Q12)** a) Explain HERF. Differentiate it with conventional forming. [6]
b) Explain Electro hydraulic forming with neat sketch. [8]
c) Explain types of explosives used in explosive forming. [4]



Total No. of Questions : 12]

SEAT No. :

P2303

[4758] - 154

[Total No. of Pages :4

T.E. (Production)

TOOL DESIGN

(2008 Course) (311088) (Semester - II)

Time : 4 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

Q1) Design a blanking die for the component shown in figure 1.

- a) Draw strip layout and find percentage utilisation of the strip. **[6]**
- b) Determine centre of pressure. **[6]**
- c) Find cutting force and press tonnage. **[4]**

Given: Strip length = 2440mm, Thickness of strip = 2 mm, Percent penetration = 70%, Shear strength of the material = 300MPa.

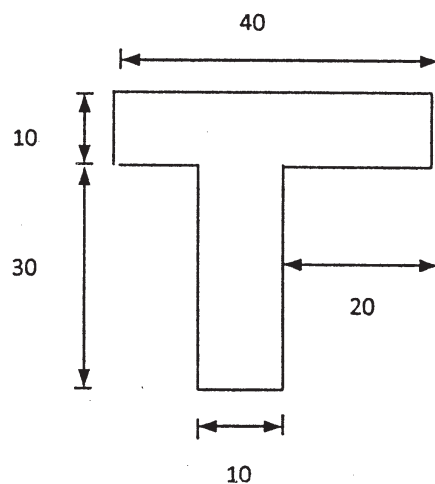


Figure 1

OR

P.T.O.

- Q2)** a) Explain and differentiate various types of strippers with neat sketch. [8]
 b) Explain various factors to be considered while laying out the sheet metal. [8]

Q3) Design a Drawing die for the component as shown in figure 2.

- a) Calculate blank size. [4]
 b) Calculate number of draws, cup diameter and height in each draw. [6]
 c) Determine punch and die dimensions. [3]
 d) Determine press capacity. [3]

(Assume stock thickness = 1mm, yield strength of material = 427 N/mm²)

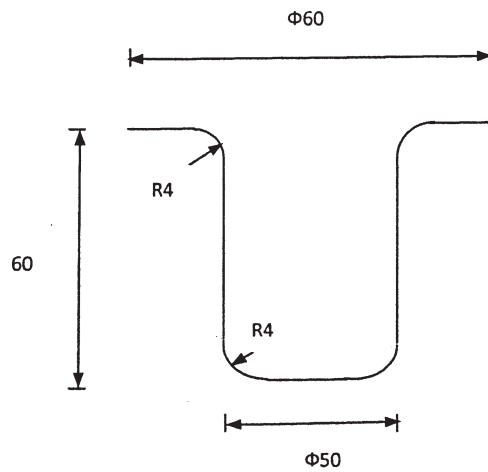


Figure 2

OR

- Q4)** a) Calculate blank size required to form a cup (figure 2) using graphical method. [8]
 b) Explain various methods to prevent spring back in bending. [8]

Q5) Design a complete a *progressive die* for a component having square blank of size 60mm × 60mm with central hole of diameter 10mm (Assume Strip length = 2440mm, Thickness of strip = 2mm, Percent penetration = 70%, Shear strength of material = 300MPa). [18]

OR

- Q6)** Design *a compound die* for the component having square blank of size 60mm × 60mm with central hole of diameter 10mm (Assume Strip length = 2440mm × 1220 mm, Thickness of strip = 2mm, Percent penetration = 70%, Shear strength of material = 300MPa). [18]

SECTION - II

- Q7)** a) Explain the steps to determine stock size in drop forging operation. [8]
b) Explain rules for designing die for upsetting operation. [8]

OR

- Q8)** a) Explain various allowances are considered while designing Multi-Impression die. [8]
b) Explain Multi-Impression die. Explain various forging operations with neat sketch are carried out on this type of die. [8]

- Q9)** a) Explain blow molding with neat. [8]
b) State and Explain injection molding terminology with neat sketch. [8]

OR

- Q10)** a) Explain the characteristics and application of rotational molding process with neat sketch. [8]
b) Explain Fan gate and Overlap gate with neat sketch. [8]

- Q11)** A cup is to be formed by injection molding process. Cup Material is ABS. The following data is available.

Thickness of cup : 3mm

Runner diameter : 6.25mm

Thermal diffusivity, α for ABS = 8.69×10^{-8}

Melt Temperature = 239°C

Cooling Temperature = 60°C

Ejection Temperature = 97.6°C

Mass of molding (Cup + runner) = 62.6gm

Plastic specific heat, C_p = 2340(J/kg °C)

Coolant: Water

Water specific heat, $C_p = 4200 \text{ (J/kg } ^\circ\text{C)}$

Density of Water, $\rho = 1000 \text{ kg/m}^3$

Viscosity of Water, $\mu = 0.001 \text{ Pa.s}$

Number of cooling lines = Four (2 lines per side)

Total length of cooling line = 604mm

Assume Reynold Number, $Re = 4000$

Determine:

- a) Cooling time for cup [3]
- b) Cooling time for runner [3]
- c) Heat to be removed [2]
- d) Heat transfer rate (cooling power) [2]
- e) Volumetric coolant flow rate [4]
(assuming Allowable increase in temperature of coolant 1°C)
- f) Maximum and minimum Diameter of Cooling channel. [4]

OR

- Q12)a)** Explain various elements to be designed for feed system with important design considerations. [9]
- b) Determine number of impressions for minimum cost for injection molding of component having weight 0.253kg. Shot weight handling capacities for various molding machines along with machine hour rate is given below: [9]

Capacity (kg)	4	6	10	14
Machine hour rate (Rs.)	20	40	60	80

Given that:

Quantity to be produced = 100000

Cycle time = 35sec,

Cost of producing one impression = Rs. 3000/-



Total No. of Questions : 11]

SEAT No. :

P2304

[4758] - 155

[Total No. of Pages :4

T.E. (Production Engineering)

INDUSTRIAL ENGINEERING AND QUALITY ASSURANCE

(2008 Course) (311089) (Semester - II)

Time :3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, wherever necessary.*

SECTION - I

- Q1)** a) Define basic work content. Explain various factors which increases the basic work content. [8]
- b) Define Industrial Engineering. Explain in detail the contribution of F.W. Taylor and Gantt in the development of Industrial Engineering. [10]

OR

- Q2)** a) Explain in detail the factors affecting productivity. [8]
- b) What are the functions of Industrial Engineering discuss in detail? [10]
- Q3)** a) What are the reasons of excess work content? Explain in detail. [8]
- b) Explain in brief the steps involved in the method study. [8]

OR

- Q4)** a) What are different aspects to be considered for selection of the job for Method Study? [8]
- b) Explain with example flow process chart and SIMO charts used in method study. [8]

P.T.O.

- Q5) a)** What are the steps involved in Time study? Explain in detail. [8]
 b) Explain with neat sketch the equipments used for doing the time study. [8]

OR

- Q6) a)** What is PMTS in time study? What are the factors to be considered while doing time study? [8]
 b) Explain in detail the allowances used in time study. [8]

SECTION - II

- Q7) a)** What is quality of Design, Conformance and Performance? [8]
 b) A machine is working to a specification of 12.58 ± 0.05 mm. A study of 50 consecutive pieces shows the following measurements: [8]

1	2	3	4	5	6	7	8	9	10
12.54	12.58	12.61	12.57	12.57	12.58	12.60	12.65	12.60	12.65
12.58	12.57	12.60	12.61	12.60	12.59	12.62	12.57	12.59	12.61
12.62	12.60	12.64	12.56	12.62	12.59	12.61	12.57	12.60	12.60
12.56	12.60	12.58	12.59	12.61	12.56	12.67	12.56	12.63	12.62
12.59	12.61	12.64	12.59	12.58	12.57	12.60	12.61	12.56	12.62

- i) Determine the process capability.
 ii) Determine \bar{X} and R control limits.
 iii) State whether the machine is capable of meeting the tolerances?
 iv) Suggest the possible ways by which the percent defective can be reduced.

Assume:

- 1) Normal distribution
 2) d_2 for sub-group size 5 is 2.326.

OR

- Q8) a)** Explain the following as applied to quality control: **[8]**
- i) Appraisal Cost
 - ii) Prevention Cost
 - iii) Failure Cost
 - iv) Optimum Cost
- b) In a manufacturing process, the number of defectives found in the inspection of 15 lots of 400 items each are given below: **[8]**

Lot no.	No. of defectives	Lot no.	No. of defectives
1	2	9	18
2	5	10	8
3	0	11	6
4	14	12	0
5	3	13	3
6	0	14	0
7	1	15	6
8	0		

- i) Determine the trial control limits for np chart and state whether the process is in control.
 - ii) What will be new value of mean fraction defective if some obvious points outside control limits are eliminated. What will be the corresponding upper and lower control limits and examine whether the process is still in control or not.
- Q9) a)** Discuss Deming's and Juran's approaches of Total Quality Management (TQM). **[10]**
- b) Explain concept of DMAC with appropriate manufacturing example. **[6]**

OR

- Q10)**a) What do you mean by term Reliability? [4]
- b) What is Design of experiments? What are objectives for performing Design of experiment? [6]
- c) Explain concept of 5 S used in industries for housekeeping. [6]

Q11) Write short note on (Any 3). [18]

- a) Different ISO standards.
- b) Compare Attribute and Variable Charts.
- c) Process Capability & Process Capability Index
- d) Operating Characteristic Curve (OC)
- e) Pareto Analysis & Quality circle.



Total No. of Questions : 12]

SEAT No. :

P3664

[4758]-156

[Total No. of Pages : 3

**T.E. (Production Engineering)
MACHINE TOOL ENGINEERING
(2008 Pattern) (Semester-II) (311087)**

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 side indicate full marks.*
- 4) *Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10, and Q.11 or Q.12.*
- 5) *Use of electronic pocket calculator is allowed.*
- 6) *Assume suitable data if necessary.*

SECTION-I

- Q1)** a) List the procedure for drawing cams for turret type automat. [6]
- b) Explain parallel action multispindle automat. [6]
- c) Explain automated production line. [6]

OR

- Q2)** a) How does an automates differ from a Capstan Lathe? [6]
- b) Explain collets used in automate. [6]
- c) Explain with figure rotary type transfer machine. [6]

- Q3)** a) Explain Positioning system in Computer Numerical Controlled (CNC) machining. [8]
- b) Explain difference between NC, CNC & DNC. [8]

OR

P.T.O.

Q4) a) Explain open loop system and closed loop system of numerical control with suitable diagram. [8]

b) Write note on Machining Centre and Turning Centre. [8]

Q5) a) Explain principles of material handling. [8]

b) Write short note on Automated Guided Vehicle System (AGVS). [8]

OR

Q6) a) Explain with neat sketch Machine Vision System. [8]

b) Write short note on Automated Storage and Retrieval System (AS/RS). [8]

SECTION-II

Q7) a) Explain with neat diagram Electric Discharge Machine (EDM). Also explain RC circuit used in EDM. [8]

b) What are the different elements of Electro chemical machining (ECM). If iron is being machined using NaCl solution. Explain various reactions those will take place on anode and cathode. [8]

OR

Q8) a) Classify Nontraditional Machining processes. Explain with neat sketch Ion Beam Machining process. [8]

b) Explain the principle of Plasma Arc Machining with sketch and state its application. [8]

Q9) a) Write short note on Reliability analysis of machine tool. [8]

b) Explain with neat diagram Adaptive Control System in CNC machine. [8]

OR

Q10)a) Explain various factors considered while designing the foundation of machine tool. Explain the method of vibration isolation. [8]

b) Explain maintenance policy, procedure adopted for CNC machine tool. [8]

Q11)a) Explain helical gear machining by using left hand/right hand hob. [9]

b) Explain with neat sketch bevel gear manufacturing by generation method. [9]

OR

Q12)a) Describe the working principle of Gear Shaper machine with suitable example. [9]

b) Why it is necessary to use Gear finishing operation? Explain any one gear finishing process. [9]



Total No. of Questions : 12]

SEAT No. :

P2305

[4758]-157

[Total No. of Pages : 4

T.E. (Prod. Engg. / Common to Prod. S/W)
NUMERICAL TECHNIQUES AND DATABASE
(2008 Course) (Semester - II) (311090)

Time : 3 Hours]

[Max. Marks :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 side indicate full marks.*
- 5) *Use of electronic pocket calculator is allowed.*
- 6) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) What are the advantages and limitations of database processing? [5]
- b) Explain the entity-relationship model with a suitable example. [5]
- c) Explain the various components of DBMS with a neat sketch? [6]

OR

Q2) Explain the following: [16]

- a) Data types used in SQL.
- b) Hierarchical and Relational database management systems.
- c) Data models.

Q3) a) Explain with an example the primary key and foreign key concepts in databases? [6]

P.T.O.

- b) Create a table 'emp' with the following columns by assuming suitable data type and size with correct syntax in SQL.

Emp_id, Ename, City, State, Salary, Age, Hire_date. [4]

- c) Give an expression in SQL to solve each of the following queries: [6]

- i) Find the names of all employees whose name starts with 'M'.
- ii) List all the employees name and salary whose age is less than 10 years.

Select the employees whose salary is between Rs. 20000 and Rs. 60000.

OR

- Q4)** a) Explain the use of compound conditions AND, OR, Joining in SQL programming with an example? [6]

- b) Explain the following with reference to SQL programming: [10]

- i) Principles of NULL value.
- ii) Grouping data from tables.
- iii) Any four aggregate functions.

- Q5)** a) What do you understand by EDI? Why EDI important in e-commerce? Explain? [9]

- b) What is ERP? Explain ERP with respect to production and operations management? [9]

OR

- Q6) a)** Explain the following terms: [8]
- i) Data
 - ii) Information
 - iii) Knowledge
 - iv) Artificial Intelligence
- b) What is an expert system? Explain in brief the need and structure of expert systems in manufacturing? [10]

SECTION - II

- Q7) a)** In a right angle triangle ABC, BC = a = 6 cm, AB = c = 15 cm, find the possible error in computed value of angle A if errors in measurements of a and c are 1 mm and 2 mm respectively. [6]
- b) $\sqrt{5.5} = 2.345$ and $\sqrt{6.1} = 2.470$ correct to four significant figures. Find the relative error in taking the difference of these numbers. [5]
- c) Find a real root of $x^3 - x = 1$ between 1 and 2 by bisection method. Compute 5 iterations. [5]

OR

- Q8) a)** Distinguish between absolute error, relative error with an example of your choice. [5]
- b) Given a circle $x^2 + y^2 = c$, write a C program to determine whether a point (x, y) lies inside the circle, on the circle, on the circle or out side the circle. [6]
- c) Perform 4 iterations of the Gauss-Seidal method for finding the solution of the linear system of equations: Assume the initial approximation as $x_1 = 0.6$, $x_2 = - 0.2$ and $x_3 = 0.5$. [5]

$$4x_1 - 2x_2 + x_3 = 4$$

$$x_1 + 2x_2 + x_3 = 0.75$$

$$3x_1 - 3x_2 + 5x_3 = 5.5$$

- Q9) a)** Using Newton's divided difference formula, find a polynomial function satisfying the following data: [8]

x	-4	-1	0	2	5
y	1245	33	5	9	1335

- b) Write an algorithm for solving the interpolation problem using Newton forward difference method? [8]

OR

- Q10)a)** Compute the value of $f(x)$ for $x = 2.5$ from the following table: [8]

x :	1	2	3	4
$f(x)$:	1	8	27	64

using Lagrange's interpolation method.

- b) Show that the line of fit to the following data is given by

$$y = 0.7x + 11.285: \quad [8]$$

x :	0	5	10	15	20	25
y :	12	15	17	22	24	30

- Q11)a)** Solve the equation $y''(x) - x.y(x) = 0$ for $y(x_i)$, $x_i = 0, 1/3, 2/3$. Given that $y(0) + y'(0) = 1$ and $y(1) = 1$. [9]

- b) Solve the equation $dy/dx = y + x$ with initial condition $y(0) = 1$ by using Runge - Kutta method from $x = 0$ to $x = 0.4$ with $h = 0.1$. [9]

OR

- Q12)a)** Use the Runge - Kutta fourth order method to find the value of y when $x = 1$ given that $y = 1$ when $x = 0$ (take $n = 2$) and $dy/dx = (y - x)/(y + x)$. [9]

- b) Solve the differential equation $d^4y/dx^4 - 16.y = x$ for $y(0.25)$, $y(0.5)$ and $y(0.75)$, given that $y(0) = 0$, $y''(0) = 0$, $y(1) = 0$ and $y'(1) = 0$. [9]

EEE

Total No. of Questions : 12]

SEAT No. :

P2306

[4758]-158

[Total No. of Pages : 4

T.E. (Production Engineering) (Common to Production S/W)

PRODUCTION METALLURGY

(2008 Course) (Semester - II) (311091)

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) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data if necessary.*
- 5) *Use of logarithmic tables, slide rules, Mollier charts, electronic pocket calculator and steam table is allowed.*

SECTION - I

- Q1)** a) Explain the steps for preparation of sample for microscopic examination. **[6]**
- b) Explain with composition:- 95Cr5Mo1, 35NiCr60, En31, AISI 1020, St50 and T105Cr1Mn60. **[6]**
- c) Draw microstructures: **[6]**
- i) Mild Steel
 - ii) 0.8%C steel
 - iii) 1.2%C steel

OR

- Q2)** a) Draw a neat Fe-Fe₃C equilibrium diagram and state the critical temperatures with their significance. **[6]**

P.T.O.

- b) Explain [6]
- i) Numerical aperture
 - ii) Resolving power
 - iii) Magnifying power

c) Explain electrolytic etching with a neat diagram. [6]

Q3) a) Write short notes: [8]

- i) Isothermal Annealing
- ii) Spherodise Annealing

b) Explain conventional hardening process. [8]

OR

Q4) a) What is retained austenite? Explain the ways to eliminate it. [8]

b) Define hardenability and explain the Jominy hardenability test. [8]

Q5) a) Compare gas carburizing with gas nitriding. [8]

b) Write short notes: [8]

- i) Patenting
- ii) Ausforming

OR

Q6) a) Describe the induction hardening process and give its merits and demerits over the flame hardening process. [8]

b) What is carburizing? Why is it done? Are post carburizing treatments necessary? [8]

SECTION - II

- Q7) a) Write short notes: [8]**
- i) Silal and Nicrosilal
 - ii) Chilled Cast iron
- b) Which alloy steels would you suggest for the following applications and justify: [10]**
- i) Wrist Watches
 - ii) Lathe tools
 - iii) Master tools
 - iv) Extrusion dies
 - v) Plastic moulds

OR

- Q8) a) Compare ferritic stainless steels with Austenitic stainless steels. [8]**
- b) State all the effects of alloying elements. [10]**
- Q9) a) Give the composition, one property and one application for the following: [8]**
- i) Y - alloy
 - ii) Inconel
 - iii) Tinman's Solder
 - iv) German silver
- b) Draw labeled microstructures: [8]**
- i) Cartridge Brass
 - ii) Tin Bronze
 - iii) Babbits
 - iv) Aluminium Bronze

OR

Q10)a) Give the composition, one property and one application: **[8]**

i) Gun metal

ii) Alnico

iii) Invar

iv) Constantan

b) Write short notes on: **[8]**

i) Dezincification

ii) Season cracking of brasses

Q11)a) What are Composites? Classify them and explain in brief carbon fiber polymer matrix composites. **[8]**

b) What is an implant? Give any two examples of implant materials with their properties and applications. **[8]**

OR

Q12)a) Compare Metal matrix composites with Ceramic matrix composites. **[8]**

b) Explain properties and applications of Nanomaterials and Sports materials. **[8]**

EEE

Total No. of Questions : 6]

SEAT No. :

P3665

[4758] - 159

[Total No. of Pages :5

T.E. (Production S/W)

MANUFACTURING TECHNOLOGY

(2008 Pattern) (Semester - I) (Self-Study) (311122)

Time : 3Hours]

[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.*

SECTION- I

- Q1) a)** Estimate the material removal rate in AJM of a brittle material with flow strength of 4 GPa. The abrasive flow rate is 2 gm/min, velocity is 200m/s and density of the abrasive is 3gm/cc. **[8]**
- b) Glass is being machined at a MRR of 6mm³/min by Al₂O₃ abrasive grits having a grit dia of 150 μm. If 100 μm grits were used, what would be the MRR in this USM process. **[8]**

OR

- a) Answer following (First attempted question in answer sheet will be evaluated). **[8]**
- i) Mechanism of material removal in Electron Beam Machining is due to
- 1) Mechanical erosion due to impact of high of energy electrons.
 - 2) Chemical etching by the high energy electron.
 - 3) Sputtering due to high energy electrons.
 - 4) Melting and vaporisation due to thermal effect of impingement of high energy electron.

P.T.O.

- ii) Mechanism of material removal in Laser Beam Machining is due to
 - 1) Mechanical erosion due to impact of high of energy photons.
 - 2) Electro-chemical etching.
 - 3) Melting and vaporisation due to thermal effect of impingement of high energy laser beam.
 - 4) Fatigue failure.
- iii) Generally Electron Beam Gun is operated at
 - 1) Atmospheric pressure
 - 2) At 1.2 bar pressure above atmosphere
 - 3) At 10-100m Torr pressure
 - 4) At 0.01-0.001 m Torr pressure
- iv) Laser Beam is produced due to
 - 1) Spontaneous emission
 - 2) Stimulated emission followed by spontaneous emission
 - 3) Spontaneous emission followed by Spontaneous absorption.
 - 4) Spontaneous absorption leading to “population inversion” and followed by stimulated emission.

- b) In electrochemical machining of pure iron a material removal rate of $600\text{mm}^3/\text{min}$ is required. Estimate current requirement. **[8]**

Q2) a) Following table shows the requirements of plastics along with its applications. List type of plastics you will prefer for all design requirements. (Any four out of five) **[12]**

Design requirement

Applications

Mechanical strength	Gears, cams, rollers, valves, fan blades, impellers, pistons
Functional and decorative	Handles, knobs, camera and battery cases, trim moldings, pipe fittings
Housings and hollow	shapes Power tools, pumps, housings, sport helmets, telephone cases
Functional and transparent	Lenses, goggles, safety glazing, signs, food-processing equipment, laboratory hardware
Wear resistance	Gears, wear strips and liners, bearings, bushings, roller-skate wheels

- b) Explain following limitations of thermoforming (Any Two). **[4]**
- i) Non-uniform wall thickness
 - ii) Sheet Cost
 - iii) Trimming

OR

Explain following molding processes for reinforced plastics (any two):**[16]**

- a) Compression Molding
- b) Vacuum Bag Molding
- c) Contact Molding
- d) Resin Transfer Molding

Q3) Why is the study of modeling and simulation important for system design, particularly for MEMS design? What are the specifications of requirement as far as modeling is concerned? Give an example of how a parallel plate actuator system can be modeled. Represent the above system in pictorial form and describe each element. **[18]**

OR

- a) Find out the desired viscosity to density ratio of a photoresist solution to be prepared for the spin coating by using a vacuum chuck. The allowed time of rotation of the chuck within a production process is 2 minutes and the desired height of photoresist is 50 microns. The rotor rotates at 10,000 rpm. Assume that the original height is 500 microns. [6]
- b) Discuss the following lithography methods: [12]
- i) X-ray lithography
 - ii) E-beam lithography
 - iii) Soft lithography

SECTION - II

- Q4)** a) Differentiate between comparing and measuring. Further, Discuss the desirable characteristics of comparator. [10]
- b) Explain working mechanism of dial indicator. [6]

OR

For measurement by light wave interference explain following (any two). [16]

- a) Fringe patterns and their interference.
- b) Michelson interferometer.
- c) NPL Flatness interferometer.

- Q5)** Explain following (any two): [16]

- a) Sine Bar.
- b) Autocollimator.
- c) Angle Dekkor.

OR

Explain principle and applications of measuring instruments of optical and bevel protractor. [16]

Q6) Explain Objectives and functions of cost estimating and principle factors in estimating, along with estimating procedure. **[18]**

OR

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

- a) Estimation of volume and weight of material
- b) Provision for scrap and its necessity in estimating
- c) Methods of Depreciation
- d) Replacement Techniques
- e) Time Value for money.



Total No. of Questions : 12]

SEAT No. :

P2259

[4758] - 16

[Total No. of Pages :8

T.E. (Mechanical Engineering)

MACHINE DESIGN - II

(2008 Course) (302047) (Semester - II)

Time : 4 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer three questions from Section I and three questions from Section II.*
- 2) *Answers to the two Sections should be written in separate answer books.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Neat diagrams must be drawn wherever necessary.*
- 5) *Use of Electronic Pocket Calculator is allowed.*
- 6) *Assume suitable data, if necessary, and mention it clearly.*

SECTION - I

Q1) a) A one work cycle consists of following parts

	Part I	Part II
Duration (seconds)	40 s	20 s
P_r (Radial load)	600 N	300 N
P_a (Axial load)	200 N	120 N
speed	1440 rpm	720 rpm

Static load and dynamic load carrying capacities are 695 N and 1430 N, respectively, for the bearing. Calculate the life of bearing in hours. Consider that the inner race of the ball bearing is rotating [Refer Table - 1] **[14]**

b) What is preloading of bearing? Explain any one with sketch. **[4]**

OR

P.T.O.

- Q2) a)** Select a single row deep groove ball bearing with the operating cycle listed below, which will have a life of 15000 hours. **[12]**

Fraction of cycle	Type of load	Radial (N)	Thrust (N)	Speed(rpm)	Service factor
1/10	Heavy shocks	2000	1200	400	3
1/10	Light shocks	1500	1000	500	1.5
1/5	Moderate Shocks	1000	1500	600	2
3/5	No shock	1200	2000	800	1

Assume radial and axial loads to be 1.0 and 1.5 respectively and inner race rotates.

- b) Write a short note on selection of bearing type. **[6]**

- Q3) a)** The following data is given for a full, hydrodynamic bearing: **[12]**

Journal speed: 1440 rpm, Journal diameter: 60 mm, Bearing length: 60 mm, radial clearance: 0.06mm, radial load: 3 kN, viscosity of lubricant: 30 cP.

Assume that total heat generated due to friction in bearing is carried by the total lubricant flow. Calculate:

- i) Coefficient of friction
 - ii) Minimum oil film thickness
 - iii) Flow requirement
 - iv) Temperature rise
 - v) Power lost in friction. [Refer- Table - 2].
- b) Write a short note on additives for mineral oils. **[4]**

OR

- Q4) a)** Following data is given for a full hydrodynamic bearing: **[10]**

Radial load: 22 kN, journal speed: 960 rpm, Unit pressure in bearing: 2.4 MPa, $1/d = 1:1$, viscosity of lubricant = 20 cP, Ratio of $h_0/c = 0.2 =$ (Minimum oil thickness)/(radial clearance) [Refer Table - 2]

Determine:

- i) Dimensions of bearing
 - ii) Minimum film thickness
 - iii) Requirements of oil flow.
- b) Explain properties and selection of bearing material in sliding contact bearing. [6]

Q5) a) What are different modifying factors? Write in details of any three modifying factor and its selection. [6]

b) The work cycle of a shaft subjected to completely reverse bending stresses consists of the following three elements: [10]

- i) $\pm 350 \text{ N/mm}^2$ for 85% of time,
- ii) $\pm 400 \text{ N/mm}^2$ for 12% of time, and
- iii) $\pm 500 \text{ N/mm}^2$ for remaining time.

The material for shaft is 50C4 ($S_{ut} = 660 \text{ N/mm}^2$) and the corrected endurance limit of shaft is 280 N/mm^2 . Determine life of shaft.

OR

Q6) a) Explain in brief bolted joint under fluctuating load. [6]

b) A machine component is subjected to two-dimensional stresses. The tensile stress in the X direction varies from 40 to 100 N/mm^2 while the tensile stress in the Y direction varies from 10 to 80 N/mm^2 . The frequency of variation of these stresses is equal. The corrected endurance limit of the component is 270 N/mm^2 . The ultimate tensile strength of the material of the component is 660 N/mm^2 . Determine the factor of safety used by the designer. [10]

SECTION - II

- Q7)** a) List desirable properties of good friction lining materials for clutches. Also list the different materials. [4]
- b) Explain self energizing and self locking brakes. [4]
- c) A single plate clutch consisting of two pairs of contacting surfaces is required to transmit 35 kW at 1440 rpm. The coefficient of friction between the contacting surfaces is 0.3 and intensity of pressure is limited to 0.38 N/mm². The outer diameter of friction disc is limited to 290 mm. If service factor is 1.25, determine: [8]
- i) Inner diameter of friction disc.
 - ii) Axial force required to engage the clutch.

OR

- Q8)** a) Draw a neat labeled sketch of internal expanding shoe brake. [4]
- b) Differentiate between single plate and multiplate clutch. [4]
- c) A caliper disk brake is to design for sport car. The required braking capacity of each brake is 450 N-m. The inner and outer radii of friction pad are 100 mm and 150 mm resp. The coefficient of friction between the pads and rotating disc is 0.4. While the limiting intensity of pressure is 1.1 N/mm². Determine, the required no. of pads if the pads are annular segment with subtended angle 60° per pad at centre of disc. Draw the sketch showing disc and annular pads. [8]
- Q9)** a) What are effect of increasing and decreasing pressure angle in design of gear pair. [4]
- b) A spur gear pair 20° full depth involute gear profile consist of 18 teeth pinion meshing with 36 teeth gear. The pinion and gear are made of steel with S_{ut} - 600 N/mm² and 510 N/mm² resp. The module is 5 mm while the face width is $10 \times m$. The surface hardness of pinion and gear are 330BHN and 280 BHN resp.

Calculate:

- i) Beam strength
- ii) Wear strength
- iii) Rated power that the gear can transmit
- iv) Maximum static load on gear.

Assume service factor & factor of safety 1.5 & 2 resp.

Use following data:

- Pinion speed - 1440 rpm
- $Y = 0.484 - \frac{2.87}{Z}$
- $V = \frac{5.6}{5.6 + \sqrt{V}}$ [14]

OR

Q10)a) What is formative no. of teeth in helical gear. Derive the expression for it. [4]

- b) A helical pinion 14 teeth made of alloy steel with S_{ut} - 800 N/mm² mesh with gear made of plain carbon steel with S_{ut} - 720 N/mm². The gear is required to transmit 30 kW power from an electric motor running at 720 rpm to machine at 225 rpm. The application factor and load concentration factor are 1.3 and 1.1 resp. While the factor of safety is 2.0. The face width is $10 \times$ normal module & tooth is 20° full depth involute. The deformation factor is $11000 \times e$ N/mm. Design the gear pair by using velocity factor and buckingham's equation for dynamic load. Also suggest the surface hardness for gear pair. Use following data:

- $Y = 0.484 - \frac{2.87}{Z}$
- $V = \frac{5.6}{5.6 + \sqrt{V}}$

- for grade 7 - $e = 11 + 0.9[Mn + 0.25\sqrt{d}] \mu m$.
- $K = 0.16 [BHN/100]^2$
- Buckingham's eqⁿ - $Pd = \frac{21V(bc \cos^2 \psi + Pt_{max}) \cos \psi}{21V + \sqrt{bc \cos^2 \psi + Pt_{max}}}$
- Standard module - 1, 1.25, 2, 3, 4, 5, 6, 8, 10, 12 [14]

Q11)a) What are different types of mountings of bevel gear. Explain any one with sketch. [4]

- b) A pair of bevel gear with 20° full depth involute tooth profile consist of 24 teeth pinion meshing with 48 teeth gear. The axes are right angle to each other. The module at large end of tooth is 6 mm while the face width is 50mm. The gear pair is made of gray cast iron FG 220. The teeth are generated, the surface hardness of gear pair is 250 BHN. The application factor and factor of safety are 1.5 and 2.0 resp. The pinion rotates at 300 rpm. Assume velocity factor accounts for dynamic load.

Determine: [12]

- Beam strength
- Wear strength
- Maximum static load on gear
- Rated power that the gear can transmit

OR

Q12)a) Derive the equation for efficiency of the worm gear. [3]

- b) A worm gear pair 2/30/10/18 consist of worm gear made of phosphor bronze with $S_{ut} - 245 \text{ MPa}$ and worm is made of hardened steel with $S_{ut} - 700 \text{ N/mm}^2$. The coefficient of friction between worm and worm gear is 0.04 while normal pressure angle is 20°. The wear factor of worm gear teeth is 0.825 MPa. The fan is used for which overall heat transfer coefficient is $22 \text{ W/m}^2\text{°C}$. The permissible temperature rise for lubricating oil above the atmospheric temperature is 45°C. The worm rotates at 720 rpm. Assume service factor 1.25. Determine the input power rating based on:

- i) Beam strength
- ii) Wear strength
- iii) Thermal consideration

Also suggest input power that worm gear can take.

Use following data,

$$Y = 0.484 - \frac{2.87}{Z_9}$$

$$C_v = \frac{6}{6 + V_9}$$

Area of housing – $A = 1.14 \times 10^{-4} \times a^{1.7} \text{m}^2$

where, a is centre distance in mm.

[13]

Table 1 Single-row deep-groove ball bearings

$\frac{P_a}{C_o}$	$\frac{P_a}{VP_r} \leq e$		$\left(\frac{P_a}{VP_r}\right) > e$		e
	X	Y	X	Y	
0.014				2.30	0.19
0.028				1.99	0.22
0.056				1.71	0.26
0.084				1.55	0.28
0.11	1	0	0.56	1.45	0.30
0.17				1.31	0.34
0.25				1.20	0.37
0.28				1.15	0.38
0.42				1.04	0.42
0.56				1.00	0.44

Table 2 Various parameters of journal bearing

$\frac{l}{d}$	ξ	$\frac{h_0}{c}$	s	ϕ	$\left(\frac{r}{c}\right)^f$	$\frac{Q}{rcn, l}$	$\left(\frac{Q_s}{Q}\right)$	$\left(\frac{p}{p_{max}}\right)$
∞	0	1.0		70.92	∞	π	0	-
	0.1	0.9	0.240	69.10	4.80	3.03	0	0.826
	0.2	0.8	0.123	67.26	2.57	2.83	0	0.814
	0.4	0.6	0.0636	61.94	1.52	2.26	0	0.764
	0.6	0.4	0.0389	54.31	1.20	1.56	0	0.667
	0.8	0.2	0.021	42.22	0.961	0.760	0	0.495
	0.97	0.03	-	-	-	-	0	-
	1.0	0	0	0	0	0	0	0
1	0	1.0	∞	85	∞	π	0	-
	0.1	0.9	1.33	79.5	26.4	3.37	0.150	0.540
	0.2	0.8	0.631	74.02	12.8	3.59	0.280	0.529
	0.4	0.6	0.264	63.10	5.79	3.99	0.497	0.484
	0.6	0.4	0.121	50.58	3.22	4.33	0.680	0.415
	0.8	0.2	0.0446	36.24	1.70	4.62	0.842	0.313
	0.9	0.1	0.0188	26.45	1.05	4.74	0.919	0.247
	0.97	0.03	0.00474	15.47	0.514	4.82	0.973	0.152
$\frac{1}{2}$	0	1.0	∞	88.5	∞	π	0	-
	0.1	0.9	4.31	81.62	85.6	3.43	0.173	0.523
	0.2	0.8	2.03	74.94	40.9	3.72	0.308	0.506
	0.4	0.6	0.779	61.45	17.0	4.29	0.552	0.441
	0.6	0.4	0.319	48.14	8.10	4.85	0.730	0.365
	0.8	0.2	0.0923	33.31	3.26	5.41	0.874	0.267
	0.9	0.1	0.0313	23.66	1.60	5.69	0.939	0.206
	0.97	0.03	0.00609	13.75	0.620	5.88	0.980	0.126
$\frac{1}{4}$	0	1.0	∞	89.5	∞	π	0	-
	0.1	0.9	16.2	82.31	322.0	3.45	0.180	0.515
	0.2	0.8	7.57	75.18	153.0	3.76	0.330	0.489
	0.4	0.6	2.83	60.86	61.1	4.37	0.567	0.415
	0.6	0.4	1.07	46.72	26.7	4.99	0.746	0.334
	0.8	0.2	0.261	31.04	8.8	5.60	0.884	0.240
	0.9	0.1	0.0736	21.85	3.50	5.91	0.945	0.180
	0.97	0.03	0.0001	12.22	0.922	6.12	0.984	0.108
1.0	0	0	0	0	-	1.0	0	

Total No. of Questions : 12]

SEAT No. :

P2307

[4758] - 160

[Total No. of Pages :5

T.E. (Production S/W)

KINEMATICS DESIGN OF MACHINE

(2008 Course)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1) a)** In a slider crank mechanism, the crank $AB = 100\text{mm}$ and the connecting rod $BC = 400\text{mm}$. The line of the stroke of the slider is offset by a perpendicular distance of 25mm . If the crank rotates at an angular velocity of 20rad/s and angular acceleration of 12rad/s^2 when the crank is inclined at an angle of 30° , determine the following: **[8]**
- i) the linear velocity and acceleration of the slider and
 - ii) the angular velocity and angular acceleration of the connecting rod.
- b) Explain “Three position synthesis by Chebychev Spacing” with figure. **[8]**

OR

- Q2) a)** Explain various kinematic principles used in the operation of gear hobbing machine used to generate helical gear. **[10]**
- b) Explain the following kinematic chain representation with figure. **[6]**
- i) E - 21
 - ii) C - 13
 - iii) K - 25

P.T.O.

Q3) a) Define following: **[6]**

- i) Notch Sensitivity
- ii) Fatigue stress concentration factor K_f
- iii) Fatigue

b) A stepped shaft is subjected to a uniform torque of 200 Nm and a completely reversed bending moment of 550 Nm at the step. The shaft is made up of cold drawn steel with ultimate tensile strength of 650 N/mm² and yield strength of 380 N/mm². The theoretical stress concentration factor for bending and torsion are 2 and 1.6 respectively. **[10]**

Notch Sensitivity = 0.96

Size Factor = 0.85

Reliability Factor = 0.868

Surface finish factor = 0.9

If the factor of safety is 1.5, determine the diameter of the shaft corresponding to the expected life for infinite life. (Use distortion energy theory).

OR

Q4) a) Determine the maximum load using the Soderberg criterion, for the simply supported beam, cyclically loaded as shown in figure. The ultimate tensile strength is 690MPa, the yield strength is 400MPa and the design factor of safety is 1.5. Use a size factor as 0.85 and a surface finish factor of 0.90. **[10]**

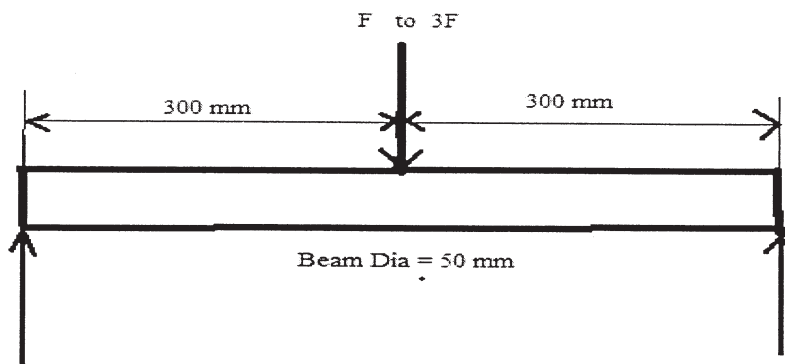


Figure Que No 4a

b) Draw Modified Goodman diagram for axial and bending stresses and explain it. **[6]**

Q5) a) The following data is given for a spur gear pair made of steel and manufactured by shaping having 20° full depth involute system. [12]

Module	= 8mm
Centre distance	= 380mm
Permissible bending stress for pinion and gear	= 60N/mm^2
Pinion & Gear speed	= 1500 & 400 rpm. respectively
Face width	= 10x module
Application factor	= 1.5
Factor of safety	= 2.0

Assuming the velocity factor accounts for the dynamic load; calculate the rated power that the gear pair can transmit. Suggest the surface hardness.

Use following data:

$$\text{Velocity Factor } K_v = \frac{6}{6 + v} \&$$

$$\text{Lewis Factor} = Y = 0.484 - \frac{2.87}{Z}$$

Notations have usual meaning.

b) What do you understand by formative number of teeth? Explain its significance in the design of helical gear. [6]

OR

Q6) a) A helical pinion having 20 teeth to be made of plain carbon steel ($S_{ut} = 720\text{N/mm}^2$) is to mesh with a gear to be made of plain carbon steel ($S_{ut} = 580\text{N/mm}^2$) The gear pair is required to transmit 7.5kW power from an electric motor running at 1440 rpm to a machine running at 600 rpm. The starting torque of the motor is 150% of the rated torque. The factor of safety required is 2.0. The face width is 10 times normal module & tooth system is 20° full depth involute. The helix angle is 25° . The gears are to be machined to meet the specification of grade 7. The gear and pinion are to be hardened to 300BHN Design the gear pair by using the dynamic factor & Spott's equation for dynamic load.

Use following data:

$$\text{Dynamic Factor } K_v = \frac{5.6}{5.6 + \sqrt{V}}$$

$$\text{For grade 7, } e = 11.0 + 0.9(m_n + 0.25\sqrt{d})$$

$$\text{Lewis Factor, } Y' = 0.484 - \frac{2.87}{Z'}$$

$$Fd = \frac{e \cdot n_p \cdot Z_p \cdot b \cdot r_p \cdot r_g}{2527 \sqrt{r_p^2 + r_g^2}} \times \cos \phi_n \cos \phi$$

Notations have usual meaning. [14]

- b) Explain the following terms: [4]
- i) Barth Factor
 - ii) Dynamic Load

SECTION - II

- Q7)** a) What is preloading of bearings? How it is achieved? [6]
- b) Explain the following terms as applied to journal bearings. [6]
- i) Bearing characteristic number
 - ii) Bearing modulus
- c) How you will select bearing from manufacturer's catalogue, explain in detailed? [6]

OR

- Q8)** a) Select a ball bearing suitable for a 50mm diameter shaft rotating at 1500rpm. The radial and thrust loads at the bearing are 4500N and 1600N respectively. The values of X & Y factors are 0.56 and 1.2 respectively. Select a proper ball bearing from the following table for the rating life of 22500hours. [10]

Bearing No.	6010	6210	6310	6410
C(N)	21600	35100	61800	87100

- b) What are the different factors that are considered in selection of rolling contact bearing? [8]

Q9) A single cylinder internal combustion engine working on four stroke cycle develops 75KW at 360rpm. The fluctuation of energy can be assumed to be 0.9 times the energy developed per cycle. If the fluctuation of speed is not to exceed 1% and the maximum centrifugal stress in the flywheel is to be 5.5 MPa, estimate the mean diameter and the cross sectional area of the rim. The material of the rim has a density of 7200kg/m³. **[16]**

OR

Q10) A two stroke gas engine develops 37.5kW at a mean speed of 1200rpm. The resisting load torque is constant throughout the cycle. The coefficient of fluctuation of energy is 0.27. A rimmed flywheel made of gray cast iron FG260 ($\rho = 7150\text{kg/m}^3$) is used to limit the coefficient of fluctuation of speed to 0.02. The linear rim speed at mean radius is limited to 30m/s. The rim has rectangular cross section with width to thickness ratio of 2.0. If the rim provides the 90% of the flywheel effect, determine: **[16]**

- a) mass of the flywheel rim, and
- b) dimensions of the flywheel rim

Q11)a) It is observed from a sample of 200 pins produced on an automatic machine that their diameters are normally distributed with a mean of 10.5 mm and a standard deviation of 0.02mm. If the rejection is to be limited to 10 pins, determine the design tolerance. Assume the process is centred. **[10]**

The areas below the standard normal distribution curve are as follows:

Z	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0
Area	0.38	0.40	0.41	0.43	0.44	0.45	0.46	0.47	0.47
	49	32	92	32	52	54	41	13	72

Use linear interpolation for intermediate values.

- b) Explain the following terms used in Johnson's method of optimum design: **[6]**
 - i) Primary design equation
 - ii) Subsidiary design equation
 - iii) Limit equations

OR

Q12)a) What is importance of reliability in modern engineering design? How it is different from the factor of safety? **[8]**

- b) Explain the difference between the design tolerance and natural tolerance. How the designer should select a tolerance for minimum rejection of component? **[8]**



Total No. of Questions : 12]

SEAT No. :

P2308

[4758] - 161

[Total No. of Pages :4

T.E.

PRODUCTION SANDWICH ENGINEERING

Material Forming and Mould Design

(2008 Course) (Semester - II) (311125)

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.*
- 6) *Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10, Q11 or Q12.*

SECTION - I

- Q1)** a) Explain various behaviour of metal when it is subjected to stress with neat sketch. **[8]**
- b) Determine the engineering strain, true strain & reduction in cross section area for each of the following situation. **[8]**
- i) Extension from L to 1.2 L
 - ii) Compression from L to 0.8L

OR

- Q2)** a) Explain concept of formability & forming limit diagram with neat sketch. **[8]**
- b) A block is subjected to following principal stresses at yield point, $\sigma_1 = 80$ Mpa, $\sigma_2 = 30$ Mpa & $\sigma_3 = -40$ Mpa. Find the yield strength of material in tension according to Tresca & Von Mises criteria. **[8]**

P.T.O.

Q3) a) Define extrusion & Explain forward extrusion & backward extrusion with neat sketch. [8]

b) Explain Following (Any two). [8]

i) Liquid Metal forging

ii) Isothermal Forging

iii) Powder Metallurgy Forging

OR

Q4) a) Calculate work done in extruding an aluminum billet 780mm diameter, 1500mm long to 25mm diameter rod, given that the flow stress of aluminum is 60N/mm^2 and the coefficient of friction between billet and container is 0.38. Also calculate power if extrusion process took 8 minutes. [8]

b) Explain following Forging operation with neat sketch (Any two). [8]

i) Fullering

ii) Edging

iii) Blocking

Q5) a) Explain various zones of wire drawing die with neat sketch. [8]

b) Explain Magnetic pulse forming & process variables in detail with neat sketch. [10]

OR

Q6) a) Calculate the drawing load required to achieve 30% reduction in area on 10mm diameter copper wire given that the yield stress of metal is 235N/mm^2 , die angle is 12° and coefficient of friction is 0.08. [10]

b) Explain Explosive forming in detail with neat sketch. [8]

SECTION- II

Q7) a) Show that for rolling process [8]

$$(\Delta h)_{\max} = \mu^2 R$$

Where, Δh = draft in rolling

μ = coefficient of friction

R = Roll radius

b) Explain following in case of Rolling [8]

- i) Angle of bite
- ii) Forward Slip
- iii) Backward Slip
- iv) Neutral Plane

OR

Q8) a) A 0.1% carbon steel strip is 50mm wide and 5mm thick was rolled in one pass to 3.5mm at 1060°C. When the homogeneous yield stress was 1.05KN/mm². The roll diameter was 340mm. Find magnitude of rolling load, taking into account roll flattening, if rolls were made up of CI.

Assume young's modulus (E) = 1.005 MN/mm² and Poisson's ratio(r) = 0.35. [8]

b) Explain following in case of Rolling [8]

- i) Automatic Gauge Control
- ii) Roll Flattening

Q9) a) Explain various elements of gating system for casting process with neat sketch. [8]

- b) Explain following. [8]
- i) Hot Chamber Die Casting
 - ii) Cold Chamber Die Casting

OR

- Q10**a) Explain progressive & directional solidification in detail. [8]
- b) Write a short note on following in case of Die casting (any two). [8]
- i) Core & Cavity
 - ii) Cooling system design
 - iii) Ejection system

- Q11**a) Explain open die & Closed die forging with neat sketch. [8]
- b) Write a short note on parting line selection in forging die design. [5]
- c) Explain the types of gates used in injection moulding. [5]

OR

- Q12**a) Explain any two types of ejection systems in case of injection moulding with neat sketch. [8]
- b) Write a short note on various types of allowances considered in forging die design. [5]
- c) Explain procedure to derive edging impression in forging with suitable example. [5]



Total No. of Questions : 12]

SEAT No. :

P3666

[4758]-162

[Total No. of Pages : 2

**T.E. (Production Sandwich Engineering)
PRODUCTION & INDUSTRIAL MANAGEMENT-II
(2008 Course) (Semester-II)**

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION-I

- Q1)** a) Explain the functions of Marketing Management. [8]
b) Explain ABC Analysis. [6]
c) What are the different forms of Money? [4]

OR

- Q2)** a) Explain the difference between marketing and selling concept. [8]
b) Explain Law of Diminishing Marginal Utility. [6]
c) Explain Law of Demand. [4]

OR

- Q3)** a) Discuss Time estimate and time standard. [8]
b) Discuss the important points regarding coordination of process engineering department with tool engineering department. [8]
- Q4)** a) Differentiate between Special purpose and General purpose machines. [8]
b) Which method process engineer adopts to limit variation in workpiece positioning? Discuss. [8]

P.T.O.

- Q5)** a) Discuss various sources of tooling and list out the combination of tooling to obtain the most economical operation. [8]
b) Explain Dimensional analysis. [8]

OR

- Q6)** a) How tolerance chart helps to develop complete and accurate process routing. [8]
b) Explain Six Point location system. [8]

SECTION-II

- Q7)** a) Discuss Single and Double sampling plan. [8]
b) Draw and explain Operation Characteristic Curve. [8]

OR

- Q8)** a) Discuss Double sample plan with the help of flow chart. [8]
b) What are the advantages and disadvantages of sampling inspection. [8]

- Q9)** a) Discuss Deming's 14 Points in detail. [12]
b) What is Quality Circle? [4]

OR

- Q10)** a) Discuss 7 QC Tools. [12]
b) What is 5'S? [4]

- Q11)** a) Write down the short note on Quality Function Deployment. [8]
b) Explain Taguchi Method. [8]
c) Define: concurrent engineering. [2]

OR

- Q12)** a) State advantage and disadvantages of ISO 9000. [8]
b) State the elements of Quality System. [8]
c) Define: Reliability. [2]



Total No. of Questions : 12]

SEAT No. :

P2309

[4758] - 165

[Total No. of Pages :3

T.E. (Biotechnology)

GENETIC ENGINEERING

(2008 Course) (Semester - I) (315461)

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 Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10, Q11 or Q12.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of Calculator is allowed.*
- 6) *Assume suitable data if necessary.*

SECTION - I

Q1) Describe the following: [18]

- a) Whole gene sequencing methods.
- b) Significance of multiple cloning sites in Genetic engineering.

OR

Q2) Explain the Microarray technology in detail. Add notes on its application. [18]

Q3) Answer the following: (8 marks each). [16]

- a) Yeast artificial chromosomes.
- b) Bacterial artificial chromosomes.

OR

Q4) Discuss the following: (8 marks each). [16]

- a) Selection of recombinant strains.
- b) With the help of flow chart explain cloning a protein in expression system.

P.T.O.

Q5) Write short notes: [16]

- a) Genomic DNA libraries.
- b) Significance of cDNA library.

OR

Q6) Answer the following: (8 marks each). [16]

- a) Amplification of gene libraries.
- b) Identifying the products of cDNA clones.

SECTION - II

Q7) Answer the following techniques in detail: (9 marks each) [18]

- a) RT-PCR
- b) Steps involved in PCR.

OR

Q8) Discuss the following: (9 marks each). [18]

- a) Different methods of gene isolation.
- b) Synthesis of artificial DNA.

Q9) Describe the development of following two recombinant products. [16]

- a) BT Cotton
- b) Humulin

OR

Q10) Describe in detail Bacterial transformation and Bacterial conjugation. Add a note on its significance. [16]

Q11) Answer the following: (8 marks each)

[16]

- a) Restriction Fragment length polymorphism
- b) Explain Recombinant Vaccines with suitable example.

OR

Q12) Write short notes on (4 marks each).

[16]

- a) DNA diagnostics
- b) Randomly amplified polymorphic DNA
- c) Golden rice
- d) Role of genetic engineering in recombinant DNA technology.



Total No. of Questions : 12]

SEAT No. :

P2310

[4758]-166

[Total No. of Pages : 2

T.E. (Biotechnology)

FERMENTATION TECHNOLOGY-I

(2008 Course) (Semester-I) (315464)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION-I

Q1) Define the term fermentation. State some applications where fermentation is used to produce industrially important products. How are micro-organisms screened during optimising a fermentation process? Explain in brief. **[16]**

OR

Q2) What is Monod kinetics? Explain the Monod equation for bacterial and fungal growth. Which fermentation metabolites are produced during exponential and stationary phase? Enlist them. **[16]**

Q3) What is nutrient medium? How are media classified? Describe various media optimisation strategies currently used fermentation industries. **[16]**

OR

Q4) Why sterilization is important in fermentation technology? Discuss *in situ* sterilisation and HTST sterilisation in brief. **[16]**

Q5) Explain the production of acetic acid. How is vinegar produced industrially? Explain the mechanism of acetic acid bacteria in detail. **[18]**

OR

Q6) Explain the industrial production, recovery and applications of any alcoholic beverage in detail. **[18]**

P.T.O.

SECTION-II

Q7) Explain antifungal antibiotics. Explain production, recovery and applications of any two antifungal antibiotics in detail. [16]

OR

Q8) What are enzymes? Explain in detail isolation, production and use of any two microbial enzymes in detail. [16]

Q9) What is solid state and liquid state fermentation? How are they different from each other? Enlist the products of solid and liquid state fermentation. [16]

OR

Q10) What are fermenters? Explain in detail about industrially used four types of fermenters. [16]

Q11) What is Scale Up of a fermentor? Explain the concept with principles, theoretical considerations and techniques used in scaling up of a fermentation process. [18]

OR

Q12) Explain the terms: Recovery, yield, efficiency in downstream processing. Explain how fermentation economics is studied with the help of any case study. [18]



Total No. of Questions : 12]

SEAT No. :

P3858

[Total No. of Pages : 4

[4758] - 167

T.E. (Biotechnology) (Semester - I)

HEAT TRANSFER

(2008 Pattern)

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 Q.1 or 2, Q.3 or 4, Q 5 or 6 from section I and Q.7 or 8, Q.9 or 10, Q.11 or 12 from section II.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of calculator is allowed.*
- 6) *Assume suitable data if necessary.*

SECTION - I

Q1) a) An electric current is passed through a wire 1mm in diameter and 10cm long. The wire is submerged in water at atmospheric pressure, and the current is increased until the water boils. For this situation heat transfer coefficient is $5000 \text{ W/m}^2 \text{ }^\circ\text{C}$ and the water temperature will be 100°C . How much electric power must be supplied to the wire to maintain the wire surface at 114°C . **[12]**

b) What are different applications of Dimensional Analysis? **[6]**

OR

Q2) a) State and explain with example the following : **[12]**

i) Newton's Law of cooling.

ii) Stefan-Boltzmann Law.

b) Explain Rayleigh's method of dimensional analysis. **[6]**

Q3) a) Derive the heat flow equation for steady state heat conduction through composite plane wall. **[9]**

b) What are fins? Explain Efficiency & Effectiveness of fin? **[7]**

P.T.O.

OR

Q4) Calculate the critical radius of insulation for asbestos ($K = 0.172 \text{ W/mK}$) surrounding a pipe & exposed to room air at 299 K with $h = 2.8 \text{ W/m}^2 \text{ K}$. Calculate the heat loss from 475 K , 60 mm diameter pipe when covered with the critical radius of insulation & without insulation? **[16]**

Q5) a) Discuss in detail Planck's law with example. **[6]**

b) Calculate the inside heat transfer coefficient for fluid flowing at a rate of $300 \text{ cm}^3/\text{sec}$ through 20 mm inside diameter of tube of heat exchanger from the data given : **[10]**

Data:	Viscosity of flowing fluid	=	0.8 NS/m^2
	Density of flowing fluid	=	1100 kg/m^3
	Specific heat of fluid	=	1.26 kJ/kg.k
	Thermal conductivity of fluid	=	0.384 w/mK
	Viscosity at wall temperature	=	1.0 NS/m^2
	Length of heat exchanger	=	6 m

OR

Q6) a) Derive Nusselt's equation of condensation over vertical plate. **[8]**

b) Water at 30°C enters a 1 cm diameter tube with a velocity of 1.5 m/s . The tube is maintained at 100°C . Find the tube length required to heat water to a temperature of 50°C . **[8]**

Given : $T_1 = 30^\circ\text{C}$ $T_2 = 50^\circ\text{C}$ $V = 1.5 \text{ m/s}$

Properties of water at 40°C are:

$Pr = 4.31$

$\rho = 992.2 \text{ kg/m}^3$

$C_p = 4174 \text{ J/kg K}$

$K = 0.634 \text{ W/mK}$

$\nu = 0.659 \times 10^{-6} \text{ m}^2/\text{s}$

Find : Tube length, L

SECTION - II

- Q7) a)** Discuss the following terms : **[8]**
- i) Emissivity
 - ii) Radiosity
 - iii) Shape factor
 - iv) Gray body
- b) Discuss Absorptivity, Reflectivity, Transmissivity terms of radiation with neat diagram. **[8]**

OR

- Q8) a)** A 40 mm I.D. iron pipe at 423 K passes through a room in which the surroundings are at temperature of 300 K. If the emissivity of the pipe metal is 0.8, what is the net interchange of radiation energy per meter length of pipe? The outside diameter of pipe is 60 mm. **[8]**
- b) What is Wien's law of displacement? Derive the expression. **[8]**
- Q9) a)** Derive the relation between effectiveness and NTU of heat exchanger for parallel flow heat exchanger? **[8]**
- b) Explain heat exchanger analysis with the use of log mean temperature difference method? **[8]**

OR

- Q10) a)** Discuss any four parameters which affect Fouling. **[8]**
- b) Explain agitated film evaporator in detail? **[8]**
- Q11) a)** An evaporator operating at atmospheric pressure (111.325 KPa) is fed at the rate of 10,000 kg/hr of weak liquor containing 4% caustic soda. Thick liquor leaving the evaporator contains 25% caustic soda. Find the Capacity of the evaporator? **[9]**
- b) Give comparison of forward feed and backward feed arrangement in the multiple effect evaporation system? **[9]**

OR

Q12)a) A single effect evaporator is to be fed with 5000 kg/hr solution containing 10% solute by wt. The feed at 310 K is to be concentrated to a solution containing 40% by wt. of the solute under an abs. pr. of 101.325 KPa. Steam available at an abs. pr. of 303.975 KPa (saturation temperature of 407 K). The overall heat transfer coefficient is 1750 w/m²K. Calculate. **[12]**

- i) The heat transfer area (that should be provided).
- ii) The economy of the evaporator.

Data : - Cp of feed = 4.187 kJ/kgK.

Temp. (K)	Enthalpy (kJ/kg)	
	Vapor	Liquid
310 K	----	170
373 K	2676	419
407 K	2725	563

b) Explain the classification of evaporators?

[6]



Total No. of Questions : 12]

SEAT No. :

P2312

[4758]-168

[Total No. of Pages : 4

T.E. (Biotechnology)

COMPUTATIONAL TECHNIQUES AND BIOSTATISTICS

(2008 Course) (Semester - I) (315465)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6. from section -I and Q7 or Q8, Q9 or Q10, Q11 or Q12 from section - II.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume suitable data if necessary.*

SECTION - I

Q1) a) Fit a parabola $y = a + bx + cx^2$ to the following data **[8]**

x	2	4	6	8	10
y	3.07	12.85	31.47	57.38	91.29

b) Fit a straight line of the form $y = a + bx$ by the method of least squares. **[8]**

x	0	1	3	6	8
y	1	3	2	5	4

OR

Q2) a) Fit an exponential curve $y = ae^{bx}$ to the following data. **[8]**

x	2	4	6	8
y	25	38	56	84

b) Fit a second degree parabola to the following data: **[8]**

x	0.2	0.3	0.5	1	2
y	16	14	11	6	3

P.T.O.

Q3) a) Determine $f(x)$ as a polynomial in x for the following data using Newton's divided difference formula. [8]

x	-4	-1	0	2	5
$f(x)$	1245	33	5	9	1335

b) State Newton's interpolation formula and use it to calculate the value of $\exp(1.85)$ given the following table. [8]

x	1.7	1.8	1.9	2.0	2.1	2.2	2.3
$f(x)$	5.474	6.050	6.686	7.389	8.166	9.025	9.974

OR

Q4) a) Given the values, evaluate $f(9)$ using Lagrange's formula. [8]

x	5	7	11	13	17
y	150	392	1452	2366	5202

b) Prove that $y_3 = y_2 + \Delta y_1 + \Delta^2 y_0 + \Delta^3 y_0$ [8]

Q5) a) Discuss in short about Numerical Integration with a suitable diagram. [9]

b) A solid of revolution is formed by rotating about the x axis the area between the x axis and the lines $x = 0$ and $x = 1$ and a curve through the points with the following ordinates. Estimate the volume of the solid formed using Simpson's rule and Trapezoidal rule. [9]

x	0	0.25	0.5	0.75	1
y	1	0.9896	0.9589	0.9089	0.8415

OR

Q6) a) Use the Simpson's $1/3^{\text{rd}}$ rule for finding the value of $\int_0^1 x^3$ between the limits 0 to 1 by considering five sub intervals. [9]

b) Write the equation of Newton's quadratic formula and thus deduce Simpson's rule. [9]

SECTION - II

- Q7)** a) Use Newton's method to find $\sqrt[4]{2}$ correct to eight decimal places. [8]
b) Using the method of Newton Raphson find the root of $3 \sin x - 2x + 5 = 0$ near 3. [8]

OR

- Q8)** a) Discuss in brief the method of finding the solution of nonlinear simultaneous equations. [8]
b) Using Bisection method find a root of the equation $x^3 - 5x + 1 = 0$. [8]
- Q9)** a) Define population. Write short notes on finite and infinite population with proper examples. [8]
b) Write a detailed notes on sampling methods? [8]

OR

- Q10)**a) Give brief notes on Semi logarithmic graphs. Explain in detail the method of constructing such graphs. [8]
b) Write short notes on O gives. [8]
- Q11)**a) Compute the median from the following data. [9]
- | | | | | | | | | | |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Mid Value: | 115 | 125 | 135 | 145 | 155 | 165 | 175 | 185 | 195 |
| Frequency: | 6 | 25 | 48 | 72 | 116 | 60 | 38 | 22 | 3 |
- b) The monthly income of 10 employees in an office is given. Calculate the mean. 4780, 5760, 6690, 7750, 4840, 4920, 6100, 7810, 7050, 6950. [9]

OR

Q12)a) Calculate deviation and its coefficient of the following distribution of collar measurements. **[9]**

Mid value (in) 12.5 13.0 13.5 14.0 14.5 15.0 15.5 16.0 16.5

No. of students 4 19 30 63 66 29 18 1 1

b) The mean and standard deviation of a set of 100 observations were worked out as 40 and 5 respectively by a computer which by mistake took the value 50 instead of 40 for one observation. Find the correct mean and variance. **[9]**

EEE

Total No. of Questions : 12]

SEAT No. :

P2311

[4758] - 169

[Total No. of Pages :3

T.E. (Biotechnology)

MASS TRANSFER

(2008 Course) (Semester - I) (315462)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10, Q11 or Q12.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume suitable data if necessary.*

SECTION - I

Q1) Explain any two theories of Mass Transfer operations with a neat sketch and suitable equations supporting them. **[16]**

OR

Q2) Define interphase Mass Transfer with a suitable diagram. Write short notes on local and overall mass transfer coefficients. **[16]**

Q3) Define distillation operation. What do you mean by low pressure distillation? Write short notes on molecular distillation with a neat sketch. **[16]**

OR

Q4) a) In a pilot plant operation, feed mixture of 50 mole% more volatile component and 50 mole% of less volatile component is fed to a pipe still through a pressure reducing valve and then into a flash disengaging chamber. The vapour and liquid leaving the chamber are assumed to be in equilibrium. If the fraction of the feed converted to vapour is 0.5 find the composition of the top and bottom products? Equilibrium data is given below: **[10]**

Liquid Composition	0	0.045	0.192	0.4	0.69	1
Vapour Composition	0	0.1775	0.538	0.78	0.932	1

b) Write short notes on type of reboilers with neat sketches. **[6]**

P.T.O.

Q5) Give a detailed procedure of estimating NTU and HTU for a distillation column using Mc Cabe Thiele method. [18]

OR

Q6) Write short notes on the following terms: [18]

- a) Fenske's equation.
- b) Continuous rectification for binary systems.

SECTION - II

Q7) a) Discuss in detail the factors effecting the choice of solvent for gas absorption operations. [8]

- b) A mixture containing 10 mole % solute and rest inert is fed to a packed tower in which 90% of the solute is absorbed. Solute free water used for absorption contains 5 mole % solute when it leaves the tower at the bottom. If the equilibrium relationship is $Y_e = 0.05X_e$ and $H_y = 0.5m$ and $H_x = 0.4m$ what is the height of the packed section. [8]

OR

Q8) a) Define Absorption with a suitable example. Explain the use of Reflux in absorption operations. [8]

- b) Derive material balance equations for continuous co-current absorption operation for the case of single component absorbed. [8]

Q9) a) Define drying hysteresis accompanied by its graph. Derive the equation for time required for drying in constant rate period. [8]

- b) Filter cake is dried in a pan $30\text{cm} \times 30\text{cm} \times 2.5\text{cm}$. Air velocity is 75 cm/sec. The initial moisture content is 0.2kg water /kg dry solid and critical moisture content is 0.09 kg water/kg dry solid. The time of drying is 0.5 hrs. What will be the drying time required if the air velocity is increased to 150cm/sec. [8]

OR

Q10) A pharmaceutical company wishes to dry a wet slurry of a medicine which has a weight of 5kg and originally contains 50% moisture on wet basis. The slab is $600 \times 900 \times 75$ mm thick. The equilibrium moisture content is 5% of the total weight when in contact with air at 20°C and 20% humidity. The drying rate is given below for contact with air of the above quality at a definite velocity. Drying is from one face only. How long it will take to dry the slab to 15% moisture content on wet basis. **[16]**

Slab of wet Slurry	9.1	7.2	5.3	4.2	3.3	2.8	2.5
Drying rate	4.9	4.9	4.4	3.9	3.4	2.0	1.0

- Q11)a)** Define crystallization with a suitable example. List out the equations for solute, solvent balance and equation for calculating the yield of crystals. **[9]**
- b) Explain the construction and working of double pipe scraped type crystallizer accompanied by a neat sketch. List out its applications. **[9]**

OR

Q12) Calculate the yield of Magnesium sulphate heptahydrate crystals when 1000kg saturated solution of magnesium sulphate at 353°K is cooled to 303°K assuming 10% of the water is lost by evaporation during cooling. Solubility of magnesium sulphate at 353 °K is 64.2 kg/kg water and at 303°K is 40.8 kg/kg water. **[18]**



Total No. of Questions : 12]

SEAT No. :

P2260

[4758] - 17

[Total No. of Pages :5

T.E. (Mech. & Mech-SW)

TURBO MACHINES

(2008 Course) (Semester - II) (302049)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10, Q11 or Q12.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of electronic pocket calculator is allowed.*
- 6) *Assume suitable data, if necessary.*

SECTION - I

- Q1) a)** How do you classify water turbines? What is the difference between the Reaction and Impulse turbines? **[6]**
- b) A jet of oil having sp. gravity 0.8 of 40mm diameter strikes a stationary plate inclined at an angle 30° with the axis of jet at a velocity of 30m/s. Find the force exerted by the jet on the plate in the direction: **[6]**
- i) Normal to plate
 - ii) Along the X-axis and Y-axis
- Also, find the ratio of discharge which is divided into two streams.
- c) Prove that the theoretical number of buckets required on a runner of impulse turbine is given as: $Z = 360^\circ/\psi$ where, $\psi = \cos^{-1}((m+1)/(m+1.2))$ in which m represents the jet ratio. **[4]**

OR

- Q2) a)** A jet of water having velocity of 30 m/s enters on a series of moving vanes having velocity of 15 m/s. The jet makes 30° to the direction of motion of the vanes at inlet and leaves the vanes at 10° and 5 m/s. Draw the velocity triangles and find: **[8]**
- i) Vane tip angles at inlet and outlet for a shock less flow.
 - ii) Work done per kg of water
 - iii) Efficiency

P.T.O.

- b) Show that, the maximum efficiency of the Pelton Wheel turbine is given by $(1 + k \cos \beta)/2$. Where, k is bucket friction factor and β is bucket outlet angle. [8]

Q3) a) What is draft tube? Why it is used in a reaction turbine? Describe with neat sketch two different types of draft tubes. [6]

- b) A Francis turbine with an overall efficiency of 75% is required to produce 148.25 kW power. It is working under a head of 7.62m. The peripheral velocity is $0.26\sqrt{2gH}$ and the radial velocity of flow at inlet is $0.96\sqrt{2gH}$. The wheel runs at 150rpm and the hydraulic losses in the turbine are 22% of the available energy. Assuming radial discharge, determine: [10]

- i) The guide blade angle,
- ii) The wheel vane angle at inlet,
- iii) Diameter of the wheel at inlet,
- iv) Width of the wheel at inlet.

OR

Q4) a) A Kaplan turbine working under a head of 20m develops 11772kW shaft power. The outer diameter of the runner is 3.5m and hub diameter 1.75m. The guide blade angle at the extreme edge of the runner is 35° . The hydraulic and overall efficiencies of the turbine are 88% and 84% respectively. If the velocity of whirl is zero at outlet, determine: [10]

- i) Runner vane angles at inlet and outlet at the extreme edge of the runner, and
 - ii) Speed of the turbine.
- b) A turbine is to operate under a head of 25m at 200 rpm. The discharge is $9\text{m}^3/\text{s}$. If the efficiency is 90%, determine: [6]
- i) Specific speed of the machine,
 - ii) Power generated, and
 - iii) Type of turbine.

- Q5) a)** Explain, with the help of h-s diagram, the effect of friction on flow through a steam nozzle. [4]
- b) Define nozzle efficiency and state the factors on which it depends. [4]
- c) The mean diameter of the blades of an impulse turbine with a single row turbine is 1.05m and the speed is 3000 rpm. The nozzle angle is 18° , the ratio of blade velocity to steam velocity is 0.42 and ratio of relative velocity at outlet from the blades to that at inlet is 0.84. The outlet angle of the blade is to be made 3° less than the inlet blade angle. The Steam flow is 8kg/s. Draw velocity diagram and find the resultant thrust on blades, tangential thrust, axial thrust, power developed and blade efficiency. [10]

OR

- Q6) a)** Show that in a 50% reaction turbine, the maximum stage efficiency is $\frac{2\cos^2 \alpha}{1 + \cos^2 \alpha}$ where, α is the nozzle angle. [8]
- b) A 50% reaction turbine runs at 3000 rpm. The angles at exit of fixed bladings and inlet of moving bladings are 20° and 30° respectively. The mean ring diameter is 0.7m and steam condition is 1.5 bar and 0.96 dry. Calculate: [10]
- Required height of blades to pass 50kg/s of steam and
 - Power developed by the stage.

SECTION - II

- Q7) a)** Show that the optimum pressure ratio for maximum work output between fixed temperature limits of the Joule cycle is given as: [6]

$$r_p = \left\{ \frac{T_{\max}}{T_{\min}} \right\}^{\frac{\gamma}{2(\gamma-1)}}$$

- b) In an oil gas turbine, air is compressed from a pressure of 1 bar and temperature of 300K up to a pressure of 5 bar. The oil used has a calorific value of 42500 kJ/kg and the combustor efficiency is 95%. The hot gases leave the combustor at 1000K. The isentropic efficiency of the

turbine and compressor are 90% and 85% respectively. Assuming a mass flow rate of air at 1 kg/s, find: [10]

- i) Air-Fuel Ratio
- ii) Power output of the plant
- iii) Thermal efficiency of power plant.

Assume $C_{pa} = 1.005 \frac{\text{kJ}}{\text{kgK}}$, $C_{pg} = 1.1 \frac{\text{kJ}}{\text{kgK}}$ and $\gamma = 1.4$ for air and gases.

Neglect pressure losses in combustor. Assume that the gases expand in the gas turbine from 5 bar pressure to 1 bar pressure.

OR

Q8) a) For an actual Brayton cycle without any pressure drops, derive the condition for maximum plant output in terms of isentropic temperature ratio and compressor and turbine efficiencies. [6]

b) A gas turbine plant of 800 kW capacities takes the air at 1.01 bar and 15°C. The pressure ratio of the cycle is 6 and maximum temperature is limited to 700°C. A regenerator of 75% effectiveness is added in the plant to increase the overall efficiency of the plant. The pressure drop in the combustion chamber is 0.15 bars as well as in the regenerator is also 0.15 bars. Assuming the isentropic efficiency of the compressor 80% and of the turbine 85%, determine the plant thermal efficiency. Neglect the mass of the fuel. [10]

Q9) a) Derive an expression for the minimum speed for starting a centrifugal pump and minimum diameter of impeller for this condition. [6]

b) A centrifugal pump is to deliver water from a tank against a static head of 40m. The suction pipe is 50m long and 25cm diameter. The delivery pipe is 20cm diameter and 1600m long. The pump characteristics can be defined as $H = 100 - 6000Q^2$ where, H is the head in meters and Q is discharge in m³/s. Calculate the net head and discharge of the pump. The coefficient of friction $f = 0.02$ for both the pipes. Calculate power required to drive the pump if overall efficiency of the pump is 85%. [10]

OR

- Q10)a)** Explain various efficiencies related to centrifugal pumps. [6]
- b) A centrifugal pump impeller whose external diameter and width at the outlet are 0.8 and 0.1m respectively is running at 550 rpm. The angle of impeller vanes at outlet is 40° . The pump delivers 0.98m^3 of water per second under an effective head of 35m. If the pump is driven by a 500 kW motor. Determine: [10]
- The Manometric efficiency
 - The overall efficiency
 - The Mechanical efficiency

- Q11)a)** Explain the terms slip factor and power input factor in a centrifugal compressor. [6]
- b) A single sided centrifugal compressor for a gas turbine is required to deliver 10 kg/s of air while operating with a total pressure ratio of 4.5 while turning 18000 rev/min. Initial conditions of air are 1.013 bar pressure and 300K temperature. The air enters the inlet eye axially with a velocity of 140 m/s with no pre-whirl. Assuming isentropic efficiency for the compressor as 80% and slip factor as 0.92, make calculations for: [12]
- Rise in total temperature
 - Tip speed of the impeller and tip diameter
 - Annulus area of inlet eye, and
 - Power required to drive the compressor.

OR

- Q12)a)** Explain the term degree of reaction for an axial flow compressor. Why is the degree of reaction generally 50%? [6]
- b) A axial flow compressor having eight stages and 50% reaction design compresses air in the pressure ratio of 4:1. The air enters the compressor at 20°C and flows through it with a constant speed of 90 m/s. The rotating blades of the compressor rotates with a mean speed of 180 m/s. Isentropic efficiency of the compressor may be taken as 82%. [12]
- Calculate:
- Work done by the machine
 - Blade angles

Assume, $\gamma = 1.4$, $C_p = 1.005 \frac{\text{kJ}}{\text{kgK}}$.



Total No. of Questions : 12]

SEAT No. :

P3667

[4758] - 170

[Total No. of Pages :4

T.E. (Biotechnology)

REACTION ENGINEERING

(2008 Course) (Semester - II) (315466)

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 Q1 or Q2, Q3 or Q4, Q5 or Q6 from section I and Q7 or Q8, Q9 or Q10, Q11 or 12 from section II.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of Calculator is allowed.*
- 6) *Assume suitable data if necessary.*

SECTION - I

- Q1) a)** Write short note with suitable example on **[6]**
- i) Molecularity
 - ii) Parallel reaction
- b) The activation energy of biochemical reaction is 17982 cal/mol in absence of catalyst, and 11980cal/mol with a catalyst, By how many times will the rate of reaction will increase in the presence of catalyst, if a reaction proceeds at 250C? **[6]**
- c) Differentiate between Elementary and non-elementary reaction. **[6]**

OR

- Q2) a)** A certain reaction has a rate given by $-r_A = 0.008C_A * C_B$ mol/(cm³.min). If the concentration is expressed in mol/lit and time in hours, what would be the value and unit of rate constant? **[6]**
- b) Differentiate between Molecularity and order of reaction. **[6]**
- c) Discuss about temperature dependency from thermodynamics. **[6]**

P.T.O.

- Q3) a)** Assuming a stoichiometry $A \rightarrow R$ for a first order reaction, the volume of plug flow reactor for 98.9% conversion of pure A is calculated to be 3.99 lit. In fact, however the reaction stoichiometry is $A \rightarrow 3R$. With this corrected stoichiometry, what is the required volume of a reactor? [9]
- b) Derive the performance equation for plug flow reactor. [7]

OR

- Q4) a)** In studying the kinetic of decomposition of a reaction, the concentration of a reaction were determined analytically at different times. The following result was obtained. [7]

Time, min	0	10	20	40	100	125
Conc. mol/lit	0.1	0.0714	0.0356	0.0385	0.02	0.0167

Determine the order of reaction.

- b) The liquid phase decomposition of reactant B is studied in mixed flow reactor and plug flow reactor. Determine the holding time required to obtain 76% conversion as initial concentration of reactant B is 0.79mol/lit. Data Given is as below: [9]

C_B in Feed mol/lit	C_B in exit stream mol/lit	Holding time sec
2.00	0.65	300
2.00	0.92	240
2.00	1.0	250
1.00	0.56	110
1.00	0.37	360
0.48	0.42	24
0.48	0.28	200
0.48	0.20	500

- Q5)** a) Discuss about earliness and lateness of fluid mixing in the vessel. [6]
b) Derive the expression for calculating E-curve and their significance. [10]

OR

- Q6)** a) Derive expression for calculating E, F and C curves. [10]
b) Discuss about state of aggregation. [6]

SECTION - II

- Q7)** a) Write detail note on Chemical reaction controls. [10]
b) What are the factors affecting on heterogeneous reactions? [6]

OR

- Q8)** a) Write note on progressive conversion model. [7]
b) Two solid samples are kept in a constant environment in over for a period of 1 hr. 4mm particles are 67.8% converted and 2mm particles are 87.5% converted. Find the time required for complete conversion of 1mm particle in this oven? [9]

- Q9)** a) Determine the amount of catalyst required in packed bed reactor for 91% conversion of 899mol/min if $C_{A0} = 10\text{mol/m}^3$ of feed. [9]
b) Explain: pore diffusion resistance combined with surface kinetics with example. [9]

OR

- Q10)** a) Derive the performance equation for porous catalyzed reaction. [9]
b) Give short note on packed bed catalytic reactor and trickle bed reactor. [6]

- Q11)**a) Differentiate between microbial and enzyme fermentation. [8]
- b) Discuss about competitive and Non-competitive inhibition. [8]

OR

Q12) Discuss the following: [16]

- a) Factors affecting growth kinetics.
- b) Enzyme deactivation kinetics.
- c) Substrate limiting microbial fermentation.



Total No. of Questions : 12]

SEAT No. :

P2313

[4758] - 171

[Total No. of Pages :3

T.E. (Biotechnology)

FERMENTATION TECHNOLOGY -II

(2008 Course) (Semester -II) (315467)

Time :3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10, Q11 or Q12.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume suitable data, if necessary.*

SECTION - I

Q1) Write short notes on the rheological properties of a fermentation broth. Explain how it effects the performance of a fermenter. **[16]**

OR

Q2) Write detailed notes on diffusional resistance to oxygen transfer in a fermenter with a neat sketch and proper assumptions. **[16]**

Q3) Explain in detail Configuration, working procedure, applications, advantages and disadvantages of freeze dryers. **[16]**

OR

Q4) Explain the need of various equipment's for processing fermentation products. What is the need of different unit operations for processing fermentation broths and products? **[16]**

Q5) a) Define Ion exchange along with a suitable example. Write short notes on its techniques and applications. **[9]**

P.T.O.

- b) Define adsorption with a suitable example. List out the nature of adsorbents used in various adsorption operations along with suitable examples. [9]

OR

- Q6) a) Explain Ion Exchange equilibria accompanied by proper equations. [9]
 b) Write short notes on Heat of adsorption and Adsorption hysteresis. [9]

SECTION- II

- Q7) a) Write short notes on preparation of solids for various types of leaching experiments. [8]
 b) What are the factors effecting leaching operations? Explain with examples. [8]

OR

- Q8) Halibut oil is to be extracted from granulated livers using ether as a solvent in countercurrent batch extraction unit. The solid charge contains 0.35kg oil per kg exhausted livers and it is desired to have 90% oil recovery. For 50kg of pure ether used per 100kg untreated solids, determine the number of theoretical stages required. The entrainment data is as follows: [16]

Concentration Kg oil/Kg solution	0	0.1	0.2	0.3	0.4	0.5	0.6	0.67
Entrainment Kg solution/Kg livers	0.28	0.34	0.40	0.47	0.55	0.66	0.80	0.96

- Q9) Give a detailed classification of Membrane separation operations. Write short notes on various types of membranes. [16]

OR

Q10) Write short notes on different types of Membrane modules and their applications accompanied by neat sketches. [16]

Q11)a) Derive material balance equations for multistage crosscurrent extraction operations accompanied by a neat sketch and proper assumptions. [9]

b) Write short notes on equilateral triangular coordinates with a neat sketch. [9]

OR

Q12) Give a detailed notes on the types of extraction equipment used in mass transfer operations. Explain any one extraction equipment along with its Construction, Working principles, Applications, Advantages and Disadvantages accompanied by a neat sketch. [18]



Total No. of Questions : 10]

SEAT No. :

P2314

[4758]-172

[Total No. of Pages : 2

T.E. (Biotechnology)
BIOSEPARATION - I
(2008 Course) (315468)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

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

SECTION - I

Q1) Give an overview of Bioseparations. Enlist and explain important bioseparation techniques in detail. **[16]**

OR

Q2) Describe in detail mechanical and enzymatic methods of cell disruption. **[16]**

Q3) Write classification of chromatography. Give general description of column chromatography. **[16]**

OR

Q4) Describe in details different types of chromatography. **[16]**

Q5) Write short notes on (Any 2) (9m each): **[18]**

- a) Centrifugation.
- b) Filtration.
- c) Membrane Separations.
- d) Sedimentation.

P.T.O.

SECTION - II

Q6) Explain the process of drying in detail. **[16]**

OR

Q7) What is chemistry of extraction? How to select the solvent for extraction? Explain the process of liquid-liquid extraction with example. **[16]**

Q8) What is the importance of separation techniques in biotechnology? Describe its scope from research to industry. **[16]**

OR

Q9) How to synthesize any bioseparation process? Write in details about process economics with examples. **[16]**

Q10) Write applications of different bioseparation techniques to following products for their industrial production (Any 2) (9M each) **[18]**

- a) Antibiotics
- b) Organic Acids
- c) Biopolymers
- d) Alcohols

EEE

Total No. of Questions : 10]

SEAT No. :

P2315

[4758]-173

[Total No. of Pages : 2

T.E. (Biotechnology)

IMMUNOLOGY AND DIAGNOSTICS

(2008 Course) (Semester - II) (315469)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) *Both sections compulsory.*
- 2) *Draw diagrams wherever necessary.*
- 3) *Maximum marks for each question is given in brackets.*

SECTION - I

Q1) Describe anatomic and physiological barriers of Innate immunity. **[18]**

OR

Q2) Enlist the important organs of immune system and summarize their functions in IR. **[18]**

Q3) Write short notes on (8marks each) (any 2): **[16]**

- a) ELISA,
- b) Hybridoma,
- c) Radio Immuno Assay,
- d) Rocket electrophoresis.

OR

Q4) With the help of examples discuss the major characteristics that make a substance a good antigen? **[16]**

P.T.O.

Q5) Describe the structure and function of each of the immunoglobulin class. [16]

OR

Q6) With the help of diagram discuss “hybridoma technique” and give three examples of monoclonal antibodies with their therapeutic applications. [16]

SECTION - II

Q7) Classify Hypersensitivity and describe anaphylaxis in detail. [16]

OR

Q8) Attempt ANY TWO (8marks each) [16]

- a) Complement,
- b) DTH,
- c) MHC.

Q9) Write short notes on ANY TWO (8 marks each): [16]

- a) Active immunization.
- b) Types of vaccines.
- c) Subunit vaccine.
- d) Adjuvants.

Q10) Write short notes on ANY TWO of following (9 marks each): [18]

- a) Graves disease,
- b) Myasthenia gravis,
- c) IR in TB,
- d) SLE,
- e) Immunodeficiency

EEE

Total No. of Questions : 12]

SEAT No. :

P3668

[4758] - 174

[Total No. of Pages :2

T.E. (Biotechnology)
BIOINFORMATICS AND MANAGEMENT
(2008 Pattern) (Semester -II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

Q1) Answer the following:(9 marks each) **[18]**

- a) Explain any one genomic database with example
- b) Explain various databases in NCBI.

OR

Q2) Discuss the following: (9 marks each). **[18]**

- a) Primary and secondary protein data bases.
- b) Object oriented database

Q3) Write short notes on: (4 marks each). **[16]**

- a) Tr EMBL
- b) Swiss prot
- c) DDBJ
- d) DNA sequencing method

OR

P.T.O.

Q4) What is an algorithm? Explain different properties of algorithm and their significance in bioinformatics. [16]

Q5) Briefly explain CATH structural classification system in details. Add a note on protein structure. [16]

OR

Q6) Answer the following (8 marks each). [16]

- a) Basic steps in BLAST algorithm and its output
- b) Various types of torsion angles and add a Ramachandran plot.

SECTION -II

Q7) Answer the following (9 marks each). [18]

- a) Computer Aided Drug Designing.
- b) Different parameters of BLAST which can influence the alignment

OR

Q8) Discuss the following. (9 marks each) [18]

- a) Dot matrix method of sequence analysis
- b) Dynamic programming method.

Q9) Explain the Maximum Parsimony method of tree building. Add a note on limitations of phylogenetic analysis. [16]

OR

Q10) What is phylogenetic analysis? Describe briefly the three general approaches to construct a tree. [16]

Q11) Briefly explain the four structural types of database management systems in details. [16]

OR

Q12) Describe in detail SWOT analysis as a strategic planning method. Add a note on Reason for privatization of public organizations in India. [16]



Total No. of Questions : 12]

SEAT No. :

[Total No. of Pages :4

P2261

[4758]-18

T.E. (Mechanical)

MECHATRONICS

(2008 Course) (Semester - II)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) *Answer 3 questions from each section.*
- 2) *Solve Q.1 or 2, Q.3 or 4, Q.5 or 6, Q.7 or 8, Q.9 or 10, Q.11 or 12.*
- 3) *Answers to the two sections should be written in separate books.*
- 4) *Neat diagrams must be drawn wherever necessary.*
- 5) *Use of electronic pocket calculator is allowed.*
- 6) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Explain how microbalance Machine works which is used for measurement of weight in jewellery shop with suitable diagram? [8]
- b) Compare RTD, Thermocouple and Thermister? [8]

OR

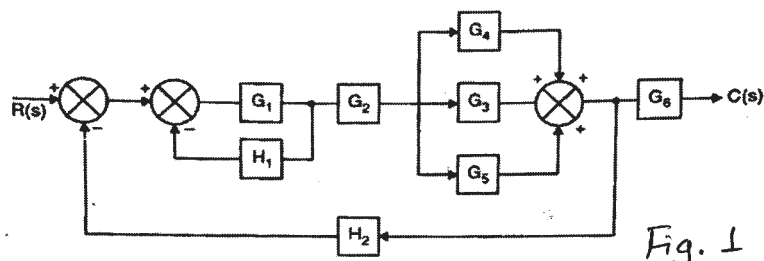
- Q2)** a) For platinum resistance thermometer, the resistance coefficient of temperature is $0.004 \Omega/\Omega/^\circ\text{C}$ resistance at 40°C is 130Ω . Find the following [6]
- i) Resistance at 300°C .
 - ii) Temperature when resistance is 90Ω .
- b) Explain in detail temperature compensation. [4]
- c) List out all level measurement method and explain any one direct method? [6]

P.T.O.

- Q3)** a) Draw and explain principle, working with advantages, disadvantages and applications of LVDT in detail? [8]
- b) Explain Eddy current type Tachometer with the principle, working and neat diagram? [6]
- c) Define dead zone and hysteresis? [2]

OR

- Q4)** a) Write short note on limit switches. [4]
- b) Describe motion measurement technique by optical method? [8]
- c) A potentiometer with a total range of 350° is supplied with a voltage of 8Vdc. The voltage at the wiper is 3.7 Vdc. What is present angle of pot? [4]
- Q5)** a) What is mean by Nyquist theorem? [4]
- b) Explain a case study of SCADA. [6]
- c) Carry out block diagram reduction for the system shown in figure.1. [8]



OR

- Q6)** a) In case of DAC (Digital to Analog converter) what is purpose of Sample and Hold Circuit and explain its working with suitable figure? [6]
- b) In Thermal system modelling, explain Thermal capacitance. [4]

- c) Carry out block diagram reduction for the system shown in figure 2. [8]

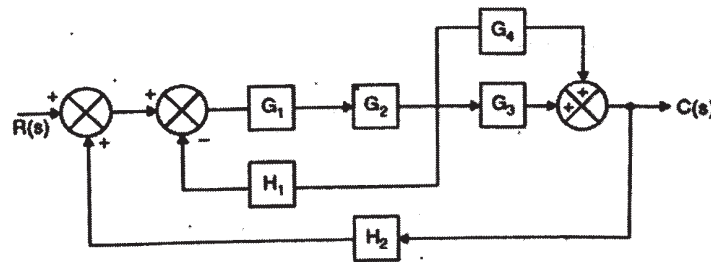


Fig. 2

SECTION - II

- Q7)** a) Explain feed forward control system with illustrative example. Compare it with feedback control system. [8]
 b) What is transfer function? Derive the transfer function for closed loop control system. [8]

OR

- Q8)** a) A controlling variable is a motor speed that varies from 800 to 1750 rpm. If the speed is controlled by a 25 to 50 V DC signal, calculate: [8]
 i) The speed produced by an input of 40 V; and
 ii) The speed calculated as a percent of span.
 b) Define and explain following process characteristics: [8]
 i) Process equation
 ii) Process load
 iii) Process capacity
 iv) Dead time

- Q9)** a) Explain Proportional plus Derivative (PD) control with mathematical expression. Write advantages of applying PD control over proportional (P) applied alone or derivative (D) applied alone. [8]
 b) Define Proportional control, Proportional Band, and Offset error with relevant mathematical expressions. [8]

OR

Q10)a) An integral controller is used for speed control of 12 rpm within a range of 10-15 rpm. The controller output is 22% initially. The constant $K_1 = -0.15\%$ controller output per second per percent error. If the speed jumps to 14.5 rpm, calculate controller output after 3 seconds for constant e_p . **[8]**

b) “Derivative controllers are not used alone.” Justify the statement with respect to some error verses time graph and corresponding controller output verses time graph. **[8]**

Q11)a) Draw a ladder diagram for a two motor system having following conditions: The start switch starts motor 1; and 10 seconds later motor 2 starts, the stop switch stops motor1 and 15 seconds later motor 2 stops.

Write boolean expressions for the rungs. **[10]**

b) Explain the basic structure of PLC with suitable sketch. What are various factors to be considered for selection of PLC. **[8]**

OR

Q12)a) Draw ladder diagram for bottle filling plant for below given sequence. **[10]**

i) Start the conveyor.

ii) When bottle is in position, stop the conveyor and open the solenoid valve.

iii) When bottle is full that is detected by optical proximity switch, close the solenoid valve.

iv) Go to step 1 for next bottle.

Write boolean expressions for the rungs.

b) How relay works? Explain the working principle of electromechanical relay. Explain the advantages of PLC over conventional relay type control. **[8]**

EEE

Total No. of Questions : 12]

SEAT No. :

P3640

[4758]-19

[Total No. of Pages : 3

T.E. (Mechanical)

METROLOGY AND QUALITY CONTROL

(2008 Course) (Semester-II)(311048)

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 different types of errors in measurement. [6]
b) Describe the Accuracy and Precision. [4]
c) What are standards of measurement? Explain classification of various standards. [8]

OR

- Q2)** a) Explain with suitable diagram, construction and working of Johansson mikrokator comparator. [8]
b) Sketch the setup and describe the construction as well as operating procedure and principle of Auto-collimator. [7]
c) Differentiate between Measurement and Calibration. [3]

- Q3)** a) Design a plug and ring gauge to control the production of 90mm shaft and hole pair of H8 e9. [10]

Data given-

- 90mm diameter steps of 80 to 100 mm.
- Fundamental deviation for 'e' shaft=-11D0.41
- $I = 0.45 \sqrt{0.001D}$.
- Standard tolerance for grade IT8=25i and IT 9/40i

P.T.O.

- b) Describe with neat sketch the fringing pattern obtained on various surface contours using interferometry. [6]

OR

- Q4)** a) Design the general type G0 and N0G0 gauge for component having 20H7f8 fit.
- Standard tolerance for grade IT7=16i and IT8=25i.
 - Micron tolerance unit $i=0.45 + 0.001D$.
 - Fundamental deviation for f shaft- 5.5D0.41.
 - Wear allowance 10% of gauge tolerance. [10]
- b) Explain with neat sketch the optical arrangement of NPL gauge length interferometer. [6]

- Q5)** a) Explain the floating carriage micrometer for effective diameter measurement of thread. Derive expression. [8]
- b) Write short notes on.
- i) Gear tooth vernier caliper.
 - ii) Machine Vision. [8]

OR

- Q6)** a) Derive an expression for best wire size and calculate diameter of best wire for M20 × 2.5 screw. [6]
- b) Computerised CMM. [4]
- c) Explain the use of constant chord method. Derive expression as constant chord. $[\pi \times m \times \cos^2\theta / 2]$
where m =module and θ =pressure angle. [6]

SECTION II

- Q7)** a) What are different quality costs? Explain cost of quality and value of quality. [6]
- b) Explain: Quality policy. [5]
- c) Explain what you understand by concurrent engineering. [5]

OR

- Q8)** a) Describe malcom national Quality awards. [4]
 b) Write a note on quality circle. [6]
 c) State seven quality control tools and explain any two. [6]

- Q9)** a) What do you mean by FMECA? Explain in detail. [8]
 b) Write short Notes on. [8]
 i) Quality Audit
 ii) Kaizen

OR

- Q10)** a) Explain ISO 9000 Quality system standards. [6]
 b) Write a short note on Total quality management. [5]
 c) What is JIT ? Explain in details its applications. [5]

- Q11)** a) Compare 'P' chart and 'c' chart. [6]
 b) Explain DMAIC uses in six sigma. [6]
 c) Explain operating characteristics curve with LTPD, AQL, producer's risk(α), Consumer's risk (β). [6]

OR

- Q12)** a) Calculate the sample size AOQ for a single sampling plan. [6]
 i) Probability of acceptance for 0.5% defectives in a lot is 0.525
 ii) Lot size N= 10,000 units.
 iii) Acceptance number =1
 iv) $nP' = 1.6$
 v) Defective found in the sample are not to be replaced
- b) A machine producing plastic moulded components is checked up for the statistical stability. Draw 'P' chart for machine and comment upon the process. Sample size=200 Nos. [6]

Sample No.	1	2	3	4	5	6	7	8	9	10
Defectives	11	8	22	15	12	27	10	15	10	2

- c) Statistical process control (SPC) [6]



Total No. of Questions : 12]

SEAT No. :

P3638

[4758]-2

[Total No. of Pages :5

T.E. (Civil)

ADVANCED SURVEYING

(2008 Pattern) (Semester - II)

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) *Figures to the right side indicate full marks.*

SECTION - I

- Q1) a) Define, [8]**
- i) Well conditioned triangle
 - ii) Extension of the base
 - iii) Phase of a signal
 - iv) Satellite Station
- b) State and explain various components of GPS and applications to civil engg. [6]
- c) What are the various points to be considered for selecting a triangulation station? [4]

OR

- Q2) a) There are two stations A and B at elevations of 240 m and 280 m respectively. The distance between A and B is 60 Km. Find the minimum height of target required at B so that line of sight may not pass near the ground than 2 meters. The intervening ground may be assumed to have a uniform elevation of 200 meters. [8]**
- b) Differentiate between triangulation and traversing and trilateration. [6]
- c) What are different types of errors in GPS signal or result? [4]

P.T.O.

Q3) a) Find the most probable values of the angles A & B from the following observations; [8]

$$A = 9^{\circ} 48' 36.6'' \quad \text{wt.2}$$

$$B = 54^{\circ} 37' 48.3'' \quad \text{wt.3}$$

$$A + B = 104^{\circ} 26' 28.5'' \quad \text{wt.4}$$

b) Explain step by step procedure for figure adjustment for a geodetic quadrilateral with central station. [4]

c) Explain the following terms; [4]

Conditioned Equation, True Error, Most Probable Value, Residual Error.

OR

Q4) a) Find the corrected values of the angles of a triangle ABC from the following observations; [8]

$$A = 77^{\circ} 14' 20'' \quad \text{wt.4}$$

$$B = 49^{\circ} 40' 35'' \quad \text{wt.3}$$

$$C = 53^{\circ} 04' 52'' \quad \text{wt.2}$$

b) What is spherical excess? What are the methods of computing the sides of a spherical triangle? Explain any one method. [4]

c) Explain the following terms; [4]

Independent quantity, Weight of an observation, Mistake, True Value

Q5) a) The following reciprocal observations were made from two points P and Q: [10]

$$\text{Horizontal distance between P and Q} = 6996 \text{ m}$$

$$\text{Angle of elevation of Q at P} = 1^{\circ}56' 10''$$

$$\text{Angle of depression of P and Q} = 1^{\circ}56'52''$$

$$\text{Height of signal at P} = 4.07 \text{ m}$$

Height of signal at Q = 3.87 m

Height of instrument at P = 1.27 m

Height of instrument at Q = 1.48 m

Find the difference in level between P and Q and the refraction correction.
Take $R \sin 1'' = 30.88$ m.

- b) Explain with a neat sketch how the alignment of tunnel is transferred from surface to the underground. [6]

OR

- Q6)** a) Find the difference of levels of the points P and Q and the R.L. of P from the following data: [10]

Horizontal distance between P and Q = 7118 m

Angle of depression to P at Q = $1^{\circ}32'12''$

Height of signal at P = 3.87 m

Height of instrument at Q = 1.27 m

Co-efficient of refraction = 0.07

R.L. of Q = 417.860 m

Take $R \sin 1'' = 30.88$ m

- b) Describe in brief the location survey of a long bridge. [6]

SECTION - II

- Q7)** a) Define Relief displacement. Derive an equation to determine the height of an object with neat sketch. [5]

- b) What is parallax of a point in photogrammetry. Describe the procedure of measuring parallax using parallax bar. [5]

- c) Determine the number of photographs required to cover an area.

25km x 20 km, if the scale is 1 in 10000 and the format is 230 x 230 mm. take longitudinal lap as 60% and the side lap as 30%. [8]

OR

- Q8)** a) What are the types of aerial photographs? Explain drift and crab. [5]
- b) Explain in brief the procedure for determining Air Base Distance using mirror stereoscope. [5]
- c) Calculate the air base, flying height and datum scale from the following data from a pair of aerial photograph. Focal length = 153 mm. [8]

Point	Absolute Parallax (mm)	Ground Height (m)
A	70.40	295
B	71.65	332

- Q9)** a) What makes data spatial? Differentiate between vector and raster data. [6]
- b) Differentiate between active and passive system of remote sensing. [5]
- c) What are the elements of image interpretation? [5]

OR

- Q10)** a) What are different types of resolutions. Explain any one in detail. [6]
- b) What is geo-stationary and sun-synchronous satellites. [5]
- c) What are the capabilities or functions available in G.I.S. [5]

- Q11)** a) The following observations were made on three stations A, B, & C from a boat at O with the help of a sextant. Station B & O being on the same side of AC. Calculate the distances of the boat from the three stations.

Angle AOB = $30^{\circ}25'$, angle BOC = $45^{\circ}25'$, Angle ABC = $130^{\circ}10'$
 AB = 4000 m, BC = 4995 m. [8]

- b) What is sounding? Enlist the instruments used & explain principle of sextant with a neat sketch. [8]

OR

- Q12)a)** A, B, & C are three visible stations in a hydrographic survey. The computed sides of the triangle ABC are $AB = 1200$ m, $BC = 1442$ m & $CA = 1960$ m. Station O is established outside the triangle and its position is to be determined by resection on A, B, & C, the angle AOB and BOC being respectively $45^{\circ}30'$ and $52^{\circ}15'$. Determine distances of OA and OC, if O & B are on the Opposite sides of line AC. **[8]**
- b) Define hydrographical surveying. Explain graphical method of solving three point problem. **[8]**

EEE

Total No. of Questions : 12]

SEAT No. :

P2262

[4758]-20

[Total No. of Pages : 6

T.E. (Mechanical)

REFRIGERATION AND AIR CONDITIONING

(2008 Course) (Semester-II) (302051)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answers to the two sections should be written in separate books.*
- 2) *Answer any three questions from each section.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of psychrometric chart, and steam tables are allowed.*
- 6) *Assume suitable data, if necessary, state clearly the assumption made.*
- 7) *Use of calculator is allowed.*

SECTION-I

- Q1)** a) Draw skeleton of p-h diagram and mark the property lines on it. Sketch ideal vapour compression cycle on T-s and p-h diagrams and mark the name of processes. **[6]**
- b) Air enters the compressor of an ideal Brayton Refrigeration Cycle at 1atm and 270 K with a volumetric flow rate of 1.5 m³/s. If the compressor pressure ratio is 3 and the turbine inlet temperature is 300 K, determine, **[8]**
- i) The net power input,
 - ii) The refrigeration capacity,
 - iii) Coefficient of performance.
- Take $\gamma = 1.4$ and $C_p = 1.005$ kJ/kg.K.
- c) State any four applications of refrigeration. **[2]**

OR

- Q2)** a) State advantages and disadvantages (four each) of air refrigeration. **[4]**

P.T.O.

- b) An ideal vapour compression system uses R-12 as refrigerant. The system uses an evaporation temperature of 0°C and condenser temperature of 40°C , the capacity of the system is 7 TR. Determine: **[8]**
- The mass flow rate of refrigerant.
 - Power required to run the compressor,
 - Heat rejected in the condenser, and
 - COP of the system.

Use the properties of R-12 from table given below:

Temp $^{\circ}\text{C}$	Pressure bar	h_f kJ/kg	h_g kJ/kg	s_f kJ/g	s_g kJ/kg.K
0	3.087	36.05	187.53	0.142	0.696
40	9.609	74.59	203.2	0.727	0.682

Take C_p for superheated vapour as 0.6 kJ/kg.K .

- c) Explain any one non-conventional refrigeration process with graphical support. **[4]**
- Q3)** a) Discuss the effect of condenser and evaporator pressures on performance of VCC with the help of p-h or T-s diagram. **[8]**
- b) Explain with suitable diagram the working lithium bromide vapour absorption system. **[7]**
- c) State any three desirable properties of refrigerant solvent combination. **[3]**

OR

- Q4)** a) Compare vapor absorption system with vapour compression system. **[4]**

- b) Draw actual vapour compression cycle on p-h diagram and discuss the losses in the cycle and its effect on its performance. [8]
- c) Prove that the maximum COP of an ideal vapour absorption refrigeration system is given by

$$\text{COP}_{\max} = \left(\frac{T_L}{T_C - T_L} \right) \times \left(\frac{T_G - T_C}{T_G} \right)$$

Where T_L = evaporator temperature, T_C = Condenser temperature and T_G = generator temperature. [6]

- Q5)** a) Draw the neat sketch of vapour compression system with two evaporators equipped with individual compressors and expansion valve and common condenser. Sketch it on p-h diagram and deduce mathematical formulation of its COP. [10]
- b) State desirable properties of refrigerant. List some eco-friendly refrigerant and state why eco-friendly refrigerant must be used. [6]

OR

- Q6)** a) State any four limitation of single stage vapour compression refrigeration cycle. [4]
- b) Sketch the block diagram of two stage VCC with flash inter-cooling. Draw its p-h diagram. Mark the components and processes. [4]
- c) Write a short note on any two from followings: [8]
- i) Global warming potential (GWP).
 - ii) Cascade refrigeration system.
 - iii) Refrigerant recovery, reclaim and recharge.

SECTION-II

- Q7) a) Define:** **[6]**
- i) SHF,
 - ii) Relative Humidity,
 - iii) Dew point temperature.
- b) Explain process of adiabatic mixing of two air streams with a psychometric chart. **[4]**
- c) A mixture of dry air and water is at a temperature of 21°C under a total pressure of 736 mm of Hg. The dew point temperature is 15°C . Find: **[6]**
- i) Partial pressure of water vapour.
 - ii) Relative humidity.
 - iii) Specific humidity.

OR

- Q8) a) Define:** **[6]**
- i) GSHF,
 - ii) Specific Humidity,
 - iii) Wet bulb temperature.
- b) Explain process of adiabatic saturation with a psychometric chart. **[4]**
- c) In a heating application, moist air enters a steam heating coil at 10°C , 50% RH and leaves at 30°C . Calculate the sensible heat if mass flow rate is 100 kg d.a./sec. Also calculate the mass flow rate of steam if it enters at 100°C , saturated and condensate leaves at 80°C . **[6]**

- Q9)** a) Compare: Unitary and Central air conditioning system. [6]
b) Write a note on Summer Air Conditioning. [4]
c) Explain any one expansion device with a neat sketch. [6]

OR

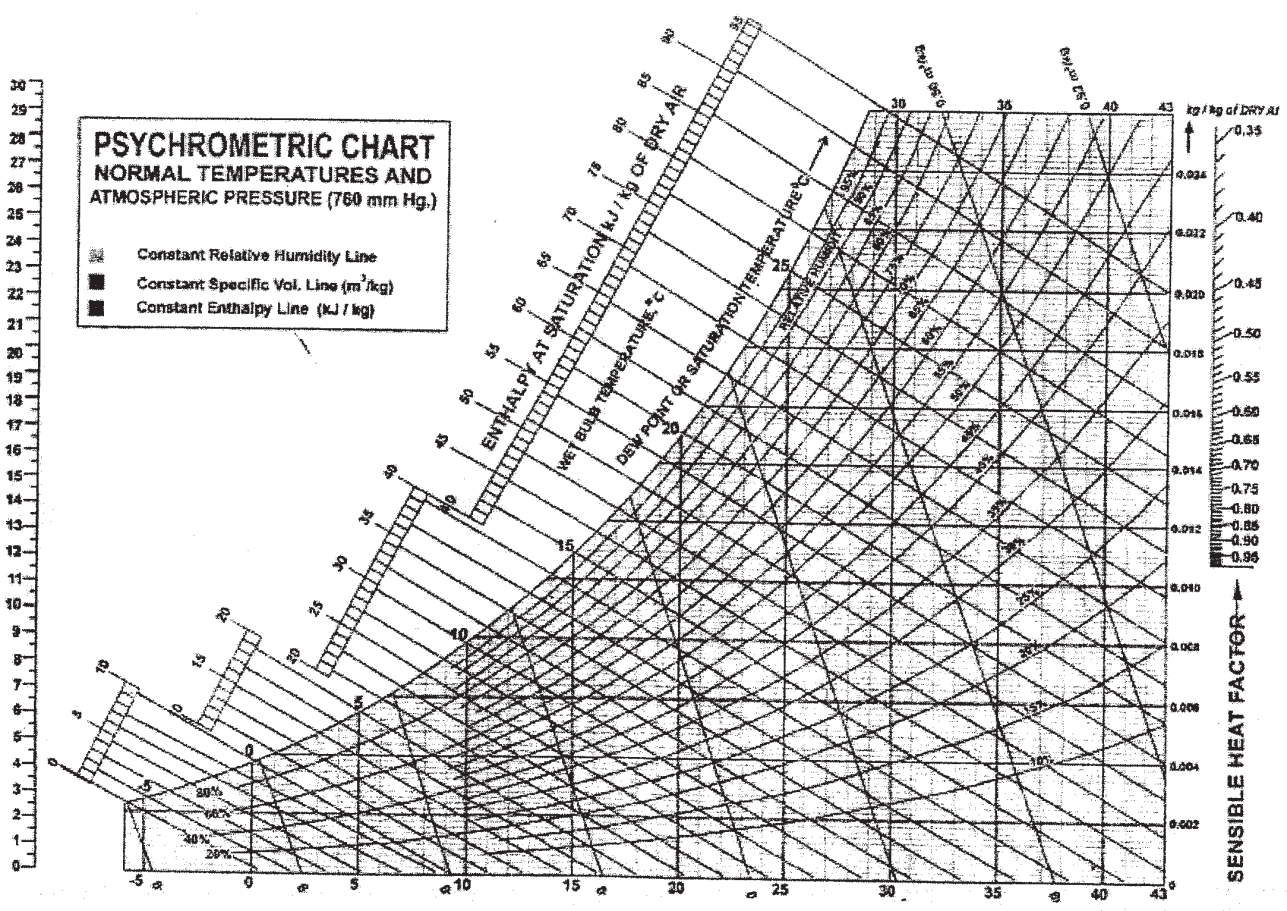
- Q10)** a) Explain Fan Coil Unit with a neat sketch. [6]
b) Write a note on Winter Air Conditioning. [4]
c) Explain any one type of condenser with a neat sketch. [6]

- Q11)** a) How ducts are classified? [3]
b) Write a note on Cold Storage. [6]
c) Explain any one method of duct design. [6]
c) Write a note on Duct Materials. [3]

OR

- Q12)** a) What are the methods of Food Preservation? [4]
b) Write a note on CAMA Storage. [6]
c) Derive expressions for equivalent diameter of a rectangular duct when the velocity of air passing through the rectangular and circular duct is same.

Hence find the size of a rectangular duct of aspect ratio 1.5 which should replace a circular duct of 40cm diameter and velocity of air is 440 m/min. [8]



Total No. of Questions : 12]

SEAT No. :

P2263

[4758]-22

[Total No. of Pages : 3

T.E. (Mech. S/W)

PRODUCTION MANAGEMENT

(2008 Course) (Semester - I)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) *Answer 3 questions from section I and 3 questions from section II.*
- 2) *Answers to the two sections must 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 meant by scientific management? Explain in brief various functions of management. [9]
- b) Explain different types of organisation in short. [9]

OR

- Q2)** a) What are different types of group dynamics explain characteristics of group dynamics. [9]
- b) Explain partnership firm and co-operative company in detail. [9]
- Q3)** a) Explain objectives of production management. [8]
- b) Compare different types of production system (job, batch and mass) and its characteristics. [8]

OR

P.T.O.

- Q4)** a) Explain plant location and various types of layout. [8]
b) Write notes on production planning and control. [8]

- Q5)** a) Explain motion study process in detail. [8]
b) Explain importance of ergonomics in industry. [8]

OR

- Q6)** a) Write short note on allowances in time study. [8]
b) Explain symbols used in motion and time study. [8]

SECTION - II

- Q7)** a) Compare various control charts with their applications. [9]
b) Explain the various terms related to OC curve. [9]

OR

- Q8)** a) Define quality and its various characteristics. [9]
b) Compare sampling and 100% inspection. [9]

- Q9)** a) Explain 5's principle of manufacturing. [8]
b) Write short notes on quality circle. [8]

OR

- Q10)** a) Explain concurrent Engg. [8]
b) Explain 7 QC tools. [8]

Q11)a) Explain the reliability in Engineering. **[8]**

b) Write short notes on I.S.O. **[8]**

OR

Q12)a) Explain Taguchi method of DOE. **[6]**

b) Explain the FMEA and FTA. **[10]**

EEE

Total No. of Questions : 8]

SEAT No. :

P3909

[Total No. of Pages : 2

[4758]- 23

**T.E. (Mechanical Sandwich)
BEHAVIOURAL SCIENCE
(Self Study)
(2008 Pattern)**

Time : 3 Hours]

[Max Marks :100

Instructions to the candidates:

- 1) *Answer three questions from section I and three questions from Section II.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Figures to the right indicate full marks.*

SECTION - I

Q1) Explain the formation and working of partnership.

- a) Organisation and joint stock company, stating their merits and demerits. **[10]**
- b) "Industrial laws are essential devil" - Explain. **[6]**

Q2) a) Compare and contrast Maslow's Hierarchy of needs theory and Herzberg's two factory theory. **[8]**

- b) Explain various Environment in the urban and Rural laws. **[10]**

Q3) Explain various organisation structure discuss advantage, disadvantage and limitation. **[16]**

Q4) Write a short note on (Any three) **[18]**

- a) Personality Traits.
- b) Influence of people on performance of Enterprise.
- c) Planning and design.
- d) Functions of management.

P.T.O.

SECTION - II

- Q5)** a) Explain in detail path goal model of leadership. State various leadership style under this model. [8]
b) Define leadership. State functions of leader and discuss analities for a good leader. [8]
- Q6)** a) State different types of interviews Explain any one of them in detail. [8]
b) Explain clearly Homan's model of small group behaviour. [8]
- Q7)** a) What do you mean by organisational culture? State its characteristic.[8]
b) Explain in brief bureaucratic type leadership style. comment on its effectiveness. [8]
- Q8)** Write a short note on (Any three) [18]
a) Ulterior transaction.
b) Down ward/ Upward communication.
c) Theory X and Y leadership.
d) Quality award models.



Total No. of Questions : 12]

SEAT No. :

P2264

[4758]-24

[Total No. of Pages : 3

T.E. (Mech. S/W)

WELDING TECHNOLOGY

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

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) *Answer any 3 questions from each section.*
- 2) *Answer 3 questions from section I and 3 questions from section II.*
- 3) *Answers to the two sections must be written in separate answer books.*
- 4) *Neat diagrams must be drawn wherever necessary.*

SECTION - I

Q1) a) Sketch the three types of flames used in OAW process. Give the uses of each. [8]

b) Write the principle of gas welding with its advantages & applications.[8]

OR

Q2) a) Explain the chemical reaction that takes place in OAW Torch. [8]

b) Sketch & compare the two system of OAW process. [8]

Q3) a) Write down different types of electrodes used in arc welding. [8]

b) Explain the following electric arc welding process with the help of neat sketches. [8]

i) GTAW

ii) GMAW

OR

P.T.O.

Q4) a) Explain submerged ARC welding with neat sketch & write its application. [8]

b) Explain plasma arc welding process & write its advantages & applications. [8]

Q5) a) Explain the spot welding process? Can dissimilar metals be spot welded? [8]

b) Write short notes on (any Two): [10]

i) Projection welding

ii) Butt welding

iii) Light, medium & heavily coated electrode.

OR

Q6) a) Describe seam welding process with its controlling parameters? Write its advantages & applications. [8]

b) Write short notes on (any Two): [10]

i) Distinguish between flash welding & upset welding.

ii) Percussion butt welding.

iii) Welding filler metal rods & flux.

SECTION - II

Q7) a) Define solid-state welding processes. Where it is used & what are the advantages & disadvantages of SSW processes. [8]

b) With the help of neat sketch explain the cold welding process also write its application. [8]

OR

- Q8)** Explain the following welding methods with neat sketches: [16]
- a) Forge welding.
 - b) Ultrasonic welding.
 - c) Friction welding.
 - d) Electron beam welding.

- Q9)** a) Explain the principle of braze weld & in detail discuss the diffusion & furnace brazing methods. [8]
- b) Write note on various soldering techniques used. [8]

OR

- Q10)** a) Explain different brazing processes. [8]
- b) Write different types of adhesive bonded joint & write its advantages & disadvantages & its application. [8]
- Q11)** a) List any four weld defects with its causes & remedies. [6]
- b) Write briefly on testing & inspection of weld joint. [6]
- c) What causes weldments to cracks? Describe the reasons & suggest the remedies. [6]

OR

- Q12)** a) Explain factors affecting welding cost? [6]
- b) Write a note on quality assurance Vs quality control. [6]
- c) Explain the following terms: [6]
- i) Deposition efficiency.
 - ii) Deposition Rate.
 - iii) Operating factor.

EEE

Total No. of Questions : 12]

SEAT No. :

P2265

[4758] - 25

[Total No. of Pages :6

T.E. (Mechanical S/W)

THEORY OF MACHINES AND MACHINE DESIGN - II

(2008 Course) (302064) (Semester - II)

Time : 4 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 side indicate full marks.*
- 4) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Explain with the help of neat sketches, what is meant by ‘path generation, and motion generation? **[4]**
- b) Draw a cam profile to drive an oscillating roller follower to the specifications given below: **[12]**
- i) Follower to move outwards through an angular displacement of 20° during the first 120° rotation of the cam;
 - ii) Follower to return to its initial position during next 120° rotation of the cam;
 - iii) Follower to dwell during the next 120° of cam rotation.

The distance between pivot centre and roller centre = 120 mm; distance between pivot Centre and cam axis = 130 mm; minimum radius of cam = 40mm; radius of roller = 10mm; inward and outward strokes take place with simple harmonic motion.

OR

- Q2)** a) Derive relation for displacement, velocity and acceleration of follower which has uniform acceleration and retardation motion during rise. **[6]**
- b) Determine the proportions of four bar mechanism, by using three precisionpoints, to generate $y = x^{1.5}$, where x varies between 1 and 4. Assume $\theta_s = 30^\circ$; $\Delta\theta = 90^\circ$; $\phi_s = 90^\circ$; and $\Delta\phi = 90^\circ$. Take length of the fixed link AD as 25mm. **[10]**

P.T.O.

- Q3) a)** Explain the term interference in connection with gear and the various methods used to avoid it. [6]
- b) A pair of involute spur gears with 16° pressure angle and pitch of module 6 mm is in mesh. The number of teeth on pinion is 16 and its rotational speed is 240 r.p.m. When the gear ratio is 1.75, find in order that the interference is just avoided;
- The addenda on pinion and gear wheel;
 - The length of path of contact; and
 - The maximum velocity of sliding of teeth on either side of the pitch point. [10]

OR

- Q4) a)** A pair of single helical gear is required to give a speed reduction of 4.2:1. The gears are have a normal module of 4 mm, pressure angle of 20° and a helix angle of 30° . If the shaft centre lines are to be approximately 400 mm apart, determine the number of teeth on each wheel and exact center distance. [6]
- b) In an epicyclic gear train, an arm carries two gears A and B having 36 and 45 teeth respectively. If the arm rotates at 150 r.p.m. in the anticlockwise direction about the centre of the gear A which is fixed, determine the speed of gear B. If the gear A instead of being fixed, makes 300 r.p.m. in the clockwise direction, what will be the speed of gear B? [10]

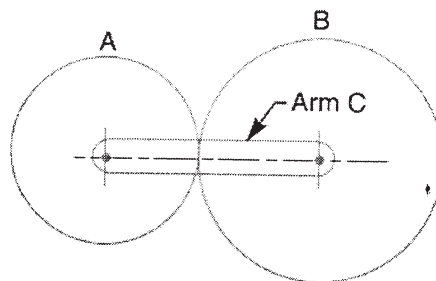


Figure 1

- Q5) a)** Explain belt transmission dynamometer with neat sketch. [6]
- b) A rear engine automobile is travelling along a track of 100 meters mean radius. Each of the four road wheels has a moment of inertia of 2.5 kg-m^2 and an effective diameter of 0.6m. The rotating parts of the engine have a moment of inertia of 1.2 kg-m^2 . The engine axis is parallel to the rear axle and the crankshaft rotates in the same sense as the road wheels. The ratio of engine speed to back axle speed is 3:1. The automobile has a mass of 1600 kg and has its centre of gravity 0.5m above road level. The width of the track of the vehicle is 1.5m. [12]

Determine the limiting speed of the vehicle around the curve for all four wheels to maintain contact with the road surface. Assume that the road surface is not cambered and centre of gravity of the automobile lies centrally with respect to the four wheels.

OR

Q6) a) Describe the gyroscopic effect on sea going vessels. [6]

Describe with the help of a neat sketch the principles of operation of an internal expanding shoe brake. [4]

b) A band and block brake, having 14 blocks each of which subtends an angle of 15° at the centre, is applied to a drum of 1m effective diameter. The drum and flywheel mounted on the same shaft has a mass of 2000 kg and a combined radius of gyration of 500mm. The two ends of the band are attached to pins on opposite sides of the brake lever at distances of 30mm and 120mm from the fulcrum. If a force of 200N is applied at a distance of 750 mm from the fulcrum, find : [8]

- i) maximum braking torque
- ii) angular retardation of the drum, and
- iii) time taken by the system to come to rest from the rated speed of 360 r.p.m.

The coefficient of friction between blocks and drum may be taken as 0.25.

SECTION - II

Q7) A helical pinion having 14 teeth to be made of alloy steel 40Ni2Cr1Mo28 ($S_{ut} = 800\text{N/mm}^2$) is to mesh with a gear to be made of plain carbon steel 55C8 ($S_{ut} = 720\text{ N/mm}^2$). The gear pair is required to transmit 30 kW power from an electric motor running at 720 rpm to a machine running at 225 rpm. The application factor and load concentration factor are 1.3 and 1.1 respectively. The required factor of safety is 2.0. The face width is 10 times the normal module and tooth system is 20° full depth involute. [18]

Design the gear pair by using velocity factor and Buckingham's equation for dynamic load. Also suggest the case hardness for gear pair.

Use the following data:

Velocity factor, $C_v = 5.6 / (5.6 + V^{1/2})$

Deformation factor, $C = 11000 e \text{ N/mm}$

For Grade 7, $e = 11.0 + 0.9 (m_n + 0.25d^{1/2})$

Select the module under first choice.

OR

Q8) a) What are different modes of worm gear tooth failure? State their causes and remedies. **[4]**

b) The following data is given for a worm gear pair: **[14]**

- i) Pitch circle diameter of worm = 48mm
- ii) Pitch circle diameter of worm gear = 192 mm
- iii) Axial pitch of worm = 18.85 mm
- iv) Pressure angle in axial plane of worm = 20.14°
- v) Lead of worm = 18.85mm
- vi) Effective width of worm gear teeth = 36mm
- vii) Worm speed = 3500rpm
- viii) Permissible bending strength for worm gear = 90 N/mm^2
- ix) Worm gear wear factor = 830 kN/m^2
- x) Coefficient of friction between worm and worm gear teeth = 0.025
- xi) Overall heat transfer coefficient without fan = $16 \text{ W/m}^2\text{C}$
- xii) Overall heat transfer coefficient with fan = $15.2 + 8.25 \times 10^{-3} n_w$, $\text{W/m}^2\text{C}$
- xiii) Effective area of housing = $9 \times 10^{-5} x(a)^{1.88}$, m^2
- xiv) Frictional losses in bearings = 4.5% of total input power

Where n_w = worm speed, rpm

a = centre distance, mm

Determine:

- 1) The dimensions of worm and worm gear
- 2) The input power rating on the basis of strength; and
- 3) The temperature rise of lubricating oil with fan
- 4) Is Fan necessary? Comment.

- Q9) a)** State the characteristics of a good friction material for the clutches. [4]
- b) A multi-plate clutch is used to transmit 12kW power at 1440 rpm. The inner and outer diameters of contacting surfaces are 70mm and 100mm respectively. The coefficient of friction and the permissible intensity of pressure for the lining are 0.12 and 0.38 N/mm² respectively. Determine: [12]
- the number of pressure plates and friction plates.
 - the axial force required to transmit the power.
 - the actual average pressure; and
 - the actual maximum pressure intensity after wear.

OR

- Q10)a)** Define static and dynamic load carrying capacity of rolling contact bearing. [4]
- b) A transmission shaft is supported by two deep groove ball bearings at two ends. The center distance between the bearings is 160 mm. A load of 300 N acts vertically downwards at 60 mm distance from the left hand bearing where as a load of 550N acts horizontally at 50 mm distance from the right hand bearing.
- Shaft speed is 3000 rpm and expected life of bearing is 7000 hrs with a reliability of 95%. It is intended to use same bearing at both ends of the shaft. Calculate dynamic load rating of the bearing so that it can be selected from manufacturer's catalogue. [12]

- Q11)a)** What is Goodman's criterion of failure? Develop an equation for the same. [4]
- b) A solid circular shaft 15mm diameter is subjected to torsional shear stress, which varies from 0 to 35 MPa and at the same time is subjected to an axial stress that varies from - 15 MPa to + 35 MPa. The frequency of variation of these stresses is equal to the shaft speed. The shaft is made of steel with $S_{ut} = 540$ MPa and $S_{yt} = 400$ MPa and corrected endurance strength of the shaft is 200 MPa. Determine the factor of safety. [12]

OR

- Q12)a)** Compare the Soderberg, Goodman and Gerber Approach for fatigue analysis. **[4]**
- b) A transmission shaft supports a pulley midway between the two bearings. The bending moment at the mid point varies from 200 N-m to 600 N-m. The torque on the shaft varies from 70 N-m to 200 N-m. The frequency of variation of bending moment and torque are equal to the shaft speed. The shaft rotates at 1440 rpm. The shaft is made of plain carbon steel with ultimate tensile strength of 540 N/mm² and yield strength of 400N/mm². The corrected endurance limit of the shaft is 200 N/mm². If the factor of safety is 2, determine the diameter of the shaft. **[12]**



Total No. of Questions : 12]

SEAT No. :

P3910

[Total No. of Pages : 4

[4758]- 27

T.E. (Mechanical Engineering S/W)

MECHATRONICS

(2008 Pattern) (Semester - II)

Time : 3 Hours]

[Max Marks :100

Instructions to the candidates:

- 1) *Answers to the two sections should be written in separate answer books.*
- 2) *Answer Q.No. 1 or Q.No.2, Q.No. 3 or Q.No. 4 and 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.11or Q.No. 12 from Section -II.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of Electronic pocket Calculator is allowed.*
- 6) *Assume Suitable data, if necessary and mention it clearly.*

SECTION - I

- Q1)** a) Classify, in details, the sensors used for measuring position. [6]
- b) Explain the following characteristics in detail: [6]
- i) Hysteresis
 - ii) Linearity
 - iii) Accuracy
- c) Sensitivity of a thermocouple is 0.01 Volts /°C. Find the output voltage if the temperature is 200°C. Also find temperature for 3.5 Volts output.[6]

OR

- Q2)** a) Draw the block diagram of generalized mechatronic system and explain the function of each element. [9]
- b) Draw a suitable diagram and explain the construction and working of a filter. Also, discuss the importance of filter in a mechatronic system.[9]

P.T.O.

Q3) a) Using a suitable diagram explain the construction and working of Variable Reluctance sensor. [8]

b) Differentiate between incremental optical encoder and absolute optical encoder. [8]

OR

Q4) a) Explain the working of rotary type Potentiometer. Also, list the advantages and applications of the Potentiometer. [8]

b) Draw a suitable diagram and explain the construction and working of the Capacitive Proximity sensor. [8]

Q5) a) Draw suitable diagrams and explain the construction and working of digital to Analog Converter. [10]

b) A 6-bit DAC has a reference voltage of -10 to 10 Volts. The binary input is 010000 . Find the equivalent analog output voltage. [6]

OR

Q6) a) The rotational mechanical system in Figure Q6(a) has Inertia J , Stiffness k and damping b . Derive the differential equation and determine the transfer function: $\theta(S)/\tau(S)$ [8]

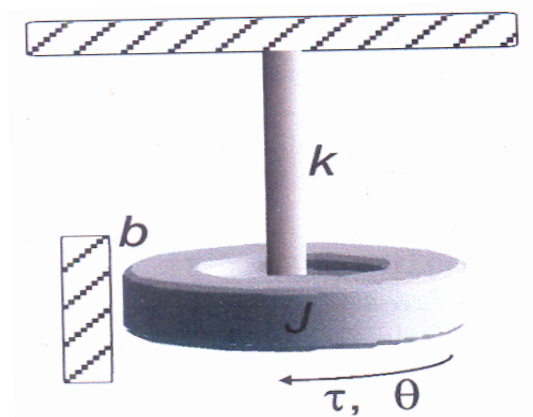


Figure Q 6 (a)

b) W.R.T. the process of Sampling, explain: Sampling Theorem, Aliasing. [8]

SECTION - II

Q7) a) Explain open loop and closed loop control system with suitable example. **[8]**

b) Figure Q. 7 (b) shows a block diagram. Simplify and find the transfer function: **[8]**
 $Y(s)/R(s)$.

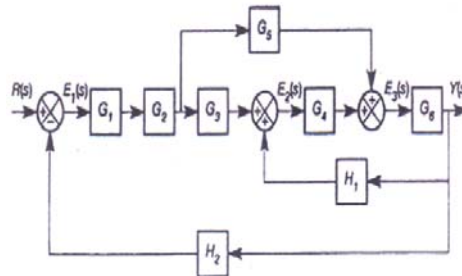


Figure Q 7 (b)

OR

Q8) a) Discuss, in detail, following four terms: **[8]**

- i) Process Load
- ii) Process Lag
- iii) Dead Time
- iv) Control parameter Range

b) Figure Q.8 (b) shows a block diagram. Simplify and find the transfer function: **[8]**

$C(s)/R(s)$.

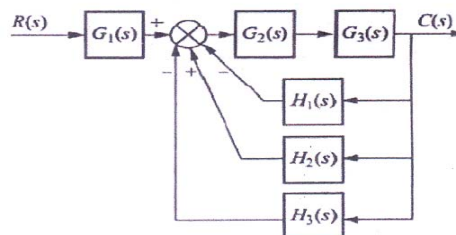


Figure Q 8 (b)

Q9) a) A proportional controller is used to control temperature within 50°C to 130°C with a set point of 73.5°C. The set point is maintained with 50% controller output. The offset error is corresponding to load change which causes 55% controller output. If the proportional gain is 2 find the % controller output if the temperature is 61°C. **[10]**

b) Explain how the three elements of the PID control system work together to create a practical control system. **[6]**

OR

Q10)a) Derive the transfer function of the PID controller as well as the control signal, u , for the PID controller. [10]

b) Discuss the advantages and disadvantages of the Derivative controller.[6]

Q11)a) A simple pick-and-place robot picks up parts from one conveyer belt and places them on another belt, as shown in Figure. Q 11 (a) [12]

- i) When a part moving along the lower conveyer belt activates Switch 1, a solenoid powered gripper clamps on the part and carries it toward the upper conveyer belt.
- ii) When the Gripper reaches Switch 2, it releases the part and moves back (empty) to receive the next part.
- iii) When the gripper reaches Switch 3, it halts and waits for the next part to start the cycle all over again.

Draw the relay logic ladder diagram to control this operation.

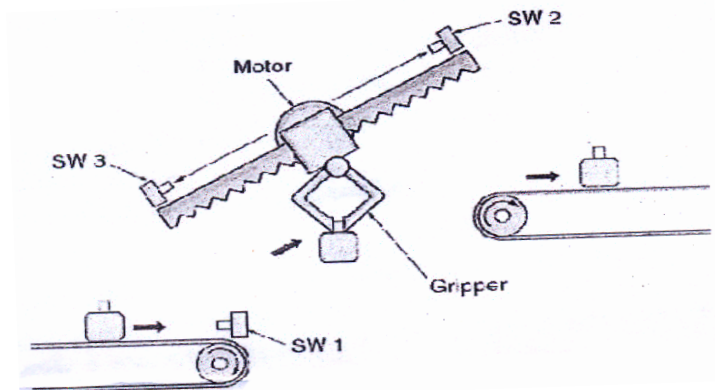


Figure Q 11 (a)

b) Differentiate between Relay Logic and PLC Logic. [6]

OR

Q12)a) Using a suitable diagram explain the architecture of PLC. Also, list the applications of PLC. [12]

b) List six important factors to be considered for selection of PLC. [6]



Total No. of Questions : 12]

SEAT No. :

P2266

[4758] - 28

[Total No. of Pages :3

T.E. (Mechanical S/W)

TRIBOLOGY

(2008 Course) (302066) (Semester - II)

Time : 3Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

Q1) a) Explain recycling of used oil? [8]

b) Discuss the various types of additives? [8]

OR

Q2) a) What is Lubrication? Write it's physical and chemical properties? [8]

b) Distinguish between Sliding contact and rolling contact bearing? [8]

Q3) a) What is friction? Write various laws of it? [8]

b) Explain in detail causes of friction and friction measurement? [8]

OR

Q4) a) What is wear? Explain in detail various factor affecting on it? [8]

b) Derive the equation for volume of abrasive wear with usual notation?[8]

Q5) a) Write derivation for Raimondi and Boyd method? [8]

b) Write in detail two dimensional Reynolds equation. [10]

OR

P.T.O.

- Q6) a)** The following data is given for 360° hydrodynamic bearing [10]
Journal diameter = 100 mm, bearing length = 100 mm, radial load = 50 kN, journal speed = 0.12 mm, viscosity of lubricant = 16 cp. Calculate:
- i) minimum film thickness,
 - ii) coefficient of friction
 - iii) power lost in friction
- b) Explain in detail hydrodynamic lubrication? [8]

SECTION - II

- Q7) a)** What is Hydrostatic lubrication? Write its advantages and limitations? [8]
b) Explain in detail optimum design of step bearing? [8]

OR

- Q8) a)** Write in detail load carrying capacity of hydrostatic step bearing? [8]
b) The following data is given for hydrostatic step bearing of vertical turbo generator [8]
Thrust load = 450 kN, shaft diameter = 400 mm, recess diameter = 250 mm, shaft speed = 750 rpm, viscosity of lubricant = 30 cp. Draw neat sketch showing effect of film thickness. Calculate:
optimum film thickness for minimum power loss

- Q9) a)** What is hydrostatic squeeze film? Write expression for pressure distribution, load carrying capacity and time of approach? [8]
b) Explain in detail gas lubrication with its merits, demerits and application? [8]

OR

- Q10) a)** What is concept of ring oil lubrication? Explain its types in detail? [8]
b) A plate of 35 mm length and infinite width is separated from the plane by an oil film 30 microns thickness and having viscosity of 0.06 N-s/m². If the normal load per unit width of 25 kN/m is applied on the plate, determine: [8]
i) The time required to reduce the film thickness to 3.5 microns; and
ii) The maximum pressure.

- Q11)a)** Write short notes on: **[10]**
- i) Rayleigh bearing
 - ii) Labyrinth Seals
- b) What is hydrostatic thrust bearing? Write in detail equation of pressure?**[8]**

OR

- Q12)a)** The Rayleigh step bearing has following details: **[10]**
- Length of the bearing = 800 mm
 - Width of the bearing = 200 mm
 - Load on the bearing = 150 kN
 - Sum of surface roughness on contacting surfaces = 7 microns
 - Minimum oil film thickness = $20 \times$ Sum of surfaces roughness value
 - Sliding velocity = 8.5 m/s
- Calculate:
- i) Dimensions of the step;
 - ii) The maximum oil film thickness;
 - iii) The viscosity of the lubricating oil; and
 - iv) Maximum pressure at the step.
- b) What is elastohydrodynamics lubrication? Write its principle and application? **[8]**



Total No. of Questions : 12]

SEAT No. :

P2267

[4758] - 29

[Total No. of Pages : 7

T.E. (Automobile)
MACHINE DESIGN
(2008 Pattern) (Semester -I) (316481)

Time : 4 Hours]

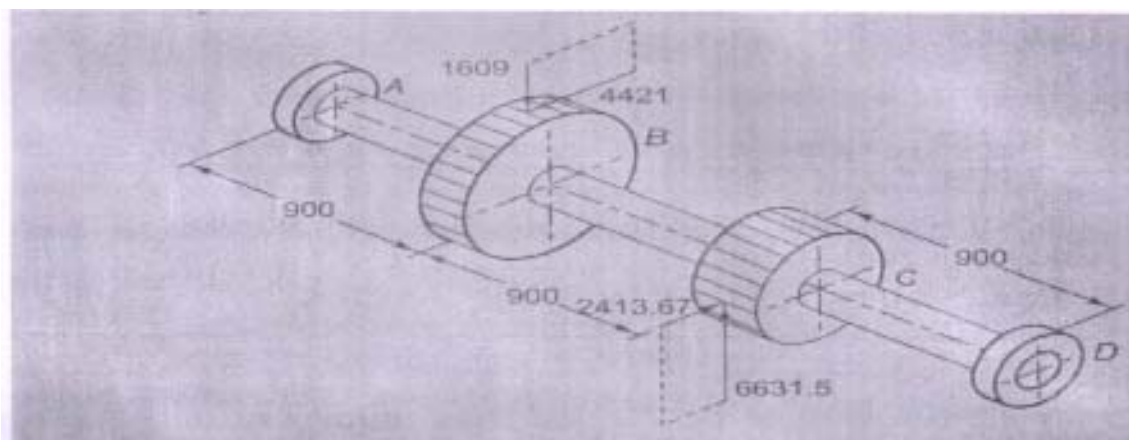
[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

Q1) The layout of an intermediate shaft of a gear box supporting two spur gear B and C is shown in fig. The shaft is mounted on two bearings A and D. The pitch circle diam. of gears B and C are 900mm and 600mm respectively. The material of the shaft is steel FeE 580 ($S_{ut} = 770$ and $S_{yt} = 580\text{N/mm}^2$). The factors k_b and k_t of ASME code are 1.5 and 2.0 respectively. Determine the shaft diameter using ASME code. Assume that the gears are connected to the shaft by means of keys. **[18]**



OR

P.T.O.

Q2) a) A solid shaft of diameter 'd' is used in power transmission. Due to modification of existing transmission system. It is required to replace the solid shaft by a hollow shaft of the same material and equally strong in torsion, further, the weight of hollow shaft per meter length should be half of the solid shaft. Determine the outer diameter of hollow shaft in terms of 'd'. [10]

b) A rigid coupling is used to transmit 50kW power at 300 rpm. There are six bolts. The diameter of flanges is 200mm, while the recess diameter is 150mm. The coefficient of friction between the flanges is 0.15. The bolts are made of steel 45C8 ($S_{yt} = 380 \text{ N/mm}^2$) & factor of safety is 3. Determine the diameters of bolts. Assume that the bolts are fitted in large clearance in hole. [8]

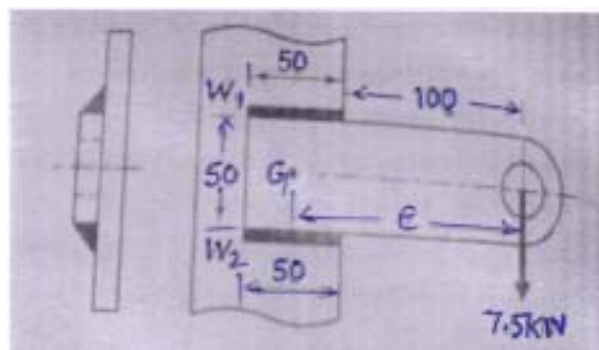
Q3) a) A double threaded power screw, with ISO metric trapezoidal threads is used to raise a load of 300kN. The nominal diameter is 100mm and the pitch is 12mm. The coefficient of friction at the screw threads is 0.15. Neglecting collar friction, calculate [10]

- i) Torque required to raise the load.
- ii) Torque required to lower the load.
- iii) Efficiency of the screw.

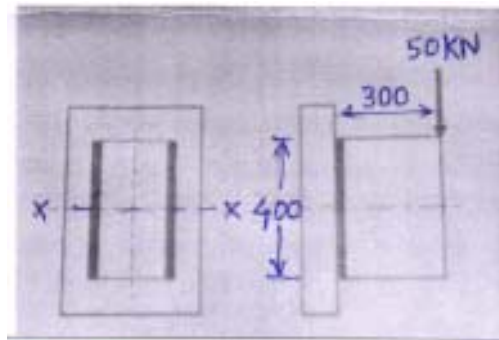
b) Derive formula for torque required to raise the load and torque required to lower the load by a square threaded power screw. [6]

OR

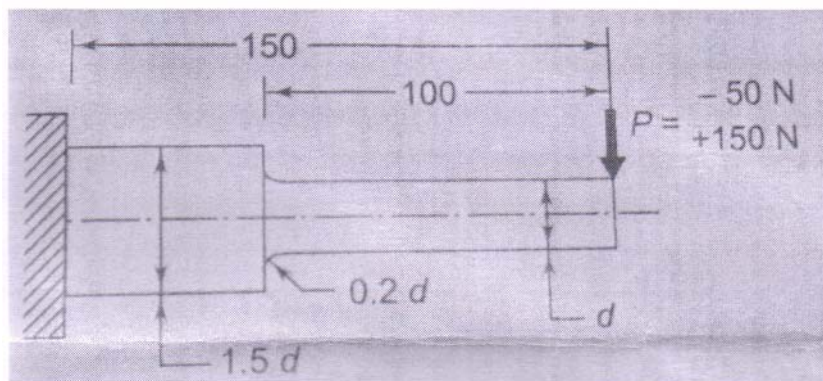
Q4) a) A welded connection, as shown in fig. which is subjected to an eccentric force of 7.5kN. Determine the size of welds if the permissible shear stress for the weld is 100N/mm^2 . Assume static conditions. [8]



- b) A bracket is welded to the vertical plate by means of two fillet welds as shown in fig. Determine the size of the welds, if the permissible shear stress is limited to 70N/mm^2 . [8]



- Q5)** A cantilever beam made of cold drawn steel 40C8 ($S_{ut} = 600\text{N/mm}^2$ and $S_{yt} = 380\text{N/mm}^2$) is as shown in fig. The force 'P' acting at the free end varies from -50N to $+150\text{N}$. The expected reliability is 90% and the factor of safety is 2. The notch sensitivity factor at the fillet is 0.9. Determine the diameter 'd' of the beam at the fillet cross-section using Gerber curve as failure criterion. [16]



OR

- Q6)** a) Define the term stress concentration. State the cause of stress concentration. Also suggest the methods to reduce it. [8]
- b) Explain Soderberg and Goodman equations in brief. [8]

SECTION - II

Q7) A railway wagon moving a velocity of 1.5m/s is brought to rest by a bumper consisting of two helical springs arranged in parallel. The mass of the wagon is 1500kg. The springs are compressed by 150mm in bringing the wagon to rest. The spring index can be taken as 6. The springs are made up of oil hardened and tempered steel wire with ultimate tensile strength of 1250N/mm² and modulus of rigidity 81370 N/mm². The permissible shear stress for the spring wire can be taken as 50% of the ultimate tensile strength. Design the spring and calculate **[18]**

- a) Wire diameter
- b) Mean coil diameter
- c) Number of active coils
- d) Total number of coils
- e) Solid length
- f) Free length
- g) Pitch of the coil
- h) Required spring rate
- i) Actual spring rate

OR

Q8) A helical tension spring is used in a spring balance to measure weights. One end is attached to a rigid support, while the other end which is free, carries the weights to be measured. Maximum weight attached is 1500N and length of scale should be approximately 100mm. Spring index is 6. For spring material, ultimate tensile strength is 1360N/mm² and modulus of rigidity 81370 N/mm². The permissible shear stress can be taken as 50% of ultimate tensile strength. Design the spring and determine, **[18]**

- a) Wire diameter
- b) Mean coil diameter

- c) Number of active coils
- d) Required spring rate
- e) Actual spring rate.

Q9) The following data is given for a 360° hydrodynamic bearing: **[16]**

Radial load = 3.2kN

Journal speed = 1490 rpm

Journal diameter = 50 mm

Bearing length = 50mm

Radial clearance = 0.05mm

Viscosity of lubricant = 25cP,

$$(r/c)f = 3.22, (h_o/c) = 0.4, \frac{Q}{rcn_s l} = 4.33$$

Assuming that the total heat generated in the bearing is carried by the total oil flow in the bearing, Calculate:

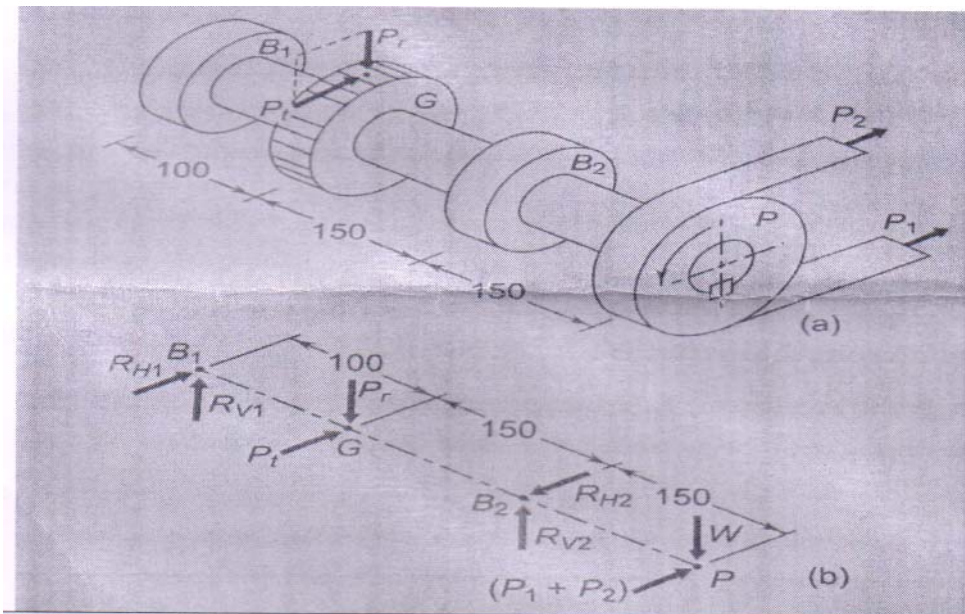
- a) Coefficient of friction
- b) Power lost in friction
- c) Minimum oil film thickness
- d) Flow requirement in liters/min
- e) Temperature rise

OR

- Q10)a)** A transmission shaft rotating at 720 rpm and transmitting power from the pulley P to the spur gear G is shown in fig. The belt tension and the gear tooth forces are as follows: [10]

$$P_1 = 498 \text{ N}, P_2 = 166 \text{ N}, P_t = 497 \text{ N} \text{ and } P_r = 181 \text{ N}.$$

The weight of the pulley is 100N. The diameter of the shaft at bearings B_1 and B_2 is 10mm and 20mm respectively. The load factor is 2.5 and the expected life for 90% of the bearing is 8000 h. Select single row deep groove ball bearings B_1 and B_2 .



- b) Draw and Explain the mechanism of pressure development in oil film of hydrodynamic lubrication. [6]

- Q11)a)** A pair of spur gears with 20 full-depth involutes teeth consists of a 20 teeth pinion meshing with a 41 teeth gear. The module is 3mm while the face width is 40mm. The material for the pinion as well as for the gear is steel with an ultimate tensile strength of 600N/mm². The gears are heat-treated to a surface hardness 400BHN. The pinion rotate at 1450 rpm and service factor for the application is 1.75. Assume that velocity factor accounts for the dynamic load and the factor of safety is 1.5. Determine the rated power that the gears can transmit. (Take Lewis form factor is 0.32 for 20 teeth, $C_v = 3/3 + v$, $K = 0.16(\text{BHN}/100)^2 \text{ N/mm}^2$). [10]

b) Write a note: - Gear Tooth Failures. [6]

OR

Q12)a) A pair of parallel helical gears consists of a 20 teeth pinion meshing with a 40 teeth gear. The helix angle is 25° and the normal pressure angle is 20 degree. The normal module is 3mm. Calculate, [12]

- i) Transverse module
- ii) Transverse pressure angle
- iii) Axial pitch
- iv) Pitch circle dia. of the pinion and gear
- v) Centre distance
- vi) Addendum and Dedendum circle diameter of the pinion.

b) What is the different mode of gear tooth failure? [4]



Total No. of Questions : 8]

SEAT No. :

P2247

[4758] - 3

[Total No. of Pages :3

T.E. (Civil)

STRUCTURAL DESIGN - I

(2008 Course) (Semester - I) (301003)

Time : 4 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6 and Q7 or Q8.*
- 2) *Neat sketches must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Take Fe 410 grade of steel.*
- 5) *Take ultimate stress in bolt, $f_{ub} = 400 \text{ N/mm}^2$.*
- 6) *Assume suitable data, if necessary.*
- 7) *Use of electronic pocket calculator IS: 800-2007 and steel table allowed.*
- 8) *Use of cell phone is prohibited in the examination hall.*

SECTION - I

- Q1)** a) State the advantage and disadvantage of the steel structures. [5]
- b) Explain in detail gauge line, gauge distance, pitch, edge distance and end distance with sketch. [10]
- c) Determine the design strength of tension member of roof truss consists of 2 ISA $100 \times 100 \times 10\text{mm}$ @ 14.9 kg/m connected to 10mm thick gusset plate by 6mm fillet weld. [10]

OR

- Q2)** a) State and explain in brief limit state of serviceability. [5]
- b) Explain the classification of cross section and hence find class of ISMC 300 @ 35.8 kg/m. [5]
- c) Design a tension member to carry factor tensile force of 400 kN using two angles sections back to back on either side of gusset plate with longer legs outstanding. The length of the member is 2.9m. [15]
- Q3)** a) Design a single angle section to carry a compression of 100kN. The centre to centre distance between the end connections is 1.2 m. Also design the welded end connection. [10]

P.T.O.

- b) A column ISHB 350@ 67.4 kg/m carries an axial compressive factored load of 1200 kN. Design a bolted gusseted base. The base rests on M20 grade concrete pedestal. Use 22 mm diameter bolts of grade 4.6 for the connections. [15]

OR

- Q4)** Design a built up column of the effective length of 6m to carry an axial load of 1000kN using two channel sections placed face to face. Also design the suitable lacing system and connection using fillet weld. [25]

SECTION - II

- Q5)** a) State and explain the following in brief with sketches. [10]
- i) Laterally supported (restrained) beam
 - ii) Laterally unsupported (unrestrained) beam
 - iii) Web buckling
 - iv) Web crippling
- b) Determine the design bending strength of ISLB 350@ 49.5 kg/m considering the beam to be laterally unsupported. The design shear force V is less than the design shear strength. The unsupported length of the beam is 4.0m. [15]

OR

- Q6)** a) An ISLB 300@ 37.7 kg/m transmits an end reaction of 385 kN, under factor load, to the web of ISMB 450 @ 72.4kg/m. Design a bolted framed connection. [10]
- b) A steel floor beam in a building has a span of 8m. It is simply supported over supports and carries a uniformly distributed load 30 kN/m including self weight. Design the beam if the compression flange is laterally restrained throughout the span. [15]

- Q7)** A simply supported welded plate girder carries a uniformly distributed load of 40 kN/m. Effective span of plate girder is 20m. Design an economical cross section, curtailment of flange plates and end bearing stiffeners. Draw the design sketches. [25]

OR

Q8) Determine the panel point dead, live and wind load for a simple fink type roof truss for an industrial building for the following data. Design suitable purlin. **[25]**

Length of building	30 m
Span of truss	12 m
Spacing of trusses	4 m
Rise of truss	1/5 of span
Self weight of purlin	318 N/m
Asbestos cement sheets of dead weight	171 N/m ²
Location	Allahabad
Life of structure	50 years
Terrain category	3
Height of columns	11m



Total No. of Questions : 12]

SEAT No. :

P2268

[4758] - 34

[Total No. of Pages :4

T.E. (Automobile)

AUTOMOTIVE ENGINE DESIGN

(2008 Pattern) (316483) (Semester - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Derive an expression for efficiency of dual cycle. **[6]**
- b) A diesel engine operating on the air standard cycle has six cylinders of 100mm bore and 120mm stroke. The engine speed is 1800 r.p.m. At the beginning of compression the pressure and temperature of air are 1.03 bar and 35°C. If the clearance volume is 1/8th of the stroke volume, calculate **[10]**
- i) Pressure and temperature at the salient point of the cycle
 - ii) Compression ratio
 - iii) Efficiency of the cycle and
 - iv) Power output
- if the air is heated to 1500°C. Assume C_p and C_v of air to be 1.005 kJ/kg K and 0.717 kJ/kg K respectively.

OR

- Q2)** a) What are the effects of clearance volume on efficiency? **[6]**
- b) An oil engine works on the dual cycle, the heat liberated at constant pressure being twice that liberated at constant volume. The compression ratio of the engine is 8 and the expansion ratio is 5.3. The compression and expansion process follow the law $pV^{1.3} = C$. The pressure and temperature at the beginning of compression are 1bar and 27°C respectively. Assuming $C_p = 1.004$ KJ/kg K and $C_v = 0.717$ kJ/kg K for air, find the air standard efficiency and the mean effective pressure. **[10]**

P.T.O.

- Q3) a)** Explain the design consideration of combustion chamber. [6]
- b) Four masses m_1 , m_2 , m_3 and m_4 are 200kg, 300kg, 240kg & 260kg respectively. The corresponding radii of rotation are 0.2m; 0.15m., 0.25m & 0.3m respectively & the angle between successive masses are 45° , 75° & 135° . Using Graphical & analytical method Find the position & magnitude of the balance mass required, if it's radius of rotation is 0.2m. [10]

OR

- Q4) a)** Estimate - bore diameter, stroke length, swept volume, engine speed for a diesel engine which develops 91kW power with mean effective pressure of 0.7 N/mm^2 & mean piston speed is 650m/min. [8]
- b) Write the classification of CI engine combustion chambers and explain any two in brief with swirl obtained in that, with suitable diagram. [8]

- Q5) a)** A two stroke diesel engine was subjected to motoring test. The watt meter reading was 1.6 kW. The engine was then tested for 1 hr. & Following observation was noted. [12]

Net brake torque = 125 N-m Engine r.p.m. = 610 Fuel consumption = 2.7kg C.V. of fuel = 41,000 kJ/kg Cooling water used = 825 kg Temperature rise of cooling water = 80°C Exhaust gas temperature = 350°C Room temperature = 300°C Air fuel ratio = 32:1 Specific heat of exhaust gas = 1.05 kJ/kg.K

Calculate:-

- i) Brake Power
 - ii) Indicated Power
 - iii) Mechanical efficiency
 - iv) Indicated thermal efficiency
 - v) Draw heat balanced sheet on minute & percentage basis
- b) Describe the types of cooling system and explain advantages and Application of them. [6]

OR

- Q6) a)** A four stroke cycle gasoline engine has six single acting cylinders of 8cm bore and 10cm stroke. The engine is coupled to a brake dynamometer having torque radius of 40cm at 3200 rpm. With all cylinders operating the net brake load is 350N. The average net brake load produced at the same speed by the remaining 5 cylinders is 250N. Estimate the indicated mean effective pressure of the engine with all cylinders operating, the fuel consumption is 0.33kg/min; calorific value of fuel is 43 MJ/kg, the cooling flow rate and temperature rise is 70kg/min and 10°C respectively. On the test, the engine is enclosed in a thermally and acoustically insulated box through which the output drive, water fuel, air and exhaust connections pass. Ventilation air blown up through the box at the rate of 15kg/min enters at 17°C and leaves at 62°C. Draw the heat balance sheet of the engine stating the items as a percentage of the heat input. [12]
- b) Explain general design procedure of water pump for I.C. Engine. [6]

SECTION - II

- Q7) a)** The following data is given for a 4-Stroke diesel engine: [10]
 Cylinder Bore = 250 mm Length of Stroke = 300 mm Speed = 600r.p.m.
 Indicated mean effective pressure = 0.6 Mpa Mechanical efficiency = 80%
 Maximum gas pressure = 4Mpa Fuel consumption = 0.25 kg/B.P/Hr.
 C.V. of fuel = 44000 kJ/kg Assume that 5% of the total heat developed in the cylinder is transmitted by the piston. The piston is gray cast iron ($S_{ut} = 200 \text{ N/mm}^2$ & $k = 46.6 \text{ w/m}^{\circ}\text{C}$) & the factor of safety is 5. The temperature difference between the center & the edge of the piston head is 220°C. Calculate,
- i) Thickness of piston head by stress consideration.
 - ii) Thickness of piston head by thermal consideration.
 - iii) Number and thickness of piston ribs.
- b) Design an exhaust valve for a horizontal diesel engine using the following data: Cylinder bore = 150mm, length of stroke = 275mm, engine speed = 500 rpm, maximum gas pressure = 3.5 MPa, seat angle = 45°, Calculate:[8]
- i) Diameter of the valve port
 - ii) Thickness of the valve head
 - iii) Diameter of the valve stem
 - iv) Maximum lift of the valve
- Assume mean velocity of the gas = 50m/s, constant K for steel valve as 0.42 and permissible bending stress σ_b as 50 N/mm².

OR

- Q8) a)** The turning moment diagram for a petrol engine is drawn to the following Scales: Turning moment, 1mm = 5N-m; Crank angle, 1mm = 1°. The turning moment diagram repeats itself at every half revolution of the engine and the areas above and below the mean turning moment line, taken in order are 295, 685, 40, 340, 960, 270 mm². Determine the mass of 300mm diameter flywheel rim when the coefficient of fluctuation of speed is 0.3% and the engine runs at 1800r.p.m. Also determine The cross-section of the rim when the width of the rim is twice of thickness. Assume Density of rim material as 7250 kg/m³. [10]
- b) Explain general design procedure of Connecting rod. [8]

Q9) Write short notes on: [16]

- a) Cylinder leakage test
- b) Ignition timing
- c) Vacuum gauge test
- d) Mechanical fuel pump testing

OR

Q10) Write short notes on: [16]

- a) Cylinder power balance
- b) Cylinder compression test
- c) Exhaust gas CO and HC analyzer
- d) Oscilloscope engine analyzers

Q11)a) Explain Variable valve timing (VVT) with neat sketch. [8]

b) Write a note on Wankel Engine & Dual fuel engine. [8]

OR

Q12)a) Write the advantages of Dual Twin Spark-ignition (DTS-i) over single spark ignition Engine. [8]

b) Explain Homogenous Charge Compression Ignition (HCCI). [8]



Total No. of Questions : 12]

SEAT No. :

P2269

[4758] - 35

[Total No. of Pages :3

**T.E. (Automobile)
AUTOMOTIVE TRANSMISSION
(2008 Course) (Semester - II)**

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Explain Types of chassis with reference to power plant location. [8]
b) Draw a neat sketch & explain Hotchkiss drive. [8]

OR

- Q2)** a) Sketch a chassis layout of truck or Bus & explain the function of each part. [8]
b) Explain with neat sketch torque tube drive. [8]

- Q3)** a) Explain with neat sketch working of diaphragm clutch. [8]
b) Explain centrifugal clutch & it's application. [8]

OR

- Q4)** a) Explain working principle of clutch and what is function of clutch. [8]
b) Explain the type of clutches & it's application. [8]

P.T.O.

- Q5)** a) Explain with neat synchromesh gear box. [10]
b) Explain constant mesh gearbox with neat sketch compare it with slidingmesh gear box. [8]

OR

- Q6)** a) Explain with neat sketch overdrive. [10]
b) What is gear selector mechanism? Explain one of gear selector mechanism. [8]

SECTION - II

- Q7)** a) Explain with neat sketch working of final drive and differential unit used in Automobile. [8]
b) Explain different types of final drives. [8]

OR

- Q8)** a) Explain briefly with neat sketch. [8]
i) Half floating Rear axle
ii) Three quarter floating rear axle
b) Explain Differential unit with neat sketch. [8]

- Q9)** a) Explain construction & working of Willson Epicyclic gear train. [8]
b) Explain with neat sketch operating principle, construction & working of torque converter. [8]

OR

- Q10)** a) Explain with neat sketch, operating principle construction & working of fluid flywheel. [8]
b) What do you mean by epicyclic gear train? How the gear ratios are calculated? [8]

- Q11)a)** Draw a schematic layout of CVT & explain it's working. [9]
- b) Explain with neat sketch construction & operating principle of Automatic Transmission. [9]

OR

- Q12)a)** Compare manual & semi Automatic Transmission. [9]
- b) Different between Hydramatic transmission & CVT. [9]



Total No. of Questions : 12]

SEAT No. :

P3641

[4758]-36

[Total No. of Pages : 3

T.E. (Automobile Engineering)

AUTOTRONICS

(2008 Course) (Semester-II) (316485)

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 Static and Dynamic Characteristics of typical sensor. **[8]**
- b) Write down principle of operation of Resistive type sensor, i.e. potentiometer for position sensing. **[7]**

OR

- Q2) a)** Explain following characteristics with suitable example (Any Two): **[8]**
- i) Precision & Accuracy.
 - ii) Sensitivity.
 - iii) Transient Response.
 - iv) Backlash & Hysteresis.
- b) Write down difference between piezoelectric principle & photovoltaic principle of sensing. **[7]**

- Q3) a)** Write down basic principle of operation of RTD & its applications. **[8]**
- b) Write a note on Exhaust Gas Sensor. **[7]**

OR

P.T.O.

- Q4)** a) How absolute pressure in manifold is measured explain with suitable diagram. [8]
b) Write a note on Throttle position sensor. [7]

- Q5)** a) Explain Sample & Hold circuit in ADC. [8]
b) What is PLC? Write a note on elements of PLC device. Explain its applications. [12]

OR

- Q6)** a) Write a difference between Timers & Counters with respect to PLC. [8]
b) Explain working of DAC (successive approxi). [12]

SECTION-II

- Q7)** a) Explain working of cold & warm start system. [8]
b) Working of open loop & close loop control system. [7]

OR

- Q8)** a) Explain working of sequential injection system. [8]
b) Write a note on ECU & μ -controller. [7]

- Q9)** a) Write down working of ABS system. [8]
b) Explain working of electronic control of suspension (i.e. damping control). [7]

OR

- Q10)** a) Explain working of crash sensor. [8]
b) Write a note on safety systems in Automobile. [7]

Q11) Write a note on following (Any Four):

[20]

- a) Electronic stability.
- b) Rollover mitigation system.
- c) Safety belts.
- d) Air bag system.
- e) Global positioning system.

OR

Q12) Write a note on following (Any Three):

[20]

- a) Rollover stability & Electronic Stability.
- b) Electronic Stability Program.
- c) Collision Avoidance Systems.
- d) Vehicle tracking system.



Total No. of Questions : 12]

SEAT No. :

P2270

[4758]-38

[Total No. of Pages : 3

T.E. (Automobile)

**VEHICLE BODY ENGINEERING
(2008 Pattern) (Semester-II) (316486)**

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

SECTION-I

- Q1)** a) List and explain the component of Aerodynamic drag. [8]
- b) Explain with neat sketch constructional features of wind tunnel. [8]

OR

- Q2)** a) Calculate aerodynamic drag on car running at 75 km/hr & having a frontal projected area 4.2m². Dimensionless coeff. is 0.28, pressure 1.013 bar & temperature is 30°C & gas constant for air 287 kJ/kg. [8]
- b) What are various aerodynamic forces and moments acting on vehicle while in motion. [8]

- Q3)** a) Sketch and explain typical car body nomenclature terms. [8]
- b) Explain the terms visibility and blind area. [5]
- c) What are the different consideration for car body design work? [5]

OR

P.T.O.

- Q4)** a) Explain various safety features you would incorporate in car body. [4]
b) Sketch five types of cars classified as per styling forms. Write two constructional features of each with application. [10]
c) Explain with neat sketch - root assembly. [4]

- Q5)** a) Prepare a suitable seating layout for 32 passenger luxury bus with their features. [8]
b) What factors you will consider for designing a passenger vehicle carrying.
i) Passenger within city area. [4]
ii) Passenger to long distances. [4]

OR

- Q6)** a) Show with sketch 8 types of metal sections used in bus body construction. [8]
b) Differentiate between single decker and double decker bus. [4]
c) What are the advantages and disadvantages of rear engine in bus. [4]

SECTION-II

- Q7)** a) List six major requirement of driver cabinet. What factor to be considered to design driver cab for truck. [8]
b) What are the different design consideration for commercial vehicle work? [8]

OR

- Q8)** a) Why is it necessary to estimates vehicle weight and weight distribution during design stage. [8]
b) Explain with sketch:
i) Tipper body [4]
ii) Workshop van. [4]

- Q9)** a) What is open integral structure? Explain how structure take bending & Torsion with neat sketch. [8]
- b) Define and explain with neat sketches working and non-working joints. [8]

OR

- Q10)**a) Explain the symmetric and asymmetric loading with neat sketch. [8]
- b) Explain shear pannel method of structural analysis of vehicle body. [8]

- Q11)**a) Explain ergonomic considerations in driver seat design for car. [6]
- b) What is the importance of bumper in automobile? [6]
- c) Write note on safety belt. [6]

OR

- Q12)**a) Why air bag is used in automobiles? Explain it's working. [6]
- b) How steering system design is made to protect driver from impact. [6]
- c) What is ergonomics? How it can be applied in designing driver's seat in luxury bus? [6]



Total No. of Questions : 12]

SEAT No. :

P2271

[4758] - 39

[Total No. of Pages : 5

T.E. (E& Tc)

CONTROL SYSTEMS

(2008 Course) (Semester - I) (304181)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

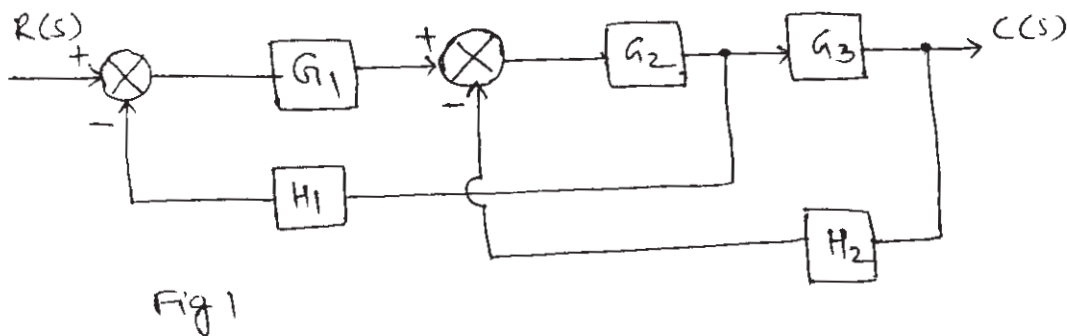
- 1) Answers to the two sections should be written in separate answer books.
- 2) Answer any three questions from each section.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Figures to the right side indicate full marks.
- 5) Assume suitable data, if necessary.

SECTION - I

Q1) a) Reduce the block diagram given in Fig.1 and find the transfer function

$$\frac{C(s)}{R(s)}$$

[8]



b) Explain the open loop and closed loop control systems with the help of suitable examples. [8]

OR

P.T.O.

- Q2) a) Obtain the transfer function $\frac{C(s)}{R(s)}$ of the signal flow graph given in Fig 2 using Mason's gain formula. [8]

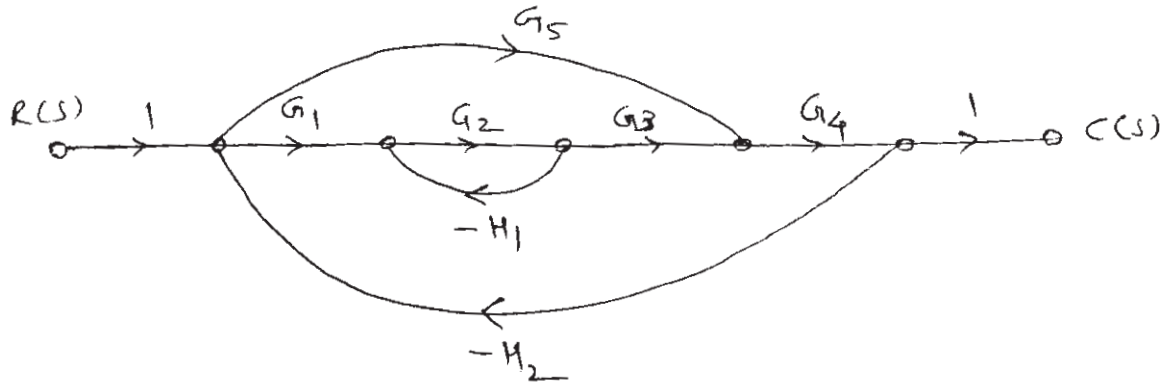


Fig 2.

- b) With neat diagram write any six rules of block diagram reduction techniques. [8]

- Q3) a) A unity feedback system has open loop transfer function as [8]

$$G(s) = \frac{20}{s(1+4s)(1+s)}$$

Determine

- Static error coefficients K_p, K_v, K_a .
 - Steady state error (e_{ss}) if $r(t) = 2 + 4 \cdot t + \frac{t^2}{2}$.
- b) Determine the stability of a system whose characteristic equation is given by

$$s^5 + 2s^4 + 3s^3 + 6s^2 + 2s + 1 = 0. \quad [8]$$

OR

Q4) a) Sketch the root locus of $G(s) = \frac{k}{s(s+3)(s+5)}$. [12]

b) A unit step input is applied to the unity feedback system for which open loop transfer function is $G(s) = \frac{16}{s(s+8)}$. [4]

Find:

- i) the closed loop transfer function
- ii) natural frequency of oscillation
- iii) damping ratio
- iv) peak overshoot

Q5) a) Sketch the Bode plot of the unity feedback system with transfer function [12]

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

from the plot find gain margin, phase margin, gain crossover frequency & phase crossover frequency. Comment on stability.

b) Explain the various frequency domain specifications of a second order closed loop system. [6]

OR

Q6) a) Sketch the Nyquist plot of the unity feedback system with transfer function

$$G(s) = \frac{40}{s(s+2)(s+10)}$$
 and comment on stability of the system. [12]

b) Explain lead & lag compensator. [6]

SECTION - II

- Q7)** a) State the properties of state transition matrix. [4]
b) Compare the classical control theory with the state variables theory. [4]
c) Consider a system having state model

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

$$Y = \begin{bmatrix} 0 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

With $D = 0$, obtain the transfer function. [8]

OR

- Q8)** a) Define the terms. [8]
i) state
ii) state variables
iii) state vector
iv) state space
b) Find the state transition matrix and the state equation. [8]

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

- Q9)** a) Draw and explain architecture of PLC. [8]
b) Write a note on PID Controller. [8]

OR

Q10)a) Sketch and comment on the output of P, PI, PD & PID controller for a ramp input. [8]

b) Draw the ladder diagram for an elevator system and explain it. [8]

Q11) Write short notes on any two. [18]

a) SCADA.

b) Model reference adaptive control.

c) Digital control system.

OR

Q12)a) Draw and explain the block diagram of Robust control system. [8]

b) Explain the concept of [10]

i) optimal control systems

ii) gain scheduling.



Total No. of Questions : 12]

SEAT No. :

P2248

[4758]-4

[Total No. of Pages :4

T.E. (Civil)

FLUID MECHANICS - II

(2008 Course) (Semester - I) (Theory) (301004)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) *Answer any 3 questions from each section.*
- 2) *Answers to the two sections must be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use 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 Civil Engineering application of flow around submerged bodies? Explain with required sketch, the effect of flow around circular cylinder giving rise to Karman Vortex trail. **[8]**
- b) Explain development of tip vortices on an air foil of finite span resulting in development of induced drag? **[4]**
- c) A circular cylinder has a diameter of 20mm & length of 75cm. air flows with a velocity of 10cm/s. Find total drag and shear drag. Take density of air = 1.23 kg/m^3 , shear drag coeff= 0.20 and total drag coefficient = 1.2. **[6]**

OR

- Q2)** a) What is unsteady flow? With required example explain four types of unsteady flow. **[6]**
- b) What is water hammer phenomenon and why does it occur? What are the effect of water hammer phenomenon and explain pressure variation in pipes due to sudden closure of valve. **[8]**
- c) Explain the effect of free surface on drag. **[4]**

P.T.O.

- Q3) a)** What is Impulse Momentum equation and its application? Derive the condition for work done and efficiency for a wheel with radial curved vane. [8]
- b) A jet of water having velocity 40 m/s strikes without shock a series of vane moving with 12m/s. The direction of motion of vane is inclined to that of jet at 20° . The relative velocity at outlet is 0.9 times that at inlet. The direction of absolute velocity at outlet is normal to direction of motion of vane. Find, [8]
- Vane angle at inlet and outlet,
 - Work done,
 - Efficiency.

OR

- Q4) a)** With neat sketch explain the various head on impulse and reaction turbine. What are the various efficiency for turbine and derive the condition for each. [8]
- b) An inward flow reaction turbine has external and internal wheel diameter of 1.2m and 0.6m respectively. The water enters the wheel at 20m/s at an angle of 10° . The width of wheel at inlet and outlet 150mm and 300mm. If the vane angle at inlet and outlet are 70° & 20° , determine, [8]
- Tangential velocity at runner inlet,
 - Absolute velocity of water at outlet.
- Q5) a)** What is draft tube and show that the pressure at the runner exit is below atmospheric. [6]
- b) What are unit and specific quantities? Derive the expression for specific speed of hydraulic turbine and classify the turbine based on specific speed. [6]
- c) What is the necessity of model testing of turbine? Give the various conditions for complete similarity between model and prototype. [4]

OR

- Q6)** a) Distinguish between Reciprocating and centrifugal pump. What are the different heads required to be developed by centrifugal pump with neat sketch? [8]
- b) A centrifugal pump has to deliver $0.25\text{m}^3/\text{s}$ of water when running at a speed of 1500 rpm at a head of 20m. If the manometric efficiency is 75% and absolute velocity of water at outlet of impeller is 150m/s. At exit the width of pump is 30% of the diameter. calculate the impeller diameter and vane angle at outlet. [8]

SECTION - II

- Q7)** a) What is an open channel and necessity of construction of open channel? What is conveyance of a channel & give the requisite equation? [6]
- b) What is the criterion for a channel to be efficient or economical? Derive the condition for most economical triangular channel. [8]
- c) What are the various uniform flow formula used for design of channels? Derive the Chezy equation for velocity of flow in an open channel. [4]

OR

- Q8)** a) Explain the establishment of uniform flow in an open channel. What are the various factors affecting the Manning coefficient? [6]
- b) What is critical depth? What are the different conditions for a flow in channel to be critical? Show that for critical flow in a channel. [6]

$$Q^2/T = A^3/T$$

- c) A rectangular channel 4.0m wide carries a discharge of $3.2\text{m}^3/\text{s}$ with a depth of flow of 0.8m. If Manning coefficient is 0.016, determine [6]
- i) Specific Energy,
- ii) Specific force,
- iii) Critical depth.

- Q9)** a) What are the different types of flow that occur in an open channel, give example of each. [4]
- b) Derive the condition for head loss in a hydraulic jump in the form. [6]
- $$\Delta E = (V_1 - V_2)^3 / 2g (V_1 + V_2)$$
- c) Explain the location of hydraulic jump when hydraulic jump forms below a regulating sluice in a Mild slope channel. [6]

OR

- Q10)**a) A sluice gate in a 2.5m wide rectangular horizontal channel releases a discharge of 170m³/s. The gate opening is 0.67m. Assuming $C_c=0.6$, state type of jump when tail water is [6]
- i) 3.5m, ii) 5m, iii) 4.65m.
- b) Explain the utility of hydraulic jump as energy dissipator. Explain the use of specific energy and specific force diagram to find energy loss in hydraulic jump. [6]
- c) Explain the classification of hydraulic jump based on Froude number and what is the amount of energy lost in each case. [4]
- Q11)**a) What are the assumptions made in derivation of dynamic equation of gradually varying flow. Derive the dynamic equation of gradually varying flow. [8]
- b) Explain the criteria for classifying channel slope and explain the development of M1, S1, & H2 using the governing equation for developing flow profile. [8]

OR

- Q12)**a) A rectangular channel is 7.5m wide and carries a discharge of 15m³/s. The depth at certain section is 1.8m, determine how far from this section the depth will be 2.5m. Take the bed slope as 1 in 7500 and Manning $n=0.016$. [8]
- b) What are the different methods for finding the length of flow profile and explain Ven Tee Chow method in detail. [6]
- c) What are the different flow measuring devices? [2]

EEE

Total No. of Questions : 12]

SEAT No. :

P2272

[4758]-40

[Total No. of Pages : 4

T.E. (E/TC)

DIGITAL COMMUNICATION

(2008 Pattern) (Semester-I)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer three questions from section-I and answer three questions from section-II. 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) Explain aliasing effect experienced in sampling process. Suggest a remedy to avoid the same. What is aperture effect? How aperture effect can be compensated? **[10]**
- b) A TV signal with a bandwidth of 4.2 MHz is transmitted using binary PCM. The number of quantization levels are 512. Calculate: **[8]**
- i) Code word length.
 - ii) Transmission bandwidth.
 - iii) Transmission Bit Rate.
 - iv) Signal to quantization noise ratio.

OR

- Q2)** a) Compare and contrast PCM, DPCM, DM and ADM on the basis of working principle, sampling rate, bit rate, bandwidth required and applications. **[10]**
- b) Explain how companding improves the signal to quantization noise ratio of PCM system. Hence explain A-law and μ -law companding. **[8]**

P.T.O.

- Q3)** a) Why line codes are needed? Explain FOUR different line codes and compare their spectral characteristics. [8]
- b) Why synchronization is necessary in digital communication? Explain any one bit synchronizer. Support your answer with suitable block diagram and waveforms. [8]

OR

- Q4)** a) Why scramblers are needed in digital communication? Draw a scrambler and corresponding unscrambler. Prove mathematically that this scrambler-unscrambler pair works satisfactorily. [8]
- b) What is inter-symbol interference? Explain its causes and remedies to avoid it. [8]

- Q5)** a) Define the following terms with reference to random processes. Write mathematical expression for the same. [8]
- i) Ensemble Average.
 - ii) Time Average.
 - iii) Auto correlation.
 - iv) Power Spectral Density.
- b) Show that if a wide sense stationary process $X(t)$ is passed through a linear time invariant filter with impulse response $h(t)$ then its output has constant mean. [8]

OR

- Q6)** a) Classify and explain different types of random processes. [8]
- b) Consider the random process $x(t) = A \cos(\omega_0 t + \theta)$ where A and ω_0 are constant, and θ is a random variable uniformly distributed in the range $(0, 2\pi)$. Determine whether it is a wide sense stationary process or not. [8]

SECTION-II

- Q7)** a) Draw and explain block diagram of QPSK transmitter and receiver. Write mathematical expression of transmitted signal. Sketch spectrum of transmitted QPSK signal and comment on the bandwidth requirement. Hence comment on bandwidth requirement. (Do not sketch waveforms). [10]

- b) Draw block diagram of BPSK receiver and explain its operation. Support the explanation with suitable mathematical equations. [8]

OR

- Q8)** a) Draw and explain block diagram of BFSK transmitter and receiver. Write mathematical expression of transmitted signal. Sketch spectrum of transmitted BFSK signal and comment on the bandwidth requirement. (Do not sketch waveforms). [10]
- b) In a digital CW communication system, the bit rate of NRZ data stream is 1 Mbps and carrier frequency is 100 MHz. Calculate symbol rate of transmission and transmission bandwidth required for the following modulation schemes. [8]
- i) BPSK.
 - ii) QPSK.
 - iii) 16 QAM.
 - iv) 16-PSK.

- Q9)** a) Derive expression for the probability of error for a BPSK system. [8]
- b) Find the error probability BPSK signal. The received signal is detected coherently by a matched filter with amplitude 10mV, bit rate 1 Mbps and carrier frequency 100 MHz. The signal is corrupted with white noise of PSD $N_0/2 = 10^{-11}$ W/Hz.
- $\text{erfc}(1.56) = 0.02737$; $\text{erfc}(1.58) = 0.02545$; $\text{erfc}(1.6) = 0.02365$;
 $\text{erfc}(1.62) = 0.02196$. [8]

OR

- Q10)**a) What is a correlator? Compare it with matched filter. Support the comparison with suitable diagrams and mathematical equations. [8]
- b) Derive expression for error probability of matched filter. [8]
- Q11)**a) What is PN sequence? State properties of PN sequence. [8]
- b) Explain FHSS in detail. Hence compare fast hopping and slow hopping FHSS schemes. [8]

OR

Q12)a) What is difference between multiplexing and multiple access techniques?
Compare TDMA, FDMA and CDMA. **[8]**

b) Write short note on any TWO: **[8]**

i) Diversity Techniques.

ii) Frequency reuse.

iii) Jamming Margin.

iv) G/T ratio.



Total No. of Questions : 12]

SEAT No. :

P2273

[4758] - 41

[Total No. of Pages :5

T.E. (E & TC)

NETWORK SYNTHESIS AND FILTER DESIGN

(2008 Course) (Semester - I)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer Any 3 questions from each section.*
- 2) *Answer to the two sections should be written in separate answer books.*
- 3) *Neat Diagrams must be drawn Wherever necessary.*
- 4) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) Test the following polynomial for Hurwitz properties **[6]**

i) $P(S) = S^3 + S^2 + 2S + 2$

ii) $P(S) = S^5 + 2S^3 + S$

b) Synthesis the following positive real function. **[6]**

$$Z(s) = \frac{S^2 + 2S + 6}{S(S+3)}$$

c) What is positive real function? Give necessary and sufficient conditions for a function to be positive real function. **[6]**

OR

Q2) a) Determine whether the following function is p.r.s. **[6]**

$$F(s) = \frac{(S+2)(S+4)}{(S+1)(S+3)}$$

b) Synthesis the following functions by successive removals of jw axis poles. **[6]**

$$\frac{S^3 + 4S}{S^2 + 2}$$

c) What is Network Analysis and Network Synthesis? Explain it. **[6]**

P.T.O.

- Q3) a)** Explain the properties of Driving point impedance function of L-C Network and Driving point admittance function of R-L Network. [8]
- b) Synthesis the following driving point impedance function using L-C Network. [8]

$$Z(s) = \frac{(S^2 + 1)(S^2 + 8)}{S(S^2 + 4)}$$

OR

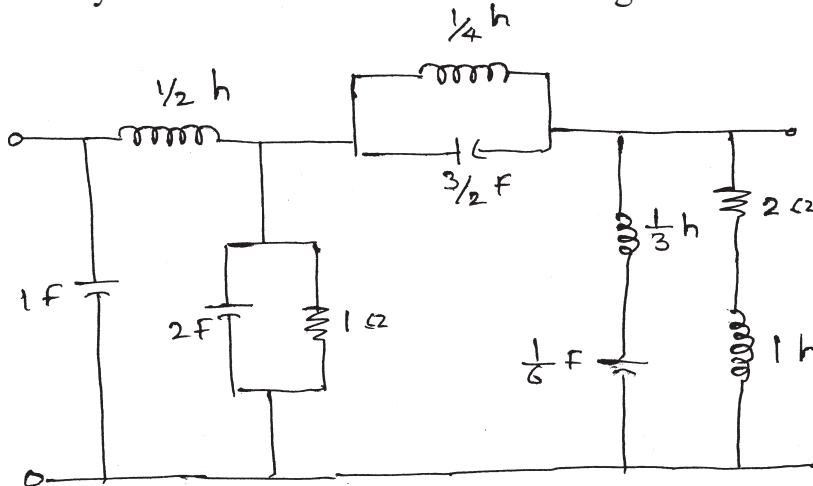
- Q4) a)** Synthesize the following function in cauer form. [8]

i) $Z(s) = \frac{S^3 + 2S^2 + S + 1}{S^3 + S^2 + S}$

ii) $Z(s) = \frac{2(S+0.5)(S+4)}{S(S+2)}$

- b) Explain the properties of Driving point impedance functions of R-C and R-L Network. [8]

- Q5) a)** Identify the zero's of transmission for the given network. [8]



- b) Synthesize the following voltage ratio using constant Resistance bridged - T circuits. [8]

$$\frac{V_2}{V_1} = \frac{(S + 2)(S + 4)}{(S + 3)(3S + 4)}$$

OR

- Q6)** a) State the properties of open circuit and short circuit parameters. [8]
 b) Synthesize the following functions with 1Ω Terminations. [8]

$$Y_{21} = \frac{S^3}{S^3 + 3S^2 + 3S + 2}$$

SECTION - II

- Q7)** a) Find the loss at $W_s = 40$ rad/sec for a 3rd and 5th order Butterworth filter that has a maximum loss of 1dB at the passband edge frequency $W_p = 10$ rad/sec [6]
 b) Find the order needed for a Chebyshev low-pass filter whose requirements are characterized by $f_p = 2$ kHz, [2]
 $f_s = 5$ kHz, $A_{\max} = 1$ dB, $A_{\min} = 35$ dB.
 c) Write a short note on following: [10]
 i) Butterworth Approximation.
 ii) Chebyshev Approximation.

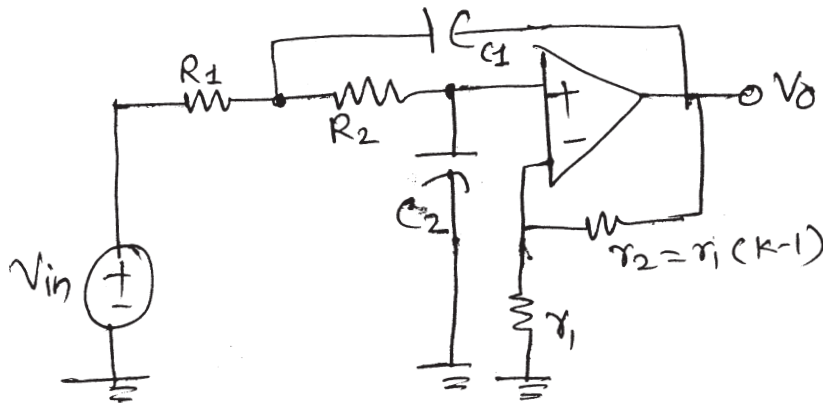
OR

- Q8)** a) State the properties of Chebyshev polynomial used in low pass filter approximation. Draw Chebyshev polynomial for $n = 3$ & $n = 4$. [6]
 b) Find the roots of normalized low pass Butterworth filter for $n = 3$. [2]
 c) Find the transfer function using Chebyshev approximation for $n = 3$ and 1dB ripples. [10]

- Q9)** a) Realize $T(s) = \frac{S + 4}{S + 1}$ using non-inverting amplifier structure. [8]
 b) Draw and explain negative feedback topology. Also, derive an expression for the transfer function. [8]

OR

- Q10)a) Obtain element values using coefficient matching technique for the given circuit. [8]



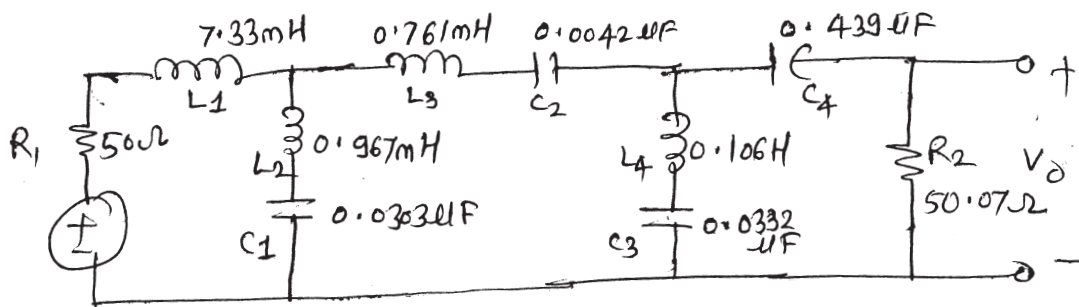
$$T(s) = \frac{2b}{s^2 + 100s + b} = \frac{20,000}{s^2 + 100s + 10,000} \text{ and it is given by}$$

$$T(s) = \frac{k/R_1 R_2 C_1 C_2}{s^2 + s \left(\frac{1}{R_1 C_1} + \frac{1}{R_2 C_1} + \frac{1-k}{R_2 C_2} \right) + \frac{1}{R_1 R_2 C_1 C_2}}$$

- b) For the above problem, find the realizable element values if the impedance scaling is by 10^7 and frequency scaling is by 5. [8]

- Q11)a) Define gain sensitivity. What are the factors affecting gain sensitivity. [8]

- b) Realize given band pass filter using FDNR - RC CKT [8]

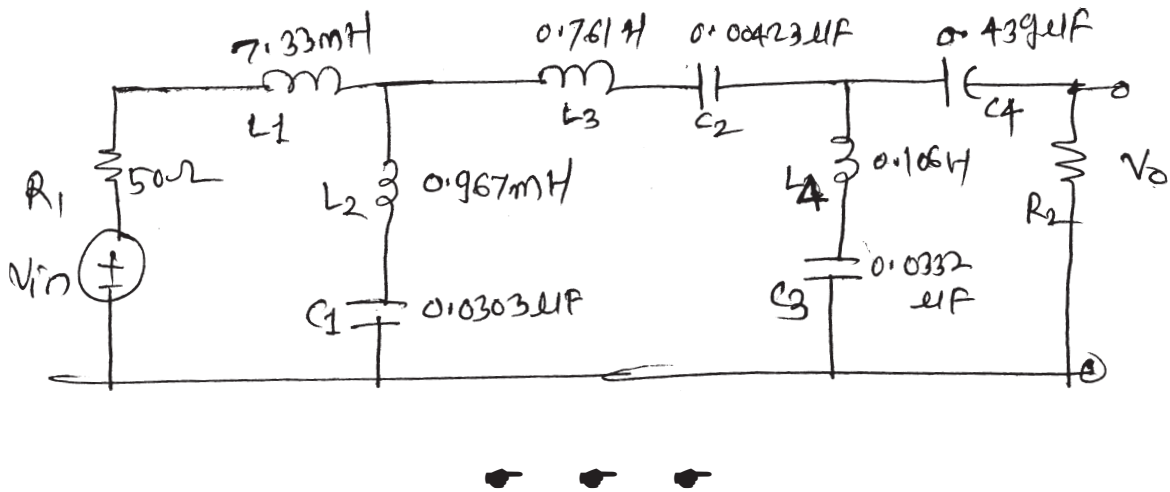


for Given, $K = 10^6$ and $R_D = 1k\Omega$

OR

Q12)a) Explain multielement deviation with neat example. [8]

b) For given fig. obtain Gyrator - RC network. [8]



Total No. of Questions : 12]

SEAT No. :

P2274

[4758]-42

[Total No. of Pages : 4

T.E. (E & TC)

DIGITAL SIGNAL PROCESSING
(2008 Course) (Semester - I) (304185)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) *Attempt three questions from section I, Q-1 or Q-2, Q-3 or Q-4, Q-5 or Q-6 and three questions from section II, Q-7 or Q-8, Q-9 or Q-10, Q-11 or Q-12.*
- 2) *Answers to the two sections must be written in separate answer books.*
- 3) *Neat diagram must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam table is allowed.*
- 6) *Assume suitable data if necessary.*

SECTION - I

- Q1)** a) State the advantages of Digital Signal Processing over Analog Signal Processing. **[4]**
- b) With the help of neat diagram State and prove the sampling theorem and the reconstruction of the original signal. **[6]**
- c) Find the impulse response and unit step response of the system described by the difference equation

$$y(n) = 0.7 y(n-1) - 0.1 y(n-2) + 2x(n) - x(n-2) \quad \mathbf{[8]}$$

OR

- Q2)** a) Comment on causality of LTIDT System. **[4]**

P.T.O.

- b) Consider the analog sinusoidal signal, $x(t) = 5 \sin(500 \Pi t)$ [6]
- i) If signal is sampled at $F_s = 1500$ Hz, what is discrete time signal obtained after sampling.
- ii) Find the frequency of discrete time signal.
- c) Obtain direct form I and II realization of a system described by, [8]
- $$y(n) = 2b \cos \omega_0 y(n-1) - b^2 y(n-2) + x(n) - b \cos \omega_0 x(n-1)$$

Q3) a) State and prove the relationship between DFT and Z transform. [4]

b) Perform [8]

i) Linear Convolution

ii) Circular convolution of the following two sequences.

$$x_1(n) = \{ \underset{\uparrow}{1} \ 1 \ 2 \ 2 \} \quad x_2(n) = \{ \underset{\uparrow}{1} \ 2 \ 3 \ 4 \}$$

c) Compute the 4- point DFT of the sequence, [4]

$$x(n) = \begin{cases} 1/5 & \text{for } -1 \leq n \leq 1 \\ 0 & \text{otherwise} \end{cases}$$

OR

Q4) a) State and prove following properties of DFT [6]

i) Circular Convolution

ii) Shifting Property

iii) Convolution theorem

b) Given $x(n) = (n + 1)$ and $N = 8$. Compute the DITFFT of the following Sequence. [8]

c) Determine $X(k)$ for $N=2$, by using basic butterfly computation in decimation in time FFT algorithm [2]

$$x(n) = \{7, 2\}$$

Q5) a) State any four properties of ROC for the Z transform. [6]

b) Find the Z transform and sketch Region of Convergence [4]

$$x(n) = \begin{cases} (1/3)^n, & n \geq 0 \\ (1/2)^{-n}, & n < 0 \end{cases}$$

c) Compute the response of the system $y(n) = 0.7 y(n-1) - 0.12 y(n-2) + x(n-1) + x(n-2)$ to an input $x(n) = nu(n)$. Is system stable. [6]

OR

Q6) a) State and prove any two properties of Z transform. [4]

b) If $X(Z) = 2 + 3Z^{-1} + 4Z^{-2}$ find the initial and final values of the corresponding sequences $x(n)$. [6]

c) Compute IZT $X(Z) = \frac{Z}{3Z^2 - 4Z + 1}$. If the region of convergence are [6]

i) $|Z| > 1$,

ii) $|Z| < 1/3$

SECTION - II

Q7) a) Write the various steps in designing FIR filter. What are the advantages and disadvantages of FIR filter. What is the meaning of linear phase and how it is achieved in FIR filter for symmetric impulse response. [10]

b) Explain the frequency sampling technique of designing the FIR filter. [8]

OR

Q8) a) What is the drawback of Impulse Invariance Transformation? How Bilinear Transformation overcomes it? The normalized transfer function of an analog filter is given by [10]

$$H(S_n) = \frac{1}{S_n^2 + 1.4142S_n + 1}$$

Convert the analog filter to a digital filter with a cutoff frequency of 0.4π , using Bilinear Transformation.

- b) Design a Butterworth digital IIR filter using Impulse Invariant Transformation by taking $T = 1$ second, to satisfy following specifications. [8]

$$0.707 \leq |H(e^{jw})| \leq 1.0 \quad ; 0 \leq w \leq 0.3\pi$$

$$|H(e^{jw})| \leq 0.2 \quad ; \text{for } 0.75\pi \leq w \leq \pi$$

- Q9) a)** Explain the process of decimation in detail using block diagram and spectrum diagram. [8]

- b) Write a detailed note on multirate DSP explaining its various applications. [8]

OR

- Q10) a)** Explain the process of upsampling with example. Derive an expression for spectrum of output signal of an interpolator. [8]

- b) Write a detailed note on polyphase decomposition of filters. Draw and explain the polyphase structure of an interpolator. [8]

- Q11) a)** Explain the need of DSP processor. Discuss the various special hardware requirements of digital signal processors. [8]

- b) Explain Von Neuman and Harvard architectures with simple sketches. Explain internal buses and memory pointers used in TMS architecture. [8]

OR

- Q12) a)** Explain important salient features of TMS 320C6713 digital signal processor and draw its functional block diagram. [8]

- b) Write short note on data and program address generation units of TMS 320CXX. Explain any four addressing modes of the processor. [8]

EEE

Total No. of Questions : 12]

SEAT No. :

P2275

[4758] -43

[Total No. of Pages : 3

T.E. (E & TC)

MICROCONTROLLERS AND APPLICATIONS

(2008 Pattern) (Semester - I) (304184)

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 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 non programmable calculator is allowed.*
- 5) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) What are the different criterions to select a microcontroller? [6]
b) Compare microcontroller and microprocessor in brief. [6]
c) Explain the important features of 8051 microcontroller in detail. [4]

OR

- Q2)** a) Draw and explain architecture of microcontroller 8051 in detail. [8]
b) Explain memory organization of microcontroller 8051. [8]

- Q3)** a) Explain timer/counter modes of 8051 with SFRs. [8]
b) Draw and explain the PSW 8051 in detail? Explain significance of Stack? [8]

OR

- Q4)** a) Explain the interrupt structure of 8051 in detail. [8]
b) Write a program to transmit letter 'T' to serial COM port using microcontroller 8051 at 9600 baud rate and assume standard XTAL. [8]

P.T.O.

- Q5) a)** Explain different addressing modes of microcontroller 8051 with examples. [8]
- b) Explain the following instructions: [10]
- i) XCH
 - ii) POP
 - iii) DA A
 - iv) MOVX
 - v) DJNZ

OR

- Q6) a)** Write an ALP to add two 8-bit BCD numbers. [8]
- b) Explain briefly following development tools: [10]
- i) Logic analyzer
 - ii) Simulator and Emulators

SECTION - II

- Q7) a)** Differentiate between RS 232 and RS 485 and explain data transfer using 12C bus. [8]
- b) Write an ALP to toggle LED connected at pin P 1.2 after every 4ms, Assume XTAL = 11.0592 MHz. [8]

OR

- Q8) a)** Write an ALP to interface 4*4 keyboard matrix with microcontroller 8051. Send ASCII code of each key to Port 0. [8]
- b) Draw an Interface of stepper motor with microcontroller 8051. Write an ALP to rotate motor in clockwise direction continuously. [8]

- Q9) a)** Explain the architecture of PIC microcontroller with neat block diagram. [8]
- b) Explain the memory organization of PIC microcontroller. [8]

OR

- Q10)a)** Explain the flag structure of PIC microcontroller. **[8]**
- b) Write an embedded C program to toggle all the bits of any suitable port of PIC microcontroller with delay 1 sec. **[8]**

Q11) Design a system ROBOT movement in clockwise direction using 8051 series/ PIC microcontroller along with suitable motors. Draw block schematic and system flow chart. Write down algorithm and program. **[18]**

OR

- Q12)a)** Design a digital thermometer to display the temperature in °C from range 0° C to 50° C. **[10]**
- b) Design a system to measure speed of DC motor and display those values on seven segment display. **[8]**



Total No. of Questions : 12]

SEAT No. :

P2276

[4758] - 44

[Total No. of Pages :4

T.E. (E & TC)

SIGNAL CODING AND ESTIMATION THEORY

(2008 Course) (304187) (Semester - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) A high resolution B/W T.V. picture consists about 2×10^6 picture element and 16 different brightness levels. Picture are repeated at the rate of 32 picture/second. All picture elements are assumed to be independent and all the levels have equiprobable. Calculate the average information and information rate conveyed by these T.V. picture source. **[8]**
- b) Draw the binary symmetric channel and find out the channel capacity of binary symmetric channel. **[8]**

OR

- Q2)** a) Consider a DMS with source alphabets: **[10]**
 $X = \{S_0, S_1, S_2\}$
 $P = \{1/4, 1/4, 1/2\}$
- i) Find out $H(X)$
 - ii) Find out the different symbol and their probability if source is extended to second order.
 - iii) Also calculate the entropy of extended source.
- b) Explain Differential Entropy and Mutual Information for continuous Ensembles. **[6]**

P.T.O.

Q3) a) What do you mean by repeated code? Consider (5, 1) repeated code, find out all possible code vector, d_{\min} , t_d and t_c . Also find out G and HT matrix. [10]

b) Write in short about implications of information capacity theorem. [6]

OR

Q4) a) For a systematic linear block code, the three parity check digits C4, C5, C6 are given by [10]

$$C4 = d1 \oplus d2 \oplus d3$$

$$C5 = d1 \oplus d2$$

$$C6 = d1 \oplus d3$$

Construct G Matrix, find out all possible code vectors.

If the received code vector is 111101, find out transmitted code vectors.

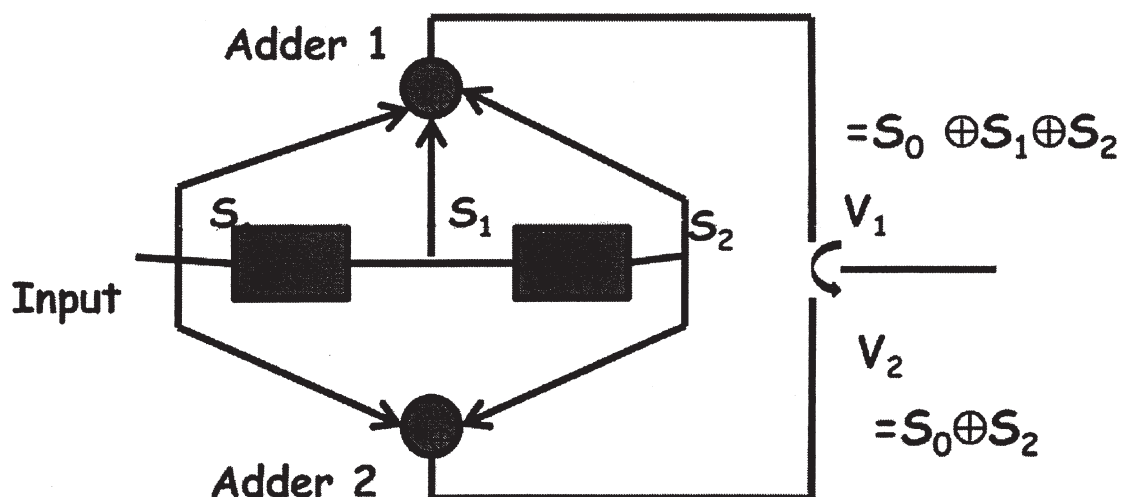
Also draw the hardware arrangement for linear encoder.

b) Explain the following term: [6]

i) JPEG

ii) DCT

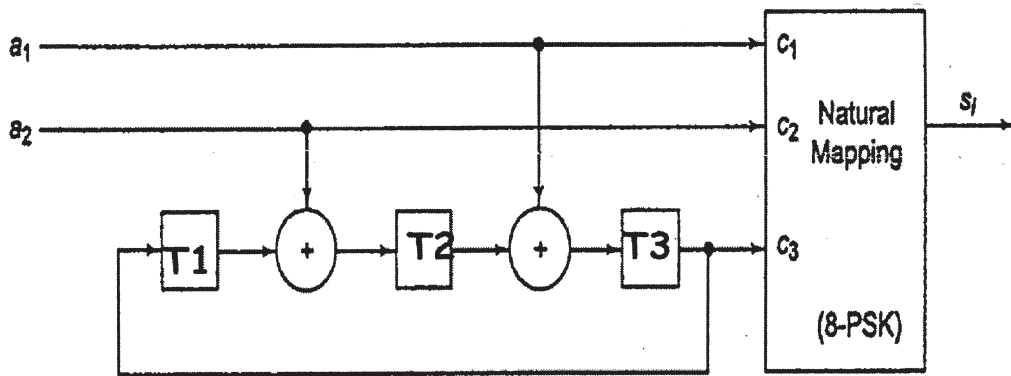
Q5) a) For the convolutional encoder shown above encode the sequence 10111 with Time Domain approach and Transform Domain. [10]



b) Write a short note on Turbo codes. [8]

OR

Q6) a) Find the Asymptotic Coding Gain for the above TCM Encoder. [9]



b) Compared state, tree and Trellis representation of convolution codes with example. [9]

SECTION - II

Q7) a) Find the generator polynomial for BCH code over GF(8) using the primitive polynomial $p(z) = z^3 + z + 1$ over GF(2) codeword. The code should correct $t = 1, 2, \dots$ errors. [10]

b) Define the terms related to BCH Codes Primitive Polynomial, Minimal Polynomial and Generator Polynomial. [8]

OR

Q8) a) Define (15, 11) RS code and Find out the generator polynomial equation $g(x)$. If message $m(x) = x + 1$; find out the RS code after RS coding. [10]

b) Write note on Cryptography. [8]

Q9) a) Let Y_1 and Y_2 be two statistically independent Gaussian random variables, such that $E[Y_1] = m$, $E[Y_2] = 3m$, and $\text{var}[Y_2] = 1$; m is unknown. Obtain the ML estimate of m . [10]

b) What is Cramer Rao Bound inequality and what are its limitations discuss in detail. [6]

OR

Q10)a) In the received signal under hypothesis H_1 and H_0 was **[10]**

$$H_1 : Y_k = m + N_k, \quad k = 1, 2, \dots, K$$

$$H_0 : Y_k = N_k, \quad k = 1, 2, \dots, K$$

- i) Assuming the constant m is unknown. Obtain the Maximum Likelihood estimation of the mean.
 - ii) Suppose now mean ' m ' is known but the variance is unknown. Obtain the MLE.
- b) What are the criteria for the good Estimator, calculate the unbiased Estimation of DC level With ' A ' as unknown in presence of WGN. **[6]**

Q11)a) In a digital communication system, consider a source whose output under hypothesis H_1 is a constant voltage of value m , while its output under H_0 is zero. The received signal is corrupted by N , an additive white Gaussian noise of zero mean, and variance σ^2 . **[8]**

- i) Set up the likelihood ratio test and determine the decision regions.
 - ii) Calculate the probability of false alarm and probability of detection.
- b) Explain the concept of MINIMAX detector in detail. **[8]**

OR

Q12)a) A ternary communication system Transmits one of three amplitude signals $\{1, 2, 3\}$ with equal probabilities. **[10]**

The independent received signal samples under each hypothesis are

$$H_1 : Y_k = 1 + N \quad k = 1, 2, \dots, K,$$

$$H_2 : Y_k = 2 + N \quad k = 1, 2, \dots, K,$$

$$H_3 : Y_k = 3 + N \quad k = 1, 2, \dots, K,$$

The additive noise N is Gaussian with zero mean and variance σ^2 , The costs are $C_{ii} = 0$, and $C_{ij} = 1$, determine The decision regions.

- b) Write short note on Neyman-Pearson detector. **[6]**



Total No. of Questions : 12]

SEAT No. :

P2277

[4758] - 45

[Total No. of Pages :3

T.E. (E& TC)

**SYSTEM PROGRAMMING AND OPERATING SYSTEM
(2008 Course) (Theory) (304188)**

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answers to the two sections should be written in separate answer-books.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Define Language Processor & different language processing tools. [8]
b) What is LITERAL? What are its advantages in assembly language processing. [4]
c) Explain Scanning & Parsing. [6]

OR

- Q2)** a) What are different language processing activities & explain in detail. [8]
b) Explain completely processing of LTORG, ORIGIN statements by PASS-I & PASS-II. [4]
c) Enlist the different types of errors that are handled by PASS-I & PASS-II of a two PASS ASSEMBLER. [6]

- Q3)** a) What is the need for code optimization? Explain various code optimization techniques. [8]
b) Explain the terms. [8]
i) Macro definition
ii) Macro call
iii) Macro Expansion
iv) Nested Macro calls

OR

P.T.O.

- Q4)** a) Explain compilation of control structure for if and while statement. [4]
b) What is static and dynamic memory allocation? [4]
c) What is compiler? Describe the different phases of compiler in detail. [8]

- Q5)** a) What is Loader? Enlist basic functions of a loader? [6]
b) Explain the five different types of editor with their applications? [10]

OR

- Q6)** a) What is a Linker? In case of a Direct Linking Loader, what is the information required to be passed by a translator to the loader. [6]
b) Explain the design of a direct linking loader. Also explain all required data structures. [10]

SECTION - II

- Q7)** a) Explain functions of an Operating System. What are the basic services and functions of an operating system. [9]
b) Write short notes on the following. [9]
i) Process Control Block
ii) Critical Section
iii) Round Robin Scheduling

OR

- Q8)** a) What is deadlock? How deadlocks avoided in operating system. Explain it with suitable example. [8]
b) Explain process and threads in detail. [10]
- Q9)** a) Give similarities and differences between paged and segmented memory management schemes. [10]
b) What do you mean by page fault? How operating system handles this? [6]

OR

- Q10)**a) Explain virtual memory management. [8]
- b) How operating system utilizes swapping technique in memory management? Explain in details. [8]

- Q11)**a) Explain different I/O software layers. [8]
- b) Draw and briefly explain the file structure. [8]

OR

- Q12)**Write short note on. [16]
- a) Clock software
- b) Graphical user interface
- c) File system and implementation with an example.



Total No. of Questions : 12]

SEAT No. :

P2278

[4758]-46

[Total No. of Pages : 3

T.E. (E & TC)

COMPUTER ORGANIZATION AND ARCHITECTURE

(2008 Pattern) (Semester - II)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) *Answers to the two sections must be written in separate answer books.*
- 2) *Neat diagram must be drawn wherever necessary.*
- 3) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Perform $(13) \times (-6)$ using Booth's multiplication algorithm. [8]
- b) Draw and explain von Neumann architecture. [6]
- c) Describe different IEEE standards for representing floating point numbers. [4]

OR

- Q2)** a) Perform division of the following numbers using non-restoring division.
dividend = 1000 and Divisor = 0011. [8]
- b) With the help of flow chart explain floating point multiplication operation. [6]
- c) Draw and explain the basic structure of CPU. [4]
- Q3)** a) Write sequence of control signals for memory read and memory write operations. [4]
- b) Differentiate between Hardwired and Micro programmed control [4]
- c) Write a control sequence for execution of the following instruction. SUB R4, R3 [8]

OR

P.T.O.

Q4) a) Describe in brief State-table and Delay-element method of hardwired control unit design. [8]

b) Explain with neat block diagram multiple bus organization. [8]

Q5) a) Explain the memory mapped I/O and I/O mapped I/O. [8]

b) Explain the concept of virtual memory. How is virtual address translated to physical address? [8]

OR

Q6) Write short note on: [16]

a) PCI

b) Cache memory

c) USB

d) SCSI

SECTION - II

Q7) a) Draw the bit pattern for flag register of 8086 and explain significance of each bit. [8]

b) Explain following addressing modes of 8086 [10]

i) Register addressing mode.

ii) Register relative addressing mode.

iii) Based indexed addressing mode.

iv) String addressing mode.

v) Direct memory addressing mode.

OR

Q8) a) With neat diagram explain the architecture of 8086 processor. [8]

b) Explain the minimum and maximum modes of operation in 8086 and pins associated with it. [4]

- c) Explain the following assembler directives: [6]
- i) EQU
 - ii) DUP
 - iii) PTR

- Q9)** a) Explain physical address generation in 80386 with and without paging. [8]
- b) Explain with neat diagram register model of 80386 microprocessor in protected mode. [8]

OR

- Q10)** a) What is segment selector? Explain selector format in detail. [4]
- b) Define and explain DPL, CPL, RPL and their role in protection mechanism. [4]
- c) State important features of virtual mode of 80386 also write steps to enter and leave virtual mode of 80386. [8]

- Q11)** a) Draw the format of program status register of ARM processor and explain significance of each bit. [8]
- b) Draw and explain ARM - core data flow model. [8]

OR

- Q12)** a) Write short note on (any two): [8]
- i) Instruction pipelining
 - ii) Superscalar processor
 - iii) Tightly couples and loosely coupled Multiprocessor.
- b) Draw and explain flynn's classification of various computer architecture. [8]

EEE

Total No. of Questions : 12]

SEAT No. :

P-2279

[4758] - 47

[Total No. of Pages :2

T.E. (E& TC)

INDUSTRIAL MANAGEMENT

(2008 Course) (Semester- II) (304190)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answers to the two sections should be written in separate books.*
- 2) *Solve three questions from each section as indicated.*

SECTION - I

- Q1)** a) What is globalization? Explain in detail major factors of globalization. [8]
b) Discuss in details about functions of management [8]

OR

- Q2)** a) Explain how today's managers use Scientific Management. [8]
b) Explain the characteristics of an organization. How the concept of an organization is changing. [8]

- Q3)** a) Explain the GE Nine Cell Matrix and discuss three different zones. [8]
b) Discuss Porter's five forces model of competition. [8]

OR

- Q4)** a) What do you understand by 'Goalpost View of Quality'? [8]
b) Explain the SWOT Analysis matrix for a hypothetical organization [8]

- Q5)** a) What is POKKA-Yoke? What are the micro level techniques used in this [8]
b) What do you understand by Quality of Design, Conformance and performance? [10]

OR

P.T.O.

- Q6)** a) Discuss the concept of Total Quality management(TQM), Explain how it is helpful to manufacturing industries. [10]
b) Explain the 'Kaizen' philosophy. State its advantages and limitation. [8]

SECTION - II

- Q7)** a) What is a project Network?
Discuss the Dummy activity, Concurrent activities in details [10]
b) Discuss in details about Fixed Capital and Working capital. [8]

OR

- Q8)** a) Explain PERT in project Management with the help of an example, [10]
b) What do you understand by SCM? [8]

- Q9)** a) Explain various types of Inventories [8]
b) Discuss the ABC Analysis in detail [8]

OR

- Q10)** a) Compare the HML, FSN and VED analysis [8]
b) Explain the concept of 3PL and 4PL Logistics [8]

- Q11)** a) What is Management Information System? Explain in details [8]
b) Discuss about ERP Systems. What are its benefits ? What are the difficulties in implementing ERP? [8]

OR

- Q12)** a) What are the types of e-Commerce? explain in details [8]
b) What is meant by Decision Support System? What are its benefits? [8]



Total No. of Questions : 12]

SEAT No. :

P2280

[4758]-48

[Total No. of Pages : 4

T.E. (E & TC)

**WAVE THEORY & ANTENNAS
(2008 Course) (Semester-II) (304191)**

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

SECTION-I

- Q1)** a) A plane wave in a nonmagnetic medium has $\vec{E} = 50\sin(10^8t + 2z)\hat{a}_y$ V/m find- **[8]**
- i) Direction of wave propagation.
 - ii) λ, f, ϵ
 - iii) \vec{H}
- b) What is pointing vector? What is its significance? Derive the expression for pointing vector. Interpret each term. **[8]**

OR

- Q2)** a) Derive the relationship between depth of penetration δ and conductivity σ for a plane wave incident on a good conductor. **[8]**
- b) In a nonmagnetic medium $\vec{E} = 10\sin(4\pi \times 10^7t - 0.9x)\hat{a}_z$ V/m. Find- **[8]**
- i) ϵ_r, η .
 - ii) The time average power carried by the wave.
 - iii) The total power crossing 100 cm^2 of plane $3x + y = 10$.

P.T.O.

- Q3) a)** Derive fundamental equation for free space propagation for the power received by an antenna with gain G_R situated at a distance d km in free space from a transmitting antenna with gain G_T radiating a power P_T at a frequency f in MHz. [8]
- b) Compare space wave and surface wave propagation. Define the terms virtual height, maximum usable frequency and their relevance in wave propagation. [8]

OR

- Q4) a)** What is fading? Explain the various types of fading encountered in the radio wave propagation. [8]
- b) In Ionospheric propagation consider that the reflection takes place at a height of 400 km and that the maximum density in the ionosphere corresponds to refractive index of 0.9 at a frequency of 10 MHz. Determine the range for which this frequency is MUF. [8]

- Q5) a)** Explain the following antenna parameters with the help of illustrative diagrams and mathematical expressions and their significance. [10]
- i) Radiation pattern.
 - ii) Radiation Intensity.
 - iii) Radiation Resistance.
 - iv) Effective Aperture.
 - v) Radiated Power.
- b) For a lossless horn antenna with directivity of 20 dB, and operating frequency of 10 GHz calculate, [8]
- i) The maximum effective aperture.
 - ii) The maximum power received when incident power density is 2 milliwatts/m².

OR

- Q6)** a) Explain three field regions defined for antenna with illustrative diagram and also explain the field properties of each region. [6]
- b) Calculate effective length of $\lambda/2$ antenna if $R_r = 73\Omega$, $A_{e(\max)} = 0.13\lambda^2$ and $\eta = 120\pi$. [6]
- c) The radiation intensity of a unidirectional antenna is $U = U_m \cos \theta$ where $0 \leq \theta \leq \pi/2$, $0 \leq \phi \leq 2\pi$. Find directivity. [6]

SECTION-II

- Q7)** a) A loop antenna consists of 20 turns, each having an area of 2m^2 . A radio wave having a frequency of 10 MHz induces a sinusoidal emf of 200m V(r.m.s.) in this antenna when it is oriented for maximum response.

Calculate the peak value of the electric field intensity of the RF wave. [8]

- b) Derive the expression for the magnetic vector potential at the field point $P(r, \theta, \phi)$ of a small circular loop of radius 'a' carrying a constant current ' I_0 '. The loop is in the X-Y plane with center at the origin. [10]

OR

- Q8)** a) Calculate the null to null beamwidth & half-power beamwidth in degrees if an array consists of 100 isotropic radiators with an inter element spacing of 0.3λ . It is required to produce broadside beam. [8]
- b) A vertical transmitting Hertzian dipole antenna of length $\lambda/50$ operates with peak current of 10 A at 100 MHz. Calculate: [10]
- i) The electric field at a distance of 1 km at an elevation of 60° (polar angle $\theta = 30^\circ$).
 - ii) The radiated power.
 - iii) The peak induced voltage at the terminals of an identical receiving dipole antenna at a distance of 5 km at $\theta = 90^\circ$.

Q9) Write short notes on the following antennas (any four) with respect to structural details, radiation pattern, features and applications: **[16]**

- a) Rhombic antenna.
- b) Beverage antennas.
- c) Ferrite-rod antenna.
- d) Travelling wave antenna.
- e) Whip antenna.

OR

Q10)a) Explain in detail, various feeding systems for an antenna. Also explain tower antennas. **[8]**

- b) Explain in detail ungrounded & grounded antennas. Also sketch the current distributions & directional characteristics for grounded vertical antennas of varying heights like λ , $\lambda/2$, $\lambda/4$, $\lambda/8$, $3\lambda/4$. **[8]**

Q11)a) A parabolic dish provides a gain of 70 dB at a frequency of 10 GHz. Calculate the capture area, 3 dB beamwidth and first null beamwidth. Find the directivity of a 460mm circular parabolic dish at 12.5 GHz. Assume aperture efficiency of 75%. **[8]**

- b) What is a helical antenna? Explain with constructional diagrams and modes of operation. Also state the applications of helical antennas. **[8]**

OR

Q12) Write short notes on the following antennas (any four) with respect to structural details, radiation pattern, diagrams, features and applications: **[16]**

- a) Horn antenna.
- b) Microstrip antenna.
- c) Turnstile and Superturnstile antenna.
- d) Yagi-Uda antenna.
- e) Slot antenna.



Total No. of Questions : 12]

SEAT No. :

P3642

[Total No. of Pages : 2

[4758] - 49

T.E. (Electrical Engg.) (Semester - I)
MICROCONTROLLER AND ITS APPLICATIONS
(2008 Pattern)

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) *Assume suitable data, if necessary.*
- 4) *Answers to the two sections should be written in separate books.*
- 5) *Neat diagrams must be drawn wherever necessary*

SECTION- I

- Q1)** a) Draw and explain architecture diagram of 8051. [9]
b) Explain the role of program counter and stack pointer registers necessary in 8051 programming. Also discuss instructions due to which stack pointer effect on program counter. [9]

OR

- Q2)** a) Explain External memory access using MOVX and MOVC with neat sketch. [9]
b) Explain all ports. Why P0 and P2 are unavailable in case of I/O operation when external memory is interfaced? [9]

- Q3)** a) Explain flags available in 8051. Also explain all bits of PSW. [8]
b) Explain addressing modes with one example. Also give instruction format and size. [8]

OR

- Q4)** a) Explain following instructions for byte size, flags affected: [8]
i) MOVX A,@DPTR
ii) SJMP D500h
iii) ADD A,R4
iv) MOVC A,@A+PC
b) Set the stack pointer to 07h and PUSH the SP register to stack. Predict what number is Pushed to address 08h. [8]

- Q5)** a) Explain TCON register with all bits. Also explain Functional block diagram of Timer 0 in mode 2. [8]
b) Explain 8051 interrupts with neat sketch. [8]

P.T.O.

OR

- Q6)** a) Explain in detail function of each bit of IE and IP [8]
b) Generate The setting of TH1, in timer mode 1, to generate a boud rate of 2400 if the serial port is in mode 1 and 11.059 MHz crystal is in use. Find the setting of both values in SMOD. [8]

SECTION- II

- Q7)** a) Explain simulator, assembler and Emulators for 8051 microcontroller. Also explain microcontroller development tool. [9]
b) Explain SPI protocol in detail. [9]

OR

- Q8)** a) $4K \times 8$ two program memory are to be interfaced with 8051. Draw an interfacing diagram and memory mapping. Also Explain EA and PSEN pin status. [9]
b) Explain RS232 with pin diagram. Also give function of each pin. [9]

- Q9)** a) Write assembly language program to rotate stepper motor in anticlockwise direction. Also give proper switching sequence. (diagram and delay program not expected) [8]
b) Draw and explain interfacing diagram of ADC with 8051. [8]

OR

- Q10)**a) Write an assembly language program to generate square wave using DAC and 8051 interfacing.(only program required) [8]
b) What are various sensors/transducer used for pressure measurement. Draw interfacing diagram for pressure measurement using 8051. (only sketch required) [8]

- Q11)**a) Explain level measurement using 8051 [8]
b) Explain interfacing of 4×4 matrix keyboard with 8051. [8]

OR

- Q12)**a) Draw and explain 8051 based speed control of DC motor. [8]
b) Explain 16×2 LCD and it's interfacing with 8051. [8]



Total No. of Questions : 12]

SEAT No. :

P2249

[4758] - 5

[Total No. of Pages :4

T.E. (Civil)

**INFRASTRUCTURE ENGINEERING AND CONSTRUCTION
TECHNIQUES**

(2008 Course) (Semester - I)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer three questions from section I and three questions from section II.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Draw a typical cross section of a permanent way and show various parts. Also state the requirements of a good track. [6]
- b) Explain in brief the importance of coning of wheel. Also draw a neat sketch. [6]
- c) Write a short note on minimum depth of ballast cushion. [6]

OR

- Q2)** a) State the comparison of wooden sleepers & concrete sleepers. [6]
- b) Explain in brief the importance of coning of wheels and tilting of rails with the help of a neat sketch. [6]
- c) What is creep? What are its effects? State the maximum permissible values of the same on Indian Railways. [6]

- Q3)** a) Define following terms: [6]
- i) Turnout

P.T.O.

- ii) Tongue rail
 - iii) Stock rail
 - iv) Switch
 - v) Crossing
 - vi) Points
- b) Write a short note on Track Maintenance. [5]
- c) Define gradient. State the various types of gradient. [5]

OR

Q4) Write a short note on: [16]

- a) Measured shovel packing
- b) Types of switches in points & crossing
- c) Mono rail and Metro Railway
- d) Grade compensation

Q5) a) Compare the advantages and disadvantages of tunnel with open cut. [6]

- b) Explain in brief NATM method of tunneling. [6]
- c) Define Dock. Differentiate between Wet Dock and Dry Dock. [4]

OR

Q6) a) What are the various points to be considered for selection of site for Harbour. [4]

- b) State the general sequence of operation for driving tunnels through hard rock. [4]
- c) Explain in brief Merits and Demerits of water transportation. [4]
- d) Define breakwater wall. What is the necessity of it? [4]

SECTION - II

- Q7)** a) Explain the construction of high rise structures considering following points . [6]
- i) Construction Techniques
 - ii) Safety
- b) Explain the importance of construction sector in the economic development of a country. [6]
- c) Write a short note on quality control in construction of Prefabricated elements. [4]

OR

- Q8)** a) State the difference between equipment oriented construction and labour oriented construction. [6]
- b) Write a comment on the difference in the construction techniques of high rise building and regular construction. [4]
- c) Differentiate between [6]
- i) Precast and prefabricated elements
 - ii) Labour and equipment oriented works.

- Q9)** a) Explain in brief the factors affecting the output of dragline. [6]
- b) Write a short note on following: [8]
- i) Power shovels,
 - ii) Trenching Machinery
- c) State the factors affecting the selection of machinery for any earth work. [4]

OR

- Q10)**a) Write short note on: [6]
- i) Preventive maintenance of equipments.
 - ii) Record keeping of equipments.
- b) What is work cycle? Explain in work cycle of a Dumper. [6]
- c) What do you mean by Depreciation of equipment? State various methods of depreciation and explain any one in brief. [6]

- Q11)**a) Differentiate between Guniting and Shotcreting. Also write one application of each. [4]
- b) Draw a neat sketch of primary and secondary crushers. Also explain difference them. [6]
- c) Enlist the methods of underwater concreting & Explain any one method of underwater concreting in detail. [6]

OR

- Q12)**a) Explain in brief the Vacuum Dewatering System. [6]
- b) What is slip-form shuttering? State the distinct advantages of this method over the conventional method. [4]
- c) What are the factors affecting the efficiency of concrete pumps? [6]



Total No. of Questions : 12]

SEAT No. :

P2281

[4758]-50

[Total No. of Pages : 3

T.E. (Electrical)

ELECTRICAL MACHINES-II

(2008 Course) (Semester-I) (303142)

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)** A 3 phase, 12 pole, 600 rpm, star connected alternator has single layer winding housed in 180 slots. There are 10 conductors per slot and the coil pitch is 2 slots less than full pitch. The flux per pole is 0.5 wb distributed sinusoidally. Determine the emf per phase and line value of EMF. **[6]**
- b) Why zero power factor method is considered to be most accurate method for determining voltage regulation of alternator? **[6]**
- c) Draw and explain power flow diagram of 3 phase alternator. **[6]**

OR

- Q2) a)** Determine voltage regulation of a 3 phase star connected alternator rated 2400 kVA, $8000\sqrt{3}$ volt. The synchronous impedance of this alternator is $(1.5 + j30)\Omega$ per phase. Calculate full load voltage regulation up at 0.866 lag, 0.866 lead power factor. **[6]**
- b) What is short circuit ratio of alternator? Elaborate its significance? **[6]**
- c) Compare EMF method and MMF method of determining voltage regulation of alternator (minimum 6 points). **[6]**
- Q3) a)** A 1000 kVA, star connected 2300 volt 3 phase salient pole alternator has direct axis reactance of 1.95Ω and quadrature axis reactance of 1.4Ω . The losses are negligibly small. Find excitation voltage for operation at rated kVA with 0.6 power factor lag. **[8]**

P.T.O.

- b) Draw connection diagram of dark lamp method for synchronizing alternator. Explain how this method is useful for synchronisation. State its drawbacks. [8]

OR

- Q4)** a) State need of parallel operation. State conditions for satisfactory parallel operation. Also explain what may happen if conditions are not satisfied. [8]
- b) Explain how synchronous motor is made to operate at different power factors by keeping mechanical load on motor constant. [8]

- Q5)** a) Compare 3 phase synchronous motor with 3 phase induction motor (minimum 8 points). [8]
- b) With suitable diagram explain construction and working of 3 phase induction regulator. [8]

OR

- Q6)** a) Explain V/F method of speed control of 3 phase induction motor. [8]
- b) State type tests and routine tests on 3 phase induction motor. [8]

SECTION-II

- Q7)** a) Explain operation of d.c series motor on a.c. supply. What are the problems associated with a.c. operation. [8]
- b) What are the types of compensated a.c. series motor? Describe each with neat diagram. [8]

OR

- Q8)** a) Draw the phaser diagram of plain series motor and show the different drops with transformer and rotational emfs. [8]
- b) Draw and describe the procedure to draw circle diagram of a.c. series motor. [8]

- Q9)** a) What are the effects of harmonics on performance of induction motor. State the remedies. [8]
- b) Describe the construction & working of permanent magnet D.C. motor. [8]

OR
2

Q10)a) Explain the construction & working of linear induction motor. State its applications. **[8]**

b) Explain the construction & working of permanent magnet type stepper motor. **[8]**

Q11)a) With neat diagram explain the construction & working of single phase capacity start induction motor. Draw its phasor diagram state applications of this motor. **[10]**

b) Explain no load & blocked rotor test in case of single phase induction motor. Draw equivalent circuit diagram in each case. **[8]**

OR

Q12)a) A 220 V, 50 Hz single phase induction motor gave following test results.

No load test	220 V	4.6 A	125 W
blocked rotor test	120 V	9.6 A	460W

The stator winding resistance is 1.5Ω and during the blocked rotor test, the starting winding is open. Determine the equivalent circuit parameters. Also find the core, frictional & windage losses. **[10]**

b) Explain construction & working of shaded pole induction motor. **[8]**



Total No. of Questions : 12]

SEAT No. :

P2360

[4758] - 501

[Total No. of Pages : 5

T.E. (Civil)

HYDROLOGY AND WATER RESOURCES ENGINEERING

(2012 Course) (Semester - I) (End Semester) (301001)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10, Q11 or Q12.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data if necessary.
- 5) Use of Calculator is allowed.

Q1) Explain the procedure for developing depth-area-duration curves. What are the applications of these curves. **[8]**

OR

Q2) A storm with 10cm precipitation produced a direct surface runoff of 5.8cm in the equivalent depth unit. The time distribution of the storm is given in the Table below. Estimate the Φ -index of the storm and the excess rainfall hyetograph. **[8]**

Time from start (hr)	1	2	3	4	5	6	7	8
Incremental rainfall in each hour (cm)	0.4	0.9	1.5	2.3	1.8	1.6	1.0	0.5

Q3) What do you understand by sub-surface irrigation? Describe it with the help of neat sketches. **[6]**

OR

Q4) The gross command area (GCA) of an irrigation canal is 1,20,000 ha. The culturable command area (CCA) is 75% of GCA and the intensities of irrigation for Kharif and Rabi crops are 40% and 55%, respectively. If the duties of water at the canal are 800 and 1550 ha for Kharif and Rabi crops, respectively, determine the head discharge of the canal. **[6]**

P.T.O.

Q5) A fully penetrating well with radius r_w in a confined aquifer is located at the centre of a circular groundwater basin having constant head boundary conditions at the outer periphery. The well is recharged maintaining a constant head at the well face. Find the recharge rate per unit rise at the well face considering flow as laminar. [6]

OR

Q6) A well 0.4m in diameter is being pumped at the rate of 1400 lit/min. The draw downs in the adjacent two wells at distances 5m and 19m, respectively, are 9m and 2.5m, respectively. The depth of impervious strata is 100m below the ground water level. Determine: [6]

- a) coefficient of permeability,
- b) draw down in the well if the observed points lie on the same draw down curve.

Q7) a) With the help of typical hydrographs describe the salient features of [6]

- i) perennial,
- ii) intermittent
- iii) ephemeral streams.

b) The 3-h unit hydrograph (UH) for a basin has the following ordinates. Using the S-curve method, determine the 9-h unit hydrograph ordinates of the basin. [8]

Time (hr)	0	3	6	9	12	15	18	21	24	27	30
3-h UH ordinates (m ³ /s)	0	12	75	132	180	210	183	156	135	144	96
Time(hr)	33	36	39	42	45	48	51	54	57	60	
3-h UH ordinates (m ³ /s)	87	66	54	42	33	24	18	12	6	6	

- c) What do you understand by time of concentration of a catchment? Describe briefly any one method of estimation of the time of concentration. [4]

OR

- Q8)** a) Write a brief note on frequency factor and its estimation in Gumble's method. [6]
- b) Explain briefly the terms: [4]
- i) design flood,
 - ii) standard project flood,
 - iii) probable maximum flood,
 - iv) design storm.
- c) The following table gives the ordinates of a direct -runoff hydrograph resulting from two successive 3-h durations of rainfall excess values of 2cm and 4cm, respectively. Derive the 3-h unit hydrograph for the catchment. [8]

Time (h)	0	3	6	9	12	15	18	21	24	27	30
Direct run off (m ³ /s)	0	120	480	660	460	260	160	100	50	20	0

- Q9)** a) Explain types of reservoirs and explain the points considered for selecting the site for reservoir and state the investigation required for construction of a reservoir. [8]
- b) A proposed reservoir has a capacity of 400 ha-m. The catchment area is 130km² and the annual stream flow averages 12.31cm of runoff. If the annual sediment production is 0.03 ha-m/km², what is the probable life of the reservoir before its capacity is reduced to 20% of its initial capacity by sediment deposition. The relation between trap efficiency (η_{trap}) and capacity-inflow (C/I) ratio is given below: [8]

C/I	$\eta_{\text{trap}} \%$	C/I	$\eta_{\text{trap}} \%$
0.1	87	0.002	2
0.2	93	0.003	13
0.3	95	0.004	20
0.4	95.5	0.005	27
0.5	96	0.006	31
0.6	96.5	0.007	36
0.7	97	0.008	38
1.0	97.5	0.01	43
		0.015	52
		0.02	60
		0.03	68
		0.04	74
		0.05	77
		0.06	80
		0.07	82

OR

- Q10)a)** What is meant by trap efficiency of a reservoir? What factors influence its value? [6]
- b) Write a note on benefit-cost studies for reservoir. Explain any two methods. [8]
- c) Explain in brief-flood routing. [2]

- Q11)**a) What is water logging? What are the ill effects of water logging? State the methods to improve the sub-surface drainage. [8]
- b) What are the merits and demerits of tile drains? [4]
- c) Write a short note on ancient system of water distribution. [4]

OR

- Q12)**a) What is lift irrigation scheme? Explain the investigations necessary and approvals required for its implementation. State the design considerations for the components of lift irrigation scheme. [8]
- b) What are the major, medium and minor irrigation projects? What are advantages and disadvantages of irrigation? [4]
- c) Derive the expression for spacing for the tile drain. [4]



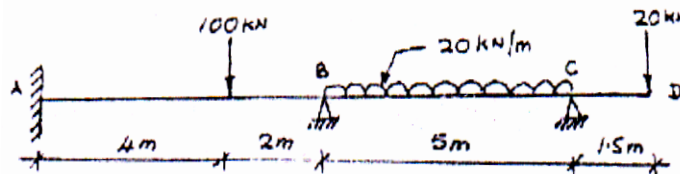
Time : 2.5 Hours]

[Max. Marks : 70

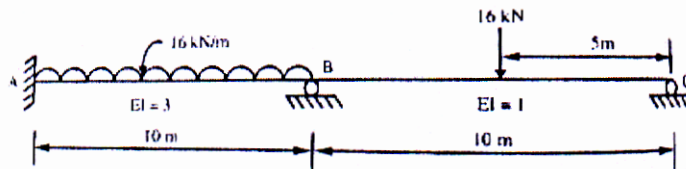
Instructions to the candidates:

- 1) Answer questions Q.1 or Q.2 Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Figures to the right indicate full marks.
- 3) If necessary, assume suitable data and indicate clearly.
- 4) Use of electronic pocket calculator is allowed.

- Q1) a) Analyse the continuous beam ABCD shown in figure by slope deflection method. The support B sinks by 15mm. [8]



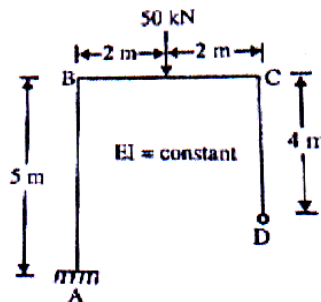
- b) Analyse the continuous beam shown in figure of above question 1 a. Using the flexibility method [8]



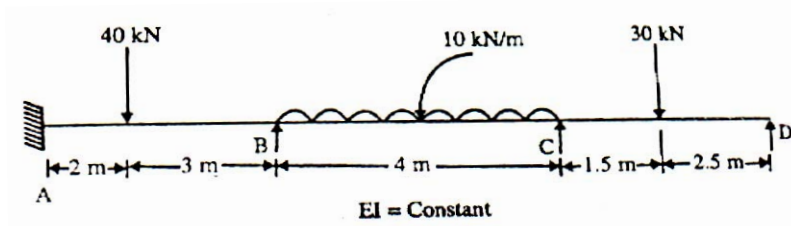
- c) Explain fixed end moment and carry over [4]

OR

- Q2) a) Analyse the portal frame loaded as shown in Fig by slope deflection method and sketch the bending moment and shear force diagram [8]

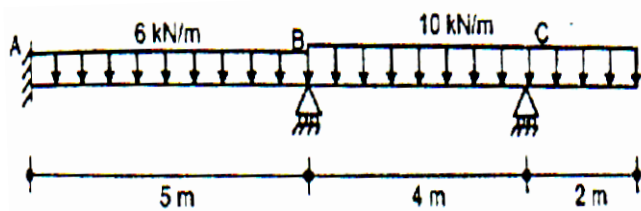


- b) Analyse the continuous beam loaded as shown in figure by the method of moment distribution method. Draw BMD and SFD [8]



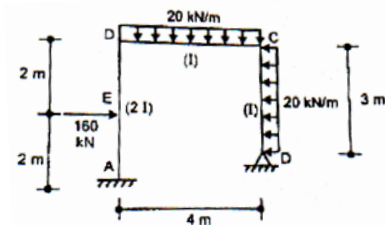
- c) Explain flexibility matrix [4]

- Q3) Find the end moments of the beams as shown in fig by stiffness matrix method add draw SFD and BMD. Take $EI = 3800 \text{ KN-m}^2$ [16]

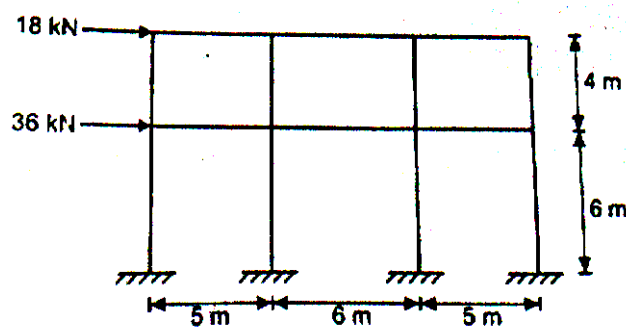


OR

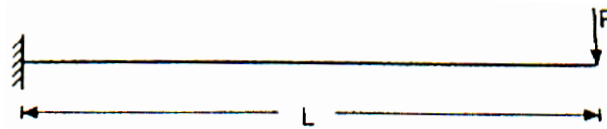
- Q4) Analyse the frame by matrix stiffness method and sketch the bending moment diagram. [16]



- Q5) a) Analyse the portal frame under lateral loading by cantilever method. The columns are assumed to have equal cross sectional areas. [10]

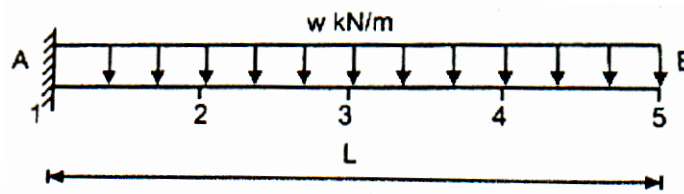


- b) The beam is loaded and supported as shown in fig. Determine the deflection at the centre of the beam. [8]



OR

- Q6)** a) Analyse the frame as shown in Q.5 a) by portal method. [10]
 b) Determine the deflection at the nodal points for beam AB loaded and supported as shown in fig. [8]



- Q7)** a) Explain shape functions for Quadratic rectangular element. [8]
 b) Explain the terms [8]
 i) Nodes
 ii) Higher order elements
 iii) Constant strain triangle
 iv) Linear strain triangle

OR

- Q8)** a) Explain constant strain triangle and linear strain triangle. [6]
 b) Determine shape functions for the constant strain triangle (CST) using polynomial functions. [10]



Total No. of Questions : 10]

SEAT No. :

P2361

[4758] - 503

[Total No. of Pages :3

T.E. (Civil)

STRUCTURAL DESIGN - I

(2012 Course) (End Semester) (301003) (Semester - I)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8 and Q.9 or Q.10.*
- 2) *Neat sketches must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Take Fe 410 grade of steel.*
- 5) *Take ultimate stress in bolt, $f_{ub} = 400 \text{ N/mm}^2$.*
- 6) *Assume suitable data, if necessary.*
- 7) *Use of electronic pocket calculator IS : 800-2007 and steel table allowed.*
- 8) *Use of cell phone is prohibited in the examination hall.*

- Q1) a)** Determine design strength of tension member consist of 2 ISA $90 \times 60 \times 6$ @ 6.8 kg/m, the longer legs is connected to gusset back to back by means of 3 bolts of 16mm dia in one line. **[6]**
- b) An ISHB 450 @ 87.2 kg/m used as a column to support a factored load of 950 kN. The column has an effective length of 5m with respect to y-axis. Check its suitability. **[4]**

OR

- Q2) a)** Design a double angles tension members connected on each side of 10mm thick gusset plate to carry an axial load of 340 kN. Use M_{20} black bolts of 4.6 Grade. **[6]**
- b) State and explain factor which affect the design strength of compression members. **[4]**
- Q3) a)** Explain in brief the design specification of compression members. **[4]**
- b) Design a base plate for column of ISHB 250 @ 51.0 kg/m carrying a factored load of 650 kN. Assume that the column is supported on a concrete of grade M25. **[6]**

OR

P.T.O.

Q4) a) Determine the design strength of a column ISHB 300@ 58.8 kg/m having a length of 5m. Assume that the bottom of the column is fixed and top is free. [5]

b) Differentiate lacing and battening in built up column on the basis of design criteria. [5]

Q5) a) A simply supported beam spanning 8 m carries a uniformly distributed load 5 kN/m including its self-weight. The compression flange is laterally restrained throughout the span. Design section and check for serviceability. [6]

b) An ISWB 600@ 133.7 kg/m, is used as a laterally unrestrained beam of span 10m subjected to uniformly distributed load of 70 kN/m. Check limit state of strength and serviceability. [10]

OR

Q6) Design a built up section of beam to carry uniformly distributed dead load of 400 kN and an imposed load of 600 kN. The beam is simply supported and has a span of 10m. The overall depth should not exceed 650 mm. Full lateral support is provided for the compression flange. Check for serviceability. [16]

Q7) a) Explain beam to beam and beam to column connection using suitable sketches. [6]

b) A beam ISMB 300@ 44.2 kg/m transmit an end reaction of 100 kN to the column ISMC 200 @ 22.1 kg/m. Design seated bolted connection, using M20 bolts of property class 4.6. [10]

OR

Q8) A simply supported welded plate girder of span 12m is subjected to dead load of 15 kN/m and live load of 30 kN/m. It is also subjected to two point load of 500 kN and 400 kN at 4m from either support. The compression flange is laterally supported throughout the span. Assuming that the depth is limited to 1500 mm for the plate girder, design the cross section and apply appropriate check. Also design the intermediate stiffeners and draw the plan and elevation. [16]

- Q9) a)** Design an I-section purlin, for an industrial building situated in the outskirts of Pune, to support a galvanized corrugated iron sheet roof for the following data: **[10]**

Spacing of truss: 6m

Span of truss : 12m

Spacing of purlins : 1.5 m

Intensity of wind pressure: 2 kN/m²

Weight of G I Sheet : 130 N/m²

- b) Determine the panel point dead load, live load and wind load for an industrial truss as shown in Fig. 9. The design wind pressure is 1200 N/m², the trusses are covered with A C sheet and the centre to centre spacing of truss is 6m. **[8]**

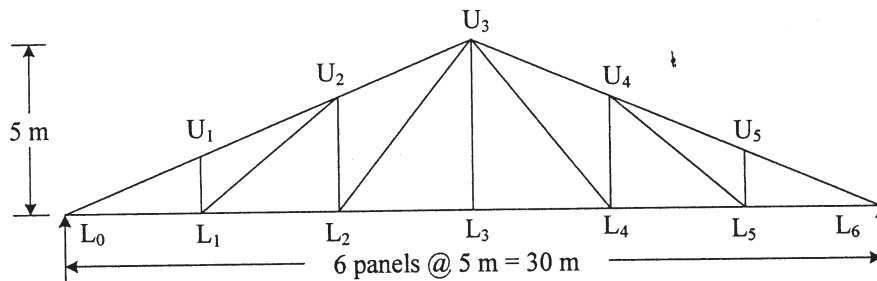


Fig. 9

OR

- Q10)** Design a cross section for simply supported gantry girder to carry electric overhead traveling crane for the following data. Design section should be checked for moment capacity, local capacity, shear capacity, web buckling and deflection. **[18]**

Crane capacity : 280 kN

Weight of crane excluding trolley : 150 kN

Weight of trolley : 120 kN

Minimum approach of crane hook : 1.0 m

Wheel Base: 3m

Distance between center to centre of gantry girders : 14m

Spacing of columns : 7 m

Weight of rail section : 0.3 kN/m

Height of rail section : 75 mm



Total No. of Questions : 12]

SEAT No. :

P2362

[4758]-504

[Total No. of Pages : 4

T.E. (Civil)

FLUID MECHANICS - II

(2012 Course) (End - Sem.) (301005) (Semester - I)

Time : 2 ½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q.No.1 or 2, Q.No.3 or 4, Q.No.5 or 6, Q.No.7 or 8, Q.No.9 or 10, Q.No. 11 or 12.*
- 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.*

Q1) a) Define: **[2]**

- i) Drag force
- ii) Lift force

b) Experiments were conducted in a wind tunnel with a wind speed of 51 km/hr on a flat plate of size 2.1m long and 1.1m wide. The density of air is 1.15 kg/m³. The coefficients of lift and drag are 0.76 and 0.16 respectively. Determine: **[6]**

- i) The lift force
- ii) The drag force
- iii) The resultant force
- iv) Direction of resultant force
- v) Power exerted by air on the plate.

OR

P.T.O.

Q2) a) Explain in brief

i) Water Hammer [2]

ii) Unsteady flow [2]

b) A valve is provided at the end of a cast iron pipe of diameter 160mm and of thickness 12mm. The water is flowing through the pipe, which is suddenly stopped by closing the valve. Find the maximum velocity of water, when the rise of pressure due to sudden closure of valve is 198.2 N/cm². Take K for water as 19.62 x 10⁴ N/cm² and E for cast iron pipe as 11.772 x10⁶ N/cm². [4]

Q3) Explain in brief:

a) Channel transitions. [3]

b) Froude number and classification of channel flow based on it. [3]

OR

Q4) Derive the expression “ $Q = \frac{8}{15} \cdot C_d \cdot \sqrt{2g} \cdot \tan\left(\frac{\theta}{2}\right) \cdot H^{5/2}$ ” for flow over right angled triangular notch. [6]

Q5) The depth of flow of water, at a certain section of a rectangular channel of 2.1m wide is 0.35m. The discharge through the channel is 1.6 m³/s. Determine, whether a hydraulic jump will occur, and if so, find its height and loss of energy per kg of water. [6]

OR

Q6) Prove that with usual notations for most economical trapezoidal channel section half of top width equal to one of sloping sides of the channel. [6]

Q7) a) Explain the working of centrifugal pump with neat sketch. [6]

b) Derive the expression for the “work done by the jet” in case of flat plate inclined and moving in the direction of jet. [6]

c) Derive the expression for “minimum speed for starting a centrifugal pump”. [6]

OR

- Q8) a)** A centrifugal pump delivers water against a net head of 14.5m and design speed of 1000 rpm, the vanes are curved back to an angle of 30° with the periphery. The impeller diameter is 30 cm and width at outlet is 5 cm. Determine the discharge of pump if manometric efficiency is 95%. [6]
- b) A jet of water of diameter 7.5cm strikes a curved plate at its centre with a velocity of 20m/s. The curved plate is moving with a velocity of 8m/s in the direction of jet. The jet is deflected through an angle of 165° . Assume the plate is smooth. Find [6]
- Force exerted on the plate in the direction of jet.
 - Power of the jet.
 - Efficiency of the jet.
- c) Explain in brief: [6]
- Reciprocating pump.
 - Submersible pump.
- Q9) a)** Explain: [4x2=8]
- Hydraulic efficiency(η_h)
 - Mechanical efficiency(η_m)
 - Volumetric efficiency(η_v)
 - Overall efficiency(η_o)
- b) A Turbine is to operate under a head of 25 m and at 200 r.p.m. The discharge is 9 cumec and if the overall efficiency is 90% determine: [8]
- Power generated (kW)
 - Specific speed of machine.
 - Type of turbine.

OR

Q10)a) A Francis turbine with an overall efficiency of 75% is required to produce 148.25 kW power. It is working under head of 7.62m. The peripheral velocity = $0.26\sqrt{2gH}$ and the radial velocity of flow at inlet is $0.96\sqrt{2gH}$. The wheel runs at 150 r.p.m. and the hydraulic losses in the turbine are 22% of the available energy. Assuming radial discharge, determine: [8]

- i) The guide blade angle
- ii) The wheel vane angle at inlet
- iii) Diameter of wheel at inlet.
- iv) Width of wheel at inlet

b) Explain [4+4]

- i) Cavitation in turbine
- ii) Governing of turbine

Q11)a) Derive the dynamic equation of G.V.F. with usual notations. [8]

b) Explain Ven Tee Chow method for computation of G.V.F. [8]

OR

Q12)a) Explain in detail the various types of water surface profiles. [6]

b) A rectangular channel 10m wide carries a discharge of 30 m³/s. It is laid at slope of 0.0001. If at a section in this channel the depth is 1.6m, how far (U/s or D/s) from the section will the depth be 2.0m? Take Manning's $n=0.015$. Use step method of integration. [10]

EEE

Total No. of Questions : 10]

SEAT No. :

P2363

[4758] - 505

[Total No. of Pages :3

T.E. (Civil)

INFRASTRUCTURE ENGINEERING

(2012 Course) (Semester - I) (End-Sem.) (301002)

Time :2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q.9 or Q.10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume suitable data if necessary.*

Q1) a) Write a note on Role of Infrastructure the economic progress of India with suitable examples. **[5]**

b) Explain the causes, effects and remedies of rail creep. **[5]**

OR

Q2) a) With suitable examples, justify the need for mechanization in Indian construction sector. **[5]**

b) Discuss the ideal requirements of a permanent way. **[5]**

Q3) a) With the help of neat labeled sketch, explain the electro osmosis dewatering. **[5]**

b) Differentiate between tunnel formwork and slip form. **[5]**

OR

Q4) a) Explain the significance of transportation infrastructure with suitable examples. Discuss various provisions proposed in the 12th five year plan for transportation infrastructure. **[5]**

b) Discuss in brief different methods to reduce the wear of rails. **[5]**

P.T.O.

- Q5)** a) Classify the tunnels on the basis of their Purpose. Explain why they are suitable for a particular purpose. [6]
- b) Explain the following term with neat sketches. [6]
- i) Pilot Tunnel
 - ii) shaft
 - iii) Portal
- c) What are the advantages of tunnel over open cut. [4]

OR

- Q6)** a) State the various methods of tunneling in soft ground. Explain Needle Beam Method in brief. [6]
- b) Write sequence of operations of Tunneling in soft soils. [6]
- c) Discuss in brief advantages and disadvantages of TBM. [4]

- Q7)** a) Define port. Distinguish between port & harbour. [6]
- b) Write short note on dry dock and wet dock. [6]
- c) Define breakwater. What is the necessity of it. [4]

OR

- Q8)** a) Discuss the general layout of the port along with its components. [6]
- b) Enlist the types of breakwaters and explain any two types with neat labeled sketch. [6]
- c) Define the following terms: [4]
- i) Quay
 - ii) Bulkhead
 - iii) Wharves
 - iv) Jetty

Q9) a) Construction machinery costs Rs. 45,000. Its useful life is 5 years. The salvage value at the end of five year is Rs. 4,500. Estimate the yearly depreciation of the equipment using; [6]

i) Straight line method

ii) Double -Declining balance Method

Tabulate your results.

b) Discuss in brief various factors affecting selection of equipment for a project. [6]

c) What are the different operations involved in earthwork. Enlist different equipment's used in these operations. With the help of a neat labeled sketch, explain any one equipment. [6]

OR

Q10)a) Differentiate between Crawler Tractor and Wheeled Tractor. [6]

b) Explain in detail the operating costs of construction equipment. [6]

c) Explain with neat labeled sketch "Dragline". What are the applications of it. [6]



Total No. of Questions : 10]

SEAT No. :

P4285

[4758] - 506

[Total No. of Pages : 3

T.E. (Civil)

**ADVANCED SURVEYING
(2012 Pattern) (Semester - II)**

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume suitable data if necessary.*

- Q1) a)** Define Geodetic Surveying. What factors are to be considered while selecting a best triangulation figure or system? **[5]**
- b) What are different types of errors in GPS signal or result. **[5]**

OR

- Q2) a)** Differentiate between triangulation and traversing and trilateration. **[5]**
- b) State any four advantages of space based positioning systems. **[5]**
- Q3) a)** The following observations were made on three stations A,B & C from a boat at O with the help of a sextant. Station B & O being on the same side of AC. Calculate the distances of the boat from the three stations.
Angle AOB = $30^{\circ}25'$, Angle BOC = $45^{\circ}25'$, Angle ABC = $130^{\circ}10'$.
AB = 4000 m, BC = 4995 m. **[6]**
- b) Derive the expression for the difference of level between two points A and B a distance D apart, with the vertical angle as the angle of elevation from A to B. The height of the, instrument at A and that of the signal at B are equal. **[4]**

OR

- Q4) a)** A,B, & C are three visible stations in a hydrographic survey. The computed sides of the triangle ABC are AB = 1200 m, BC = 1442 m & CA = 1960 m. Station O is established outside the triangle and its position is to be determined by resection on A,B, & C, the angle AOB and BOC being respectively $45^{\circ} 30'$ and $52^{\circ} 15'$. Determine distances of OA and OC, if O & B are on the opposite sides of line AC. **[6]**

P.T.O.

- b) Explain with a neat sketch how the alignment of tunnel is transferred from surface to the underground? [4]

Q5) a) Explain step by step procedure for figure adjustment for a geodetic quadrilateral without central station. [5]

- b) Explain the following terms : [5]
Conditioned Equation, True Error, Most Probable Value, Residual Error.

c) Find the most probable values of the angles closing the horizon at a station, from the following observations. [8]

$$A = 110^{\circ} 5' 58.9'' \quad \text{wt. 2}$$

$$B = 98^{\circ} 45' 16.1'' \quad \text{wt. 1}$$

$$C = 72^{\circ} 55' 30.7'' \quad \text{wt. 3}$$

$$D = 78^{\circ} 13' 17.3'' \quad \text{wt. 1}$$

OR

Q6) a) What is spherical excess? What are the methods of computing the sides of a spherical triangle? Explain any one method. [5]

- b) Explain the following terms : [5]
Independent Quantity, Weight of an observation, Mistake, True Value

c) The following values were recorded for a spherical triangle ABC, the individual angles are: [8]

$$A = 62^{\circ} 28' 06'' \quad \text{wt. 8}$$

$$B = 57^{\circ} 43' 36'' \quad \text{wt. 6}$$

$$C = 59^{\circ} 48' 38'' \quad \text{wt. 4}$$

Spherical excess was known to be $7''$. Find the corrected spherical angles.

Q7) a) Define Relief displacement. Derive an equation to determine the height of an object with neat sketch. [5]

- b) What is parallax of a point. Describe the procedure of measuring parallax. [5]

c) A tower PK, 50m high, appears in a vertical photograph taken at a flight altitude of 2500 m above m.s.l. the distance of the image of the top of the tower is 6.35 cm. compute the displacement of the image of the top of the tower with respect to the image of its bottom. The elevation of the bottom of the tower is 1250 m. [6]

OR

- Q8)** a) What are the types of aerial photographs? Explain drift and crab. [5]
b) Explain in brief the procedure for determining Air Base Distance using mirror stereoscope. [5]
c) A square building on the ground $30\text{m} \times 30\text{m}$ base, Appears on the photograph with side top = 19.60 mm, side base = 18.00 mm, focal length = 150.20 mm. Determine the height of building. [6]
- Q9)** a) Draw a neat sketch of Electromagnetic Spectrum and show all bands. [5]
b) What is Digital Image Processing and explain various techniques. [5]
c) Explain use of remote sensing and GIS for Earthquake management. [6]

OR

- Q10)** a) Explain supervised and unsupervised classification of digital images. [5]
b) What is geo-stationary and sun-synchronous satellites. [5]
c) Explain use of remote sensing and GIS for drinking water management. [6]



Total No. of Questions : 12]

SEAT No. :

P3916

[Total No. of Pages : 3

[4758] - 507

T.E. (Civil) (Semester - II)

FOUNDATION ENGINEERING

(2012 Pattern)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10, Q11 or Q12.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Non programmable calculator is allowed.*
- 5) *Assume suitable data wherever required and specify it clearly.*

SECTION - I

Q1) Explain with neat sketch “wash boring”. **[6]**

Q2) Define : **[6]**

- a) area ratio
- b) inside clearance
- c) outside clearance

Q3) Explain modes of shear failure. **[7]**

Q4) Explain various types of mat foundations. **[7]**

Q5) Explain the terms : **[7]**

- a) allowable settlement,
- b) differential settlement,
- c) elastic settlement
- d) consolidation settlement.

P.T.O

Q6) Explain with a neat sketch square root of time fitting method for determination of coefficient of consolidation. [7]

SECTION - II

Q7) a) Differentiate between cast in situ piles and driven piles. [6]

b) Write note on “pile load test and interpretation of test results”. [6]

c) Explain in detail negative skin friction on piles. [4]

Q8) a) Compute the efficiency of pile group consisting of 20 piles arranged in four rows, if the diameter of the pile is 400mm & spacing is 1m center to center by using : [6]

i) Converse Labbare’s formula

ii) Seiler keeney’s formula

iii) Feld’s rule.

b) What is pier? Explain different methods of installation of pier. [5]

c) Explain different parts of well foundation with a neat sketch. [5]

Q9) a) Write detailed note on “earth and rockfill cofferdam”. [6]

b) Explain with sketch “circular type cellular cofferdam”. [4]

c) Explain with sketch construction under reamed piles. [6]

Q10) a) Explain ‘stone column technique’ of soil improvement. [6]

b) What are the engineering problems associated with black cotton soil as a foundation. [5]

c) Explain method to determine depth of embedment in cantilever sheet pile wall with simplified assumptions. [5]

- Q11)** a) What are the various types of geosynthetics used in road pavements. [6]
- b) What are different functions of geosynthetics? Explain any four with sketches. [7]
- c) Explain different liquefaction hazard mitigation methods. [5]
- Q12)** a) What is liquefaction? Explain any three effects of liquefaction. [7]
- b) Enlist & explain different types of seismic waves. [6]
- c) Differentiate between reinforcement in soil and reinforcement in concrete. [5]



Total No. of Questions : 12]

SEAT No. :

P2364

[4758]-508

[Total No. of Pages : 3

T.E. (Civil)

ENVIRONMENTAL ENGINEERING - I
(2012 Pattern) (Semester - II) (End - Sem.)

Time : 2 ½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or 2, Q.3 or 4, Q.5 or 6, Q.7 or 8, Q.9 or 10, Q. 11 or 12.*
- 2) Neat diagrams must be drawn wherever necessary.*
- 3) Figures to the right side indicate full marks.*
- 4) Assume suitable data, if necessary.*
- 5) Use of Scientific calculator is allowed.*

Q1) Explain the noise control techniques. **[6]**

OR

Q2) Explain primary and secondary air pollutants and state their importance. **[6]**

Q3) Explain with neat sketch the working, location and function of air relief valve and non-return valve. **[6]**

OR

Q4) Explain with neat sketch river intake and lake intake. **[6]**

Q5) Explain type I and type II settling. What are the various types of plain sedimentation basins? Explain any one basin type with a neat sketh. **[8]**

OR

P.T.O.

Q6) Design a tube settler module with the following data- **[8]**

- a) Average output required from tube settler = $250\text{m}^3/\text{hr}$.
- b) Loss of water in desludging = 2% of output required.
- c) Average design flow = $(250 \times 100)/(100-2) = 255.1 \text{ m}^3/\text{hr}$.
- d) Cross section of square tubes - $50\text{mm} \times 50\text{mm}$.
- e) Length of tubes = 1m.
- f) Angle of inclination of tubes 60° .

Q7) Design a clariflocculator for desired average outflow of $250\text{m}^3/\text{hr}$, water lost in desludging-2%, design average flow = $(250 \times 100)/(100-2) = 255.1 \text{ m}^3/\text{hr}$, detention period - 20 minutes and average value of velocity gradient $G = 40/\text{second}$. **[16]**

OR

Q8) Design a RSGF unit for treating 400 MLD of supply, with underdrainage system and wash water troughs. **[16]**

- Q9)**
- a) Explain chlorine demand, residual chlorine, super chlorination, dechlorination, rechlorination and post chlorination. **[9]**
 - b) Chlorine usage in treatment plant of 20MLD of water is 8.5 kg/day. The residual chlorine content after 10min. is 0.2 mg/L. Calculate dosage of chlorine in mg/L and chlorine demand of water. **[4]**
 - c) State the factors affecting chlorination. **[3]**

OR

Q10) State the principles, working, advantages and disadvantages of water softening by zeolite method and demineralization of water by ion exchange method. **[16]**

Q11)a) Describe the various layouts of distribution networks in water supply scheme and state their advantages and disadvantages. **[10]**

b) Explain detection and prevention of wastage of water. **[8]**

OR

Q12)a) Explain the benefits of rain water harvesting and discuss the different methods of rain water harvesting. **[10]**

b) Explain RO process with a neat sketch. **[8]**

EEE

Total No. of Questions : 12]

SEAT No. :

P3669

[4758] - 509

[Total No. of Pages :7

T.E. (Civil)

STRUCTURAL DESIGN - II

(2012 Pattern) (Semester - II) (301010) (End-Sem.)

Time : 4Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q.1 or Q.2, Q3 or Q.4, Q.5 or Q.6, Q7 or Q.8, Q.9 or Q.10, Q.11 or Q.12*
- 2) *Figures to the right indicates full marks.*
- 3) *Use I.S. 456-2000 and non programmable calculator is allowed.*
- 4) *Neat figures must be drawn wherever necessary.*
- 5) *Mere reproduction of IS Code as answer will not be considered.*
- 6) *Assume Suitable data if required.*

Q1) Answer the following:

[6]

- a) Compare LSM and WSM with respect to material behavior.
- b) In what proportion f_{ck} is utilized in WSM and LSM?

OR

Q2) A simply supported beam AB of span 4.5 m carries UDL of intensity 25 KN/m Including self weight, Design suitable Singly reinforced rectangular section for flexure Only using WSM, use M20 and Fe 415. **[6]**

Q3) For an assembly hall of size 16m × 8.5m floor beams are spaced at 4 m C/C and have a Simply supported span of 8.5 m, these beams supports a floor slab of 140 mm thick, the size of the beam is 230 mm × 500 mm overall design the intermediate flanged section for flexure for the following data, use LSM. **[8]**

- a) Live load on slab = 4KN/m²
- b) Floor finish = 1.5 KN/m²
- c) Wall on beam = 230 mm thick and 3 m height
- d) Effective cover = 50 mm
- e) Material - M20 and Fe 415

OR

P.T.O.

Q4) A Simply supported RCC beam 230×375 overall is simply supported over a span of 5 m carries a UDL of 33.33 KN/m throughout design the section using M20 and Fe 415 LSM is recommended. [8]

Q5) Design a simply supported two way slab over a room $4.8 \text{ m} \times 4 \text{ m}$ effective with corners are free to lift carrying L.L of 4 KN/m^2 and F.F of 1.5 KN/m^2 use M20 and Fe 500. Draw details of reinforcement LSM is recommended. [6]

OR

Q6) Design a Cantilever slab for effective span of 1.5 m carrying L.L of 3 KN/m^2 and F.F of 1.5 KN/m^2 use M20 and Fe 500. Draw details of reinforcement LSM is recommended. [6]

Q7) Design a Continuous beam ABCD ($AB = BC = CD = 4.2\text{m}$) for flexure and shear using I.S Code method for following data. Use M20 and Fe 415 [16]

a) Dead load = 24 KN/m

b) Live load = 16 KN/m

Show details of reinforcement in L-Section and cross section at continuous support and at mid span.

OR

Q8) a) A rectangular R.C.C. beam simply supported over a span of 5 m is $230 \text{ mm} \times 450 \text{ mm}$ Effective is reinforced with 0.75% tension steel; Design the shear reinforcement using 6 mm diameter two legged vertical stirrups use M20 and Fe 415. [8]

b) A rectangular R.C.C beam $230 \times 500 \text{ mm}$ with effective cover 40 mm is subjected to following actions

i) Factored B.M. = 90 KN-m

ii) Factored S.F = 50 KN

iii) Factored torsional moment = 60 KN-m

Design the beam for flexure and shear using M20 and Fe 415 [8]

Q9) A R.C Beam ABC of rectangular section is simply supported at A and C, and

Continuous over support B, Span $AB = BC = 4.25$ m the beam carries dead load (including self weight) of 18 KN/m and L.L of 23 KN/m. Calculate design moments at central support B and near midspan of AB and BC after 20% redistribution of moments. Draw the design moment envelopes and design the beam for flexure only Use M20 and Fe415. [18]

OR

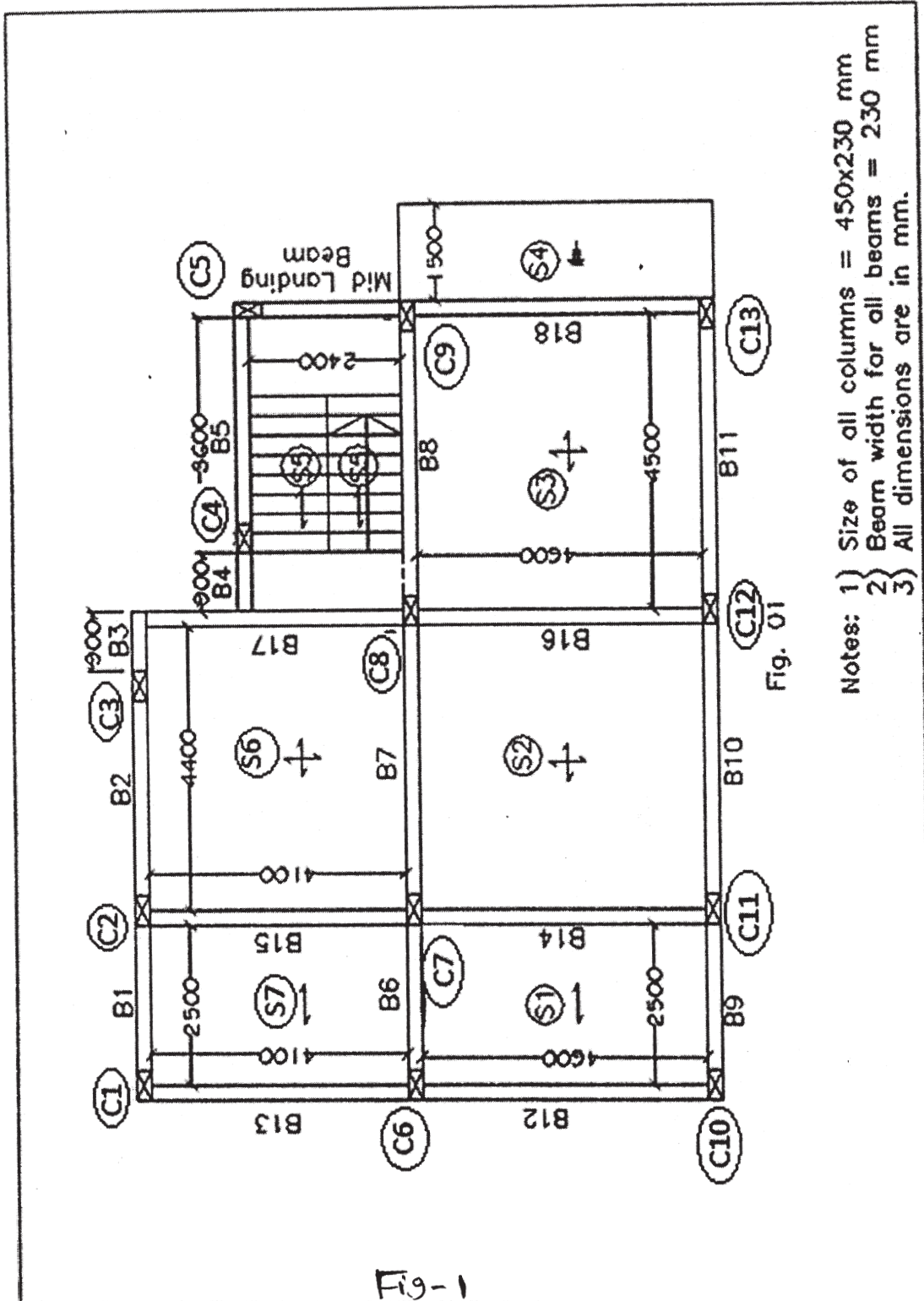
Q10) Design a short RC Column by LSM using M20 and Fe 415 to carry a working load 750 KN and working moment of 90 KN-m about major axis bisecting the depth of column, assuming unsupported length of column as 4.5 m and both ends are fixed, also design the footing for this column. Take SBC of soil as 210 KN/m² show detail design calculations and reinforcement details in plan and sectional elevation. [18]

Q11) Design a short column to carry working axial load of 900 KN and working moment of $M_x = 65$ KN-m and $M_y = 15$ KN-m acting about axis bisecting the depth and width of column respectively, the effective length about X-axis is 4.6 m and about Y-axis is 3.2 m. The unsupported length about axis is 3.8 m, use M20 and Fe 415 steel show detailed design calculations and reinforcement details. [16]

OR

Q12) Design Column C-7 as axially loaded short column along with its footing for G+2 Building for the following data refer fig - 1 [16]

- a) Floor to floor height ---- 3.15 m
- b) Height of plinth above G.L ---- 1.0 m
- c) Depth of foundation below G.L. ---- 1.5 m
- d) Live load on all slabs ---- 4 KN/m²
- e) Floor finish load on all slabs ---- 1.5 KN/m²
- f) Thickness of slab ---- 130 mm
- g) Thickness of wall ---- 230 mm
- h) Height of parapet wall ---- 1 m
- i) Size of beam ---- 230×450 mm
- j) SBC of soil ---- 200 KN/m²
- k) Material ---- M20 and Fe415



- Notes:
- 1) Size of all columns = 450x230 mm
 - 2) Beam width for all beams = 230 mm
 - 3) All dimensions are in mm.

Fig. 01

Fig-1

Chart 5 : Interaction Diagram for Combined Bending and Compression Rectangular Section-Equal Reinforcement on All Sides

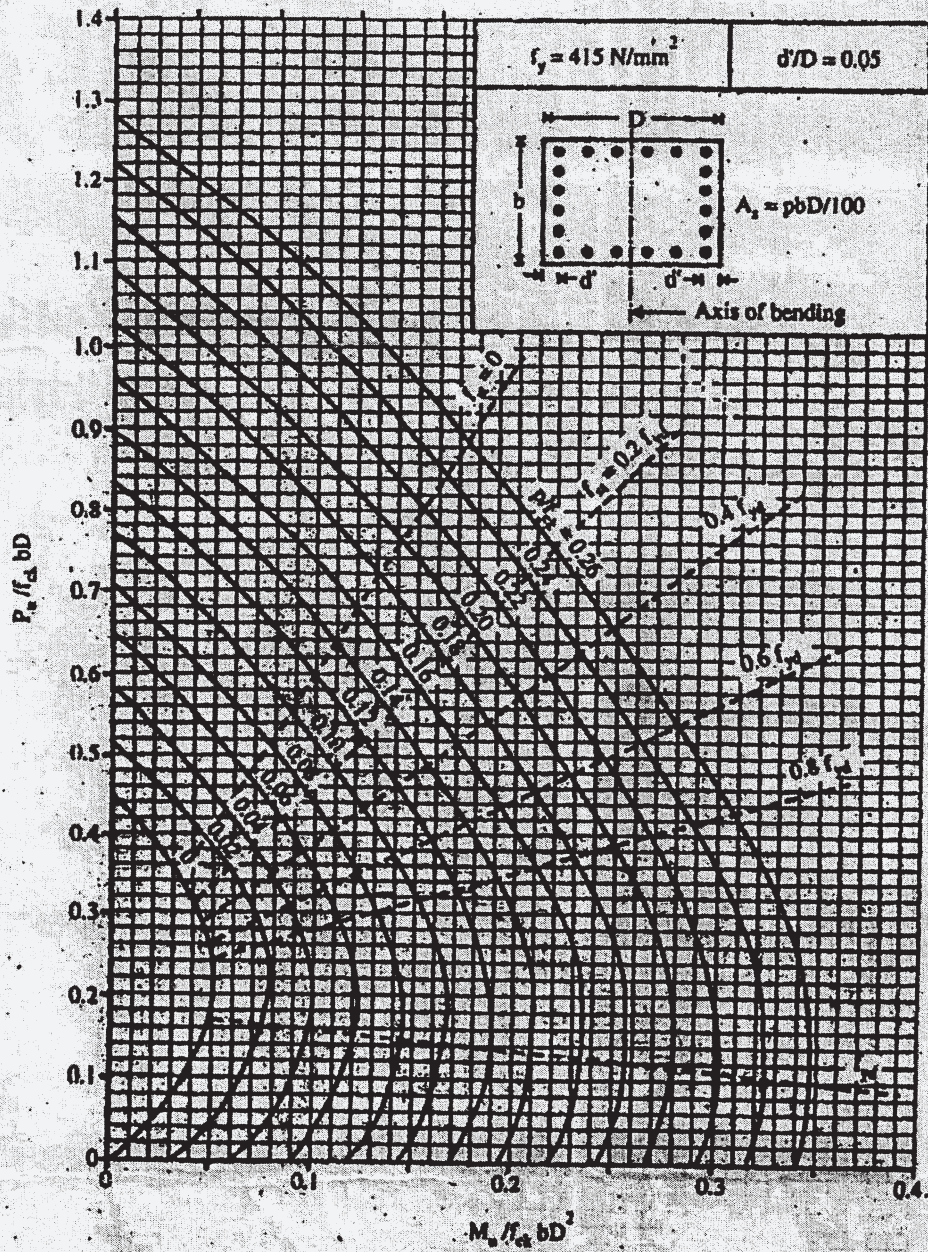


Chart 5

Chart 6 : Interaction Diagram for Combined Bending and Compression Rectangular Section-Equal Reinforcement on All Sides

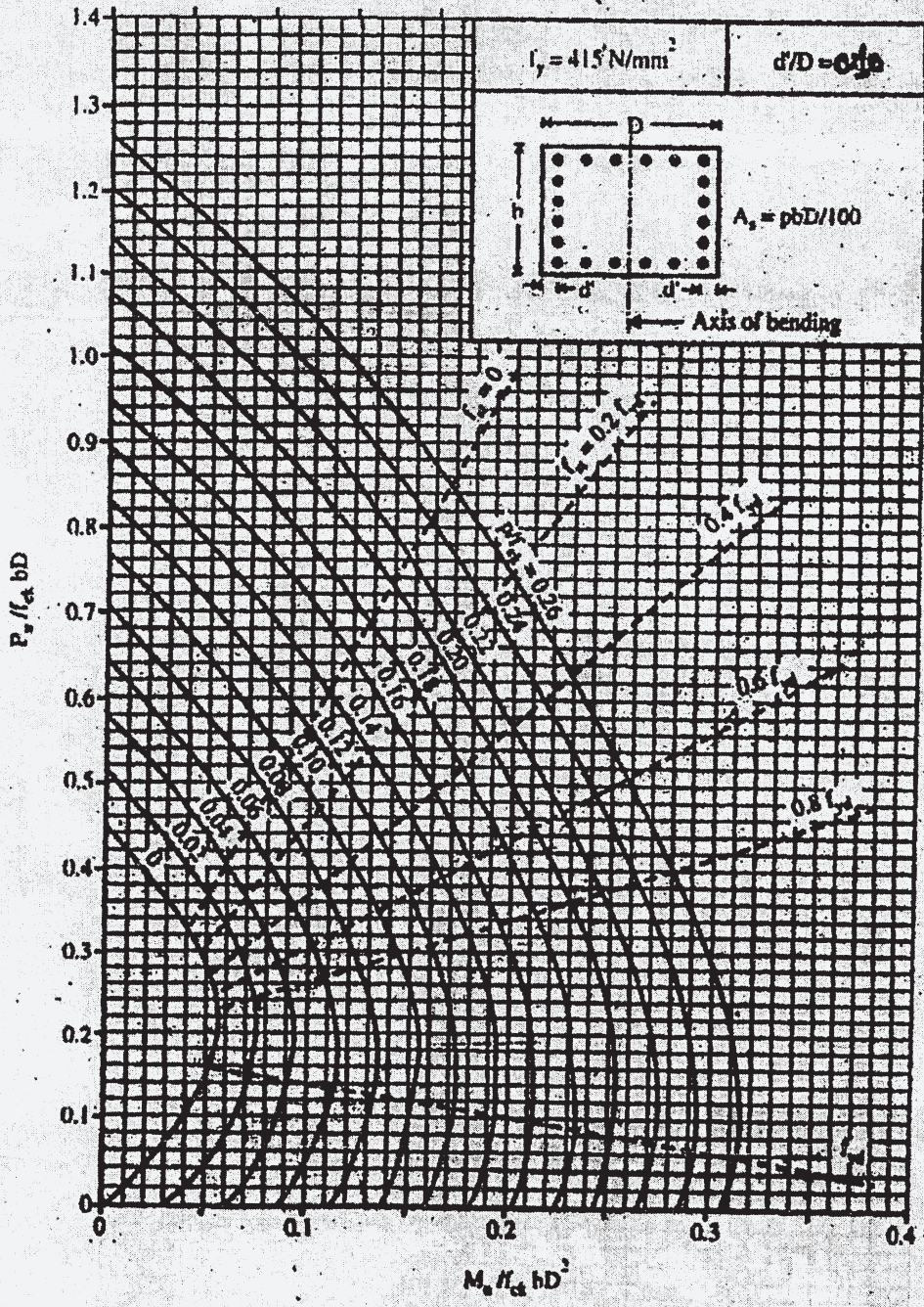
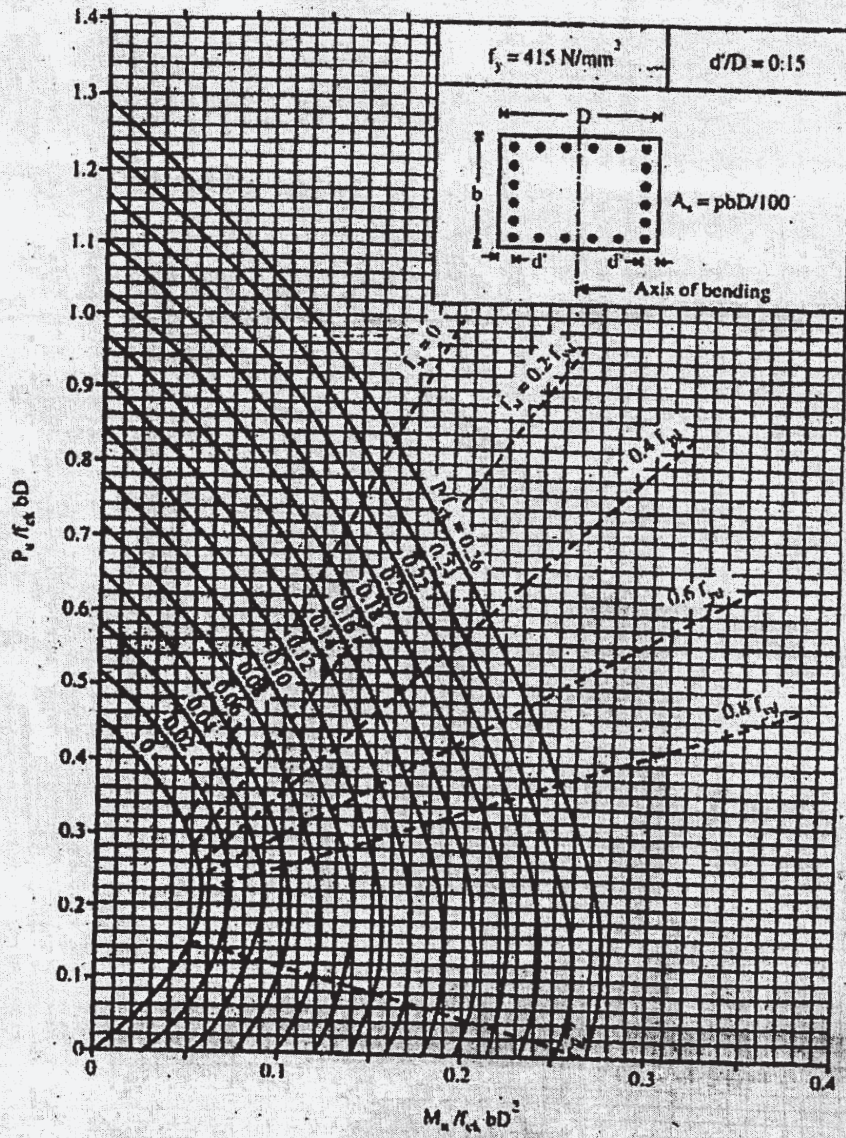


Chart 6

Chart 7 : Interaction Diagram for Combined Bending and Compression Rectangular Section-Equal Reinforcement on All Sides



Total No. of Questions : 12]

SEAT No. :

P2316

[4758] - 51

[Total No. of Pages :3

T.E. (Electrical)

**POWER ELECTRONICS
(2008 Course) (Semester - I)**

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10, Q11 or Q12.*
- 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) Draw and explain switching characteristics of SCR. [8]
b) State different gate triggering circuits of thyristor. Explain any one in detail. [8]

OR

- Q2)** a) What are different protections provided to SCR? Explain briefly. [8]
i) dv/dt
ii) di/dt
b) Draw and explain Gate characteristic of SCR. [8]

- Q3)** a) With neat circuit diagram and output waveforms explain working of single phase fully controlled converter. Derive expressions for output voltage, average & rms voltage. [Assume load is RL load]. [9]
b) Explain working of three phase semi converter with output waveforms. Obtain expression for phase and line voltage. [9]

OR

- Q4)** a) What is overlap angle? Derive expression for voltage drop due to overlap angle. [9]
b) Explain single phase dual converter with circulating current mode, draw output waveforms for $\alpha_1 = 60^\circ$. [9]

P.T.O.

- Q5) a)** Explain four mode operation of TRIAC. [8]
- b) Describe the working of two stage sequence control of voltage regulators for R load. State advantage of it over single phase full wave regulator. [8]

OR

- Q6) a)** Draw neat diagram and explain working of single phase full wave regulator with RL load. Derive rms output voltage expression, with output waveforms. [8]
- b) Explain step by step procedure of design of snubber circuit. [8]

SECTION - II

- Q7) a)** Draw and explain construction of MOSFET and its switching characteristics. [8]
- b) What is Safe Operating Area (SOA)? Compare MOSFET & BJTSOA. [8]

OR

- Q8) a)** Explain IGBT characteristics & Latch up in IGBT. [8]
- b) Explain construction & characteristics of MCT, with applications. [8]

- Q9) a)** How choppers are classified? Explain working of class C chopper with neat circuit diagram. [6]
- b) A step down chopper has input voltage of 200V feeding RLE load with $R = 2\Omega$, $L = 10\text{ mH}$ and $E = 20\text{V}$. The time period of chopping cycle is $1000\mu\text{ sec}$ and on time of chopper in $300\mu\text{ sec}$.

Find: [10]

- i) Maxi. & mini value of Load current.
- ii) Average load current.

OR

- Q10)a)** For a step down chopper feeding RL load, derive expression for [10]
- i) average output voltage & current
 - ii) RMS output voltage
 - iii) Effective input resistance of chopper
- Draw circuit diagram & relevant waveforms
- b) What are control strategies used in chopper circuits? Explain. [6]

- Q11)a)** Draw circuit for 1ph. full bridge inverter feeding inductive load & explain its operation. Draw output voltage and current waveforms. Calculate RMS output voltage. [10]
- b) Explain sinusoidal PWM used for harmonic control in inverters. [8]

OR

- Q12)a)** Explain working of three phase bridge inverter using 180° mode of conduction feeding 3ph resistive load. Draw control signals & phase voltages. [10]
- b) Explain why: [8]
- i) IGBTs are preferred over SCRs in inverter circuits.
 - ii) Antiparallel diodes are used across switching devices in inverters feeding inductive loads.



Total No. of Questions : 9]

SEAT No. :

P2365

[4758]-510

[Total No. of Pages : 4

T.E. (Civil)

PROJECT MANAGEMENT AND ENGINEERING ECONOMICS

(2012 Pattern) (Semester - II) (End - Sem.) (301008)

Time : 2½ Hours]

[Max. Marks :70

Instructions to the candidates:

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *Figures to the right side indicate full marks.*
- 3) *Assume suitable data, if necessary.*

Q1) a) What are the different types of organizational structures? Explain scalar types of organizational structure. **[6]**

OR

b) List out rules of drawing network diagram & explain “Fulkerson’s Rules” of numbering system. **[6]**

Q2) a) The following tables gives the time estimates of the various activity of a project. **[6]**

Activity	1 - 2	2 - 3	2 - 4	3 - 5	4 - 6	5 - 6	5 - 7	6 - 7
t_o	1	3	2	4	4	0	3	2
t_m	2	6	4	6	6	0	4	5
t_p	3	9	6	9	8	0	5	9

- i) Draw project network & find out total duration.
- ii) Calculate variance along critical path.

OR

P.T.O.

- b) Calculate EST, EFT, LST, LFT, IDF & IF for following activities. Tabulate the result with sample calculation. [6]

Activity	1 - 2	1 - 3	2 - 4	3 - 4	4 - 5
Duration in 'Days'	2	3	4	5	6

- Q3)** a) What is updating of network? Write down procedure for updating. [4]
 b) Write down different project management software used in construction Industries. Explain the advantage of using these software. [4]

OR

- Q3)** The Review of small construction project was taken after 12 days & following conditions exists. [8]

Conditions:

- a) Activity - A, B, E have been completed.
 b) Activity - D has been progress for "4" weeks & required "7" more weeks for completion.
 c) Activity -F, has been in progress for "1" week & require "4" more weeks for completion.
 d) Activity - G has been in progress for "1" week & require "7" more weeks for completion.
 e) Activity -C has been in progress for "4" weeks & require "5" more weeks for completion.
 f) It has been reassessed that activity - H, needs "6" weeks for completion.

Draw original network diagram & shows critical path of following.

Event	1 - 2	1 - 3	2 - 5	2 - 4	3 - 4	4 - 5	4 - 6	5 - 6
Activity	A	B	C	D	E	F	G	H
Duration (weeks)	6	4	7	9	5	6	7	4

& after taking all conditions update your network diagram & shows all critical path.

- Q4)** a) Explain roll of construction industry in economical growth of any country. [4]
- b) What are the factors influencing on demand & supply. Explain each in brief. [6]
- c) Define “Annuity” with the help of example. State formula to find out sinking fund annuity. A financial Institution introduces a plan to pay a sum of Rs. 15 lakhs after 10 years at the rate of 18% compounded annually. Find the annual equivalent amount that person should invest at the end of every year for the next 10 years to receive 15 lakhs after 10 years from the institutions. [6]

OR

- Q5)** a) Explain law of diminishing marginal utility with help of suitable example. [4]
- b) Explain demand & supply curve with neat diagram. [6]
- c) What are the kinds of annuities? State the formula of capital recovery annuity.

Mayuresh developer taken a loan from a bank Rs. 40 lakhs at an interest of 15% rate compounded annually. This amount should be repaid 10 years in equal installments. Find monthly installment that Mayuresh developer has to pay to bank. [6]

- Q6)** a) Write a note on “ABC” analysis & how to conduct “ABC” analysis. [6]
- b) Determine expression for “EOQ”. [8]

The rate of use of a particular raw material from stores is 1000 unit/year. The cost of placing a receiving order is Rs. 50/-. The cost of each unit is Rs. 100/-. The cost of carrying inventory in percent per year is 0.20, depends on average store.

Determine

- i) EOQ
- ii) Calculate order point when lead time is 6 months
- c) Write down safety programme for construction of Highway project. [4]

OR

- Q7) a)** What are the functions of material management Department. [6]
- b) Perform “ABC” analysis for following data. [8]

Sr. No.	1	2	3	4	5	6
Items	Cement	Bricks	Nails	Dry Distemper	Oil	Tiles
Amount Expenditure (Rs.)	4,90,000	95,000	3,000	12,000	10,000	30,000

Draw the curve also.

- c) Define the terms IRR, ISR, injury index & disablement. [4]
- Q8) a)** What are the appraisal essential before understanding of any project? Explain any three brief. [6]
- b) What are the methods of capital budgeting cost of project “A” is Rs. 60000/- it has a cash inflow of Rs. 20,000/- for a period of 4 years. What is the “NPV” if the firm expects 12% of annum? [6]
- c) Explain pay back period method with the help of suitable example. [4]

OR

- Q9) a)** Explain with neat sketch “Break even analysis”. [4]
- b) Write a short note on “concept of benefit cost analysis. [4]
- c) Surya associates has following details. [8]
- Fixed cost = Rs. 30 lakhs
 - Variable cost per unit = Rs. 150
 - Selling price per unit = Rs. 300
- Find 1) Break even quantity.
2) Break even sale.
3) Actual production quantity is 80,000 find out contribution.

EEE

Total No. of Questions : 10]

SEAT No. :

P2366

[4758] - 511

[Total No. of Pages :5

T.E. (Mechanical)

DESIGN OF MACHINE ELEMENTS - I

(2012 Course) (Semester - I) (End Semester) (302041)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data if necessary, and mention it clearly.
- 5) Use of Electronic Pocket Calculator is allowed.

Q1) a) Write in brief use of standards in design on machine element. What are three basic types of standards used in a design office? [6]

b) Determine the diameter below which the angle of twist of a shaft, and not the maximum stress, is the controlling factor in design of a solid shaft in torsion. The allowable shear stress is 55 MN/m^2 and the maximum allowable twist is 0.3 deg/m . (Consider a shaft with no key). $G = 80 \text{ GN/m}^2$. [4]

OR

Q2) a) A spring clip, made from a 25mm diameter rod, is shown in figure 1. Determine the maximum shear stress and specify its location or locations. [6]

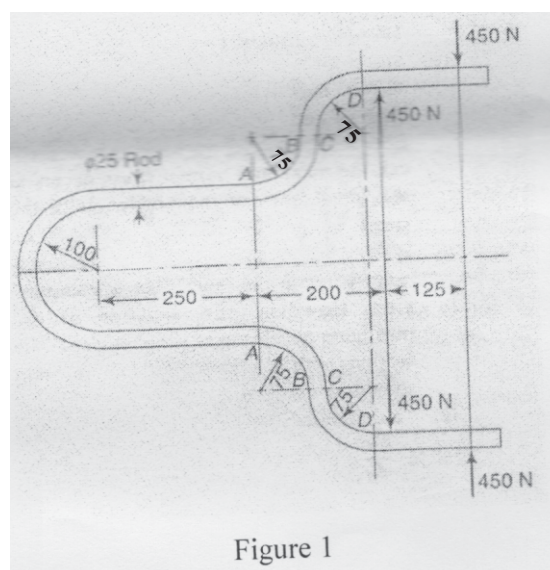


Figure 1

b) Explain design of splines. [4]

P.T.O.

- Q3) a)** Explain ASME code of shaft design. [2]
- b) Determine the diameter of a circular rod made of ductile material with a fatigue strength (complete stress reversal), $\sigma_e = 265$ MPa and a tensile yield strength of 350 MPa. The member is subjected to a varying axial load from $W_{min} = -300$ kN to $W_{max} = 700$ kN and has a stress concentration factor = 1.8. Use factor of safety as 2.0 [8]

OR

- Q4) a)** Explain theories of failures used in Shaft Design. [2]
- b) A centrifugal blower rotates at 600 rpm. A belt drive is used to connect the blower to a 15 kW and 1750 rpm electric motor. The belt forces a torque of 250 N-m and a force of 2500 N on the shaft. Figure 2 shows the location of bearings, the steps in the shaft and the plane in which the resultant belt force and torque act. The ratio of the journal diameter to the overhung shaft diameter is 1.2 and the radius of the fillet is $1/10^{\text{th}}$ of overhung shaft diameter. Find the shaft diameter, journal diameter and radius of fillet to have a factor of safety 3. The blower shaft is to be machined from hot rolled steel having the following values of stresses:

Endurance limit = 180 MPa, yield point stress = 300 MPa, ultimate tensile stress = 450 MPa. Theoretical stress concentration factor at fillet is 1.62, at keyway is 1.6. [8]

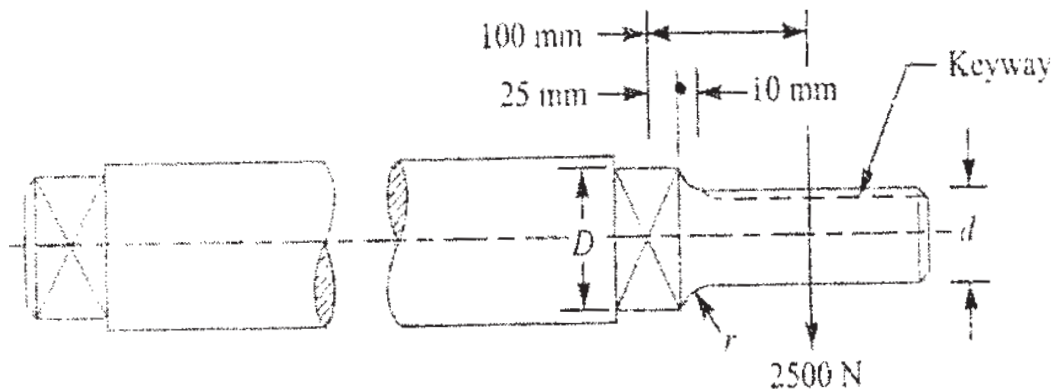


Figure 2

- Q5) a)** Explain significance of helix angle in efficiency of square threaded screw. Also explain two methods to increase efficiency of a square threaded screw. [6]
- b) Design nut of screw jack for taking up a load of 50kN for a lift taking up a load of 50kN for a lift of 500mm. Take $S_{yt} = 300\text{MPa}$, Factor of safety = 5, pitch = 12mm and $P_b = 12\text{MPa}$. [10]

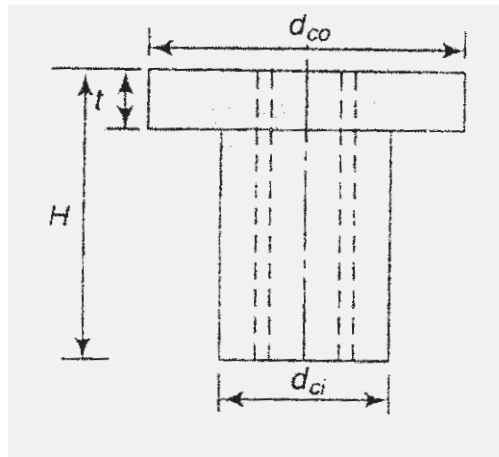


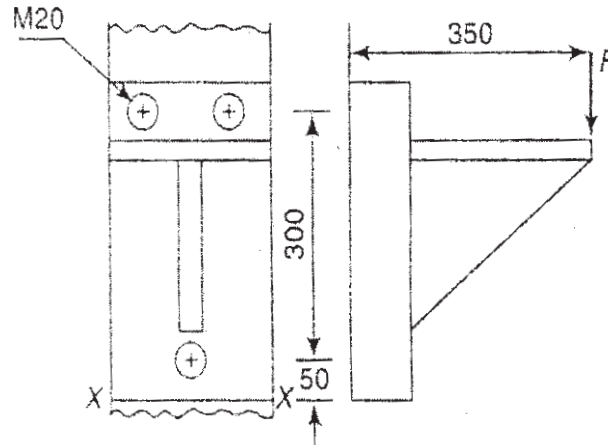
Figure 3

OR

- Q6) a)** Explain with neat sketch recirculating ball screw. State its applications. [6]
- b) A load of 600kN is to be raised and lowered by means of two square threaded screws. If the coefficient of frictions between the screw and nut is 0.048, determine the size of screw and nut. Take $\sigma_t = 80\text{MPa}$, $P = 15\text{MPa}$, pitch = 10mm. Find also the torque required to raise and lower the load. [10]

- Q7) a)** Derive the strength eqⁿ of [8]
- i) single transverse fillet weld
 - ii) double parallel filled weld.

- b) A steel bracket as shown in Figure 4 is mounted on a wall by means of three bolts of M20 size. Find the maximum load which may be taken by the bracket when applied at 350mm from the wall. Ignore initial tightening of bolt. Take $S_t = 60\text{MPa}$. [8]



OR

Figure 4

OR

- Q8)** a) Explain with neat sketch 4 types of screw fasteners. [8]
- b) Determine the torsional stress in the weldment as shown in figure 5. This is a case where a crank is made of a plate whose one end is welded to a shaft while other end is subjected to a tangential force of 12kN. Take weld thickness = 5mm and overload factor =1.2. [8]

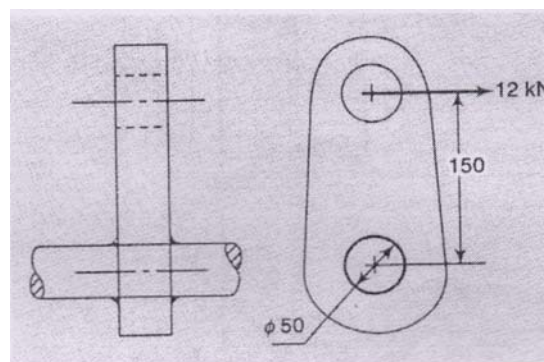


Figure 5

- Q9)** a) Derive basic two equations for the design of helical spring. Also state the importance of Wahl factor in spring design. [8]

- b) A railway wagon of mass 250kN moving with a velocity of 2.5m/sec is brought to rest by springs of mean diameter 350mm. The maximum deflection of the spring is 210mm. Find the wire diameter and number of turns. Take $S_s = 600\text{MPa}$ and $G = 80 \text{ GPa}$. [10]

OR

- Q10)** a) Explain the following methods. [8]

- i) Shot peening
- ii) Nipping of leaf spring.

- b) One helical spring is nested inside another; the dimensions are as tabulated. Both springs have the same free length and carry a total maximum load of 2500N. [10]

	Outer spring	Inner spring
Number of active coils	6	10
Wire diameter, mm	12.5	9.0
Mean coil diameter,mm	100	70

Determine:

- i) The maximum load carried by each spring.
- ii) The total deflection of each spring.
- iii) The maximum stress in two springs. Take $G = 83 \text{ GN/m}^2$.



Total No. of Questions : 9]

SEAT No. :

P2367

[4758]-512

[Total No. of Pages : 3

**T.E. (Mechanical/Automobile)
METROLOGY AND QUALITY CONTROL (End Semester)
(2012 Pattern) (Semester-I)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of electronic pocket calculator and steam tables is allowed.*
- 4) *Assume suitable data if necessary.*

Q1) a) Explain principle's of Engineering metrology in details. **[6]**

b) Write a note on laser interferometer. **[4]**

OR

Q2) a) Explain different methods of measuring flatness. **[6]**

b) Differentiate between primary texture and secondary texture. **[4]**

Q3) a) Define Taylor's principle. **[2]**

b) Write a note on floating carriage micrometer. **[4]**

c) Explain universal measuring machine. **[4]**

OR

Q4) a) Explain principle of interferometry. **[2]**

b) Write a note on span gauging. **[4]**

c) Explain Automatic inspection system. **[4]**

Q5) a) Explain Deming's fourteen points in details. **[8]**

b) Explain seven New Quality tools. **[8]**

OR

P.T.O.

- Q6) a)** Define cost of prevention, cost of appraisal, cost of internal failure & cost of external failure. **[8]**
- b) Explain seven quality control tools. **[8]**

- Q7) a)** Explain in detail OC curve and show following element on OC curve**[6]**
- i) α -Risk
- ii) β -Risk
- iii) AOQ
- iv) LTPD
- b) Two machines producing components are checked up for the statistical stability. Draw the 'P' chart for both machines and comment upon the processes. Sample size for both machines are 200. **[10]**

Machine A

Sample No.	1	2	3	4	5	6	7	8	9	10
Defectives	25	28	30	30	20	29	31	26	31	27

Machine B

Sample No.	1	2	3	4	5	6	7	8	9	10
Defectives	11	08	22	15	12	27	10	15	10	02

OR

- Q8) a)** Differentiate between single, double and multiple sampling plan. **[6]**
- b) Components are being turned on CNC lathe to a specification of $12.58 \pm 0.05\text{mm}$. Five batches of five components each have been drawn for inspection at 1 hour intervals. The readings are tabulated below. **[10]**

Batch 1	Batch 2	Batch 3	Batch 4	Batch 5
12.62	12.63	12.62	12.61	12.59
12.60	12.56	12.56	12.66	12.58
12.62	12.60	12.57	12.62	12.57
12.61	12.59	12.58	12.61	12.59
12.65	12.60	12.63	12.60	12.56

- i) Determine the process capability.
- ii) Determine the three-sigma limits for the \bar{X} chart.
- iii) Draw the control chart and give your assessment. Assume the normal distribution and d_2 for group size 5 is 2.326.

Q9) Write short notes on following (Any Three):

[18]

- a) TPM.
- b) Six sigma.
- c) Kanban.
- d) QFD.
- e) JIT.
- f) Poka-yoke.



Total No. of Questions : 10]

SEAT No. :

P2368

[4758] - 513

[Total No. of Pages :4

T.E. (Mechanical) (Common to Mech. S/W, Automobile)

HEAT TRANSFER

(2012 Course) (302042) (End Semester) (Semester - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Assume suitable data if necessary.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of Scientific calculator is allowed.*

- Q1) a)** Derive three dimensional general heat conduction equation in Cartesian coordinates for anisotropic material for unsteady state condition with uniform internal heat generation. **[7]**
- b) What is unsteady state? Define internal temperature gradient. When can it be neglected? **[3]**

OR

- Q2) a)** Write a note on temperature boundary condition and heat flux boundary condition. **[4]**
- b) A long hollow cylinder has inner and outer radii as 10cm and 20cm respectively. The rate of heat generation is 1 kW/m³, the thermal conductivity of cylinder material is 0.2 W/mk. If the maximum temperature occurs at radius of 15cm and temperature of Outer surface is 60°C, find temperature at the inner surface of the cylinder. **[6]**
- Q3) a)** Explain critical radius of insulation. **[4]**
- b) A 5cm diameter steel ball, initially at a uniform temp of 450°C is suddenly placed in an environment at 100°C with $h = 10 \text{ W/m}^2\text{K}$. Steel properties: $C_p = 460 \text{ J/kgK}$, density = 7800 kg/m³, $K = 35 \text{ W/mK}$. Calculate the time required for the ball to attain a temperature of 150°C. **[6]**

OR

P.T.O.

- Q4) a)** Write a note on Overall heat transfer coefficient. [4]
- b) A cylindrical metal rod of 5 cm diameter and 20 cm long with thermal conductivity 225 W/mK protrudes in atmosphere at 30°C. It projects from furnace wall at 300°C. A convective heat transfer coefficient of air is 10 W/m²K. Determine temperature at the free end of the rod assuming it as a fin insulated at end. [6]

- Q5) a)** Explain physical significance of any four dimensionless numbers used in convection. [8]
- b) Water flows at the rate of 360kg/hr through a metallic tube of 10mm diameter and 3m length. It enters the tube at 25°C. Outer surface of the tube is maintained at a constant temperature of 100°C. Calculate the exit temperature of the water. [8]

Properties of water:

$$\mu = 5.62 \times 10^{-4} \text{ kg/ms}; C_p = 4174 \text{ J/kgK}; K = 0.664 \text{ W/mK}.$$

Use the following correlation:

$$N_u = 0.023 \text{Re}^{0.8} \text{Pr}^{0.4} \text{ for turbulent flow}$$

$$N_u = 3.66 \text{ for laminar flow}$$

OR

- Q6) a)** Write a note on velocity boundary layer and thermal boundary layer. [6]
- b) Explain mechanism of natural convection. Distinguish it from forced convection. [4]
- c) A rectangular plate of length 7cm and width 4cm maintained is at 115°C. It is exposed to still air at 25°C on both sides. Calculate convective heat transfer rate if smaller side of the plate is held vertical. [6]

$$\text{Use Correlation } N_u = 0.59 (\text{Gr.Pr})^{0.25}$$

For air at 70°C, $K = 0.03 \text{ W/mK}$; $\text{Pr} = 0.697$; kinematic viscosity $\nu = 2.076 \times 10^{-6} \text{ m}^2/\text{s}$.

Q7) a) State and explain following laws of radiation: **[10]**

- i) Planck's Law
- ii) Wein's Law
- iii) Lambert's cosine rule
- iv) Kirchoff's Law
- v) Stefan Boltzmann Law

b) Two large parallel steel plates of emissivities 0.8 and 0.4 are held at temperatures 1100 K & 500 K respectively. If a thin radiation shield of emissivity 0.09 is introduced between two plates, determine radiation heat exchange in W/m^2 with and without radiation shield. **[6]**

Use $\sigma = 5.67 \times 10^{-8} W/m^2 K^4$.

OR

Q8) a) What is shape factor? What is shape factor for a plane surface and convex surface with respect to itself? **[10]**

Find the shape factor of following with respect to itself:

- i) Cylindrical cavity of diameter D and depth H,
- ii) Hemispherical cavity of diameter D,
- iii) Conical hole of diameter D and depth H

b) Consider two concentric spheres 'A' and 'B' with diameter of 200mm and 300mm respectively. Space in between these two spheres is evacuated. Liquid air at $-153^\circ C$ is stored inside sphere 'A'. The surfaces of spheres 'A' and 'B' facing each other are coated with aluminium foil ($\epsilon = 0.03$). Latent heat of vaporization of liquid air is 209.35 kJ/kg. If the system is kept in a room where ambient temperature is $30^\circ C$,

Calculate the rate of evaporation of liquid air. **[6]**

Q9) a) What is the significance of critical heat flux in design of evaporators? Explain different regimes in pool boiling curve with neat sketch. [10]

b) What is LMTD for a heat exchanger? Derive an expression for LMTD of parallel flow heat exchanger. [8]

OR

Q10)a) Explain dropwise condensation and filmwise condensation. compare these two. [6]

b) A parallel flow heat exchanger is to be designed to cool oil ($C_p = 2.1$ kJ/kgK, 20 kg/min) from 70°C to 40°C by using cold water ($C_p = 4.2$ kJ/kg K, 50 kg/min), available at 30°C. The overall transfer coefficient is 133 W/m²K. Find the area of heat exchanger, outlet temperature of water and effectiveness. [8]

c) Explain effectiveness and NTU for a heat exchanger. [4]



Total No. of Questions : 10]

SEAT No. :

P2369

[4758]-514

[Total No. of Pages : 3

T.E. (Mechanical / Automobile Engg. / Mech. S/W)

THEORY OF MACHINES - II

(2012 Course) (Semester - I) (End - Sem.) (302043)

Time : 2½ Hours]

[Max. Marks :70

Instructions to the candidates:

- 1) *Answer Q.No.1 or 2, Q.No.3 or 4, Q.No.5 or 6, Q.No.7 or 8, Q.No.9 or 10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume suitable data, if necessary.*

Q1) a) State and prove the law of gearing. **[6]**

b) Explain with the help of neat sketch, the various forces acting on the tooth of a helical gear with usual notations. Also obtain the inter - relationship in between them. **[6]**

OR

Q2) a) Compare the cycloidal and involute gear tooth profile. **[6]**

b) A three start worm has pitch diameter of 80mm and a pitch of 20mm. It rotates at 600 rpm and drives a 40 tooth worm gear. If coefficient of friction is 0.05, find **[6]**

- i) The helix angle of the worm.
- ii) The speed of the gear.
- iii) The centre distance.

Q3) Classify different types of gear trains with neat sketch, explanation with merit, demerits and application. **[8]**

OR

P.T.O.

Q4) Explain tabulation method for Sun and planet gear train and write speed of different elements. [8]

Q5) a) Describe cone variators used to transmit the power between parallel, non parallel and intersecting shaft axes. [6]

b) Each road wheel of a motor cycle has a mass moment of inertia 1.5 kg-m^2 . The rotating parts of the engine of the motor cycle have a mass moment of inertia of 0.25 kg-m^2 . The speed of the engine is 5 times the speed of the wheels and is in the same sense. The mass of the motor cycle with its rider is 250 kg and its center of gravity is 0.6 m above the ground level. Find the angle of heel, if the motor cycle is travelling at 50 km per hour and is taking a turn of 30 m radius. Wheel diameter is 0.6m. [10]

OR

Q6) a) What is the PIV chain drive? Compare it with axially displaceable cone drive using rubber belt. [6]

b) The turbine rotor of a ship is of mass 3500 kg. It has a radius of gyration of 0.45 m and a speed of 3000 rpm, clockwise when looking from stern. Determine the gyroscopic couple and its effect upon the ship: [10]

i) When the ship is steering to the left on a curve of 100 m radius at a speed of 36 km/hr;

ii) When the ship is pitching in a simple harmonic motion, the bow falling with its maximum velocity. The period of pitching is 40 seconds and the total angular displacement between the two extreme positions of pitching is 12 degrees.

Q7) a) Explain the following terms related to kinematic synthesis [6]

i) Function generation,

ii) Path generation and

iii) Body guidance (Motion generation).

b) Synthesize a four-bar mechanism to generate a function $y = 2 \log_{10}(x)$ and x varies from 2 to 4 with an interval of 1. Assume θ to vary from 30° to 70° and ϕ from 40° to 100° . Starting position of input and output link is 30° and 40° . If length of fixed link is 1 unit determine other link lengths and draw mechanism in its first position. [10]

OR

Q8) a) Write short notes on **[6]**

- i) Precision positions,
- ii) Structural error,
- iii) Chebychev spacing.

b) Synthesis a four bar mechanism by the method of inversion. **[10]**

Assume the following data,

- i) Length of fixed link is 100 mm and input link length is 30mm.
- ii) Initial position of input link 30° and 2- positions of the input link from the initial position 30° and 60° .
- iii) 2-positions of the output link from the initial position 20° and 40° .

And determine the length of coupler link, output link and initial position of output link.

Q9) The following data relate to a cam profile in which the follower moves with cycloidal motion during lift and returning it with uniform acceleration and retardation, acceleration being $\frac{1}{2}$ of the deceleration. Minimum radius of cam is 30mm, roller radius is 10 mm, lift of follower is 45 mm, offset of follower axis is 12 mm towards right, angle of ascent is 80° , angle of decent 120° , angle of dwell between ascent and decent is 50° & speed of cam 175 rpm. Draw cam profile & determine maximum velocity and acceleration during lift. **[18]**

OR

Q10)a) Write short note on Jump phenomenon in cam system. **[6]**

b) What do you mean by Advanced Cam Curves? Explain 3-4-5 polynomial curve. **[6]**

c) Derive expressions for displacement for circular arc cam operating a flat faced follower, when the contact is on the circular flank. **[6]**

EEE

Total No. of Questions : 12]

SEAT No. :

P2370

[4758] - 515

[Total No. of Pages :4

T.E. (Mechanical)

HYDRAULICS AND PNEUMATICS

(2012 Pattern) (302045) (Semester -I) (End-Sem.)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer 6 questions.*
- 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.*

Q1) Distinguish between Hydraulics and Pneumatics systems. **[6]**

OR

Q2) Draw ISO symbols for the following components: **[6]**

- a) Unidirectional, fixed displacement pump
- b) Quick disconnect coupling with check
- c) 3/2, solenoid operated, spring return DCV
- d) 4/3, tandem centre, spring centered, oil pilot operated DCV
- e) Muffler
- f) Double acting cylinder with both side variable cushioning.

Q3) a) Classify and Explain hydraulic accumulators. **[4]**

- b) A gas charged accumulator supplies energy to a system with 15 liters of oil within the range of 125 bar (abs) to 175bar (abs). If the accumulator has pre-charged pressure of 90 bar (abs). Size the accumulator for Adiabatic process. **[4]**

OR

P.T.O.

- Q4) a)** Classify hydraulic Pumps & define various efficiencies of a pump? [6]
 b) Draw symbolic representation of Hydraulic Power Pack unit. [2]

Q5) What is Cushioning of Cylinders? Explain with neat sketch with symbolic representation. [6]

OR

Q6) Explain with neat sketch Piston type Hydraulic Motors. [6]

Q7)a) Draw neat sketch and explain the following with their application in circuit:[12]

- i) Three Way, Two Position Direction Control Valve
 - ii) Four Way, Three Position Direction Control Valve (Closed Centre)
- b) Draw & Explain Meter-In speed control circuit. Specify its application.[6]

OR

Q8) a) For the circuit diagram given in Fig.1, identify the type of Circuit & the numbered Components, also describe the circuit's operation. [8]

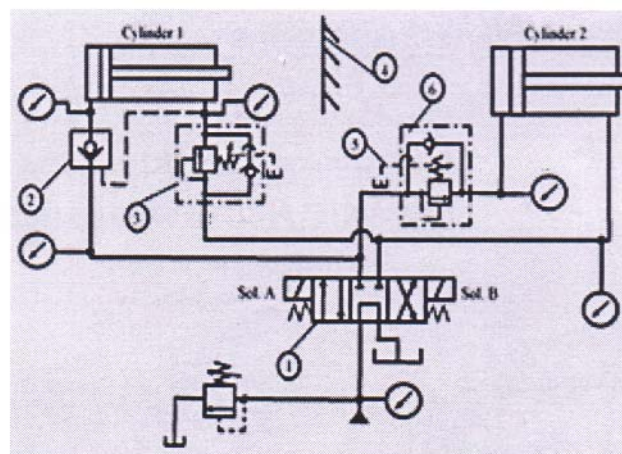


Fig.1

- b) Draw a circuit for automatic cylinder reciprocation using sequence valves & explain its operation. [10]

- Q9)** a) Explain the working of a FRL unit with neat sketch and symbols. [8]
b) Write a short note on the following with application in the circuit: [8]
i) Shuttle valve (OR Gate)
ii) Quick Exhaust Valve

OR

- Q10)**a) Draw and explain position dependent sequencing circuit for two cylinders in pneumatics. [8]
b) Compare Air Motors with Electric Motors. [4]
c) Classify different actuators used in pneumatics with symbols. [4]

Q11) Movement of a machine is obtained by using hydraulic system. Load on the cylinder during the forward stroke is 12kN while that the return stroke is 10kN.

Requirement of the machine is such that the forward speed and the return speed are to be equal. Range of speeds for the cylinder is between 2m/min and 4m/min. The total stroke of the cylinder is 350mm.

Draw a circuit which will fulfill these requirements. Select different components used in the circuit from the data given. Mention ratings of components in case it is not available in the given data (Suitable system requirements can be assumed, if required). [16]

OR

Q12) A machine tool cross slide is moved by means of a hydraulic system. The motion of the cylinder is as follows: [16]

- a) Initially it moves through a distance of 150mm against a load of 15kN in about 4 seconds.
b) It is followed by a working stroke of another 150mm against an effective load of 25kN.
The feed rate during this part of the stroke is required to be 1m/min.
c) The load during return stroke is 15kN.

A meter-in type of circuit is used. Draw a circuit which will fulfill these requirements. Select different components used in the circuit from the data given. Mention ratings of components in case it is not available in the given data.

DATA

1. SUCTION STRAINER:

Model	Flow capacity (lpm)
S1	38
S2	76
S3	152

2. PRESSURE GAUGE:

Model	Range (bar)
PG1	0-25
PG2	0-40
PG3	0-100
PG4	0-160

3. VANE PUMP:

Model	Delivery (lpm)			Model	Max. working pressure (bar)	Flow capacity (lpm)
	at 0 bar	at 35 bar	at 70 bar			
P1	8.5	7.1	5.3	PO1	210	19
P2	12.9	11.4	9.5	PO2	210	38
P3	17.6	16.1	14.3	PO3	210	76
P4	25.1	23.8	22.4			
P5	39	37.5	35.6			

4. RELIEF VALVE:

Model	Flow range (lpm)	Max. working pressure (bar)	Model	Bore Dia. (mm)	Rod Dia (mm)
			A1	25	12.5
R1	11.4	70	A2	40	16
R2	19	210	A3	50	35
R3	30.4	70	A4	75	45
R4	57	105	A5	100	50

5. FLOW CONTROL VALVE:

Model	Max. working pressure (bar)	Flow range (lpm)	Model	Capacity (lit)
	70	0-4.1	T1	40
F1	70	0-4.1	T2	100
F2	105	0-4.9	T3	250
F3	105	0-16.3	T4	400
F4	70	0-24.6	T5	600

6. DIRECTION CONTROL VALVE:

Model	Max. working pressure (bar)	Flow capacity (lpm)
D1	350	19
D2	210	38
D3	210	76

7. CHECK VALVE:

Model	Max. working pressure (bar)	Flow capacity (lpm)
C1	210	15.2
C2	210	30.4
C3	210	76

8. SEQUENCE VALVE

9. CYLINDER (Max. working pressure - 210):

Model	Bore Dia. (mm)	Rod Dia (mm)
A1	25	12.5
A2	40	16
A3	50	35
A4	75	45
A5	100	50

10. OIL RESERVOIR:

Model	Max. working pressure (bar)	Flow range (lpm)	Model	Capacity (lit)
	70	0-4.1	T1	40
F1	70	0-4.1	T2	100
F2	105	0-4.9	T3	250
F3	105	0-16.3	T4	400
F4	70	0-24.6	T5	600



[4758] - 516

T.E. (Mechanical) (End-Semester)
DESIGN OF MACHINE ELEMENTS - II
(2012 Pattern)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer five questions from following.*
- 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) *Use of programmable calculator is not permitted.*
- 6) *Assume suitable data if necessary.*

Q1) a) What are the advantages and disadvantages for increasing the helix angle in helical gear. **[4]**

b) Design a pair of spur gear with 20° full-depth involute teeth based on Lewis Equation. The velocity factor is to be used to account for dynamic load. The pinion shaft is to be connected to 10kW, 1440 rpm motor. The starting torque of the motor is 150% of the rated torque. The speed reduction is 4:1. The pinion as well as gear is made of plain carbon steel 40C8 ($S_{ut} = 600 \text{ N/mm}^2$). The factor of safety as 1.5. Design the gears based on Velocity factor and, determine their dimensions. **[6]**

Use following data :

i) Lewis form factor, $Y = 0.484 - \frac{2.87}{Z}$

ii) Velocity factor $C_v = \frac{3}{3 + V}$

iii) Number of teeth on pinion : 18

OR

- Q2)** a) A spur gear pair with 20° full depth involute tooth profile consist of 18 teeth pinion meshing with 36 teeth gear. The pinion & gear is made of steel with ultimate tensile strength 600 N/mm^2 & 510 N/mm^2 respectively, the module is 5 mm while the face width is $10 \times$ module. The surface hardness of pinion & gear are 330 BHN & 280 BHN respectively. [6]

- Calculate :
- i) Beam strength
 - ii) Wear strength

Use following Data :

- Factor of safety - 2
 - pinion speed - 1440 rpm
 - Lewis form factor - $Y = 0.484 - 2.87/Z$
 - Velocity factor - $V = \frac{5.6}{5.6 + \sqrt{V}}$
- b) What are different mountings of bevel gear Explain any one with sketch.[4]

- Q3)** a) A right hand 18 teeth pinion meshes with 40 teeth helical gear mounted on parallel shaft. The pinion is to be driven by 22 KW, 1440 rpm motor. The tooth system is 20° full Depth involute, while helix angle 23° & normal module is 6mm. Determine the components of tooth forces. [4]
- b) Write selection of bearing from manufacturer's catalogue. [6]

OR

- Q4)** a) Differentiate between Spiral bevel with Hypoid bevel gear with sketch.[4]
- b) A radial load acting on ball bearing is 2500N for first five revolutions and reduces to 1500 N for next ten revolution the load variation repeats itself. The expected life of bearing is 25 million revolutions. Determine the dynamic load carrying capacity of bearing. [6]

Q5) a) Derive an expression for the efficiency of worm gear pair. [5]

b) A worm transmitting 2.2 kW power at 1000 rpm drives a worm gear rotating at 20 rpm. The pitch diameter of the right hand, single start worm is 60mm. The transverse pitch of the worm gear is 15.7mm, while the normal pressure angle is 14.5° . The worm is above the worm gear and rotates in clockwise direction as viewed from the right side. [11]

Determine :

- i) The components of tooth forces acting on the worm and worm gear along with directions and free body diagram.
- ii) The efficiency of worm gear pair.
- iii) The power lost in friction.
- iv) The designation of worm gear pair.

The coefficient of friction between the worm and worm gear teeth is 0.0406.

OR

Q6) a) In a design of worm gear pair why worm gear governs the design. [3]

b) A worm gear pair 2/30/10/8 consist of worm gear made of phosphor bronze with $Sut=245N/mm^2$ & worm made of case hardened steel with $Sut=700N/mm^2$. The coefficient of friction between the worm & worm gear is 0.04 while normal pressure angle is 20° . The wear factor of worm gear teeth is $0.825 N/mm^2$. The fan is used for which overall heat transfer coefficient is $22/w/m^2/^\circ C$. The permissible temperature rise for the lubricating oil above the atmospheric temperature is $45^\circ C$. The worm rotates at 720 rpm. Assume service factor 1.25. Determine the input power rating based on, [13]

- i) Beam strenght
- ii) Wear strenght.
- iii) Thermal consideration

Also. Suggest the input power that the worm gear can take. Use following data,

$$\text{Lewis form factor} - Y = 0.484 - \frac{2.87}{Z_g}$$

$$\text{Velocity factor} - C_v = \frac{6}{6 + V_g}$$

$$\text{Area of housing} - A = 1.14 \times 10^{-4} \times a^{1.7} \text{.m}^2$$

Where a = center distance in mm

- Q7)** a) A pulley of 1000mm diameter is driven by an open type flat belt from 25 KW, 1440 rpm electric motor. The pulley on motor shaft is 250mm in diameter and the center distance between the two shaft is 2m. The allowable tensile stress for the belt material is 2N/mm^2 and coefficient of friction between belt and pulley is 0.28. The density of belt material is 900 kg/m^3 . If the width of belt is 125mm, **[12]**

Determine :

- i) Thickness of belt.
 - ii) Length of belt.
 - iii) Initial tension required in the belt.
- b) What are the different belt tensioning methods, Explain any one with neat sketch. **[4]**

OR

Q8) a) Draw neat sketch of 6×7 and 6×19 rope. [6]

b) Give the classification of chain, Explain polygonal effect of chain. [4]

c) Explain selection of V belt from manufacturers catalogue. [6]

Q9) a) The following data is given for a 360° hydrodynamic bearing. [12]

- Radial load = 3.2 KN.
- Journal diameter = 50mm.
- Bearing length = 50mm
- Journal speed = 1490 rpm.
- Radial clearance = 50 microns.
- Viscosity of lubricants = 25 cP.
- Density of lubricant = 860 kg/m^3 .
- Specific heat of lubricant = $1.76 \text{ KJ/Kg}^\circ\text{c}$

Assume that the total heat generated in the bearing is carried by the total oil flow in the bearing. calculate :

- i) Minimum oil - film thickness;
- ii) Coefficient of friction;
- iii) Power lost in friction;

- iv) Total flow rate of lubricant in litres/min;
- v) Side leakage;
- vi) Temperature rise

l/d	h_o/c	ϵ	S	$(r/c)f$	$Q/rcn_s l$	Q_s/Q	P_{max}/P
1.0	0.2	0.8	0.0446	1.70	4.62	0.842	3.195
	0.4	0.6	0.121	3.22	4.33	0.680	2.409
	0.6	0.4	0.264	5.79	3.99	0.497	2.066
	0.8	0.2	0.631	12.8	3.59	0.280	1.890

Dimensionless parameters for Full Journal Bearings

- b) Explain design variables and performance variable of Hydrodynamic bearing. [6]

OR

- Q10)** a) Derive the Petroff's equation for hydrodynamic bearing. State its limitations. [7]

- b) The following data refers to short hydrodynamic full Journal bearing :[11]

- Radial Load = 1000N
- Journal speed = 2100 rpm

(l/d) Ratio = 0.5

- Eccentricity ratio = 0.65
- Radial clearance = $0.002 \times$ journal radius
- Flow rate of lubricant = 3.45 litres per hour

Calculate,

- i) the diameter of journal
- ii) the radial clearance
- iii) the dimensions of bearing
- iv) the minimum oil film thickness
- v) the absolute viscosity of lubricant



Total No. of Questions : 10]

SEAT No. :

P3670

[4758]-517

[Total No. of Pages : 4

T.E. (Mechanical)

TURBO MACHINES

(2012 Pattern) (Semester - II) (302049) (End - Semester)

Time : 2½ Hours]

[Max. Marks :70

Instructions to the candidates:

- 1) *Answer Q.No.1 or 2, Q.No.3 or 4, Q.No.5 or 6, Q.No.7 or 8, Q.9 or Q.10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Use of Calculator, Steam Table is allowed.*
- 5) *Assume suitable data if necessary.*

Q1) a) A jet of water moving with V m/s strikes at the centre of a curved vane which is moving with 'u'm/s. If the outgoing jet makes an angle θ with the incoming jet, prove that **[6]**

i) Maximum efficiency = $\eta_{\max} = \frac{8}{27}(1 + \cos \theta)$

ii) Blade speed $u = V/3$

b) Explain the functions of following **[4]**

i) Casing of pelton wheel.

ii) Notch of bucket.

OR

Q2) a) Describe with a neat sketch the construction of Francis turbine. **[5]**

b) A Kaplan turbine has a runner diameter of 4 m and hub diameter of 1.2 m. Discharge through the turbine = 7000 LPS. The hydraulic & mechanical efficiencies are 90% and 93% respectively. Assume no whirl at outlet. Find the net head and power developed by the turbine. **[5]**

P.T.O.

- Q3) a)** What is cavitation? How it can be prevented? [4]
- b) Steam issues from the nozzle at an angle of 22° with a velocity of 430 m/s. The friction factor is 0.9. For a stage turbine designed for maximum efficiency. Find [6]
- i) The blade velocity
 - ii) Moving blade angles for equiangular blades
 - iii) Power developed

OR

- Q4) a)** Prove that for Parson's reaction turbine moving & fixed blades are symmetrical in shape. [6]
- b) Explain different types of draft tubes used in reaction turbines. [4]
- Q5) a)** Define specific speed of a hydrodynamic pump. Derive expression for the same. [8]
- b) A centrifugal pump running at 800 rpm is working against a head of 20.2 m. The external diameter of impeller is 480 mm and its width is 60 mm. If the vane angle at exit is 40° and manometric efficiency is 70% find [10]
- i) Flow velocity at outlet
 - ii) Absolute velocity of water leaving the vane.
 - iii) Angle made by the absolute velocity at outlet with direction of motion at the outlet.
 - iv) Discharge
 - v) Specific speed.

OR

- Q6) a)** Explain effect of blade angle (outlet) on discharge in centrifugal pump. [6]
- b) A three stage centrifugal pump has impeller diameter 400 mm and 20 mm wide. The vane angle at outlet is 45° and the area occupied by the thickness of vane is 8% of total area. Inner diameter of impeller is half of outer diameter and inlet width is twice that of outlet. The pump discharge is 3.6 m^3 per minute & runs at 920 rpm. Flow velocity is constant from inlet to outlet. Find [12]

- i) Power output of pump in KW
- ii) Total manometric head
- iii) Specific speed
- iv) Shaft power
- v) Vane angle at inlet

Take mechanical efficiency = 88%

Manometric efficiency = 77%

- Q7) a)** Explain slip and slip factor, its importance in centrifugal compressor. [6]
- b) A centrifugal compressor inducing air at 20°C is running at 15000 rpm. The pressure ratio is 4:1 with an isentropic efficiency of 80%. Curved vanes at inlet give the air a prewhirl of 25° to the axial direction at all radii and mean diameter of eye is 25 cm. Impeller tip diameter is 60 cm. The absolute velocity of air at inlet is 150 m/s. Find the slip factor. [10]

OR

- Q8) a)** Write short note on [6]
- i) Fan
 - ii) Blower
- b) A centrifugal compressor delivers 10 m^3 of air when running at 10000 rpm. The air is drawn in at 1 bar & 300K and delivered at 4 bar. The isentropic efficiency is 80%. The blades are radial at outlet and velocity of flow is constant = 64 m/s. The outer diameter of impeller is twice the inner diameter. Take slip factor as 0.9. Find [10]
- i) Temperature of air at outlet tip of impeller.

- ii) Power required to drive the compressor.
- iii) Impeller diameters at inlet & outlet.
- iv) Impeller blade angle at inlet.
- v) Diffuser blade angle at inlet.

- Q9) a)** Explain choking and surging in an axial flow compressor. **[6]**
- b) An eight stage axial flow compressor takes in air at a temperature of 30°C at the rate of 3 kg/s. The pressure ratio is 6 and isentropic efficiency is 89%. The compressor is designed for 50% reaction. The blade speed for each stage is constant and is equal to 180m/s. Flow velocity is 100 m/s. Find the power required to run the compressor and the direction of air at entry & exit from the rotor & stator. The total work is equally shared between the stages. **[10]**

OR

- Q10)a)** Explain Pressure co-efficient, flow co-efficient and work input factor. **[6]**
- b) An axial flow compressor with eight stages and 50% reaction compresses air with a pressure ratio of 4:1. The air enters the compressor at 20°C and flows through it with a constant velocity of 90m/s. The blades of compressor runs with a mean speed of 180 m/s. Take isentropic efficiency = 82%. Find **[10]**
- i) Work done by machine
 - ii) Blade angles

EEE

Total No. of Questions : 10]

SEAT No. :

P3918

[4758] - 518

[Total No. of Pages : 4

T.E. (Mechanical) (Semester - II)

MECHATRONICS

(2012 Pattern)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume suitable data, if necessary.*

Q1) a) Using a suitable diagram, explain the construction as well as the working of a digital optical encoder. [6]

b) From the block diagram in Figure 1, determine the transfer function: Y/X . [4]

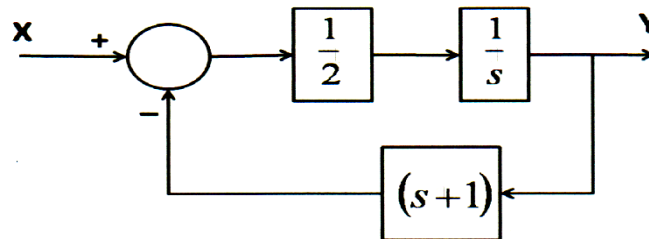


Figure 1

OR

Q2) a) A potentiometer, used to measure the angular position of a motor, has 750 turns of wire. The input range is from -150° to $+150^\circ$. The output range is from 0 to 10 Volts. Determine: [6]

- i) The sensitivity
- ii) The average resolution

b) Using a suitable block diagram, explain the application of a closed loop control system in temperature control in a house hold refrigerator. [4]

P.T.O.

- Q3)** a) Draw suitable diagrams and explain the construction, working and performance characteristics of a Current Amplifier. [8]
- b) Define “Transfer Function” and discuss its importance in the context of control of a Machatronic system. [2]

OR

- Q4)** a) Draw the flowchart and explain the working of the SAR type Analog to Digital converter. [8]
- b) List two important advantages of a closed loop control system. [2]

- Q5)** a) Given four normally open switches (P1, P2, S1 and S2), with DC motor (M) write a PLC program to satisfy following objectives: [10]
- i) When P1 (Start Button) is pushed the Cycle shall start. The cycle shall continue to remain *On* until P2 (Stop Button) is pushed.
 - ii) When S1 is pushed and S2 is not pushed then Motor is ON clockwise direction.
 - iii) When S2 is pushed and S1 is not pushed then Motor is ON in counter clockwise direction.
 - iv) When P2 is pushed the program stops.
- b) Draw a suitable block diagram and explain the architecture of the SCADA system. [6]

OR

- Q6)** a) Using a suitable schematic list the components in a PLC as well as explain the significance of each of the components. [8]
- b) List the criterion for the selection of a PLC and explain any three criterions in details. [8]

- Q7) a)** For the system in Figure 2, assume $M = \text{mass} = 1 \text{ kg}$, $k = \text{stiffness} = 2 \text{ N/m}$ and $d = \text{damping} = 0.5 \text{ Ns/m}$. Also, $F = \text{force input in N}$ and $y = \text{displacement output in m}$. **[10]**

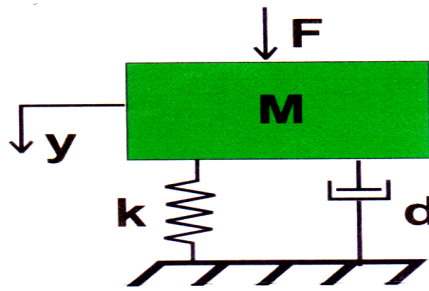


Figure 2

For this system:

- i) Determine the transfer function: $y(s)/F(s)$,
 - ii) Identify the location of the Poles and Zeros and
 - iii) Comment on the stability of the system.
- b) Using the values of the natural frequency $\omega_n = 1.414$ and the damping factor $\xi = 0.177$, estimate the values for percentage overshoot & 2% settling time. **[6]**

OR

- Q8) a)** Using four distinct points, compare, in detail, between Time Domain and Frequency Domain techniques for analysis of a system. **[8]**
- b) Draw suitable sketch to depict the unit step response of a second order system when: **[8]**
- i) System poles are negative and real
 - ii) System poles are complex conjugate pair with negative real part
 - iii) System poles are positive and real
 - iv) System poles are a imaginary pair with no real part

- Q9) a)** Figure 3 shows an error time graph. Sketch the PID controller (series form) output w.r.t. time. Assume $K_p=10$, $K_i = 2$, $K_D= 0.5$ and $P_o=0$ i.e the controller output is zero when the error is zero. **[10]**

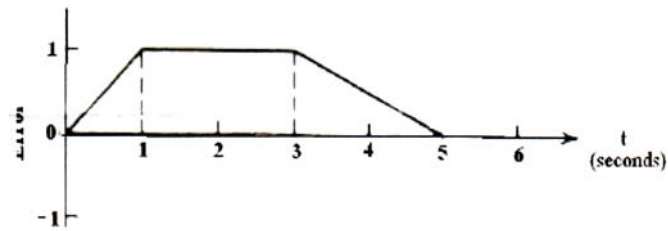


Figure 3

- b) Derive the equation for the control signal, u , for the Proportional plus Derivative (PD) controller in parallel form. Discuss, in detail, the advantages and disadvantages of adding a Derivative term to the Proportional term. **[8]**

OR

- Q10 a)** Draw a suitable block diagram and derive the transfer function of the Proportional Integral Derivative (PID) controller in series form. Also, discuss the significance of the Integral and the Derivate term in the PID controller. **[10]**

- b) Discuss the role of transient specifications W.R.T the performance of the PID controller. **[8]**



Total No. of Questions : 10]

SEAT No. :

P2371

[4758]-519

[Total No. of Pages : 4

T.E. (Common-Mechanical / Auto)

NUMERICAL METHODS AND OPTIMIZATION

(2012 Pattern) (End - Semester - II) (302047)

Time : 2½ Hours]

[Max. Marks :70

Instructions to the candidates:

- 1) *Answer Q.No.1 or 2, Q.No.3 or 4, Q.No.5 or 6, Q.No.7 or 8, Q.No.9 or 10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume suitable data, if necessary.*

Q1) a) Define and explain following types of errors.

[6]

- i) Truncation Error.
 - ii) Round Off Error.
 - iii) Absolute Error.
 - iv) Relative Error.
 - v) Percentage relative Error.
 - vi) Inherent Error.
- b) Using Gauss Seidal method solve the following set of simultaneous equations.

$$x_1 + 20x_2 + 9x_3 = -23$$

$$2x_1 - 7x_2 - 20x_3 = -57$$

$$20x_1 + 2x_2 + 6x_3 = 28$$

Show two iterations in tabular form.

[6]

OR

P.T.O.

Q2) a) Find the roots of $\cos x - x = 0$ by Regula Falsi method. Take $x_1 = 0.6$ and $x_2 = 1$. Find the value of x for 3 iterations. [6]

b) Draw flow chart for Thomas algorithm method. [6]

Q3) a) Maximize $Z = 2x_1 + 5x_2$ subjected to,

$$x_1 + 4x_2 \leq 24$$

$$3x_1 + x_2 \leq 21$$

$$x_1 + x_2 \leq 9$$

$$x_1, x_2 \geq 0 \quad [5]$$

b) Write a note on constrained optimization. [3]

OR

Q4) a) Using Newton's method find the maximum value for the equation $x^3 - 5x + 3$. Take initial guess as zero up to accuracy 0.001. [5]

b) Write down the advantages of genetic algorithm. [3]

Q5) a) A material is tested for cyclic fatigue failure where by a stress in MPa is applied to the material and the number of cycles needed to cause failure is measured. The results are in the table below: [8]

N Cycles	1	10	100	1000	10,000	100000	1000000
σ	1131	1058	993	801	651	562	427

When a log-log plot of stress versus cycles is generated, the data trend shows a linear relationship. Use the method of least squares to find the equation of that straight line.

b) Find the polynomial passing through points (0, 1), (1, 1), (2, 7), (3, 25), (4, 61), (5, 12) using Newton's interpolation formula and hence find y at $x = 0.5$. [8]

OR

- Q6) a)** The pressure (P) and volume (V) of a gas are related by the equation $PV^r = K$, r and K are constants. Fit this equation for the following set of observations: [8]

P kg/m ²	0.5	1	1.5	2	2.5	3
V(liters)	1.62	1	0.75	0.62	0.52	0.46

- b) A set of values of x and f(x) are given below. Using Lagrange's interpolation formula, find f(9). [8]

x	5	7	11	13	17
y=f(x)	150	392	1452	2366	5202

- Q7) a)** Evaluate $\int_0^1 \frac{\sin x}{2+3\sin x} dx$ using Simpson's 3/8th rule. Take 6 strips. [8]

- b) Draw flowchart for Gauss Legendre 2 point and three point formulae combinely. [8]

OR

- Q8) a)** Use Trapezoidal rule to evaluate [8]

$$\int_0^1 \int_1^2 \frac{2xy}{(1+x^2)(1+y^2)} dx.dy .$$

- b) Explain Simpson's $\frac{1}{3}$ rd rule graphically and derive formula for integration of a function. [8]

- Q9) a)** The relationship between x and y is given by $\frac{dy}{dx} + xy = 2$. Estimate y at x = 5.1 using 2nd order Runge-Kutta method. Assume y = 2 at x = 5. Take step size of 0.02. [10]

- b) Draw flow chart for Laplace equation when plate is divided in nine parts and temperatures at four nodes are to be find out when temperatures at four sides are given. [8]

OR

Q10)a) Using Runge Kutta method, solve $2\frac{d^2y}{dx^2} - 3x\frac{dy}{dx} + 9y = 9$ for $x = 0.1$, initial conditions are $x = 0, y = 1, \frac{dy}{dx} = -2, h = 0.1$. [8]

- b) Solve the heat equation $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ subjected to the conditions $u(0, t) = u(1, t) = 0$ and $u(x, 0) = 2x$ for $0 \leq x \leq \frac{1}{2}$ and $u(x, 0) = 2(1 - x)$ for $\frac{1}{2} \leq x \leq 1$. Take $h = \frac{1}{4}$ and $k = 1$. [10]

EEE

Total No. of Questions : 12]

SEAT No. :

P2317

[4758]-52

[Total No. of Pages : 3

T.E. (Electrical)

ELECTRICAL INSTALLATION MAINTENANCE & TESTING

(2008 Course) (303144)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6. from section -I and Q7 or Q8, Q9 or Q10, Q11 or Q12 from section - II.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Explain the terms feeder and distributor and discuss the factors to be considered in designing the overhead feeder and distributor. **[8]**
- b) Classify different supply systems and compare the relative amount of material required, assuming maximum voltage to earth in the following cases: **[10]**
- i) ac, 1 phase, 2 wire overhead system,
 - ii) ac, 3 phase, 4 wire overhead system.

State the assumptions made in comparison.

OR

- Q2)** a) Compare overhead and underground supply system stating their advantages and disadvantages. **[8]**
- b) State and prove Kelvin's law for feeder design with reference to supply system. State limitations of Kelvin's law. **[10]**

P.T.O.

- Q3)** a) Explain in detail function of the equipments used in the substation. [8]
b) Explain in detail design of earthing grid of substation. [8]

OR

- Q4)** a) State the objectives of substation grounding. State and explain the factors which affect the soil resistivity. [8]
b) Explain the terms: [8]
i) Touch potential,
ii) Step potential,
iii) Transfer potential.

- Q5)** a) Explain the breakdown maintenance and preventive maintenance strategies. [8]
b) Define and explain the significance w.r.t. condition monitoring [8]
i) polarization index,
ii) Dielectric absorption ratio.

OR

- Q6)** a) Discuss planned and preventing maintenance of induction motor. [8]
b) Write short notes on: [8]
i) Signature Analysis,
ii) Tan Delta measurement.

SECTION - II

- Q7)** a) Explain in details failure modes of transformers. [8]
b) How degree of polymerization and partial discharge measurement is used for condition monitoring of transformers. [8]

OR

Q8) a) How transformer oil gets contaminated? With help of block diagram explain the reconditioning process of transformer oil. [8]

b) Explain the process of condition monitoring of transformer bushings.[8]

Q9) a) What is signature Analysis? How it is useful in condition monitoring of electrical equipment. [8]

b) Explain various methods used for location of faults in power cables.[8]

OR

Q10)a) Enlists different fault occurring in IM and their causes. [8]

b) Write detail note on thermography. [8]

Q11)Write short notes (covering construction, working principle & trouble shooting- Electrical faults only): [18]

a) Washing machine.

b) Fan

OR

Q12)Write short notes (covering construction, working principle & trouble shooting- Electrical faults only): [18]

a) Water Pump

b) Refrigerator

EEE

Total No. of Questions : 10]

SEAT No. :

P2372

[4758]-520

[Total No. of Pages : 3

T.E. (Mechanical Engg.)

MANUFACTURING PROCESS - II

(2012 Course) (Semester - II) (End - Sem.) (302051)

Time : 2½ Hours]

[Max. Marks :70

Instructions to the candidates:

- 1) *Solve Q.No.1 or 2, Q.No.3 or 4, Q.No.5 or 6, Q.No.7 or 8, Q.No.9 or 10.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of electronic pocket calculator is allowed.*
- 4) *Assume suitable data, if necessary.*

- Q1) a)** Explain lapping process with neat sketch. **[6]**
- b) A plain surface 60 mm wide and 230 mm long is to be milled on a horizontal milling machine with cutter diameter 80 mm and speed 50 m/min. Take feed per tooth is 0.11 mm and number of teeth on cutter = 12. Calculate machining cutter. **[6]**

OR

- Q2) a)** Draw figure of any four grinding wheel shapes used, with its names. **[6]**
- b) Draw and explain broach tool geometry. **[6]**
- Q3) a)** A 250 mm diameter bar is turned at 40 rev/min. with depth of cut of 2 mm and feed of 0.3 mm/rev. Calculate Power consumption and specific cutting energy with cutting force 1500 N and Feed force 400 N. **[4]**
- b) Explain economics of machining in metal cutting. **[4]**

OR

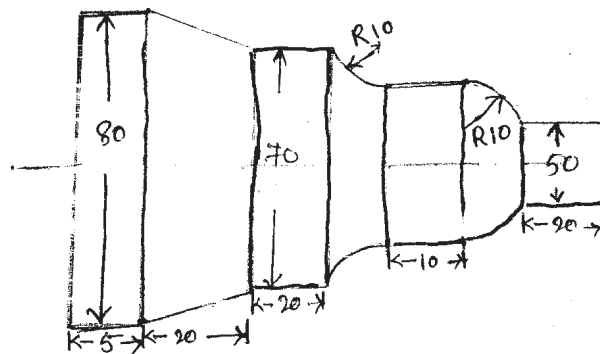
- Q4) a)** Draw neat sketch of single point cutting tool geometry. **[4]**
- b) Define built up edge. With neat sketch explain formation of BUE. **[4]**

P.T.O.

- Q5) a)** Explain LBM process with its adv., limitations and applications. [8]
b) Compare the ECM and USM with various process parameters. [8]

OR

- Q6) a)** Draw a Schematic diagram of 'Electro-discharge Machining' and explain its working principle and process parameters. [8]
b) Explain AJM process with its advantages, limitations and applications. [8]
- Q7) a)** Explain CNC machines with neat sketch. State its advantages and limitations. [6]
b) Differentiate between subroutine and canned cycle. [4]
c) Write a CNC program for manufacturing component shown in fig. from a 100 mm long cylindrical component of 80 mm dia. [6]



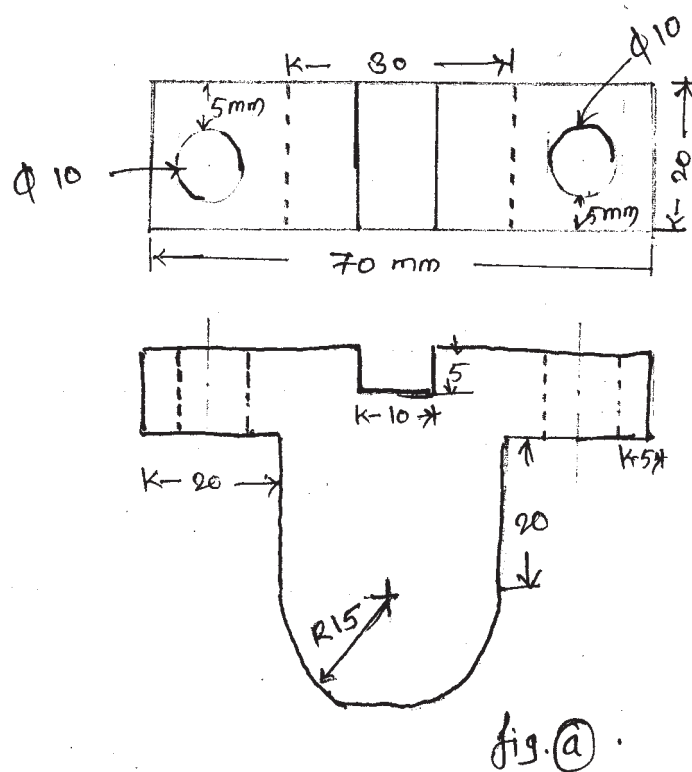
OR

- Q8) a)** Write short notes on the following: [8]
 i) Machining Center.
 ii) Automatic tool changer (ATC)
- b)** Differentiate between absolute and incremental positioning system in CNC. [4]
- c)** Explain the following codes G02, M06, G04, M09. [4]

- Q9)** a) What is 3-2-1 location principle? Explain with the help of neat sketches. [6]
 b) What are the different types of jigs? Explain any one with suitable sketch. [4]
 c) Design and draw drilling jig for drilling the two 10 mm dia. holes in the component shown in fig. (a) [8]

OR

- Q10)** a) List various types of clamping devices used in jig and fixtures. Explain any one in detail. [6]
 b) Explain concept of Poka Yoke in jig and fixture. [4]
 c) Design and draw milling fixture for milling slot of 10 mm wide, 5 mm deep and 20 mm in length for the component shown in fig. (a) [8]



EEE

- Mean collar radius = 8 mm.
- Factor of safety = 3.
- Distance between axis of handle and nut surface in clamped condition = 150mm
- Force applied by an operator = 100N.
- Length for gripping on handle = 60 mm.

Nominal diameter, mm	22	24	26	28	30	32	36
Pitch, mm	5	5	5	5	6	6	6

Design screw and nut for C-clamp and determine the following :

- Standard dimensions of screw.
- Stresses in screw body at two critical section.
- Height of nut.

UNIT - 2 & 3

- Q3)** a) Determine the weld size of an annular fillet used to weld a circular cantilever shaft of diameter 30mm and length 100mm. The force acting at the free end of the shaft is 5KN and permissible weld stress is 80N/mm^2 . [8]
- b) State the explain necessity of modified Goodman's diagram. [2]

OR

- Q4)** a) A spring – loaded safety valve for the boiler is required to blow at the pressure of 1.20N/mm^2 . Diameter of the valve is 65mm. The maximum lift of the valve is 17.5 mm. Design suitable compression spring of the safety valve. Assume $C = 6$ and provide initial compression of 30mm. Assume limiting permissible shear stress in spring material as 450N/mm^2 and G as 84000N/mm^2 . [8]
- b) State an expression for torque required to raise the load and lower the load for power screw. [2]

UNIT - 4

Q5) a) The following data is given for a steel spur gear pair transmitting 5KW power from a shaft running at 3000 rpm to another parallel shaft running at 1500 rpm. **[12]**

- i) Module = 4 mm
- ii) Number of teeth on pinion = 18
- iii) UTS for pinion and gear material = 630 MPa
- iv) Face width = 10 * module
- v) Surface hardness = 400 BHN
- vi) Combined teeth error = 15 microns
- vii) Deformation factor C (when e is in mm) = 11400 * e N/mm
- viii) Service factor and load concentration factor = 1.0

Assuming dynamic load is accounted by Buckingham's Equation, calculate:

- i) Factor of safety against bending failure
- ii) Factor of safety against pitting failure

$$F_d = \frac{21V(bc + Ft_{\max})}{21V + \sqrt{bc + Ft_{\max}}}$$

b) What is virtual number of teeth in case of helical gear. **[4]**

OR

Q6) a) A pair of parallel helical gears consists of 20 teeth pinion meshing with a 100 teeth gear. The pinion rotates at 720 rpm. The normal pressure angle is 20° and helix angle is 25°. The face width is 40 mm and normal module is 4 mm. The pinion is made up of plain carbon steel 55C8 (UTS = 720 MPa) and gear is made up of plain carbon steel 40C8 (UTS = 580 MPa). The pinion and gear are heat treated to a surface hardness of 350 BHN and 300 BHN respectively. The service factor and factor of safety are 1.5 and 2.0 respectively. Assuming velocity factor accounts for dynamic load, find the power transmission capacity of the helical gear pair. Barth's Velocity Factor K_v can be taken as

$$K_v = \frac{5.6}{5.6 + \sqrt{V}} \text{ where } V \text{ is velocity in m/s.} \quad \text{[11]}$$

b) Derive an expression of beam strength with all assumptions for spur gear. **[5]**

UNIT - 5

- Q7)** a) Derive Stribeck Equation for static load carrying capacity of rolling contact bearing. State the assumptions made. [5]
- b) A 10 KW, 720 rpm electric motor is directly coupled to a shaft of 25 mm diameter which is supported by two cylindrical roller bearings. The shaft transmits power to another shaft through a pulley of diameter 250 mm which is placed mid-way between the two bearings. The coefficient of friction between the belt and pulley is 0.3 and angle of lap is 180°. The belt is vertical. The overload factor is 1.75 and race rotation factor is 1.0. If the expected life of bearings is 76000 hours, select one of the following bearing, which is taken from the manufacturer's catalogue.
- NU 2205 with basic dynamic capacity = 15.99 KN
 - NU 2305 with basic dynamic capacity = 31.39 KN [11]

OR

- Q8)** a) Explain the preloading objectives in rolling contact bearing. [4]
- b) A shaft of length 1.2 m is supported on two vertical identical single row deep groove ball bearings. The shaft carries a gear at its mid-length and rotates at 720 rpm. The tangential and radial force components of the gear are 1 KN and 0.8 KN respectively. The expected life of bearings is 15000 hours with reliability of 80%. Neglecting the effect of axial force, calculate the dynamic load carrying capacity of the bearing so that it can be selected from manufacturer's catalogue. Take load factor as 1.2 and race rotation factor as 1.0. Use $L = 4.48 * L_{10} * [\log_e(1/R)]^{1/1.5}$ [12]

UNIT - 6

- Q9)** a) Explain selection of roller chain from manufacturer catalogue. [6]
- b) The following data is given for an open flat belt drive used to transmit 22 KW power from an electric motor to an exhaust fan. [12]

No.	Parameter	Motor Pulley	Fan Pulley
1	Diameter	300 mm	1200 mm
2	Angle of contact	2.50 radians	3.75 radians
3	Coefficient of friction	0.30	0.25
4	Speed	900 rpm	

The permissible tensile stress for belt material is 2 MPa. The belt is 6 mm thick and density of belt material is 0.97 gm/cc. Which pulley governs the design of belt and why? What width of belt should be used?

OR

- Q10)**a) Explain polygon effect of chain. **[6]**
- b) A single V belt drive is to transmit power from a grooved pulley of pitch diameter of 200 mm running at 1500 rpm to a flat pulley of diameter 600 mm. The center distance between the pulleys is 1000 mm. The belt mass is 0.3 Kg/m. The coefficient of friction between belt and pulley is 0.25. The V belt pulley groove angle is 38° . If the allowable tension in belt is 800N, find : **[12]**
- i) Power transmission capacity of belt.
 - ii) Initial tension required in belt.



Total No. of Questions : 12]

SEAT No. :

P2373

[4758]-522

[Total No. of Pages : 3

T.E. (Mechanical Sandwich)

NUMERICAL METHODS AND COMPUTATIONAL TECHNIQUES

(2012 Course) (Semester-I) (302061) (End-Semester)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer 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) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of logarithmic tables, Mollier charts, electronic calculator is allowed.*
- 5) *Your answers will be valued as a whole.*
- 6) *Assume suitable data, if necessary.*

Q1) Apply successive approximation method to find the root of the following equation correct up to two decimal places near to $\pi/2$.

$$f(x) = x \tan(x) - 1 = 0 \quad [6]$$

OR

Q2) Use Simpson's 3/8 rule to evaluate

$$\int_0^{\pi} \sqrt{1+3\cos^2 x} dx$$

with $n = 6$. [6]

Q3) The velocity distribution of a fluid near a flat surface is given as [6]

x	0.1	0.3	0.5	0.7	0.9
v	0.72	1.81	2.73	3.47	3.98

Where x is distance from the surface (cm) and v is velocity (cm/s). Using a suitable interpolation formula obtain the velocity at $x = 0.4$.

OR

Q4) Draw the flowchart to find interpolating value using Lagrange's interpolation formula for given set of data ($x y$). [6]

P.T.O.

Q5) Use Gauss elimination with partial pivoting to solve the set of equations: [8]

$$x + y - 2z = 3;$$

$$4x - 2y + z = 5;$$

$$3x - y + 3z = 8$$

OR

Q6) Use Gauss Seidel method to solve up to one decimal accuracy. [8]

$$3x - 2y = 5;$$

$$-x + 2y - z = 0;$$

$$-2y + z = -1$$

Q7) a) Explain the following with example: [8]

i) Round off error

ii) Truncation error

iii) Error Propagation

b) Fit the geometric curve $y = ax^b$ to the following data: [8]

X	2	4	6	8	10	12
Y	1.4	2.0	2.4	2.8	3.6	5.0

OR

Q8) a) Draw the flowchart to fit the curve of the form: $y = a + bx + cx^2$ for given set of data (x, y) . [8]

b) Derive the normal equations for evaluating the parameters a and b to fit the data to population growth model of the form $y = a e^{bx}$. [8]

Q9) a) Solve the ODE using modified Euler Method. [10]

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

for $x = 0.25$ and 0.50 .

b) What are the limitations of Taylor series method? Explain the order of accuracy of Euler, modified Euler and RK methods with respect to Taylor series. [6]

OR

- Q10)a)** Use fourth order RK method to estimate $y(0.4)$ when $y'(x) = x^2 + y^2$ with $y(0) = 0$. Assume $h = 0.2$. [10]
- b) Draw the flowchart to solve ODE using predictor-corrector method. [6]

- Q11)a)** Draw the flowchart to solve Laplace equation $u_{xx} + u_{yy} = 0$. [8]
- b) Solve [10]

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

for the following conditions by using Crank-Nicolson method.

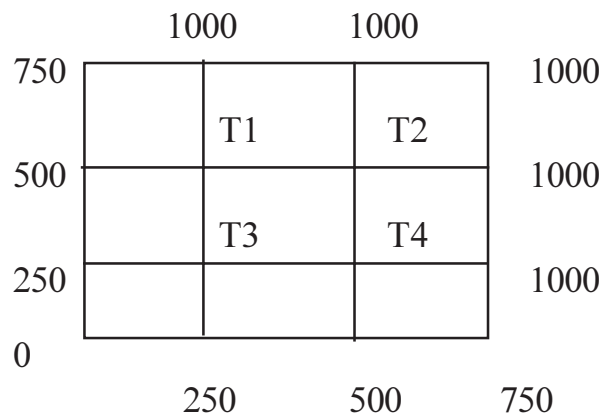
At $x = 0$ and $x = 3$, $u = 0$ for all t 's.

At $t = 0$, $u = x^2$ for $0 < x < 3$.

Assume $h = 1$, $k = 0.1$ find u at $t = 0.3$

OR

- Q12)a)** Draw the flowchart to solve wave equation $u_{tt} = c^2 u_{xx}$. [8]
- b) Solve Laplace equation $T_{xx} + T_{yy} = 0$ subject to the BC's as shown in Fig. [10]



Total No. of Questions : 10]

SEAT No. :

P3919

[Total No. of Pages : 3

[4758] - 525

T.E. (Mechanical S/W) (Semester - I)

MECHATRONICS

(2012 Pattern)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume Suitable data if necessary.

Q1) a) Using a suitable diagram explain the working of Solenoid Actuator. [6]

b) Compare: Closed Loop Control vs Open Loop Control. [4]

OR

Q2) a) Draw a suitable diagram and explain the working of the Resistive Temperature Detector. [6]

b) Find the transfer function $C(s)/R(s)$ for the block diagram shown in Figure 1. [4]

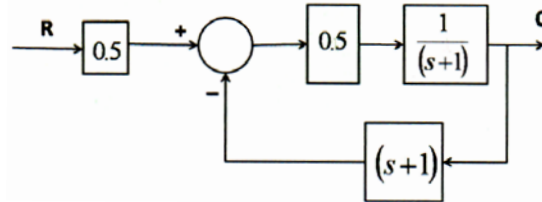


Figure - 1

Q3) a) An 8-bit ADC with a 0V to 10 Volts range is used for the purpose of sampling the voltage of an analog sensor. Determine the digital output code that would correspond to the analog input of 7.5 Volts. [8]

b) Discuss the importance of sensor in a Mechatronic System. [2]

OR

Q4) a) List the criterion for selection of the Data Acquisition Card and explain any 3 criterions in detail. [8]

b) Explain why the Transfer Function approach is complicated to implement for a Multi-Input-Multi-Output (MIMO) system. [2]

P.T.O.

- Q5) a)** Write the truth table and draw the ladder diagram for: [10]
- i) OR Logic
 - ii) NOT Logic
- b) Explain in detail the functioning of following sub-systems in a PLC: [6]
- i) BUS
 - ii) Output Module

OR

- Q6) a)** In a certain bank, each of three bank officers has a unique key to the vault. The bank rules require that two out of the three officers be present when the vault is opened. Draw the ladder diagram for a relay logic circuit that will unlatch the door and turn on the light when two of the three keys are inserted. [10]
- b) Discuss the criterion for selection of the SCADA system. [6]
- Q7) a)** Discuss the procedure for Frequency Domain Analysis of a Mechanical System. [10]
- b) Determine the Poles and Zeros of the system shown in Eq. (1). Also comment on the stability of the system. [6]

$$\frac{y(s)}{u(s)} = \frac{0.5s + 2}{s^2 + 0.5s + 2} \dots\dots\dots(1)$$

OR

- Q8) a)** For the translational mechanical system in figure 2, determine the transfer function: $Z(s)/u(s)$. [10]

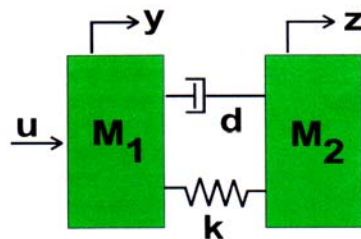


Figure - 2

- b) Define the following terms: [6]
- i) Percent Overshoot
 - ii) Steady State Error
 - iii) Gain Margin

- Q9)** a) Draw the block diagram and derive the transfer function of the PID controller in parallel form. Also, derive the equation for the control signal, u . [10]
- b) A position control system has a proportional gain K_p of 2 N-mm/deg and works against a constant friction torque of 6N - mm. What is the size of the dead band? [8]

OR

- Q10)**a) List the disadvantages of the P1 control. Also, discuss how the D control will assist with overcoming these disadvantages. [10]
- b) Draw the block diagram and derive the transfer function of the PID controller in series form. [8]



Total No. of Questions : 12]

SEAT No. :

P4529

[4758] - 527

[Total No. of Pages : 3

T.E. (Mechanical Sandwich)

INDUSTRIAL ENGINEERING AND PRODUCTION MANAGEMENT

(2012 Pattern) (Semester - II) (Self Study - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer Section-I and Section-II in separate answer book.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Use of calculator is allowed.*
- 5) *Assume suitable data if necessary.*

SECTION - I

- Q1)** a) Define Industrial Engineering. Explain its role in production management. **[8]**
b) Explain various functions of Management. **[8]**

OR

- Q2)** a) What are ideas and thoughts of F.W. Taylor? How did they lay the foundation for Industrial Engineering? Explain. **[8]**
b) Explain Maslow's hierarchy theory of needs. **[8]**

- Q3)** a) Explain different tools and technique used in method study. **[8]**
b) Explain : **[8]**
i) Two hand Chart
ii) Multiple activity chart

OR

- Q4)** a) What measurements are to be done in a stop watch time study? Discuss briefly how they are done? What is measurement of difficulty in stop watch time study? How is it done? **[8]**
b) Differentiate between IE and Ergonomics. State some laws or principles of ergonomics and how do you use them in human effort design? Explain. **[8]**

- Q5)** a) Explain concept of productivity and total productivity with suitable example. **[8]**
b) Explain procedure for selection of plant location & layout for a typical two wheeler automobile plant. **[10]**

P.T.O.

OR

Q6) Write short note on the following : [18]

- a) Factors affecting plant location
- b) Responsibilities of Production manager
- c) Principle of Material Handling

SECTION - II

Q7) a) Define production planning and control. Explain the functions and techniques of production planning and control. [8]

b) An automobile company uses 36000 units of a particular component per year. The ordering cost is Rs. 500 per order and inventory carrying cost is estimated at 20% of average inventory value. The cost per unit of the component is Rs. 10. Assuming 300 working days in a year, determine. [8]

- i) EOQ
- ii) No. of orders/year
- iii) Inventory Cycle and
- iv) Total Inventory Cost

OR

Q8) a) Explain the following : [8]

- i) EOQ
- ii) ABC analysis

b) Differentiate between Production Planning and Production Control. [8]

Q9) a) Describe what you understand by process planning. What is the role of it in product engineering department? [8]

b) State and explain how CPM and PERT techniques used as a tool of project net work analysis. [8]

OR

Q10)a) Explain various phases of process planning in detail. [8]

b) Explain with example Crashing of network in PERT CPM. [8]

Q11)a) Why is an ISO-9000 certification important to a firm? Explain the methodology of ISO-9000 certification. [10]

b) Describe the seven sources of manufacturing wastes as identified in the JIT system. [8]

OR

Q12) Write short note on following :

[18]

- a) Concept of Loading and Scheduling.
- b) Supply chain Management.
- c) Concurrent Engineering.



Total No. of Questions : 10]

SEAT No. :

P2374

[4758] - 528

[Total No. of Pages :4

T.E. (Automobile Engg.)

DESIGN OF MACHINE ELEMENTS

(2012 Pattern) (Semester - I) (316481) (End-Sem.)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Explain the general design procedure. **[6]**

b) Differentiate between rigid and flexible coupling. **[4]**

OR

Q2) a) A foot lever is 1m from the center of shaft to the point of application of 800N load, find **[6]**

i) diameter of shaft

ii) dimensions of the key

iii) dimensions of rectangular arm of the foot lever at 60mm from the center of the shaft, assuming width of the arm as 3 times thickness. The allowable tensile strength may be taken as 73MPa and allowable shear stress as 70MPa, Width of key = 12mm and thickness of key = 8mm.

b) Explain the different types of keys. **[4]**

Q3) a) How do you classify couplings? **[2]**

P.T.O.

- b) A square threaded power screw has a nominal diameter of 30mm and a pitch of 6mm with double threads. The lead on the screw is 6KN and the mean diameter of thrust collar is 40mm. The coefficient of friction for the screw is 0.1 and for the collar is 0.09. Determine [8]
- i) Torque required to rotate the screw against the load
 - ii) Torque required to rotate the screw with load
 - iii) Overall efficiency

OR

- Q4)** a) Determine the required length of square key if key and shaft are made up of same material. Take diameter of shaft as 40mm. [2]
- b) Derive an expression for torque required to raise the load in power screws. [8]

- Q5)** a) What are the causes of stress concentration and what are the methods of reducing stress concentration? [6]
- b) A hot rolled steel rod is subjected to torsional load varying from -110N-m to 440N-m and axial load varying from 4500N to 13500N. Assume factor of safety as 8. Take ultimate stress = 550 MPa, yield shear stress = 235 MPa, yield stress = 470 MPa, fatigue stress concentration factor = 1, load factor = 0.7 for axial and 1 for torsion, surface finish factor = 0.89, size factor = 1. Calculate the diameter of rod. [10]

OR

- Q6)** a) Derive soderberg equation. [10]
- b) A mass of 500Kg is being lowered by means of steel wire rope having cross sectional area 250mm². The velocity of weight is 0.5m/sec. when the length of extended rope is 20m, the sheave gets stuck up. Determine the stress induced in the rope due to sudden stoppage of sheave. Take $E = 0.8 \times 10^6$ MPa. [6]

- Q7) a)** Explain the hydrodynamic theory of lubrication. **[6]**
- b) The following data is given for a 360° hydrodynamic bearing. Radial load = 3.2KN, Journal speed = 1490 rpm, journal diameter = 50mm, bearing length = 50mm, radial clearance = 0.05mm, viscosity of lubricant = 25cP. Assuming that the total heat generated in the bearing is carried by the total flow in the bearing. Calculate **[10]**
- i) coefficient of friction
 - ii) power lost in friction
 - iii) minimum oil film thickness
 - iv) flow requirement in Lit/min
 - v) temperature rise

I/d	S	(r/c)f	(h _o /c)	Q/rcnl
1	0.121	3.22	0.4	4.33
1.5	0.134	3.49	0.6	4.89

OR

- Q8) a)** Derive petroff's equation for bearing. **[6]**
- b) A 6306 radial ball bearing with inner ring rotation has a 10 seconds work cycle as follows. If basic dynamic capacity of the bearing is 24.25KN, determine the expected life of this bearing. Take radial factor $x = 0.56$, thrust factor $y = 1.43$ and rotating factor $v = 1$. **[10]**

	<u>For 2 seconds</u>	<u>For 8 seconds</u>
Radial load	4KN	3KN
Axial load	2KN	0
Speed	900rpm	1200rpm

Q9) a) Derive Lewis equation for beam strength. [6]

b) Design spur gear set to transmit 20KW at 900rpm of pinion. The transmission ratio is 3. Take 20° FDI, $Z_1 = 18$, $\sigma_d = 193.2\text{MPa}$, BHN = 250 for pinion and $\sigma_d = 47.1\text{ MPa}$, BHN = 200 for gear. Check only tangential tooth load. Form factor [12]

$$Y = \pi(0.154-0.912/Z), C_v = 3.05/3.05+V .$$

OR

Q10)a) Derive an expression for formative number of teeth in helical gear. [6]

b) Design a pair of helical gears are to transmit 15KW at 10,000 rpm of the pinion with PCD 80mm. The transmission ratio is 3:1. Assume $\alpha = 20^\circ$ FDI, $\beta = 45^\circ$. $\sigma_d = 193.2\text{MPa}$, BHN = 250 for pinion and gear. Check only tangential tooth load. [12]

$$Y = \pi(0.154-0.912/Z_e), C_v = 5.55/5.55+V^{0.5} .$$



Total No. of Questions : 12]

SEAT No. :

P2318

[4758] - 53

[Total No. of Pages :3

T.E. (Electrical Engineering)
ENGINEERING ECONOMICS & MANAGEMENT
(2008 Course) (Theory) (311121) (Semester - I)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Figures to the right indicate full marks.*

SECTION - I

Q1) Define organization. Explain various types of Business ownerships with suitable examples. **[16]**

OR

Q2) a) Explain the Role of Government in Macro-economics. **[8]**

b) Explain the concept of Supply, Demand & Elasticity of Demand. **[8]**

Q3) Define management. Explain various functions of management. Differentiate management from Administration. **[16]**

OR

Q4) a) Explain various types of plant Layout. **[8]**

b) Explain the concept of six sigma & TQM. **[8]**

Q5) a) Define marketing management. Explain the functions of marketing in detail. **[10]**

b) Differentiate between conventional marketing & online marketing. **[8]**

OR

P.T.O.

- Q6)** a) Define financial management. Explain functions of financial management. [10]
- b) Explain various types of costs with examples. [8]

SECTION - II

- Q7)** a) Define motivation. Explain Maslow's need hierarchy theory of motivation. [8]
- b) Differentiate between 'X' theory & 'Y' theory of motivation. [8]

OR

Q8) Write short notes.

- a) Group Dynamics. [4]
- b) Job satisfaction. [4]
- c) Team work. [4]
- d) Leadership styles. [4]

- Q9)** a) Define Human resources management. Explain various function of Human resources management. [8]
- b) Differentiate between Recruitment & selection. [8]

OR

Q10) Write short notes.

- a) Time management. [4]
- b) Personality development. [4]

c) Stress management. [4]

d) Ethics in business. [4]

Q11)a) State & Explain the concept of Disaster management in detail. [10]

b) Explain the concept of T.P.M. [8]

OR

Q12) Prepare a detailed Disaster management plan for “Terrorist Attack”. [18]



Total No. of Questions : 12]

SEAT No. :

P2375

[4758] - 532

[Total No. of Pages :2

T.E. (Automobile)

AUTOMOTIVE ELECTRICAL & ELECTRONICS

(2012 Pattern) (Semester - I) (End -Sem.) (316482)

Time : 2 ½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Neat diagrams must be drawn wherever necessary.*
- 2) Use of logarithmic tables slide rule, Mollier chars, electronic pocket calculator and steam tables is allowed.*

Q1) Discuss in brief different battery failure. **[6]**

OR

Q2) a) Explain in brief wiring harness. **[3]**

b) Compare lead acid battery with alkaline batteries. **[3]**

Q3) With the help of sketch explain current & voltage regulator. **[8]**

OR

Q4) a) Explain with neat sketch semiconductor type regulator. **[4]**

b) Write a short note on spark advance mechanism. **[4]**

Q5) What is the purpose of indicating & warning devices provided in vehicle?
Enlist reason in support of their usefulness. **[6]**

OR

Q6) Explain following warning light:- **[6]**

- a) Oil pressure warning light
- b) Chock out warning light
- c) Ignition warning light

P.T.O.

- Q7) a)** Explain in detail with the help of neat sketch. [8]
i) Throttle Angle Sensor
ii) MAP sensor
b) Explain actuators with its types. [8]

OR

- Q8) a)** Explain solenoid actuator with the help of neat sketch & give any four automotive applications. [8]
b) Explain in detail with the help of neat sketch. [8]
i) Air flow rate sensor
ii) Angular position sensor

- Q9) a)** Describe construction & working of electronic ignition system. [8]
b) Explain in detail fuel control MAPs. [8]

OR

- Q10)a)** Write a short note on. [8]
i) ECU
ii) Micro controller
b) Explain idle speed control with its types. [8]

- Q11)a)** Explain ABS system with layout & working. [8]
b) Write a short note on [10]
i) Crash sensor
ii) Collision avoidance

OR

- Q12)a)** Write a short note on [10]
i) Radar Warning system
ii) Cruise control
b) Explain electronic control of suspension with neat sketch diagram. [8]



Total No. of Questions : 10]

SEAT No. :

P2376

[4758] - 533

[Total No. of Pages :4

T.E. (Automobile)

DESIGN OF ENGINE COMPONENTS

(2012 Pattern) (Semester - II) (316484) (End Semester)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Describe the different types of radiator matrix commonly used. What are their relative advantages and disadvantages? **[4]**

b) As Designer Select the type of engine for TATA 407 truck with 1665kg load capacity & estimate the bore diameter, stroke length, swept volume, engine speed. If the engine develops 66 kW power with mean effective pressure of 0.8 N/mm² & mean piston speed of 666m/min. **[6]**

OR

Q2) a) What are difference between water & air cooling system? **[4]**

b) Estimate - bore diameter, stroke length, swept volume, engine speed for a diesel engine which develops 91 kW power with mean effective pressure of 0.7 N/mm² & mean piston speed is 650m/min. **[6]**

Q3) a) Define Indicated thermal efficiency & Brake thermal efficiency. **[2]**

b) Determine the dimension of small end & big end bearing of the connecting rod for a diesel engine with the following data: **[8]**

Cylinder bore = 100mm, maximum gas pressure = 4 MPa, (l/d) ratio for piston pin bearing = 2, (l/d) ratio for crank pin bearing = 1.3, allowable bearing pressure for piston pin bearing = 12MPa, allowable bearing pressure for crank pin bearing = 7.5 MPa.

OR

P.T.O.

Q4) a) Enlist the type of lubricant used in recent I.C. Engine with grade. [2]

b) The following data is given for the piston of a four stroke diesel-engine
Cylinder bore = 250mm, Maximum gas pressure = 4N/mm², Allowable bearing pressure for skirt = 0.4 MPa, ratio of side thrust on liner to maximum gas load on piston = 0.1, Width of top land = 45mm, width of ring grooves = 6mm, total number of piston ring = 4, Axial thickness of piston rings = 7mm. Calculate Length of the skirt & length of the piston.[8]

Q5) a) Draw Valve gear mechanism for 4-Stroke I.C. engine & explain the function of each component. [4]

b) The cylinder of a four stroke diesel engine has the following specifications: [12]

Brake power = 7.5kW, speed = 1400 rpm, indicated mean effective pressure = 0.35 MPa, mechanical efficiency = 80%, maximum gas pressure = 3.5MPa. The cylinder liner and head are made of grey cast iron FG 260 ($S_{ut} = 260 \text{ N/mm}^2$ and $\mu = 0.25$). The studs are made of plain carbon steel 40 C8 ($S_{yt} = 380 \text{ N/mm}^2$) The factor of safety for all parts is 6.

Calculate:

- i) Bore and length of the cylinder liner
- ii) Thickness of the cylinder liner
- iii) Thickness of the cylinder head
- iv) Size, number and pitch of studs.

Re-boring allowance for I.C.engine cylinder is:

D	75	100	150	200	250	300	350	400	450	500
C	1.5	2.4	4.0	6.3	8.0	9.5	11.0	12.5	12.5	12.5

OR

Q6) a) Design an exhaust valve for a horizontal diesel engine using the following data: Cylinder bore = 150mm, length of stroke = 275mm, engine speed = 500 rpm, maximum gas pressure = 3.5 MPa, seat angle = 45°. **[8]**

Calculate:

- i) Diameter of the valve port
- ii) Thickness of the valve head
- iii) Diameter of the valve stem
- iv) Maximum lift of the valve

Assume mean velocity of the gas = 50m/s, constant K for steel valve as 0.42 and permissible bending stress σ_b as 50N/mm².

b) The Cylinder of four stroke diesel engine has the following specification, Cylinder bore = 150mm, maximum gas pressure = 3.5 N/mm², Cylinder material = Grey C.I. FG 200 ($S_{ut} = 200\text{MPa}$), Factor of Safety = 5, position ratio = 0.25, Determine thickness of the wall & net circumferential stresses in the cylinder wall. **[8]**

Q7) a) Explain the working procedure of mechanical fuel pump with neat Sketch. **[8]**

b) Explain working of exhaust gas CO and HC analyzer with neat sketch. **[8]**

OR

Q8) Write a short note on: **[16]**

- a) Cylinder leakage test
- b) Cylinder compression test
- c) Vacuum gauge test
- d) Cylinder power balance

- Q9)** a) Write the advantages of Dual Twin Spark-ignition (DTS-i) over single spark ignition Engine. [9]
- b) Explain Homogenous Charge Compression Ignition (HCCI). [9]

OR

- Q10)**a) Explain Variable valve timing (VVT) with neat sketch. [9]
- b) Write a note on Wankel Engine & Dual fuel engine. [9]



Total No. of Questions : 10]

SEAT No. :

P2377

[4758] - 534

[Total No. of Pages :3

T.E. (Automobile Engineering)
AUTOMOTIVE TRANSMISSION
(2012 Course) (Semester - II) (End-Sem.) (316485)

Time :2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Attempt all questions.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary.*

Q1) a) Explain construction & working to torque tube drive arrangement with neat sketch. **[5]**

b) Compare front engine rear wheel drive with Rear engine rear wheel drive. **[5]**

OR

Q2) a) Explain Bus chasis layout with all components mounted on it. **[5]**

b) Explain constant velocity joint with neat sketch. **[5]**

Q3) a) Explain in detail with neat sketch construction and working of centrifugal clutch. **[5]**

b) Explain with neat sketch working of single plate clutch. **[5]**

OR

Q4) a) Which are the clutch lining materials? Explain it in brief. **[5]**

b) Explain construction and working of synchromesh gearbox with neat sketch. **[5]**

P.T.O.

- Q5) a)** Explain with neat sketch semi floating axle? [8]
- b) What are types of differential? Explain the construction & working of conventional differential. [8]

OR

- Q6) a)** What is the function of final drive? Enlist the various types of loads acting on the rear axle. [8]
- b) Explain fully floating rear axle in detail with neat sketch. [8]

- Q7) a)** An epicyclic gear train as shown in fig.A. Sun Wheel S-30 teeth & two planet wheels P, P-50 teeth each. The planet wheels mesh with internal teeth of a fixed annulus A. The driving shaft is connected to an arm which carries the planet wheels. The driving shaft carries the sun wheel transmits 4kW at 300rpm determine speed of driven shaft and torque transmitted if overall efficiency is 95%. [12]

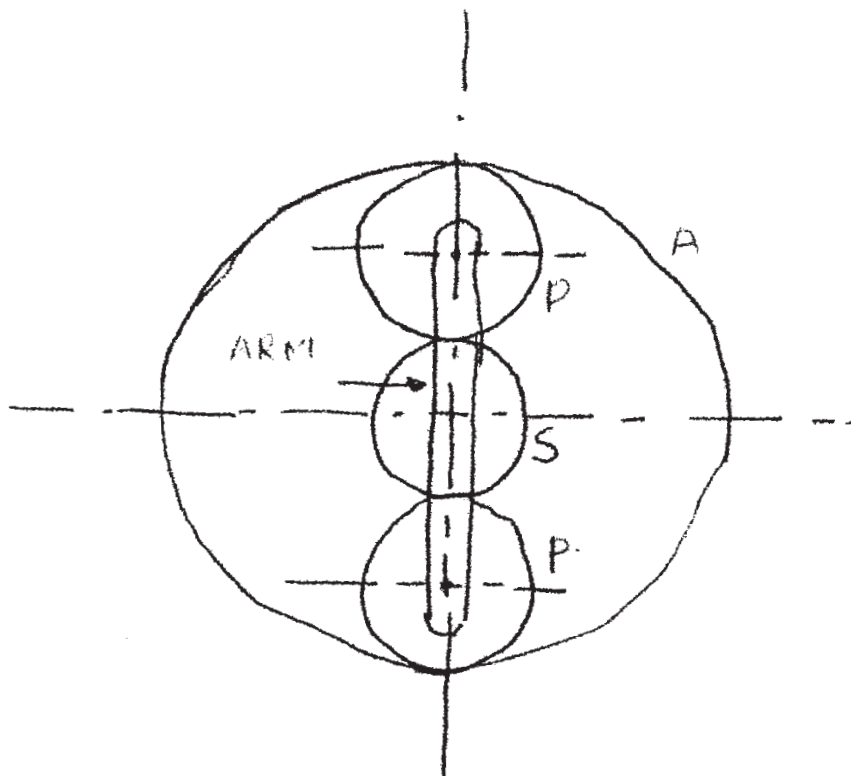


Fig (A) Epicyclic gear train.

- b) Explain the torque converter with its constructional details? [6]

OR

Q8) a) An epicyclic gear train consist of a sun wheel S a stationary internal gear E and three identical planet wheels P carried on a star shaped planet carrier C. The size of different toothed wheel is such that the planet carrier C rotate at $\frac{1}{5}$ th speed of sun wheel S. The minimum number of teeth on any wheels is 16 the driving torque on sun wheel is 98.1 Nm. Determine (Refer Fig. B). **[12]**

- i) Number of teeth on different wheels of train
- ii) Torque necessary to keep the internal gear stationary.

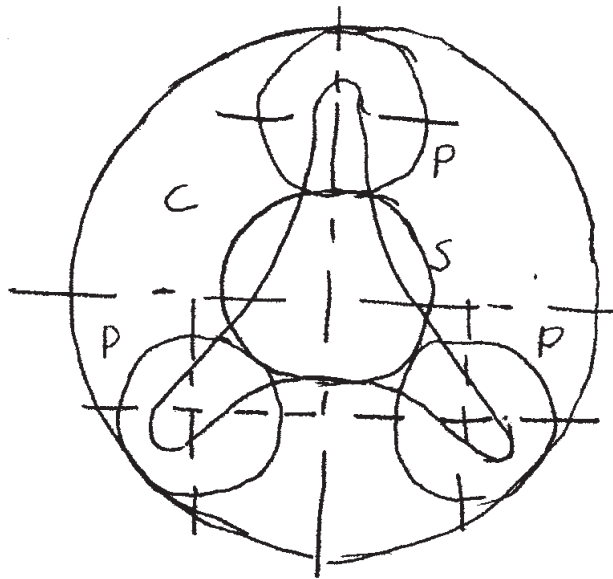


Fig (B) Epicyclic Gear Train.

b) Explain the construction and working of fluid fly wheel with neat sketch. **[6]**

Q9) a) Explain with neat sketch continuous variable Transmission (CVT). **[8]**

b) What do you mean by Hydromatic transmission? Explain it in detail with neat sketch. **[8]**

OR

Q10) a) Compare manual transmission with Automatic transmission. **[8]**

b) What are the advantages & disadvantages of CVT. **[8]**



Total No. of Questions : 12]

SEAT No. :

P2378

[4758]-535

[Total No. of Pages : 3

T.E. (Automobile)

AUTOMOTIVE AERODYNAMICS & BODY ENGG.

(2012 Pattern) (Semester - II) (End - Semester) (316486)

Time : 2 ½ Hours]

[Max. Marks :70

Instructions to the candidates:

- 1) Neat diagrams must be drawn wherever necessary.*
- 2) Figures to the right side indicate full marks.*
- 3) Assume suitable data, if necessary.*
- 4) Use of non- programmable calculator is allowed.*

Q1) Write a short note on:

[6]

- a) Rolling, pitching & yawing.
- b) Development of lift on Aero foil.

OR

Q2) Explain the various body optimization techniques to reduce drag.

[6]

Q3) Write a short note on:

[8]

- a) Full scale wind tunnel
- b) Flow visualisation technique

OR

Q4) a) Explain the strategies for aerodynamic development of car.

[6]

- b) Describe drag cars as a bluff body.

[2]

P.T.O.

Q5) Explain with a neat sketch Hatch back, fast back & square back for dust flow pattern at rear. [6]

OR

Q6) How forces and moments will act on the vehicle at running condition. [6]

Q7) a) Prepare the layout of the luxury bus having capacity of 42 seats considering any six features. [12]

b) Sketch and explain typical car body with its nomenclature. [6]

OR

Q8) a) Write a short note on [8]

i) Double skin construction.

ii) Split level and articulated bus.

b) Sketch five types of car classified as per styling forms, similarly write two constructional features of each. [10]

Q9) a) List six major requirements of driver cabin. What factors to be considered while designing driver cabin for truck. [8]

b) Write a short note related to bus. [8]

i) Luggage space location.

ii) Emergency door location.

OR

Q10) a) Sketch the different types of commercial vehicle bodies with its brief description. [10]

b) Explain ladder type chassis frame with neat sketch. [6]

- Q11)a)** Explain different types of seats and seat belts used in Automobiles.[10]
- b) Explain the ergonomic considerations in driver seat design for bus. [6]

OR

- Q12)a)** Define and explain the working and non working joints with neat sketch.[8]
- b) Explain symmetric and asymmetric loading with neat sketch. [8]

EEE

Total No. of Questions : 8]

SEAT No. :

P2379

[4758] - 536

[Total No. of Pages :3

T.E. (E& TC)

SYSTEM PROGRAMMING AND OPERATING SYSTEM

(2012 Course) (Semester - I) (End-Sem.) (304185)

Time :2 ½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data if necessary.*

Q1) a) Show parsing steps of $\langle id \rangle + \langle id \rangle * \langle id \rangle$ according to the following grammar: **[7]**

$E ::= TE''$

$E'' ::= + E \mid \epsilon$ (epsilon)

$T ::= VT''$

$T'' ::= *T \mid \epsilon$ (epsilon)

$V ::= \langle id \rangle$

b) Explain design of direct linking loader. Also explain the required data structures. **[7]**

c) Explain analysis phase of a compiler. **[6]**

OR

Q2) a) What is parsing. Explain the language processing tools. **[7]**

b) Discuss the terminologies Translated origin, Link origin, Load origin Relocation factor. **[7]**

c) Explain nested macros with example. Also explain expansion time variables with example. **[6]**

P.T.O.

- Q3)** a) Explain various states of a process with diagram. [6]
 b) List the categories of system calls and explain process system call with an example. [6]
 c) Find out the safe sequence for execution of 3 processes using Bankers algorithm [6]

Maximum Resources: $R_1 = 4, R_2 = 4$

Allocation Matrix

	R_1	R_2
P_1	1	0
P_2	1	1
P_3	1	2

Maximum Requirement Matrix

	R_1	R_2
P_1	1	1
P_2	2	3
P_3	2	2

OR

- Q4)** a) Explain different models of threads. [6]
 b) Explain dining philosopher's problem and Readers-Writers problem with example. [6]
 c) Consider the following processes where Arrival and Burst time are as shown below [6]

Process	Burst Time
P_1	05
P_2	04
P_3	07
P_4	06

Calculate the Average Waiting Time and Average Turn-around Time if the processes are scheduled using SJF.

- Q5)** a) List the design issues for paging systems and explain any 2. [6]
 b) Consider the following Page reference string: 8,1,3,5,3,1,4,8,5,7,1,2.
 The number of page frames = 3, calculate the page faults and the hit ratio for First In First Out Page replacement algorithm. [6]
 c) Explain the types of fragmentation and ways to reduce them. [4]

OR

- Q6)** a) Write the difference between paging and segmentation. [6]
b) Consider memory partitions as 100K, 500K, 200K, 300K and 600K in order. How would each of the First fit, Best fit and Worst fit algorithms place the processes of 212K, 417K, 112K and 426K are to be allocated (in order)? Which algorithm makes the most efficient use of memory. [6]
c) Explain need of demand paging with advantages. [4]

- Q7)** a) Explain file attributes and the file operations. [6]
b) Explain Linux EXT 2 file system with diagram. [6]
c) Explain I/O software layers. [4]

OR

- Q8)** a) Write short note on CD and DVD. [6]
b) Explain the directory system with diagram and directory operations. [6]
c) Explain the need of EXT 3 over EXT 2 file system of Linux. [4]



Total No. of Questions : 8]

SEAT No. :

P2380

[4758]-537

[Total No. of Pages : 2

T.E. (E & TC)

DIGITAL COMMUNICATION

(2012 Course) (Semester-I) (304181) (End Semester)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Attempt all questions.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of electronic pocket calculator and steam tables is allowed.*
- 5) *Assume suitable data if necessary.*

- Q1)** a) The signal $x(t) = \cos(200\pi)t + 0.25 \cos(700\pi)t$ is sampled at the rate of 400 samples per second, waveform is then passed through an ideal low pass filter with 200 Hz BW. Write an expression for filter output and sketch the frequency spectrum of sampled waveform. [8]
- b) Explain ergodic process if $x(t) = A \cos(2\pi fct + \phi)$ is random process with ϕ as a random variable uniformly distributed over $(0, 2\pi)$ prove that $x(t)$ is ergodic in mean. [6]
- c) Explain various data formats. [6]

OR

- Q2)** a) With suitable spectral diagram prove the sampling theorem and explain aliasing effect. [6]
- b) What is digital Hierarchy used in digital communication system? Explain anyone with a neat sketch. [6]
- c) When a WSS random process $x(t)$ is applied to input of LTI system with impulse response $h(t) = 3e^{-2t} u(t)$ find the mean value of system if $E[x(t)] = 2$ and its autocorrelation. [8]

- Q3)** a) A polar binary signal $p_i(t)$ is +1 or -1 pulse during interval $[0, T]$. AWGN noise with power spectral density 10^{-5} W/Hz is added to the signal. Determine the energy per bit with bit error probability of $P_e \leq 10^{-4}$ using match filter. [8]
- b) Derive an expression of error probability of BPSK using matched filter. [8]

OR

P.T.O.

- Q4)** a) Explain likelihood ratio test in detection theory. [8]
b) Explain Gram-Schmit procedure for orthogonalization. [8]
- Q5)** a) Explain GMSK and its use in wireless data transmission. [8]
b) Compare following digital modulation schemes [10]
i) QPSK
ii) DPSK
iii) FSK

OR

- Q6)** a) Sketch the waveforms of MSK for the given bit stream 11001001. [8]
b) A bandpass data transmission scheme uses PSK with bit interval 0.2m sec. The carrier amplitude at the receiver input is 1mV and PSD of AWGN is 10^{-11} watt/Hz. Calculate the probability of error of the receiver. [10]
- Q7)** a) What is PN sequence? State the properties of PN sequence with the help of 4 stage shift register. [8]
b) Draw and explain FHSS. System with transmitter and receiver section. [8]

OR

- Q8)** a) Explain in brief: [8]
i) Processing gain.
ii) Jamming margin.
iii) Fast freq. hopping.
iv) Slow freq. hopping
- b) Represent variation of the frequency of an fast hop spread spectrum system with binary FSK, having following parameters. Number of bits per MFSK symbol $K = 2$, Number of MFSK tones $M = 2^K = 4$, length of pN segment per hop $K = 3$, total number of frequency hops $2^K = 8$ for the binary message of 01111110001001111010. [8]



Total No. of Questions : 8]

SEAT No. :

P2381

[4758] - 538

[Total No. of Pages :3

T.E. (Electronics & Telecommunication)
ELECTROMAGNETICS AND TRANSMISSION LINES
(2012 Pattern) (304184) (Semester - I) (End Semester)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answers to the two sections should be written in separate answer books.*
- 2) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of calculator is allowed.*
- 6) *Assume suitable data if necessary.*

Q1) a) Derive the expression for electric field intensity \vec{E} at a point 'P' due to infinite line charge with uniform line charge density ' ρ_L '. [6]

b) Derive Laplace and Poisson equations for electrostatics & hence state physical significance of Laplace & Poisson equations. [6]

c) A current sheet $\vec{k} = 9\vec{a}_y$ A/m is located at $z = 0$. The region 1 which is at $z < 0$ has $\mu_{r1} = 4$ and region 2 which is at $z > 0$ has $\mu_{r2} = 3$.

Given : $\vec{H}_2 = 14.5\vec{a}_x + 8\vec{a}_z$ A / m Find \vec{H}_1 [8]

OR

Q2) a) Derive the expression for the capacitance of spherical plate capacitor. [6]

b) Derive expression for Biot & Savart law using magnetic vector potential. [6]

c) $\vec{D} = \frac{5x^3}{2} \hat{a}_x$ c/m². Prove divergence theorem for a volume of cube of side 1m. Centered at origin & edges parallel to the axis. [8]

P.T.O.

- Q3) a)** Define displacement current and displacement current density & hence show that [8]

$$\nabla \times \mathbf{H} = \mathbf{J}_c + \mathbf{J}_d$$

Where $\mathbf{J}_c \rightarrow$ conduction current density

$\mathbf{J}_d \rightarrow$ Displacement current density

- b) Select values of K such that each of the following pairs of fields satisfies Maxwell's equation. [8]

i) $\bar{\mathbf{E}} = (Kx - 100t)\bar{a}_y \text{ V / m}$

$$\bar{\mathbf{H}} = (x + 20t)\bar{a}_z \text{ A / m}$$

$$\mu = 0.25 \text{ H / m} \quad \epsilon = 0.01 \text{ F / m}$$

ii) $\bar{\mathbf{D}} = 5x \hat{a}_x - 2y \hat{a}_y + Kz \hat{a}_z \text{ } \mu\text{C / m}^2$

$$\bar{\mathbf{B}} = 2\bar{a}_y \text{ mT}$$

$$\mu = \mu_0 \quad \epsilon = \epsilon_0$$

OR

- Q4) a)** What is mean by uniform plane wave, obtain the wave equation travelling in free space in terms of E. [8]

- b) Derive Maxwell's equations in differential and integral form for time varying and free space. [8]

- Q5) a)** Derive the expression for characteristic impedance (Z_0) and propagation constant (γ) in terms of primary constants of transmission line. [8]

- b) A cable has an attenuation of 3.5dB/Km and a phase constant of 0.28 rad/km. If 3V is applied to the sending end then what will be the voltage at point 10 km down the line when line is terminated with Z_0 . [8]

OR

- Q6) a)** Explain the phenomenon of reflection of transmission line and hence define reflection coefficient. [6]

- b) A transmission line cable has following primary constants. [10]

$$R = 11 \Omega/\text{km}, G = 0.8 \mu\text{mho} / \text{km}$$

$$L = 0.00367 \text{ H/Km} \quad C = 8.35 \text{ nF/km}$$

At a signal of 1 kHz calculate

- i) Characteristic impedance Z_0
- ii) Attenuation constant (α) in Np/Km
- iii) Phase constant (β) in radians / Km
- iv) Wavelength (λ) in Km
- v) Velocity of signal in Km/sec.

- Q7)** a) What is the impedance matching? Explain necessity of it, what is stub matching? Explain the single stub matching with its merits and demerits. [9]
- b) Explain standing wave and why they generate? Derive the relation between the SWR and magnitude of reflection coefficient? [9]

OR

- Q8)** a) What do you mean by distortionless line. Derive expression for characteristic impedance and propagation constant for distortionless line. [8]
- b) The VSWR on a lossless line is found to be '5' and successive voltage minima are 40 cm apart. The first voltage minima is observed to be 15cm from load. The length of a line is 160cm and characteristic impedance is 300Ω . Using Smith chart find load impedance, sending end impedance. [10]



Total No. of Questions : 10]

SEAT No. :

P2382

[4758]-539

[Total No. of Pages : 4

T.E. (E & TC)

DIGITAL SIGNAL PROCESSING

(2012 Course) (Semester - I) (304182) (End Semester)

Time : 2½ Hours]

[Max. Marks :70

Instructions to the candidates:

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 4) *Assume suitable data, if necessary.*

Q1) a) Consider the analog signal $x_a(t)$ as $x_a(t) = 6 \cos 50 \pi t + 3 \sin 200 \pi t - 3 \cos 100 \pi t$ **[5]**

- i) Determine the minimum sampling frequency.
 - ii) Determine $x(n)$ at minimum sampling frequency.
 - iii) Sketch the waveform and show the sampling points.
- b) Determine the transfer function and impulse response of the LTI system given by the difference equation. **[5]**

$$y(n) + \frac{3}{4} y(n-1) + \frac{1}{8} y(n-2) = x(n) + x(n-1)$$

OR

Q2) a) State and prove convolution property of Z transform. **[5]**

- b) Compute 4- points DFT of the sequence given by $x(n) = (-1)^n$ using DIT FFT algorithm. **[5]**

P.T.O.

Q3) a) State four important advantages of digital signal processing over analog signal processing. **[4]**

b) For the following sequences, **[6]**

$$x_1(n) = \begin{cases} 1 & 0 \leq n \leq 2 \\ 0 & \text{otherwise} \end{cases}$$

$$x_2(n) = \begin{cases} 1 & 0 \leq n \leq 2 \\ 0 & \text{otherwise} \end{cases}$$

Compute linear convolution using circular convolution.

OR

Q4) a) Using partial fraction expansion, find inverse Z-Transform of following system function and verify it using long division method, **[5]**

$$H(Z) = \frac{1+2Z^{-1}}{1-0.4Z^{-1}-0.12Z^{-2}} \text{ if } h(n) \text{ is causal.}$$

b) State and prove circular time shift property of DFT **[5]**

Q5) a) Design a butterworth digital IIR lowpass filter using bilinear transformation to satisfy following specifications: **[10]**

$$\begin{aligned} 0.6 \leq |H(e^{jw})| \leq 1.0 & \quad 0 \leq w \leq 0.35\pi \\ |H(e^{jw})| \leq 0.1 & \quad 0.7\pi \leq w < \pi \end{aligned} \cdot \text{ Use } T = 0.1 \text{ seconds.}$$

b) Compare between Bilinear transformation method and impulse invariant method. **[3]**

c) Draw direct form I & direct form II realisations for the second order system given by: **[4]**

$$y(n) = 2b \cos w_0 y(n-1) - b^2 y(n-2) + x(n) - b \cos w_0 x(n-1)$$

OR

- Q6) a)** The system function of an analog filter is given by [4]

$$H(s) = \frac{s + 0.2}{(s + 0.2)^2 + 9}$$

Convert it to digital filter using Impulse Invariant technique. Assume $T = 1$ second.

- b) Given $H(s) = \frac{1}{s+1}$. Apply impulse invariant method to obtain digital filter transfer function and difference equation. Assume $T = 1$ second. [4]

- c) For the system given by following equation [9]

$$H(z) = \frac{1 - z^{-1}}{1 - 0.2z^{-1} - 0.15z^{-2}}$$

Draw cascade and parallel realisation.

- Q7) a)** Design a linear phase FIR band pass filter using hamming window with cut off frequencies 0.2 rad/sec & 0.3 rad/sec. $M = 7$. [9]

- b) Explain the characteristics of window function. [4]

- c) Distinguish between FIR and IIR filter. [4]

OR

- Q8) a)** Design a linear phase FIR lowpass filter with a cutoff frequency of 0.5 rad/sample by taking 11 samples of ideal frequency response. [9]

- b) What is Gibb's phenomenon? How it is reduced? [4]

- c) Show that the filter with symmetric impulse response has linear phase response. [4]

- Q9)** a) With the help of neat diagram, and waveform explain sampling rate conversion by non-integer factor. [4]
- b) Sampling rate is to be reduced from 96kHz to 1 kHz. Highest frequency of interest is 450 Hz $\delta_p = 0.01$, $\delta_s = 0.001$. Design a decimator with decimating factors of 32 and 3. [6]
- c) Write short notes on [6]
- i) MAC unit
 - ii) Barrel shifter

OR

- Q10)**a) What is the role of anti aliasing filter & anti imaging filter in decimator & interpolator, respectively. [4]
- b) Describe four important features of a digital signal processor. [6]
- c) Explain the architecture of TMS 320C67XX digital signal processor. [6]

EEE

Total No. of Questions : 12]

SEAT No. :

P2319

[4758] - 54

[Total No. of Pages :3

T.E. (Electrical)

ENERGY AUDIT & MANAGEMENT

(2008 Course) (303146) (Semester - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

Q1) a) Write a exhaustive note on energy scenario in India and across the globe. **[8]**

b) Give highlights of Electricity Act 2003. What are the provisions in act for power for every one. **[8]**

OR

Q2) a) What is energy security? Discuss various ways to secure our nation on energy front. **[8]**

b) Define term energy intensity. Explain significance of it. Also state importance of energy conservation. **[8]**

Q3) a) What is energy policy? What is the significance of energy policy? How this will help Organisation to save energy. **[9]**

b) Explain different avenues for demand control in management in Demand side management. State benefits of Demand Side Management. **[9]**

OR

Q4) a) What are desirable qualities of Energy Manager? State duties and responsibilities of Energy Manager. **[10]**

b) With suitable examples give structure of energy management division and energy committee. **[8]**

P.T.O.

- Q5)** a) Discuss steps in detailed energy audit. [8]
b) Explain ABC analysis and data analysis relevant to energy audit. [8]

OR

- Q6)** a) Explain the format of energy audit report. Also state the importance of Executive Summary. [8]
b) Compare detailed energy audit and preliminary audit. [8]

SECTION - II

- Q7)** a) A energy conservation project require initial investment of Rs. 1,00,000 at the beginning. The cash flow generated over five years are Rs. 20,000, Rs. 20,000, Rs. 30,000, Rs. 30,000 and Rs. 30,000 respectively. The sample discounting factors are 10% 12% and 14%. Calculate internal rate of return for above investment. [10]
b) Explain following tariffs and how these are helpful for energy saving. [8]
i) Apparent energy tariff
ii) Time of day tariff

OR

- Q8)** a) Explain time value of money and criteria for financial appraisal of project. [9]
b) Calculate NPV for following investment Capital cost Rs. 50,000, cash flows Rs. 5,000, Rs. 7,000, Rs. 9,000, Rs. 11,000, Rs. 15,000 and Rs. 20,000. Take discounting factor as 10%. Comment on your findings. [9]
- Q9)** a) What is cogeneration? Explain topping cycle in detail. Also state advantages of cogeneration. [8]
b) Enlist energy saving options in lighting systems. [8]

OR

- Q10)a)** Discuss energy conservation measures in boiler and steam systems. **[8]**
b) Explain no cost options for energy savings in residential and commercial sector. **[8]**

- Q11)a)** Highlight findings of energy audit of T & D sector and enumerate suitable measures for reducing energy losses. **[8]**
b) Report energy saving recommendations after energy audit of foundry and steel mill. **[8]**

OR

- Q12)a)** Discuss energy audit report of sugar industry. **[8]**
b) Identify energy saving opportunities during energy audit of commercial building and IT industry. **[8]**



Total No. of Questions : 8]

SEAT No. :

P3920

[4758] - 540

[Total No. of Pages : 2

T.E. (E & TC) (Semester - I)
MICROCONTROLLER APPLICATION

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *All questions are compulsory.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Use of Calculator is allowed.*
- 5) *Assume suitable data, if necessary.*

Q1) a) What are different addressing modes of 8051 Microcontroller? Explain giving example. **[6]**

b) What is RISC Microcontroller, how it is different than CISC Microcontroller? **[6]**

c) Explain memory mapping of PIC18F Microcontroller? **[8]**

OR

Q2) a) Explain role of microcontroller in embedded system. **[6]**

b) Explain Interrupt Enable and Interrupt Priority register? **[6]**

c) Draw and Explain PIC18F Microcontroller Architecture. **[8]**

Q3) a) Write a program for 1Khz 10% duty cycle PWM waveform. **[8]**

b) Draw and Explain the interfacing of LCD with Port D and Port E of PIC18Fxxx microcontroller. Write C code to display 'WELCOME'. **[8]**

P.T.O.

OR

- Q4)** a) Explain different Timer modes and their applications of PIC 18xx in detail. [8]
- b) Draw and explain the interfacing of LCD in 8-bit mode with PIC18x microcontroller without busy flag. Write C code to display “S.P. Univ. Pune”. [8]
- Q5)** a) Draw interfacing diagram and write a algorithm for DC Motor speed controller using PIC18xxx. [10]
- b) Compare SPI and I2C protocol. [8]

OR

- Q6)** a) Draw interfacing diagram and write a program for I2C based RTC with PIC18Fxxx. [10]
- b) Draw and Explain MSSP structure of PIC18Fxx. [8]
- Q7)** Design of DAS system for pressure monitoring system (use any suitable sensor). [16]

OR

- Q8)** Design of Digital Multimeter to display values on LCD display. [16]



Total No. of Questions : 8]

SEAT No. :

P2383

[4758] - 541

[Total No. of Pages :2

T.E. (E & TC)

INFORMATION THEORY AND CODING TECH.

(2012 Course) (End - Sem.) (Semester - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q1 or 2, 3 or 4, 5 or 6, 7 or 8.*
- 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.*

- Q1)** a) Design a Shannon-Fano code for a source generating 5 different messages with probabilities 0.45, 0.3, 0.15, 0.05, 0.05. Find the coding efficiency. [7]
- b) What are interleaved codes? Explain with suitable example. [7]
- c) Write the procedure for decoding a cyclic code. [6]

OR

- Q2)** a) What is Run length encoding? Explain how it is used in bitmap file formats. [7]
- b) What are single parity check codes? Write about the decoding performance of these codes. [7]
- c) What is CRC code? Explain how are they generated? [6]

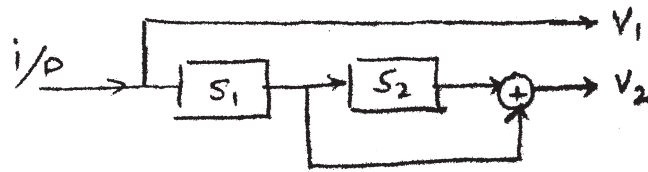
- Q3)** a) Find the generator polynomial for (7, 4) BCH code. Use primitive polynomial $x^3 + x + 1$. [10]
- b) What are RS-codes? Write features & applications of Rs. codes. [6]

OR

- Q4)** a) The received code polynomial for a (7, 4) BCH code is $r(x) = x^6 + x^4 + x^3 + x^2$. Find the corrected codeword polynomial if single error has occurred. [8]
- b) What are cyclic hamming codes? Give one example of cyclic hamming code. [4]
- c) Explain stop-and-wait ARQ. [4]

P.T.O.

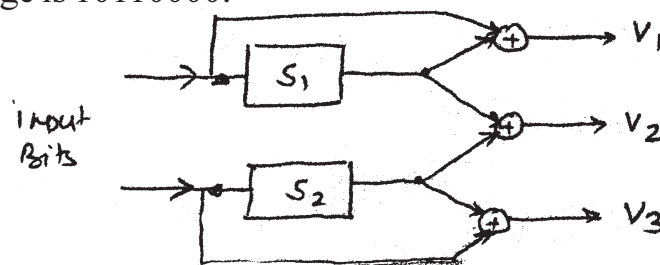
Q5) a) Draw state diagram for following convolutional encoder. [6]



- b) Explain with suitable example generator polynomial description of convolutional codes. [8]
- c) Write a short note on Turbo codes. [4]

OR

Q6) a) For the following convolutional encoder, find the coded output if input message is 10110000. [8]



- b) What is sequential decoding? Explain in brief. [6]
- c) Write a short note on LDPC codes. [4]

Q7) a) Explain how the goals of the communication system designer are conflicting. [6]

- b) What is bandwidth efficiency plane? Explain different regions in the plane. [6]
- c) Write Ungerboeck's TCM design rules. [4]

OR

Q8) a) What is error probability plane? Indicate various trade-offs on this plane. [6]

- b) What is coding gain in TCM encoder? How it is calculated? [6]
- c) What are typical design specifications of communication system? What techniques are used when [4]
 - i) Power is limited
 - ii) Bandwidth is limited



Total No. of Questions : 10]

SEAT No. :

P2384

[4758] - 542

[Total No. of Pages :3

T.E. (E & TC)

EMBEDDED PROCESSORS

(2012 Pattern) (End-Sem.) (Semester -II) (304191)

Time :3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 4) *Assume suitable data, if necessary.*

- Q1)** a) What is the function of Barrel shifter in ARM data flow model. [2]
b) What is the significance of special purpose registers r_{13} , r_{14} and r_{15} . [3]
c) Compare ARM 7, ARM 9, ARM 11. [5]

OR

- Q2)** a) Write a program for on chip ADC for LPC 2148. [6]
b) List the features of UART0? Compare it with UAR 11. [4]

- Q3)** a) Draw and explain interfacing diagram of I2C EEPROM to LPC 2148. [4]
b) Draw and explain block diagram of LPC 2148. [6]

OR

- Q4)** a) Draw and explain CPSR register structure of LPC 2148. [4]
b) Explain the following instructions with example. [6]
i) SWP R_0, R_1
ii) MUL R_1, R_2, R_3
iii) LDR $R_2, [R_3]!$

P.T.O.

- Q5) a)** Draw and explain CMSIS structure of cortex series. **[8]**
- b) Draw and explain interfacing diagram of 7 segment display with LPC1768. Draw flow chart. **[8]**

OR

- Q6) a)** Compare ARM7 with CORTEX M series. **[4]**
- b) What is need of operating system in ES? Explain desired features of OS for complex embedded system design. **[6]**
- c) Draw & explain with algorithm interfacing diagram for RGB LEDs with LPC 1768. **[6]**

- Q7) a)** What is PWM? Write a embedded C program to drive DC motor using PWM for LPC 1768. **[8]**
- b) Explain the role of following registers in LPC 1768. **[8]**
- i) Direction registers
 - ii) SET Registers
 - iii) Clear Registers
 - iv) Mask registers

OR

- Q8) a)** Draw and explain block diagram of LPC 1768 in detail. **[8]**
- b) Draw and explain power control block of LPC 1768 and explain various power saving modes. **[8]**

- Q9)** a) Draw and explain clock control block of LPC 1768 in details. [9]
- b) Explain the following blocks of LPC 1768. [9]
- i) NVIC (Nested Vector Interrupt Controller)
 - ii) MPU (Memory Protection Unit)

OR

- Q10)** Write short note on [18]
- a) Ethernet (Features, Frame structures etc)
 - b) CAN Protocol (Features, Block diag, applications, etc)
 - c) USB (Features, frame structures, etc)



Total No. of Questions : 8]

SEAT No. :

P3921

[4758] - 543

[Total No. of Pages : 4

T.E. (E & TC Engineering)
POWER ELECTRONICS
(2012 Pattern) (Semester - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6 and Q7 or Q8.*
- 2) *Neat diagrams and wave forms must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Using of nonprogrammable calculator is allowed.*
- 5) *Assume suitable data if necessary.*

- Q1) a)** Draw two transistor analogy of SCR and derive an expression for its anode current I_A ? [7]
- b) Draw & explain single phase fully controlled rectifier (full converter) for R-L load with various o/p voltage waveforms. [7]
- c) Single phase full bridge inverter is operated from 48V dc supply, it has a resistive load of $R = 2.4\Omega$. Find : [6]
- i) rms o/p voltage at fundamental frequency (VO1)
 - ii) rms o/p power
 - iii) rms o/p voltages at second & third harmonic (VO2 & VO3)

OR

- Q2) a)** Draw construction diagram of n-channel enhancement type MOSFET and explain its steady state characteristics. [7]
- b) Draw & explain three phase half controlled bridge converter for R load with o/p voltage waveforms. [7]

P.T.O.

- c) Compare 120° mode with 180° mode in three phase inverter for balanced star R load. [6]

Q3) a) Explain operation of step up chopper with circuit diagram and derive an expression for its o/p voltage : $V_o = \frac{V_s}{(1-D)}$ where D is duty cycle. [6]

- b) A DC chopper with R-L load is operated from 220V dc supply. The load parameters are $R = 5 \Omega$, $L = 7.5 \text{ mH}$ and chopping frequency $F_c = 1\text{KHz}$. If peak to peak load ripple current is maximum, calculate : [6]

- i) Maximum instantaneous load current
- ii) Minimum instantaneous load current
- iii) Peak to peak load ripple current
- iv) Average load current

- c) Explain various control strategies in DC chopper. [6]

OR

Q4) a) Explain operation of four quadrant chopper with circuit diagram. [6]

- b) Explain with block schematic working of SMPS. What are its advantages over linear power supply. [6]

- c) A single phase full wave ac voltage controller has a resistive load of $R = 10 \Omega$ and the input voltage is $V_s = 120 \text{ V(rms)}$, 50 Hz. The delay angles of thyristors T1 and T2 are equal : $\alpha_1 = \alpha_2 = \pi/2$. Determine [6]

- i) the rms output voltage
- ii) the rms output current
- iii) the input PF

- Q5) a)** Explain with block schematic working of On-line & off-line UPS. [8]
- b) The speed of a separately excited dc motor (armature) is controlled by a 1- ϕ semi-converter. The field current is also controlled by a 1- ϕ semi-converter and is set to its maximum possible value. The ac supply to both armature & field converters is single phase 208V, 60Hz. The armature resistance $R_a = 0.25\Omega$, field resistance $R_f = 147\Omega$. The motor voltage constant $K_v = 0.7032$ V/A. rad/s, the armature & field currents are continuous & ripple free. If load torque $T_L = 45$ N-m at 1000 rpm, calculate: [8]
- i) Field current I_f
 - ii) Back emf E_g
 - iii) Firing angle of converter in armature circuit
 - iv) Input power factor of armature circuit converter.

OR

- Q6) a)** Explain voltage & frequency control method for 3- ϕ induction motor drive in detail. [8]
- b) What are advantages of electronic ballast over conventional ballast? Explain working of electronic ballast with block schematic. [8]
- Q7) a)** What is EMI? Explain various sources & minimizing techniques of EMI. [6]
- b) For a thyristor, Maximum junction temperature is 125°C . The thermal resistances are $\theta_{JC} = 0.16$, $\theta_{CS} = 0.08^\circ\text{C/W}$. for heat sink temperature of 70°C , calculate total average power loss in thyristor - sink combination.
If heat sink temperature is reduced to 60°C , find new total average power loss in thyristor - sink combination. [4]
- c) Write a note on “over voltage protection” in power electronics. [6]

OR

- Q8)** a) What is the need of resonant converter? Explain ZCS resonant converter with circuit & waveforms. **[8]**
- b) Explain SLR half bridge dc-dc converter in low frequency with suitable waveforms. **[8]**



Total No. of Questions : 8]

SEAT No. :

P2385

[4758]-544

[Total No. of Pages : 2

T.E. (E & TC)

INDUSTRIAL MANAGEMENT

(2012 Course) (End - Sem.) (304192)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q.No.1 or 2, Q.No.3 or 4, Q.No.5 or 6, Q.No.7 or 8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume suitable data if necessary.*

- Q1)** a) Compare theories of F.W. Taylor and Henry Fayol. **[4]**
- b) Explain any 2 Quality Management Assistance tools with examples. **[8]**
- c) Write short note on CPM and explain following terms related to CPM.**[8]**
- i) Earliest Start Time
 - ii) Earliest Finish Time
 - iii) Latest Start Time
 - iv) Latest finish Time

OR

- Q2)** a) Enlist advantages and disadvantages of Line Organization. **[6]**
- b) Write a short note on Five S(5S). **[6]**
- c) Explain project crashing and resource leveling in detail. **[8]**

P.T.O.

- Q3)** a) Explain in detail challenges faced by HR professionals. [10]
b) What do mean by Human resource planning. Explain different steps of HR planning with neat block diagram. [8]

OR

- Q4)** a) What is HR management. Explain significance of Human Resource Management at all levels. [10]
b) Explain different roles played by HR professional. [8]
- Q5)** a) Explain any 4 C's of opportunity identification. [8]
b) Enlist advantages and disadvantages of any 2 types of business ownerships. [8]

OR

- Q6)** a) Role of an Entrepreneur in Economic Development. Explain any 8 points. [8]
b) Enlist and explain different traits of entrepreneur. [8]
- Q7)** a) Explain different types of B2C(Business to consumer) companies. [10]
b) Write a short note on Decision support System (DSS). [6]

OR

- Q8)** a) Define MIS. Explain its components. Enlist any 6 advantages of MIS.[10]
b) Write a short note on ERP (enterprise resource planning). [6]

EEE

Total No. of Questions : 8]

SEAT No. :

P2386

[4758]-545

[Total No. of Pages : 3

T.E. (E & TC)

ANTENNA & WAVE PROPAGATION

(2012 Course) (Semester - II) (End - Sem.)

Time : 3 Hours]

[Max. Marks :70

Instructions to the candidates:

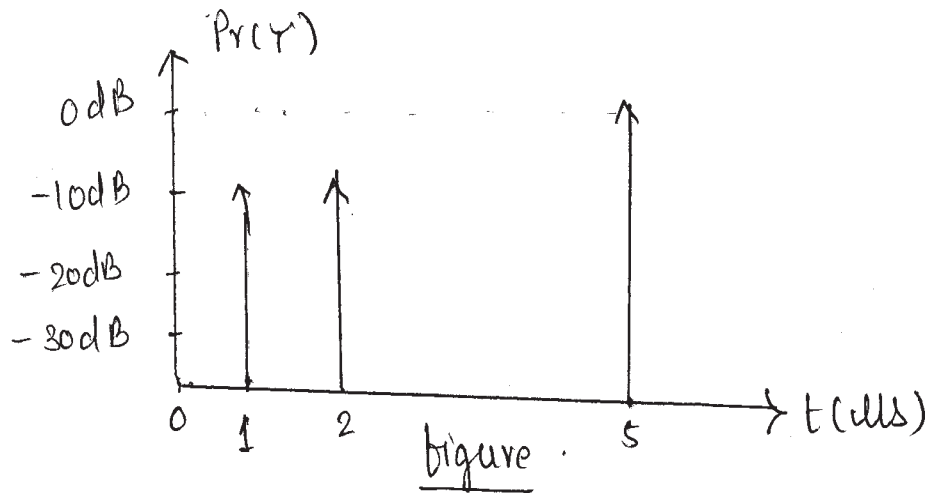
- 1) *Answer any one Questions out of Q.No.1 or 2, Q.No.3 or 4, Q.No.5 or 6, Q.No.7 or 8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume suitable data if necessary.*

- Q1)** a) What is polarization of wave? Explain the polarization of three types of wave with the help of relevant diagram? **[8]**
- b) Write a short note on **[6]**
- i) Ionospheric abnormalities
 - ii) Multiwave propagation
- c) A lossless resonant $\lambda/2$ dipole antenna with input impedance of 73Ω is to be connected to a transmission line whose characteristics impedance is 50Ω . Assuming that the pattern the antenna is given approximately by $U = B \sin^3\theta$. Find the overall maximum gain of this antenna. **[6]**

OR

- Q2)** a) What is Poynting vector? What is its significance? Derive an expression for Poynting vector? **[6]**
- b) Explain antenna radiation mechanism in detail. **[6]**
- c) Calculate the mean excess delay, rms delay spread, and the maximum excess delay (10dB) for the multipath profile given in the figure below. Estimate the 50% coherence bandwidth of the channel. **[8]**

P.T.O.



- Q3)** a) Derive the expression for radiation resistance of Infinitesimal Dipole. [9]
 b) Derive the expression for radiation resistance of small dipole antenna. [9]

OR

- Q4)** a) Calculate the radiation resistance of a double turn and an eight turn small circular loop when radius of loop is $\lambda/10$ and the medium is free space. Calculate its efficiency if loss resistance is 25Ω . [8]
 b) Derive mathematical expression for power density and radiation intensity of half wave dipole antenna and draw radiation pattern of half wave dipole antenna in E and H plane. [10]

- Q5)** a) Write a short notes on [8]
 i) Pattern Multiplication.
 ii) Binomial Array.
 b) Design a broad side Dolph-Tschebysheff array of five elements with half wavelength spacing between elements and with major to minor lobe ratio to be 19dB. Find the excitation coefficients & array factor. [8]

OR

- Q6)** a) Explain planar array. State its advantages and applications. [6]
- b) An Endfire array with element spaced at $\lambda/2$ and with axes of elements at right angles to the line of array is required to have directivity of 36. Determine -the array length and the width of major lobe. [5]
- c) Give the comparison of broadside and End fire antenna array. [5]
- Q7)** a) Give structure details, radiation pattern, specification and application of Super-turnstile Antenna. [5]
- b) What is meant by Rhombic Antenna? Explain its construction and operating principle. [5]
- c) Write a short notes on following antennas with respect to structural details, radiation pattern features and applications. [6]
- i) Hertz antenna
- ii) Lens Antenna

OR

- Q8)** a) Write short notes on the following antennas. [12]
- i) Whip antenna
- ii) Slot Antenna
- iii) Microstrip patch antenna
- b) A paraboloidal reflector antenna with diameter 20m is designed to operate at frequency of 6 GHz and illumination efficiency of 0.54. calculate the antenna gain in decibels. [4]

EEE

Total No. of Questions : 8]

SEAT No. :

P2387

[4758] - 546

[Total No. of Pages :2

T.E. (Electrical)

ADVANCE MICROCONTROLLER AND ITS APPLICATIONS

(2012 Course) (Semester - I) (303141) (End - Sem.)

Time : 2 ½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer all questions.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Use of Calculator is allowed.*
- 5) *Assume suitable data if necessary.*

Q1) a) Compare CISC and RISC. [6]

b) Explain any four instructions with example. [8]

i) MOVFF

ii) SETF

iii) ADDWFC

iv) IORLW

v) BSF

vi) DECF

c) Assuming that clock pulses are fed into pin T0CKI, write a program for counter 0 in 8 bit mode to count the pulses and display the state of the TMR0L count on PORTB. [6]

OR

Q2) a) Write a short note on oscillator modes of PIC18F458. [6]

b) Explain CALL and RETURN instructions in PIC18. [7]

c) State and explain SFR T0CON associated with timers. Find the value to be loaded in T0CON for following configuration. [7]

Timer 0 in 16 bit mode, prescaler of 128 and internal clock.

P.T.O.

- Q3)** a) Explain the function of following pins associated with a 16×2 LCD controller RS, R/ \bar{W} , E, DB0 - DB 7. [8]
- b) With a neat diagram and flow chart explain the interfacing of 4×4 key pad with PIC 18 microcontroller. [8]

OR

- Q4)** a) Write a program to receive a bytes of data serially and continuously at a baud rate of 9600. Assume Crystal frequency of 10MHz. [8]
- b) Write a short note on SPI protocol. [8]

- Q5)** a) Explain capture mode of operation of PIC 18 and also explain SFR CCP1CON register in detail. [8]
- b) Assume a pulse is being fed to the CCP 1 pin. Using Capture mode, write Assembly language program to measure the period of the pulse and puts the results on PORTB and PORTD. Use Timer 3 for Capture mode. [8]

OR

- Q6)** a) Create a 1.8KHz PWM frequency with 25% duty cycle on the CCP 1 pin. Assume XTAL = 10 MHz. [8]
- b) How PWM is used for DC motor? Explain with the connection diagram and code. [8]

- Q7)** a) Explain features of on-board ADC of PIC 18F458. Write a program for it select analog channel 0, Fosc/64, right justified display result on PORT D. [9]
- b) Explain with a flow chart flow measurement using PIC 18F458. [9]

OR

- Q8)** a) Explain interfacing of DAC with PIC 18F458. Write a program to generate triangular wave. [9]
- b) Show interfacing of LM35 with PIC 18F458. Write a program to measure and display temperature. [9]



Total No. of Questions : 10]

SEAT No. :

P2388

[4758]-547

[Total No. of Pages : 3

T.E. (Electrical)

ELECTRICAL MACHINES-II

(2012 Course) (Semester-I) (End-Semester)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Attempt Q. No. 1 or 2, Q. No. 3 or 4, Q. No. 5 or 6, Q. No. 7 or 8, Q. No. 9 or 10.*
- 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)** With suitable diagrams explain Blondel's two reaction theory. **[6]**
b) Explain parallel generator theorem. **[4]**

OR

- Q2) a)** A 1200 kVA, 3300 volt, 50Hz, 3 phase, star connected alternator has armature resistance of 0.25Ω per phase. A field current of 40 Ampere produces a short circuit current of 209.95 Ampere and the same field current of 40 ampere produces an open circuit emf of 1100 volt.

Find the voltage regulation of alternator on-

- i) Full load 0.8 lagging power factor.
 - ii) Full load 0.8 leading power factor. **[8]**
- b) Draw equivalent circuit of synchronous generator and mark all parameters in it. **[2]**

- Q3) a)** A star connected synchronous motor is rated 10 HP 400 volt. The synchronous reactance of the motor is 10Ω per phase. The armature resistance is negligible. The motor operates at unity power factor. Find current taken by the motor and back emf. Assume motor efficiency as 85%. **[6]**
b) Explain dark lamp method of synchronising the two alternators. **[4]**

OR

P.T.O.

- Q4) a)** Open circuit test and short circuit test is conducted on 3 phase alternator rated 6600 volt. Following observations are noted- [8]

Open circuit voltage (volt)	3100	5000	6600	7500	8300
Field current (ampere)	16	25	37.5	50	70

A field current of 20 Ampere produces full load current on short circuit plot occ. Calculate voltage regulation on full load at 0.8 power factor lagging. Use ampere turn (MMF) method.

- b) State any four applications of synchronous motor. [2]

- Q5) a)** With suitable diagram explain speed control of slip ring induction motor by varying the rotor resistance. [8]

Draw speed torque characteristics for different values of rotor resistance.

- b) With suitable diagram explain construction and working of permanent magnet DC motor. [8]

OR

- Q6) a)** Explain speed control of three phase induction motor by cascade connection with suitable diagram. [8]

- b) Explain construction and working of single phase induction type voltage regulator. [8]

- Q7) a)** Compare uncompensated AC series motor with compensated AC series motor. [9]

- b) A 2 pole universal motor operates on AC supply drawing a current of 4.6 Ampere. It runs at 4500 rpm. It draws input power of 320 watt from supply of 100 volt. Evaluate the maximum value of flux per pole and armature reactance. Assume armature resistance of 3.6Ω . [9]

OR

- Q8) a)** Draw circle diagram of AC series motor. Mark respective voltage drop intercepts on the circle diagram. State the meaning of each intercepts. Also write how output power, efficiency is obtained from these intercepts. [9]

- b) Explain operation of DC series motor on AC supply. State the modifications necessary to improve the performance of motor. [9]

- Q9) a)** With suitable diagram, explain construction and working of capacitor start-capacitor run motor. Draw its speed-torque characteristics. [8]
- b) Explain construction and working of shaded pole motor with suitable diagrams. State applications of this motor. [8]

OR

- Q10)a)** A 200 watt, 230 volt, 50 Hz capacitor start motor has following winding parameters-
- Main winding $R = 4.5\Omega$, $X_L = 3.7\Omega$
- Starting winding $R = 9.5\Omega$, $X_L = 3.5\Omega$
- Find the value of starting capacitance that will give maximum starting torque. [8]
- b) Explain double field revolving theory for single phase induction motor with suitable diagrams. Also plot torque speed characteristics. [8]



Total No. of Questions : 10]

SEAT No. :

P2389

[4758] - 548

[Total No. of Pages :2

T.E. (Electrical)

POWER ELECTRONICS

(2012 Course) (End - Sem.) (Semester - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume Suitable data if necessary.*

- Q1)** a) What type of triggering is used in SCRs? Explain R & RC triggering. [5]
b) Explain characteristics of GTO. [5]

OR

- Q2)** a) Explain over voltage & over current protections for SCR. [5]
b) For 1ph full controlled bridge rectifier, calculate rectification efficiency, for Resistive load. [5]

- Q3)** a) Explain working of Triac as light dimmer switch. [5]
b) What is current source converter? Explain its operation. [5]

OR

- Q4)** Explain operation of 3ph half controlled bridge converter feeding RL load. Draw output voltage waveform for $\alpha = 30^\circ$ & write output voltage expression. [10]

- Q5)** a) Draw VI chara. of MOSFET & explain its control. [8]
b) Draw step down chopper circuit & explain with expression for output voltage interms of control parameter. [8]

OR

P.T.O.

- Q6)** a) Explain VI chara. of MCT & give applications. [8]
- b) A step down chopper feeding load with $R = 10\Omega$ and $L = 5 \text{ mH}$ from 220V supply at 500 Hz and 30% duty. Calculate average output voltage and av. current. Find I_{\max} & I_{\min} if % ripple is 10%. [8]

- Q7)** a) Explain 1ph. full bridge voltage source inverter. Derive output voltage expression for RL load. Draw relevant waveforms. [8]
- b) Explain Sinusoidal PWM Technique for Inverters. Using 5 pulses /half cycle. Comment on harmonics in output voltage. [8]

OR

- Q8)** a) Explain working of 1ph full bridge inverter generating quasisquare wave in output, across inductive load. Draw waveform & explain. [10]
- b) Explain Multiple pulse PWM used in inverters. What is its advantage over single pulse PWM? [6]

- Q9)** a) Explain 3ph. 120° mode conduction VSI operation with control signals & output phase voltage waveforms for 3ph. resistive star connected load. [10]
- b) Explain voltage control & harmonic elimination techniques used in inverters. [8]

OR

- Q10)** a) Explain cascaded Multilevel inverter using 3H- bridges connected to V input supply. Draw output voltage waveforms. [10]
- b) Compare: [8]
- Multipulse and Multi level inverters.
 - VSI & CSI.



Total No. of Questions : 8]

SEAT No. :

P2390

[4758]-549

[Total No. of Pages : 3

T.E. (Electrical)

ELECTRICAL INSTALLATION, MAINTENANCE & TESTING

(2012 Course) (End - Sem.)

Time : 2 ½ Hours]

[Max. Marks :70

Instructions to the candidates:

- 1) *Answer Q.No.1 or 2, Q.No.3 or 4, Q.No.5 or 6, Q.No.7 or 8.*
- 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.*

Q1) a) Explain the following maintenance strategies: **[8]**

- i) Corrective maintenance
- ii) Predictive maintenance

b) Write a short note on Degree of polymerization. **[6]**

c) State the Induction motor fault parameters. **[6]**

OR

Q2) a) What is condition based maintenance? State its advantages. **[8]**

b) State the reasons for the Insulation Degradation. **[6]**

c) Write a short note on Infrared Thermography in relation with condition monitoring of Induction motor. **[6]**

P.T.O.

- Q3) a)** Write a trouble shooting chart of transformer. [8]
- b) State the various failure modes of power cables and explain any one fault diagnostic test to be conducted on power cables. [8]

OR

- Q4) a)** Explain the various abnormal condition in Induction Motor. [8]
- b) Write a short note on testing of capacitor Bank. [8]

- Q5) a)** Differentiate between [8]

- i) Feeder & Distributor
- ii) Overhead Line & Underground line.

- b) A 1Φ a.c distributor AB 300 m long is fed from end A and is loaded under [10]

- i) 100 A at 0.707 pf lagging 200m from pt. A.
- ii) 200 A at 0.8 pf lag 300m from pt. A.

The load resistance and reactance of the distributor is 0.2Ω and 0.1Ω per KM. Calculate the total voltage drop in the distributor. The load pf refer to the voltage at the far end.

OR

- Q6) a)** Explain the general design consideration of the Distribution feeder. [8]

- b) A two conductor cable 1Km long is required to supply a constant current of 200A throughout the year. The cost of cable including installation is Rs $(20a+20)$ / meter where 'a' is the area of the cross section of conductor in cm^2 . The cost of energy is 5 paise/KWH and the interest and depreciation charges amount to 10%. Calculate the most economical conductor size. Assume resistivity of conductor material to be $1.73\mu\Omega\text{cm}$. [10]

- Q7)** a) Explain the following terms with their equivalent circuit [6]
- i) Touch potential
 - ii) Step potential
- b) Explain in detail the design of earthing grid of substation w.r.t IEEE standard 80-2000. [10]

OR

- Q8)** a) Write the general rules for the residential and commercial wiring work. [6]
- b) State the general factors that should be considered in estimation of HT or LT lines. [10]

EEE

Total No. of Questions : 12]

SEAT No. :

P2320

[4758] - 55

[Total No. of Pages :4

T.E.

ELECTRICAL

Power System - II

(2008 Course) (Semester - II)

Time :3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Derive the power flow equations for real and reactive power at receiving end. **[8]**
- b) A three phase 132kV overhead line delivers 50MVA at 132kV and power factor 0.8 lagging at its receiving end. The constants of line are $A = 0.98$, $\alpha = 3^\circ$ and $B = 110$, $\beta = 75^\circ$ ohm per phase. **[8]**

Find

- i) Sending end voltage and power angle
- ii) Sending end active and reactive power
- iii) Line losses and vars absorbed by the line

Capacity of static compensation equipment at the receiving end if the sending end voltage to 140kV for the same load condition.

OR

P.T.O.

Q2) a) Explain procedure to draw receiving end circle diagram. What information can be obtained from power circle diagram? [8]

b) What is surge impedance loading? Explain different methods used to improve surge impedance loading. [8]

Q3) a) Explain the advantages and drawbacks of EHVAC transmission. [8]

b) Explain the phenomenon of corona and state various methods to reduce it. [8]

OR

Q4) a) Find the disruptive critical voltage and visual critical voltage for local and general corona for a three phase line consisting of 21mm diameter conductors spaced in 6m delta configuration. Take temperature 25°C, pressure 73cm of mercury, surface factor 0.84, irregularity factor for local visual corona 0.72 and for general (decided) visual corona 0.82. [8]

b) What is corona loss? Why it is different in different weather conditions? How can it be estimated? [8]

Q5) a) Explain in detail the sub transient, transient and steady states at the 3 phase S.C. fault condition on an unloaded alternator, and explain how you will find sub transient, transient and steady state currents? [8]

b) A 50 MVA generator with 10% reactance and 100MVA generator with 8% reactance (on their own base) are connected as shown in fig 1. The fault level on bus 1 is to be restricted to 1000MVA. Calculate on 100MVA base [10]

i) Reactance of bus bar reactor X

ii) Fault level of bus 2

MVA ratings of circuit breaker C.

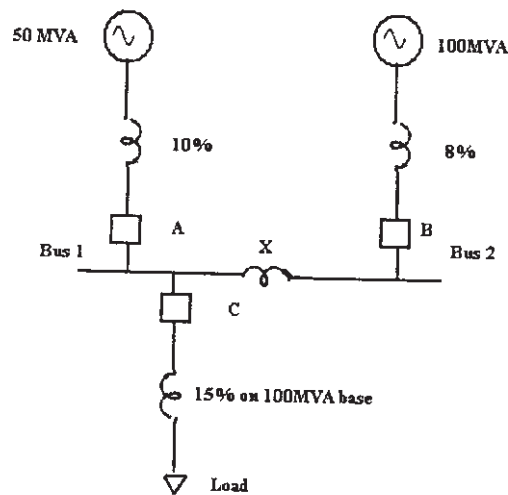


Figure 1

OR

- Q6) a) What do you mean by DC offset current? What is the effect of instant of short circuit on the waveform of short circuit current of R-L circuit. [10]
- b) Determine the required MVA rating of the circuit breaker CB for the system shown in fig..2. Consider the grid as infinite bus. Choose 6MVA as base. [8]

Transformer - 3 phase, 33/11kV, 6 MVA, impedance $0.01 + j 0.07$ pu

Load - 3 phase, 11kV, 5000kVA, 0.85 lagging, impedance $j 0.2$ pu

Impedance of each feeder is $9.5 + j 7 \Omega$ /ph.

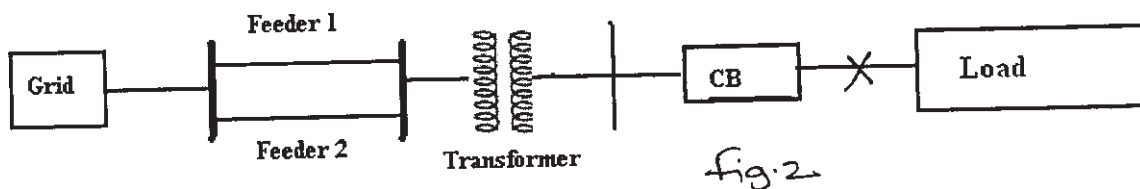


fig.2

SECTION- II

- Q7) a)** Explain the use of symmetrical components in the fault analysis. What do you mean by operator 'a'? Give its significance in fault analysis. [10]
- b) Derive the expression for fault current in case of SLG fault considering the sequence network under this type of fault with suitable diagram. [8]

OR

- Q8) a)** A 30 MVA, 11kV, Y connected synchronous generator is at no load and rated voltage. If $X_1 = X_2 = 14\%$, $X_0 = 7\%$. Estimate [8]
- i) Resistance X_n to limit SLG fault current, if the ratio of SLG fault current to three phase short circuit current is 1.
- ii) LLG fault current with X_n in neutral grounding circuit.
- b) Derive the expressions of positive, negative and zero sequence reactances of transmission line. [10]

- Q9) a)** Explain Gauss-Seidal method of load flow analysis. [8]
- b) Derive the static load flow equations. [8]

OR

- Q10)a)** Explain the types of buses in detail. [8]
- b) Explain formulation of Y bus matrix using direct method. [8]

- Q11)a)** Give the advantages and limitations of HVDC transmission. [8]
- b) Explain the constant extinction angle control method in detail. [8]

OR

- Q12)a)** Compare the HVDC with EHVAC transmission. [6]
- b) What are the various components of HVDC sub-station system? Draw the simple block diagram for the same. [10]



Total No. of Questions : 10]

SEAT No. :

P2391

[4758] -550

[Total No. of Pages :3

T.E. (Electrical)

INDUSTRIAL AND TECHNOLOGY MANAGEMENT

(2012 Course) (End - Sem.) (311121)

Time : 2 ½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer 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.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicates full marks.*
- 4) *Assume suitable data, if necessary.*

- Q1) a)** Differentiate between Proprietary firm and partnership firm. **[3]**
- b) Differentiate between Administration and Management. **[3]**
- c) What is marketing research? State and explain methods of marketing research. **[4]**

OR

- Q2) a)** Define Management. What are the different functions of Management? State the importance of Management. **[3]**
- b) Explain the contribution of F.W. Taylor in the field of Management. **[3]**
- c) What is sales promotion? State its significance along with the advantages and its disadvantages. **[4]**
- Q3) a)** What are the different types of organization? Explain functional organization. **[3]**
- b) Explain in brief following: **[4]**
- i) Pokka Yoke
 - ii) Classification of technology

P.T.O.

- c) Define the concept of Financial Management. Elaborate the scope of financial management in a business organization. [3]

OR

- Q4)** a) What is Creation & Creativity. [3]
b) Explain in brief following: [4]
i) Quality circle
ii) Pareto Analysis
c) Differentiate between selling and marketing. [3]

- Q5)** a) State group dynamics theories. What are different types of conflicts? [6]
b) Define Motivation. Explain any five theories of motivation. [6]
c) Distinguish between X & Y Theory. [4]

OR

- Q6)** a) Define leadership. Describe its types. What are their importances? [6]
b) Define Entrepreneur. Explain the different traits of Entrepreneur. [6]
c) Differentiate between Team & Group. [4]

- Q7)** a) What is performance appraisal? State the objectives and types of performance Appraisal in details. [9]
b) What are the provisions of Labour Welfare as per Factories Act 1948? [8]

OR

- Q8)** a) Explain in brief following: [9]
i) HR Planning
ii) Training and Development
iii) Time Management

- b) Explain in brief following: [8]
- i) Halo effect
 - ii) Professional and Business ethics

- Q9)** a) What is the Intellectual Property Rights (IPR)? Explain all its types. [7]
- b) Explain the Patent format and structure. [7]
- c) What is Trademark? How trademark is registered? [3]

OR

- Q10)** a) State the Patent Laws, Trade mark and Copy Right Laws. [9]
- b) State the criteria for securing Patents. What are the guidelines of the common IPR policy on patents? [8]



Total No. of Questions : 10]

SEAT No. :

P2392

[4758] - 551

[Total No. of Pages :2

T.E. (Electrical)

ENERGY AUDIT AND MANAGEMENT

(2012 Course) (End - Sem.) (303150) (Semester - II)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Use of calculator is allowed.*
- 5) *Assume Suitable data if necessary.*

- Q1)** a) Explain concept of green building. **[6]**
b) Explain importance of energy conservation in India. **[4]**

OR

- Q2)** a) Give salient features of Electricity Act 2003. **[4]**
b) Explain responsibilities and duties of Energy Manager Under EC act - 2001. **[6]**

- Q3)** a) Differentiate SSM and DSM. **[6]**
b) Explain DSM in agriculture sector. **[4]**

OR

- Q4)** a) Define energy management as per energy conservation act - 2001. Explain principles of energy management. **[6]**
b) Explain features of automatic meter reading in utility energy management. **[4]**

- Q5)** a) Define energy audit as per EC act - 2001. Why energy audit is necessary? What are the types of energy audit? **[10]**
b) Describe the "Sankey diagram" and its application in energy audit. **[8]**

OR

P.T.O.

- Q6)** a) Enlist and explain various instrumentation used in energy audit. [10]
b) Explain terms energy production relationship and specific energy consumption in detail. [8]

- Q7)** a) Explain energy conservation techniques in illumination and pumping system. [8]
b) What is cogeneration? Explain topping and bottoming cycles with block diagram. [8]

OR

- Q8)** a) Explain energy conservation techniques in transmission and distribution (T & D) sector of utility industries. [8]
b) Explain energy conservation potential in electric motors. What are the advantages of energy efficient motors. [8]

- Q9)** a) Define payback period and ROI methods used in economic analysis of energy conservation project. What are the limitations of these methods? [8]
b) Explain energy audit case study in Municipal corporations. [8]

OR

- Q10)** a) Explain time value of money concept and Net present value (NPV) method. [8]
b) Explain energy audit case study in educational institutes. [8]



Total No. of Questions : 10]

SEAT No. :

P3352

[Total No. of Pages : 3

[4758] - 552

T.E. Electrical (Semester - II)

Power System - II

(2012 Pattern)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

- Q1)** a) A three phase 132 kV overhead line delivers 60 MVA at 132 kV and power factor 0.85 lagging at its receiving end. The constants of line are $A = 0.98$, $\alpha = 3^\circ$ and $B = 110$, $\beta = 75^\circ$ ohm per phase. Find [5]
- i) Sending end voltage and power angle.
 - ii) Sending end active and reactive power.
- b) Explain the advantages and drawbacks of EHVAC transmission. [5]

OR

- Q2)** a) Explain the phenomenon of corona and state various methods to reduce it. [5]
- b) A 132kV three phase line has the following line constants : [5]
- $A = 0.9 < 2.5^\circ$, $B = 100 < 70^\circ \Omega$, $C = 0.0006 < 80^\circ S$.

Draw the receiving end power circle for a load of 40 MW at 0.8 power factor lagging at the receiving end and determine the sending end voltage.

- Q3)** a) Explain the constant ignition angle control method in detail. [5]
- b) Find the disruptive critical voltage and visual critical voltage for local and general corona for a three phase line consisting of 21mm diameter conductors spaced in 6m delta configuration. Take temperature $25^\circ C$, pressure 73cm of mercury, surface factor 0.84, irregularity factor for local visual corona 0.72 and for general (decided) visual corona 0.82.[5]

P.T.O.

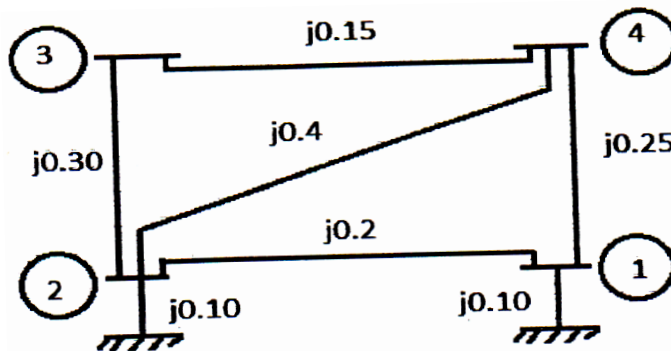
OR

- Q4) a) What are the various components of HVDC system. [5]
 b) Prove the reactive power is proportional to voltage drop ($Q \propto \Delta V$) [5]

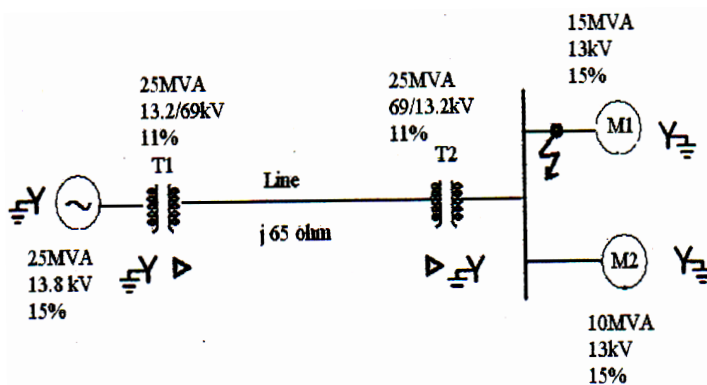
- Q5) a) What is per unit system? Explain the advantages and applications of per unit system. [8]
 b) Explain with flow chart Gauss Seidel method of load flow analysis. [8]

OR

- Q6) a) Give in detail classification of bus for load flow analysis. [8]
 b) For the given power system reactances are shown in the fig. find bus admittance matrix $[Y_{BUS}]$ [8]



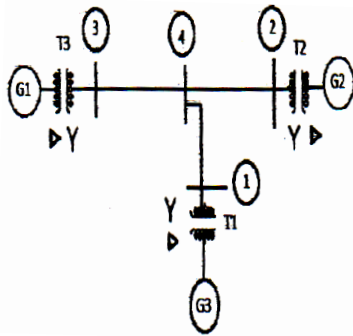
- Q7) a) A one line diagram of a three phase power system is shown in fig. A three phase short circuit fault occurs at point shown in fig. Choose 13.8k V, the generator voltage as the base voltage and 25MVA as the base MVA, Find fault current at fault location. [8]



- b) How the selection of circuit breaker is done in power system? What are the current limiting reactors? Explain its use in power system. [8]

OR

- Q8)** a) Explain the concept of sub transient, transient and steady state current and impedances of unloaded alternator under symmetrical fault condition. [8]
- b) The power system network shown in figure has the following equipment ratings. A three phase short circuit fault occurs on bus 1 of the network. Find fault current and fault MVA. Select Base power = 500 MVA & base voltage = 400k V on transmission line. [8]



Generator G_1	500 MVA, 11 kV $X'' = 0.15$ pu
Generator G_2	400 MVA, 11 kV, $X'' = 0.12$ pu
Generator G_3	300 MVA, 11 kV, $X'' = 0.10$ pu
Transformer T_1	500 MVA, 11/400 kV, star - delta, $X = 0.08$ pu
Transformer T_2	300 MVA, 11/400 kV, star - delta, $X = 0.1$ pu
Transformer T_3	300 MVA, 22/400 kV, star - delta, $X = 0.1$ pu
Transmission Lines	
1 - 4 --- $X = j 40 \Omega$, 2 - 4 ---- $X = j 50 \Omega$,	
3 - 4 --- $X = j 30 \Omega$	

- Q9)** a) A 20 MVA, 11kV, Y connected synchronous generator is no load and rated voltage. If $X_1 = X_2 = 12\%$, $X_0 = 6\%$. Estimate [9]
- i) Reactance X_n to limit SLG fault current, if the ratio of SLG fault current to three phase short circuit current is 1.
- ii) LLG fault current with X_n in neutral grounding circuit.
- b) For the three phase transmission line with self impedances Z_s and mutual impedance Z_M , show that $Z_1 = Z_2 = Z_s - Z_M$ and $Z_0 = Z_s + 2 Z_M$. [9]

OR

- Q10)** a) Derive the expression for fault current in case of LLG fault considering the sequence network under this type of fault with suitable diagram. [9]
- b) Draw zero sequence diagram for all types of combinations of transformer. [9]

☺ ☺ ☺ ☺

Total No. of Questions : 8]

SEAT No. :

P2393

[4758]-553

[Total No. of Pages : 3

T.E. (Electrical)

DESIGN OF ELECTRICAL MACHINES

(2012 Course) (Semester - I) (End - Semester)

Time : 3 Hours]

[Max. Marks :70

Instructions to the candidates:

- 1) *Answer Q.No.1 or 2, Q.No.3 or 4, Q.No.5 or 6, Q.No.7 or 8.*
- 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.*

- Q1) a)** Explain in brief various modes of heat dissipation. **[5]**
- b) Derive the output equation of a three phase transformer with usual notation. **[5]**
- c) Estimate the P.U. regulation at full load & 0.8 p.f. lagging for 300KVA, 50 Hz, 6600/400v, three phase, delta-star, core type transformer. The data given as H.V. winding, - outside diameter = 0.36m, inside diameter = 0.29 m, area of conductor = 5.4 mm², L.V. winding, - outside diameter = 0.26m, inside diameter = 0.22m, area of conductor = 170 mm², length of coils = 0.5m, voltage/turn = 8v, resistivity = 0.21 ohms/m/mm². **[10]**

OR

- Q2) a)** Explain the short time rating and continuous rating of Electrical Machines. **[5]**
- b) Discuss mechanical forces developed under short circuit condition in a transformer and measures to overcome this effect. **[5]**

P.T.O.

- c) A 200 KVA, 6600/400V, three phase transformer, delta/star connected, 50 Hz, core type transformer has the following particulars: Maximum flux density = 1.3 wb/m^2 , current density = 2.5 A/mm^2 , window space factor = 0.3,

Overall height = overall width and use three stepped core, stacking factor = 0.9, emf per turn = 10 volts. Width of largest stamping = $0.9d$ and net iron area = $0.6d^2$. Calculate overall core dimensions. [10]

- Q3)** a) Derive output equation of a three phase induction motor with usual notation. [6]
- b) Explain harmonic field effects on the performance of three phase induction motor. [6]
- c) State different types of ac windings and explain any two. [6]

OR

- Q4)** a) Define specific electric and specific magnetic loading and explain various factors considered for choice of specific electric and specific magnetic loading of a three phase induction motor. [6]
- b) Discuss various constraints in the selection of suitable combination of stator and rotor slots. [6]
- c) Find the main dimension of a 15kW, 3 phases, 400V, 50Hz, 2810 r.p.m. squirrel cage induction motor having an efficiency of 0.88 & a full load power factor of 0.9. Assume: specific magnetic loading = 0.5 Wb/m^2 ; specific electric loading = 2500 A/m . Take the rotor peripheral speed as approximately 20m/s at synchronous speed. [6]
- Q5)** a) Explain the factors should be considered when estimating the length of air gap of three phase induction motor. Why the air gaps should be as small as possible? [8]
- b) Estimate the stator core dimensions, number of stator slots and number of stator conductors per slot for a 100 KW, 3300V, 50Hz, 12 pole star connected slip ring induction motor, assume: average gap density = 0.4 wb/m^2 , conductors per metre = 25000 A/m , efficiency = 0.9, power factor = 0.9, and winding factor = 0.96, choose main dimensions to give best power factor. Slot loading should not exceed 500 ampere conductors. [8]

OR

- Q6) a)** What is unbalanced magnetic pull in a three phase induction motor and explain procedure of its estimation. [8]
- b) A 11KW, three phase, 6 poles, 50Hz, 220V, star connected induction motor has 54 stator slots, each containing 9 conductors. Calculate the values of bar and end ring currents. The number of rotor bars is 64. The machine has an efficiency of 0.86 and a power factor of 0.85. The rotor mmf may be assumed as 85 percent of stator mmf. Also find the bar and the end ring section if the current density is 5A/mm². [8]
- Q7) a)** State and explain with neat sketches different types of leakage fluxes in an induction motor and estimate slot leakage reactance in an induction motor. [8]
- b) A 80KW, 2 pole machine with sinusoidal flux distribution has the following data, axial length of core = 0.25m, stator bore = 0.52m, length of air gap = 5mm, peak magnetizing mmf per pole = 4800 A, Calculate [8]
- magnetic pull per pole when the rotor is symmetrical centered.
 - UMP per pole if rotor axis is displaced by 0.8mm,
 - ratio of UMP to useful force neglecting saturation.

OR

- Q8) a)** Explain the procedure to calculate the no load current of a three phase induction motor. [8]
- b) A 15kW, 400V, 3 phases, 50Hz, 6 pole induction motor has a diameter of 0.3m & the length of core 0.12m. The number of stator slots is 72 with 20 conductors per slot. The stator is delta connected. Calculate the value of magnetizing current per phase if the length of air gap is 0.55m. The gap contraction factor is 1.2. Assume the mmf required for the iron parts to be 35 per cent of the air gap mmf. Coil span = 11 slots. [8]

EEE

Total No. of Questions : 8]

SEAT No. :

P2394

[4758]-554

[Total No. of Pages : 3

T.E. (Electrical)

CONTROL SYSTEM-I

(2012 Course) (Semester - II) (303147) (End - Semester)

Time : 2.30 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer all questions.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Use of calculator is allowed.*
- 5) *Assume suitable data if necessary.*

Q1) a) The transfer function of a system is given by

[6]

$$T(s) = \frac{K(s+2)}{s(s+4)(s^2+2s+2)}$$

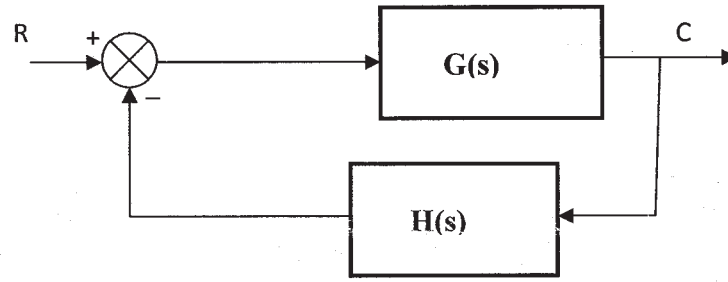
Determine

- i) poles
 - ii) zeros
 - iii) Pole zero plot in s plane
 - iv) Characteristic equation
- b) Write short note on synchro transmitter receiver. **[7]**
- c) Sketch the time response for standard second order under damped system, mark and explain different time domain specifications from that. **[7]**

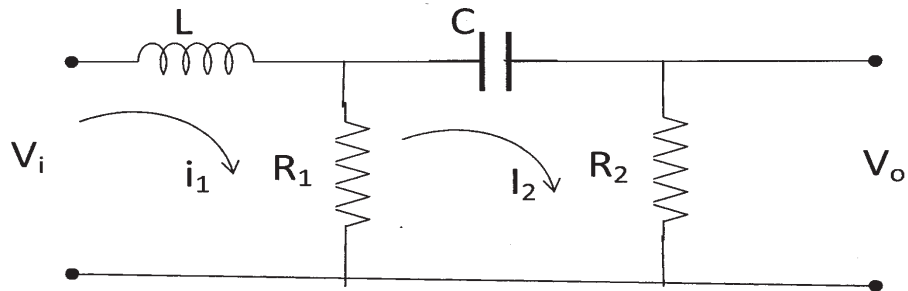
OR

P.T.O.

Q2) a) Define transfer function. Derive transfer function of following [6]



b) Determine transfer function of following electrical network. [7]



c) What is type and order of system. Explain effect of type of system on steady state error. [7]

Q3) a) Explain Routh Hurwitz stability criterion. [6]

b) Draw root locus for following system. Also find range of values of K for which system is stable. $G(s) = \frac{K}{s(s+3)(s^2+2s+2)}$ [10]

OR

Q4) a) Using Routh Hurwitz criterion for the unity feedback control system with open loop transfer function $G(s) = \frac{K}{s(s+1)(s+2)(s+5)}$ [8]

- i) Find range of K for stability.
- ii) Find the value of K for marginally stable and corresponding close loop poles.

b) State magnitude criterion and angle criterion for point to be on root locus. Explain any three rules for root locus. [8]

Q5) a) Draw bode plot for following system $G(s)=\frac{40}{s(s+3)(s+12)}$ Find gain margin and phase margin comment on stability. [12]

b) Explain Nyquist stability criterion. [6]

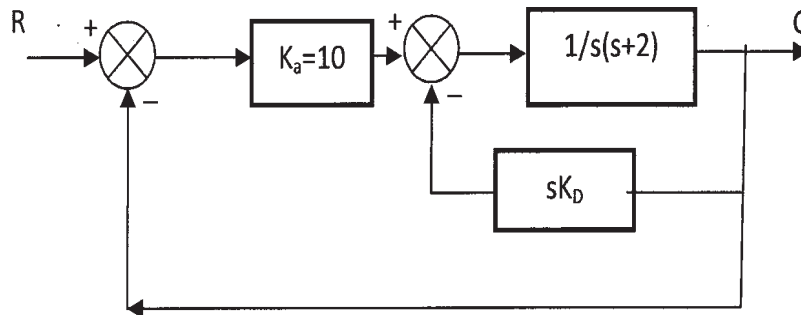
OR

Q6) a) Explain correlation between frequency domain and time domain. [9]

b) Draw nyquist plot for following open loop system $G(s)=\frac{50}{s(s+3)(s+6)}$ and check for stability. [9]

Q7) a) Explain P, PI, PID controller and their features. [8]

b) A feedback system which employs output rate feedback is shown. Determine the derivative feedback constant K_D which will increase the damping factor of the system to 0.6. What is the steady state error to unit ramp input. [8]



OR

Q8) a) Explain Ziegler Nichols method of tuning PID controller. [8]

b) Using Ziegler Nichols method design a PID controller for system with unity feedback and $G(s)=\frac{1}{s(s+1)(s+5)}$ [8]

EEE

Total No. of Questions : 8]

SEAT No. :

P2395

[4758]-555

[Total No. of Pages : 3

T.E. (Electrical)

UTILIZATION OF ELECTRICAL ENERGY

(2012 Course) (Semester - II) (303148) (End - Semester)

Time :3 Hours]

[Max. Marks :70

Instructions to the candidates:

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume suitable data if necessary.*

- Q1)** a) Describe the construction and working of core type induction furnace. **[6]**
- b) Explain the factors affecting quality of Electro-Deposition. **[6]**
- c) A lamp of L is at the height of 10 meters from the horizontal plane. The point B is at the vertically down the lamp and B is away from the lamp on the same plane. Find the distance between AB if illumination at B = 0.1 of that of at A. **[8]**

OR

- Q2)** a) With suitable diagram explain Dielectric heating. State application of dielectric heating. **[6]**
- b) Explain electric circuit used in summer type Air conditioner. **[6]**
- c) Define: **[8]**
- i) Illumination
 - ii) Space height Ratio
 - iii) Depreciation Factor
 - iv) Reflection Factor.

P.T.O.

- Q3)** a) Explain advantages of Electric traction. [8]
b) Draw typical layout of traction substation. Label all parts and describe it in brief. [8]

OR

- Q4)** a) Write a note on following systems of track electrification: [8]
i) D.C System.
ii) Single phase low frequency A C system
b) State advantages of 25 kv AC system. [8]

- Q5)** a) Draw Trapezoidal speed - time curve and obtain expression for maximum velocity. [8]
b) A 250 tonne motor coach having four motors, each developing 5000 N-M torque during acceleration starts from rest. If up gradient is 25 in 1000, gear ratio is 5, gear transmission efficiency is 88%, wheel radius is 44 cm, train resistance is 50 N/tonne, addition of rotational inertia 10%. Calculate the time taken to reach a speed of 45 kmph. If the supply voltage were 1500 V DC and efficiency of motor 83.4%. Determine the current drawn per motor during notching period. [8]

OR

- Q6)** a) Define tractive effort. Elaborate the parts of total tractive effort with usual notations. [8]
b) The speed time curve of a train consists of uniform acceleration of 6 kmphs for 25 sec, free running for 10 minutes, uniform deceleration of 6 kmphs to stop the train, a stop of 5 minutes. Find the distance between stations, average speed and schedule speed. [8]
- Q7)** a) Explain suitability of D.C. series motor for traction service. [6]
b) Derive the expression for energy lost and efficiency for series parallel control of two DC series motors. [6]
c) Write a note on Anti - collision system. [6]

OR

- Q8)** a) What is Transition? Explain shunt and bridge transition in detail. [6]
- b) Two D.C. series motor coach have resistance of 0.1Ω each. These motors draw a current of 500 A from 600 V mains during series - parallel starting period of 20 sec. If the acceleration during starting period remains uniform, determine [6]
- i) Time during which the motors operate in series, parallel.
- ii) Speed at which the series connection are to be changed if the speed just after starting period is 70 kmph.
- c) Explain how regenerative braking is used in electric traction. [6]

EEE

Total No. of Questions : 8]

SEAT No. :

P2396

[4758] - 556

[Total No. of Pages :3

T.E. (Electronics)

ELECTRICAL MACHINES & POWER DEVICES

(2012 Course) (Semester - I) (Theory) (End-Sem.) (304201)

Time :2 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume suitable data if necessary.*

Q1) a) Explain the V-I characteristics of the following. **[6]**

- i) Power BJT
- ii) MOSFET
- iii) IGBT

b) Draw and explain construction and operation of power BJT. **[7]**

c) Explain switching characteristics of power MOSFET. **[7]**

OR

Q2) a) Explain construction & operation of IGBT. **[6]**

b) Explain the need for protection of power devices and State different types of protections required to ensure safety of power devices. **[7]**

c) Write note on triggering circuit of TRIAC using DIAC. **[7]**

Q3) a) Derive the EMF expression of a DC generator. **[6]**

b) Explain the working and performance characteristics of a permanent magnet DC motor. State advantages, disadvantages and applications. **[6]**

P.T.O.

- c) A 230 V dc shunt motor takes 32A at full load. Find the back emf on full load if $R_a = 0.2\ \Omega$ and $R_{sh} = 1\ \Omega$ respectively. [4]

OR

- Q4)** a) Derive the expression for torque of a DC motor. [6]
b) Distinguish between self excited and separately excited DC generator. [6]
c) A 4 pole dc motor is having induced EMF 188 V across armature. Find the torque and gross mechanical power developed when the motor is drawing 25A and running at 1500 rpm. [4]

- Q5)** a) Explain the effect of slip on [8]
i) Frequency
ii) Induced EMF
iii) Current
iv) Power factor
v) Reactance
vi) Impedance
b) Explain the procedure for no load test and blocked rotor test on a three phase induction motor. How are the parameters of equivalent circuit determined from test results? [10]

OR

- Q6)** a) State various losses that occur in an induction motor. Explain how they vary with frequency, voltage and load. [8]
b) A 6 pole, 50Hz, 3-phase induction motor running on full load develops a useful torque of 160Nm when the rotor EMF makes 120 complete cycles per minute. Calculate the shaft power output. If the mechanical torque lost in friction and that for core loss is 10 Nm. Compute [10]
i) the copper loss in the rotor winding
ii) the input to the motor
iii) the efficiency.

The total stator loss is given to be 800W.

- Q7)** a) Compare variable reluctance motor with permanent magnet stepper motor. [8]
- b) Explain the principle of operation of capacitor start and capacitor run single phase induction motor along with the torque slip characteristics and the applications. [8]

OR

- Q8)** a) Explain the working principle of permanent magnet stepper motor with constructional diagram. [8]
- b) Explain the operation of a variable reluctance motor. [8]



Total No. of Questions : 8]

SEAT No. :

P3672

[4758]-557

[Total No. of Pages : 3

T.E. (Electronics)

DATA COMMUNICATION

(2012 Course) (End - Sem.) (Semester - I)

Time : 3 Hours]

[Max. Marks :70

Instructions to the candidates:

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 4) *Assume suitable data, if necessary.*

- Q1)** a) List the factors to be considered for selection of transmission media. What are the major advantages of STP over UTP? [7]
- b) Explain with suitable block diagram and waveforms, working principle of DPCM. [7]
- c) Compare ARQ and FEC methods of error control. [6]

OR

- Q2)** a) A binary LBC has a generator matrix [7]

$$G = \begin{bmatrix} 1 & 1 & 0 & 1 & 1 & 0 & 0 \\ 1 & 1 & 1 & 0 & 0 & 1 & 0 \\ 0 & 1 & 1 & 1 & 0 & 0 & 1 \end{bmatrix}$$

Determine all its code words.

- b) Describe constructional details of co-axial cable. Compare its characteristics with twisted pair cable. [7]
- c) The fixed step delta modulator (DM) of 0.4V size is provided with input sinusoidal message of 1KHz. If sampling frequency is four times the Nyquist rate, determine the maximum permissible amplitude of the message signal, if slope overload is to be avoided. [6]

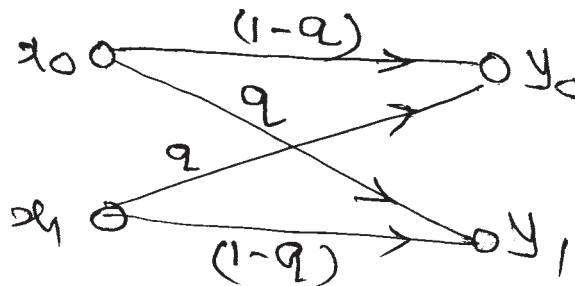
P.T.O.

Q3) a) An information source is producing sequence of independent symbols X_1, X_2, X_3 and X_4 with probabilities $P(X_1) = 0.5, P(X_2) = 0.25, P(X_3) = P(X_4) = 0.125$. [8]

i) Obtain an unambiguous binary code for the output of this source using Shannan-Fano scheme.

ii) Compute its coding efficiency.

b) Determine $I(X; Y)$ the mutual information of a binary symmetric channel with $p(x_0) = p(x_1) = 0.5, q = 0.5$. [8]



OR

Q4) a) Find the channel capacity of a BSC. Sketch channel Vs transitional probability curve. [8]

b) Explain cyclic code with its properties. Why cyclic codes are well suited for error detection? [8]

Q5) a) Describe in detail QPSK signalling scheme. Show how is it a BW efficient scheme. [8]

b) Draw the block diagram of QAM transmitter and explain its operation. [6]

c) Compare the noise performance of KSK and PSK for fixed average transmitted power with same noise component. [4]

OR

Q6) a) Derive expression for probability of error for QPSK. [8]

b) Explain any method of carrier recovery for a coherent bandpass signalling system. [6]

c) What are the advantages and disadvantages of M- ary scheme. [4]

- Q7)** a) With suitable block diagram, explain working of BPSK/DS spread spectrum receiver. [8]
- b) What are the properties of orthogonal codes. [4]
- c) Compare throughputs of pure ALOHA and slotted ALOHA. [4]

OR

- Q8)** a) Explain CSMA /CD protocol and its efficiency considering typical local area network. [8]
- b) Compare DS-SS and FH-SS. [4]
- c) Assume a CSMA/CD system in which the transmission rate on the bus is 1mbps. The bus is 1km long and the propagation delay is $2 \mu\text{sec/km}$.. packets are 1000 bits long. Obtain [4]
- i) A end - to -end delay e_d .
- ii) The packet duration T_p .

EEE

Total No. of Questions : 8]

SEAT No. :

P2397

[4758] - 558

[Total No. of Pages :4

T.E. (Electronics)

NETWORK SYNTHESIS

(2012 Pattern) (Semester - I) (End - Semester)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Use of electronic pocket calculator is allowed.
- 5) Assume Suitable data if necessary.

- Q1)** a) Determine the range of 'k' so that, polynomial $P(s) = s^3 + 14s^2 + 56s + k$ is Hurwitz. **[6]**
- b) Synthesize the following function using Foster - II and Cauer - II form. **[6]**

$$Z(s) = \frac{s(s^2 + 9)}{(s^2 + 1)(s^2 + 16)}$$

- c) Realize the transfer function as an open circuited LC ladder network. **[8]**

$$H(s) = \frac{s^4}{(s^2 + 1)(s^2 + 3)}$$

OR

- Q2)** a) Explain the following basic removal operations? **[6]**
- i) Removal of a pole at $s = \infty$ from the function.
 - ii) Removal of a pole at $s = 0$ from the function.
- b) An admittance function is given as: **[6]**

$$Y(s) = \frac{8s^2 + 10s}{s + 1}$$

Realize the network using Cauer - I and Cauer - II form.

P.T.O.

- c) What is constant Resistance Network? Also Synthesize the following transfer function for a constant resistance lattice with 1Ω termination. [8]

$$\frac{V_2}{V_1} = \frac{s^2 - 3s + 2}{s^2 + 3s + 2}$$

- Q3)** a) State the properties of Butterworth Approximation? [4]
 b) Find the transfer function of third order normalized low pass Butterworth filter and realize as a LC transfer impedance function terminated by 1Ω ? [8]
 c) Convert the low pass filter of Fig 1, into a band stop filter with 500Ω impedance level, bandwidth (B.W) = 20 Krad/sec. and pass band center at $\omega_0 = 50$ Krad/sec. [4]

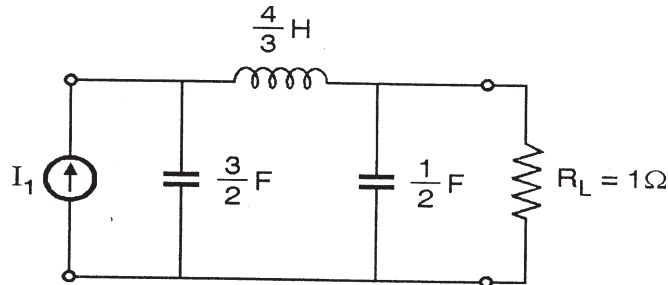


Figure 1

OR

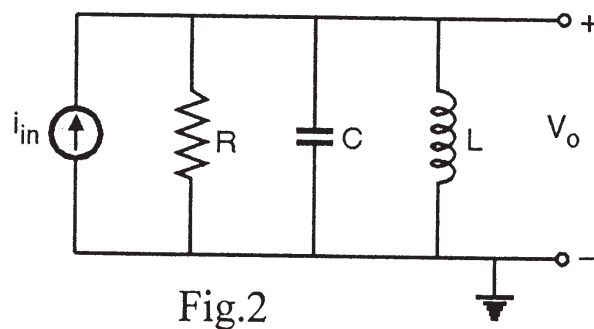
- Q4)** a) Explain frequency and impedance normalization? [5]
 b) Obtain a system function $H(s)$ that exhibits the Chebyshev characteristics with not more than 1dB ripple in pass band and attenuation of 20dB at $\omega = 2$ rad/sec. [6]
 c) Explain in detail the properties of Chebyshev polynomials used in filter approximation? [5]

- Q5)** a) Synthesize second order low pass filter to have a pole frequency of 25 kHz and a pole Q is 10? Use Sallen and Key circuits based on positive feedback topology. [10]
 b) What is cascade approach in active filter synthesis? Explain in brief and list the advantages of the approach? [6]

OR

- Q6) a)** Design third order low pass Butterworth filter with cut-off frequency $f_c = 2\text{kHz}$ (use positive feedback topology)? [8]
- b) Design a second order Butterworth low pass filter having upper cut off frequency is 1.5kHz ? Then using RC-CR transformation realize high pass filter with same frequency? [8]

- Q7) a)** Find the transfer impedance function $\frac{V_o}{I_{in}}$ for the passive RLC Circuit shown in fig. 2? Compute the sensitivities of ω_p , Q_p and K with respect to the passive elements R, L and C? [6]



- b) Explain the concept of gain sensitivity? Also explain the various factors affecting the gain sensitivity? [6]
- c) Explain the effect of offset voltage on active filter performance. The input to the inverter shown in Fig. 3 is a sine wave of amplitude 5 volt. If the slew rate of the op amp is 1V/sec , find the frequency at which the slew rate limiting occurs. [6]

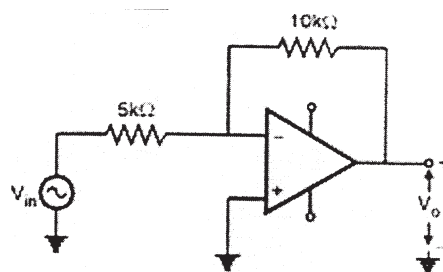


Figure 3

OR

Q8) a) Define sensitivity? Why it is needed? Find sensitivity of resonating frequency of series resonating circuit with respect to the components R, L and C? [6]

b) Prove the following sensitivity relationships? [4]

i) $S_{\sqrt{P}} = \frac{1}{2} S_x^P$

ii) $S_{\sqrt{x}}^P = 2S_x^P$

c) Discuss how the following parameters of op amp affect the filter performance? [8]

i) Dynamic range

ii) Slew rate

iii) Input Offset voltage

iv) CMRR



Total No. of Questions : 8]

SEAT No. :

P2398

[4758]-559

[Total No. of Pages : 2

T.E. (Electronics Engineering)

MICROCONTROLLER AND APPLICATIONS

(2012 Course) (End - Semester) (304203) (Semester - I)

Time : 3 Hours]

[Max. Marks :70

Instructions to the candidates:

- 1) *Answer Q.No.1 or 2, Q.No.3 or 4, Q.No.5 or 6, Q.No.7 or 8.*
- 2) *Answer any four questions.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of calculator is allowed.*
- 6) *Assume suitable data, if necessary.*

- Q1)** a) Explain the Limitations of 8 bit microcontroller. **[4]**
- b) Draw & explain the Internal RAM organization 8051 microcontroller. **[8]**
- c) Explain the addressing modes of PIC 18FXXX Microcontroller with example. **[8]**

OR

- Q2)** a) Explain the Logic Analyzer. **[4]**
- b) Explain any three addressing modes of 8051 microcontroller. **[8]**
- c) Explain the memory organization of PIC 18FXX Microcontroller. **[8]**
- Q3)** a) Draw an interfacing diagram and write an Embedded C Program to interface 16x2 LCD with PIC 18FXX Microcontroller to display the "WELCOME" message. **[8]**
- b) Draw and Explain the interrupt structure for the PIC 18FXX microcontroller.. **[8]**

OR

P.T.O.

- Q4)** a) Write an embedded C program to get a byte of data from port C. If it is less than 100, send it to port B otherwise send it to port D. [8]
- b) Write a C18 program to toggle only the PORTB.4 bit continuously every 50ms. Use timer 0, 16 bit mode, the 1:4 prescaler to create the delay. Assume that XTAL = 10MHZ. [8]

- Q5)** a) Draw and explain Interfacing of RTC with PIC18FXXX? Also write embedded C Program to update date. [8]
- b) Explain the MSSP with 12C master mode. [8]

OR

- Q6)** a) Explain the EEPROM with PIC 18FXX using SPI Protocol. [8]
- b) Explain the MSSP with SPI mode. [8]

- Q7)** a) Explain in brief various steps involved in designing data acquisition system. [10]
- b) Design a voltmeter to display range between 0v to 50v using internal ADC of PIC18FXXX. [8]

OR

- Q8)** a) Design frequency counter using PIC18FXXX for following specifications Frequency range Dc to 5 MHz. Design and draw interfacing circuit. Also explain required flow chart. [12]
- b) Explain how the speed of the DC motor controlled by PWM. [6]

EEE

Total No. of Questions : 12]

SEAT No. :

P2321

[4758]-56

[Total No. of Pages : 4

T.E. (Electrical)

DESIGN OF ELECTRICAL MACHINES

(2008 Course) (Semester - II)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) *Answer 3 questions from Section -I and 3 questions from Section - II.*
- 2) *Answers to the two sections should be written 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 “ $B_{t\frac{1}{3}}$ method” to calculate the mmf of small taper teeth of an electrical machines. **[8]**
- b) Calculate the specific iron loss in a specimen of alloy steel for a maximum flux density of 3.2 Wb/m^2 and freq. of 50 Hz, using 0.5 mm thick sheets. The resistivity of alloy steel is $0.3 \times 10^{-6} \Omega\text{m}$. The density is $7.8 \times 10^3 \text{ kg/m}^3$. Hysteresis loss in each cycle is 400 J/m^3 . **[8]**

OR

- Q2)** a) Explain the various types of stator leakage flux in three-phase induction motor. **[8]**
- b) Explain the components of core loss in rotating machines. Also explain the factors on which the core loss depend. Why core loss is called constant loss. **[8]**

P.T.O.

- Q3) a)** Explain why the hydrogen cooling is used in modern ac generators. What are the advantages of hydrogen cooling. [8]
- b) Explain why tappings are provided on hv winding of transformer. [8]

OR

- Q4) a)** Explain the possible connections of windings in transformer what are the advantages of star connection. [8]
- b) The temperature rise of a transformer is 25°C after one hour and 37.5°C after two hours of starting from cold conditions. Calculate its final steady temperature rise and the heating time constant. If its temperature falls from the final steady value of 40°C in 1.5 hour when disconnected, calculate the cooling time constant. The ambient temperature is 30°C. [8]

- Q5) a)** Explain the effect of change in supply frequency on [8]
- i) Voltage,
 - ii) Losses
 - iii) Leakage reactance and
 - iv) Resistance of the transformer windings.

- b) Calculate the no load current of a 400V, 50Hz, 1-phase core type transformer, the particulars of which are as given below.

Length of mean magnetic path = 200 cm, Gross core area = 100 cm², Joints equivalent to 0.1 mm air-gap, the max. flux density = 0.7 tesla, specific core loss at given frequency and flux density = 0.5 W/kg mmf 2.2 per cm for 0.7 tesla. The Stacking factor = 0.9. Density of core material = 7.5×10^3 kg/m³. [10]

OR

- Q6) a)** Derive the equation for radial mechanical force developed in transformer when fault occur at the terminals of the transformer. [8]

b) Design cooling tube arrangement for a 250KVA, 6600/400V, 50Hz, 3-phase, Δ / Y , core type transformer immersed in oil with following particulars. [10]

- i) Working temp. rise not to exceed 50°C.
- ii) Total losses at 90°C are 5 kW.
- iii) Tank dimensions, height x length x width = 125 (mm) x 100 (mm) x 50 mm.
- iv) Oil level = 115 cm length

Draw the diagram to show the arrangement. Neglect top and bottom heat dissipating surfaces of the tank.

SECTION - II

Q7) a) Explain the factors affecting the size of rotating electrical machines. [8]

b) Calculate the following design information for a 30 kW, 440V, 3-phase, 6-pole, 50Hz, delta connected squirrel cage induction motor. [8]

- i) Main dimensions, D and L.
- ii) Nos. of stator turns per phase.
- iii) Nos. of stator slots.

Assume:

Specific magnetic loading = 0.48 tesla

Specific electric loading = 26,000 amp-cond/m

full load efficiency = 0.88

full load power factor = 0.86

winding factor = 0.955

OR

- Q8)** a) Explain the guidelines that help design engineer to select the number of stator slots in three phase induction motor. [8]
- b) Derive the output equation of three-phase induction motor. [8]
- Q9)** a) Explain the factors to be considered while estimating the length of air-gap in induction motor. How the length of air - gap affect the overload capacity of motor. [8]
- b) Explain the phenomenon of crawling and logging as applicable to squirrel cage induction motor. What steps are taken while designing motor to avoid their occurrence? [10]

OR

- Q10)**a) Explain the procedure to design the rotor of squirrel cage induction motor. What is the effect of selecting higher value of current density in rotor bars than normal value on the performance of the motor. [8]
- b) A 11 kW, 3-phase, 6-pole, 50Hz, 220V, star connected induction motor has 54 stator slots, each containing 9 conductors. calculate the value of bar current and end ring current. The number of rotor bars is 64. The machine has efficiency of 0.86 and power factor of 0.85. The rotor mmf may be assumed as 85% of stator mmf. Also find the size of rotor bar and end ring. Assume current density $\delta_b = \delta_e = 5A / mm^2$ [10]
- Q11)**a) Explain why the flux density at 60° from the neutral axis is considered while estimating the magnetising current of a three-phase induction motor. [8]
- b) Explain the effect of dispersion coefficient on overload capacity of induction motor. [8]

OR

- Q12)**a) Derive the relation for slot leakage reactance for a parallel sided semiclosed slots. Give the standard nomenclature. State clearly the assumptions used. [8]
- b) Explain the methods of improving starting torque in induction motor. [8]

EEE

Total No. of Questions : 10]

SEAT No. :

P2399

[4758] -560

[Total No. of Pages :2

T.E. (Electronics)

ELECTROMAGNETICS & WAVE PROPAGATION

(2012 Course) (End - Sem.)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer 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.*
- 2) *Neat diagrams must be drawn whenever necessary.*
- 3) *Figures to the right indicates full marks.*
- 4) *Assume suitable data, if necessary.*

Q1) a) State & explain Coulomb's law. Write the derivation for Electric Field Intensity. **[4]**

b) Derive continuity equation for current. **[6]**

OR

Q2) a) A region $y \geq 0$ consist of a dielectric medium and the region $y < 0$ is a conductor. For the surface of $4nc/m^2$ on the conductor and $\epsilon r_1 = 3$ (for the dielectric medium). Find \bar{E} and \bar{D} at the points. **[6]**

i) M (4, -2, 1) &

ii) N(-3, 1,4)

b) Derive Boundary conditions between conductor & free space. **[4]**

Q3) a) Derive the equation for capacitance of spherical capacitor. **[4]**

b) State Biot- Savart's law. Determine the magnetic field at any point due to a straight filamentary conductor using Biot-Savart's law. **[6]**

OR

Q4) a) Explain the concept of polarization interms of dielectrics. **[4]**

b) State and prove how line integral of flux density can be converted into surface integral. **[6]**

Q5) a) Explain Faraday's law with special case as 'Faraday's Disc generator'. **[8]**

P.T.O.

- b) What is Poynting vector? What is its significance? Derive an expression for Poynting vector P. [8]

OR

- Q6)** a) In a material for which $\sigma = 5.0 \text{ s/m}$ and $\epsilon_r = 1$, the electric field intensity is $E = 250 \sin 10^{10} t \text{ V/m}$. Find the conduction and displacement current densities and the frequency at which both have equal magnitudes. [8]
- b) State & explain Maxwell's equation in Point and Integral form. [8]

- Q7)** a) A plane electromagnetic wave having frequency of 10MHz has an average Poynting vector of 1 W/m^2 . The medium is lossless with relative permeability of 2 & relative permittivity of '3' find [8]
- Velocity of propagation
 - Wavelength
 - Impedance of the medium
 - RMS electric field 'E'.
- b) Define polarization & explain all types of polarization with expression. [6]
- c) Explain effects of Earth's magnetic field on wave propagation. [4]

OR

- Q8)** a) Formulate the wave equation from Maxwell's equation. Solve it for perfectly conducting media. [10]
- b) 'E' & 'H' waves, travelling in free space, are normally incident on the interface with a perfect dielectric with $\mu_r = 1$, $\epsilon_r = 4$. Calculate the transmission & reflection coefficient. Also find E_t & E_r if $E_i = 1.5 \text{ V/m}$. [8]

- Q9)** a) Explain the fundamental equations for the free space propagation and Friis Transmission equation. [8]
- b) Explain Ground wave, sky wave & space wave propagation & effects of the earth's curvature on propagation. [8]

OR

- Q10)** a) Explain the characteristics of wireless channel. [8]
- b) Explain
- Multi-hop propagation. [4]
 - Space-link Geometry. [4]



Total No. of Questions : 10]

SEAT No. :

P2400

[4758] - 561

[Total No. of Pages :2

T.E. (Electronics)

INSTRUMENTATION SYSTEMS

(2012 Course) (End-Sem.) (304209) (Semester - II)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 4) *Assume suitable data, if necessary.*

- Q1)** a) Explain transit time type of ultrasonic flow meter. [5]
b) State the difference between active and passive transducers. Enlist three examples each of active and passive transducers. [5]

OR

- Q2)** a) Explain the different fundamental standards and units for common physical parameters. [5]
b) Explain capacitive and inductive principles used in proximity sensing. [5]

- Q3)** a) Explain the working principle of optical Pyrometer. [5]
b) Explain construction and working of electromagnetic flow sensor. [5]

OR

- Q4)** a) State working principle of thermocouple. Explain how cold junction compensation is achieved for thermocouple. [5]
b) Explain capacitive sensor for level measurement when, [5]
i) Liquid is conducting
ii) Liquid is not conducting

- Q5)** a) Explain with suitable block diagram LM75 semiconductor temperature sensor. [8]
b) Write short note on: [8]
i) Micro-machined hot wire anemometer.
ii) Magnetic field sensors.

OR

P.T.O.

- Q6)** a) Explain the steps involved in surface micromachining of MEMS accelerometer. Draw a neat sketch of MEMS accelerometer. [8]
b) Write short note on: [8]
i) Micro-machined absolute pressure sensor.
ii) Smart sensors.

- Q7)** a) Explain how simultaneous analog and digital communication is achieved with HART protocol? [8]
b) Write short note on: [10]
i) I²C bus.
ii) Foundation field bus.

OR

- Q8)** a) Explain with neat diagram I/P and P/I convertor. [8]
b) Write short notes on: [10]
i) RS 232 standard
ii) IEEE 488 bus

- Q9)** a) What is actuator? Explain with diagram working of: [8]
i) Spring diaphragm actuator
ii) Piston actuator
b) Explain principle of operation of stepper motor. State important selection criteria of stepper motor? [8]

OR

- Q10)**a) Explain with neat diagram working of poppet valve. Draw the symbol for a 2/2 valve and a 3/2 valve. [8]
b) Explain role of relay and solenoid valve with any one application. [8]



Total No. of Questions : 10]

SEAT No. :

P2401

[4758] - 562

[Total No. of Pages :3

T.E. (Electronics)

EMBEDDED PROCESSORS

(2012 Course) (End-Sem.) (Semester - II) (304211)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Neat diagrams must be drawn wherever necessary.*
- 2) Figures to the right indicate full marks.*
- 3) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 4) Assume suitable data, if necessary.*

- Q1)** a) Describe complete memory map of LPC 2148. **[4]**
- b) Explain the PINSEL registers. **[4]**
- i) PINSEL0
 - ii) PINSEL 1
 - iii) PINSEL 2
 - iv) IODIR
- c) Explain the following instruction (Any two). **[2]**
- i) MUL R₃, R₂, R₁
 - ii) LDR R₀, [R₁]
 - iii) SWPB R₂, R₁, [R₄]

OR

- Q2)** a) Describe CPSR and SPSR of ARM 7. **[4]**
- b) Draw interfacing diagram of temperature sensor (LM 35: 10mV/°C) and also write a program to display temperature on LCD. **[6]**

P.T.O.

- Q3)** a) Draw and explain interfacing of I2C EEPROM with LPC 2148. Write a embedded 'C' program for the same. [6]
- b) Explain UART block in LPC 2148. [4]

OR

- Q4)** a) Write a embedded 'C' program for generation of square wave using on chip DAC of LPC 2148. [6]
- b) Explain different operating modes in ARM 7. [4]

- Q5)** a) Compare cortex A, cortex R and cortex M processors. What are the improvement of ARM cortex M₃ over ARM 7. [8]
- b) Explain CMSIS standard with structure in detail. [6]
- c) Explain thread and handler with the help of state diagram. [2]

OR

- Q6)** a) Explain features of embedded operating system and explain need for developing complex application. [8]
- b) Draw and explain block diagram of ARM cortex M₃. [8]

- Q7)** a) Draw interfacing diagram of RGB LED with LPC 1768 also write embedded 'C' program to generate different colours. [6]
- b) Explain features of NVIC in LPC 1768. [4]
- c) Describe system control block of LPC 1768. [6]

OR

- Q8)** a) Interface 7 segment display with LPC 1768 and also write embedded 'C' program to display 0 to 9. [10]
- b) What are the different clock sources available with LPC 1768. [6]

Q9) Write a short note on following block in LPC 1768. (Any three). **[18]**

- a) Ethernet
- b) SDCARD
- c) USB
- d) CAN

OR

Q10)a) Write application of CAN, Ethernet, USB with real world example. **[4]**

b) Draw and explain interfacing diagram of DC motor using PWM of LPC 1768 also write embedded 'C' program for the same. **[8]**

c) Draw and explain interfacing of TFT with LPC 1768. **[6]**



Total No. of Questions : 8]

SEAT No. :

P2402

[4758]-563

[Total No. of Pages : 2

T.E. (Electronics)

POWER ELECTRONICS & APPLICATIONS

(2012 Course) (End -Semester)

Time : 2½ Hours]

[Max. Marks :70

Instructions to the candidates:

- 1) *Answer Q.No.1 or 2, Q.No.3 or 4, Q.No.5 or 6, Q.No.7 or 8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of logarithmic tables and non programmable electronic pocket calculator is allowed.*
- 5) *Assume suitable data, if necessary.*

- Q1)** a) Derive the expression for the average output voltage of 1 ϕ full converter. Draw the variation of average output voltage with α . Also draw the output voltage waveforms. [6]
- b) With the help of neat diagram and waveforms explain operation of 120° conduction mode of 3 ϕ inverters for star connected balanced resistive load. [7]
- c) How are choppers classified? Explain with a typical application. [7]

OR

- Q2)** a) Explain triggering circuit requirements for 3 ϕ full converter. [6]
- b) Explain modified sinusoidal PWM method for controlling output voltage and harmonic reduction in bridge inverter. [7]
- c) State the advantages and disadvantages of SMPS over linear power supply. [7]
- Q3)** a) With the help of circuit diagram and waveforms, explain the operation of SLR DC-DC converter. [8]
- b) Define power quality. State various power line disturbances and their sources. [8]

OR

P.T.O.

Q4) a) With the help of neat diagram and waveforms explain the operation of ZCS resonant switch DC-DC converter. [8]

b) What are advantages and disadvantages of resonant converters? [8]

Q5) a) Draw the block diagram of an online UPS and explain the function of each block. [8]

b) Draw the block diagram of HVDC transmission system and explain its operation. [10]

OR

Q6) a) Compare offline and online UPS. [6]

b) Explain the operation of electronic ballast with the help of block diagram. [6]

c) Compare HVAC and HVDC transmission. [6]

Q7) a) State advantages, disadvantages and applications of PV. [4]

b) Explain with block diagram grid connected PV system. [6]

c) Distinguish between horizontal axis wind turbine generator and vertical axis wind turbine generator. [6]

OR

Q8) a) What is meant by MPPT? Explain in brief analog and digital methods used for MPPT. [4]

b) Explain with the help of neat diagram application of standalone PV system. [6]

c) Explain in brief isolated grid supply system with multiple wind turbines. [6]

EEE

Total No. of Questions : 8]

SEAT No. :

P2403

[4758]-564

[Total No. of Pages : 2

**T.E. (Electronics Engineering)
INDUSTRIAL MANAGEMENT**

(2012 Pattern) (Semester - II) (end - Sem.) (304213)

Time : 3 Hours]

[Max. Marks :70

Instructions to the candidates:

- 1) *Attempt Q.1 or Q2, Q.3 or Q4, Q.5 or Q6, Q.7 or Q8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Assume suitable data if necessary.*

- Q1)** a) What are the characteristics of management. [6]
- b) Write a short note on ISO standards. [6]
- c) Write a short note on [8]
- i) CPM
 - ii) PERT

OR

- Q2)** a) Explain how management help in accelerating the productivity of the organization. [7]
- b) Explain Kaizen. State the benefits of Kaizen. [7]
- c) Explain the types of Capital. [6]
- Q3)** a) Explain the term HRM. What are the advantages of HRM? State the roles and responsibility of HR professionals. [10]
- b) What are benefits of tanning? Explain with suitable example. [7]

OR

P.T.O.

- Q4)** a) State the objectives of HRM. [6]
b) Explain the term “Talent Acquisition”. [6]
c) Short note on Human resource Information system. [5]

- Q5)** a) Short note on “Woman Entrepreneurship”. [6]
b) What are different types of businesses? [10]

OR

- Q6)** a) Explain the different sources of finance. [5]
b) What is difference between shares & debentures. [5]
c) Explain cooperative society with suitable example. [6]

- Q7)** a) What is DSS. Differentiate MIS & DSS. [7]
b) Write a short note on [10]
i) ERP
ii) BPR

OR

- Q8)** a) Explain the term MIS. What is the need of MIS. What are the objectives of MIS. [10]
b) What is e commerce. Explain the types of e commerce. [7]

EEE

Total No. of Questions : 10]

SEAT No. :

P2404

[4758]-565

[Total No. of Pages : 4

T.E. (Electronics)

DISCRETE TIME SIGNAL PROCESSING

(2012 Course) (End-Sem.) (Semester - II) (304210)

Time : 2½ Hours]

[Max. Marks :70

Instructions to the candidates:

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 4) *Assume suitable data, if necessary.*

Q1) a) An analog signal is represented as $x(t) = 5 \cos(2\pi 2000t) + \cos(2\pi 5000\pi t)$ **[6]**

- i) What is the Nyquist rate for the signal?
 - ii) Suppose, we sample this signal with a sampling frequency $F_s = 8\text{kHz}$, what is the folding frequency?
 - iii) Write the equation of sampled signal.
- b) If the DFT of the sequence $x(n) = \{1 \ 2 \ 3 \ 4\}$ is given by $X(k) = \{10 \ -2 + j2 \ -2 \ -2 - j2\}$. What will be the DFT of time reversed sequence?**[4]**

OR

Q2) a) The analog signal is represented as

$$x(t) = \sin(10\pi t) + 2 \sin(20\pi t) - 2\cos(30\pi t) \quad \text{[6]}$$

- i) What is the Nyquist rate for this signal?
 - ii) If the signal is sampled with a sampling frequency of 20Hz, what is the discrete time signal obtained after sampling?
 - iii) What is the recovered signal?
- b) Complete 4 - point DFT of the sequence $x(n) = \cos \frac{n\pi}{2}$ using DIF FFT algorithm. **[4]**

P.T.O.

Q3) a) Compute the 4 - point DFT of the sequence $x(n) = \{4 \ 3 \ 2 \ 1\}$ by linear transformation. [4]

b) A causal discrete time system is described by

$$y(n) - \frac{3}{4}y(n-1) + \frac{1}{8}y(n-2) = x(n). \quad [6]$$

- i) Determine the system function $H(z)$.
- ii) Compute the impulse response of the system.

OR

Q4) a) Find the z-transform of $x(n) = n^2u(n)$. [4]

b) Compute $x_1(n) \textcircled{N} x_2(n)$ if

$$x_1(n) = \delta(n) + \delta(n-1) - \delta(n-2) - \delta(n-3)$$

$$x_2(n) = \delta(n) - \delta(n-2) + \delta(n-4) \quad [6]$$

Q5) a) Design a bandpass linear phase FIR filter having cut-off frequencies of $\omega_{c_1} = 1$ rad/sample and $\omega_{c_2} = 2$ rad/sample. Use rectangular window function. [6]

b) Write a note on window functions. [4]

c) Show that symmetric FIR filter has linear phase response. [7]

OR

Q6) a) Using frequency sampling technique, determine the filter coefficients, length of filter is 17.

Specifications:

$$H_d(e^{j\omega}) = \begin{cases} e^{-j8\omega} & 0 \leq \omega \leq \pi/2 \\ 1 & \pi/2 \leq \omega \leq \pi \end{cases} \quad [8]$$

- b) Obtain direct form I & cascade form realisation for the transfer function given by

$$H(z) = \left(1 - \frac{1}{4}z^{-1} + \frac{3}{8}z^{-2}\right) \left(1 - \frac{1}{8}z^{-1} - \frac{1}{2}z^{-2}\right) \quad [9]$$

- Q7) a)** An analog filter has the transfer function [4]

$$H(s) = \frac{1}{s+1}$$

Using bilinear transformation, determine the transfer function of digital filter $H(z)$ and also write the difference equation of digital filter. Assume $T = 1$ sec.

- b) Using bilinear transformation, design a butterworth filter which satisfies the following conditions. [8]

$$0.8 \leq |H(e^{j\omega})| \leq 1 \quad 0 \leq \omega \leq 0.2\pi$$

$$|H(e^{j\omega})| \leq 0.2 \quad 0.6\pi \leq \omega < \pi \quad \text{Assume } T = 1 \text{ sec.}$$

- c) Realize the following second order system in direct form I & direct form II. [5]

$$y(n) = 2r \cos(\omega_0) y(n-1) - r^2 y(n-2) + x(n) - r \cos(\omega_0) x(n-1)$$

OR

- Q8) a)** For the analog system transfer function

$$H(s) = \frac{1}{(s+1)(s+2)}, \text{ Assume } T = 1 \text{ second}$$

determine $H(z)$ using impulse invariant technique. [5]

- b) What are the effects of finite word length in digital filter IIR filters. [5]
- c) Determine parallel realisation of the IIR digital filter transfer function [7]

$$H(z) = \frac{3(2z^2 + 5z + 4)}{(2z+1)(z+2)}$$

Q9) a) Explain the role of anti-aliasing filter in decimation. **[4]**

b) An audio signal is to be decimated by a factor of 30. Design a two stage decimator with factors 15 & 2, that satisfy the following specifications. **[6]**

Input sampling frequency f_s : 240 kHz

Highest frequency of interest : 3.4 kHz

Pass band ripple : 0.05

Stop band ripple : 0.01

c) Write notes on **[6]**

i) Multiply and Accumulate unit.

ii) Pipelining.

OR

Q10)a) Write the help of block diagram and waveform explain sampling rate conversion by non-integer factor. **[8]**

b) Draw the architectural block diagram of TMS 320C67XX processor and explain five salient features. **[8]**

EEE

Total No. of Questions : 10]

SEAT No. :

P2405

[4758] - 566

[Total No. of Pages :2

T.E. (Instrumentation & Control)

INSTRUMENTAL METHODS FOR CHEMICAL ANALYSIS

(2012 Course) (Semester -I) (306262) (End Semester)

Time :2 ½ hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume suitable data if necessary.*

Q1) a) Difference between Classical method and Instrumental method for chemical analysis on the basis of merits and demerits. [6]

b) Write a short notes on Hollow Cathode Lamp. [4]

OR

Q2) a) Explain Direct reading spectrophotometer with neat sketch. [6]

b) Write Short notes on Potentiometry. [4]

Q3) a) Explain with neat sketch Atomic Emission Spectroscopy. [6]

b) Write a Short notes on Multichannel Filter photometer. [4]

OR

Q4) a) Explain the principle & Working of Flame photometry with neat sketch. [6]

b) Classify various Instrumental methods of chemical analysis. [4]

Q5) a) What is chemical shift? Explain working of NMR spectrometer with neat diagram. How sensitivity can be enhanced in NMR spectrometer. [10]

b) Explain O₂ Analyzer With neat Sketch. [8]

OR

P.T.O.

Q6) a) Derive the relationship between fluorescent power and sample concentration. [10]

b) Explain Spectrofluorimeter with neat sketch. [8]

Q7) a) Explain Magnetic depletion mass spectrometer with neat sketch. [8]

b) Explain Gas chromatography with neat sketch. [8]

OR

Q8) a) Explain Thermal conductivity detector (TCD) with sketch. [8]

b) Explain with neat sketch sample injection system & Chromatographic column used in GC. [8]

Q9) a) Explain with neat sketch Proportional counter. [8]

b) Explain Instrumentation for 'X-ray Spectroscopy'. [8]

OR

Q10)a) Explain with neat sketch Scintillation Counter. [8]

b) State and prove Bragg's law of X-ray diffraction. [8]



OR

- Q6)** a) With a neat schematic, explain the interfacing of RTC to 8051 microcontroller. [8]
b) With a neat diagram, explain the interfacing of Serial EEPROM with 8051 microcontroller. [8]

- Q7)** a) Enlist the architectural features of ATmega8535 microcontroller. [10]
b) What is a watchdog timer? Explain WDTCR ATmega8535 microcontroller. [8]

			WDTOE	WDE	WDP2	WDP1	WDP0
--	--	--	-------	-----	------	------	------

OR

- Q8)** a) Explain the function of watchdog timer for ATmega8535 controller with the help of suitable diagram. [8]
b) Explain the following instructions of AVR microcontroller : [10]
i) ADD R17, R16
ii) LD R16, Y
iii) ST Z+, R16
iv) SUBI R15, \$10
v) LPM

- Q9)** a) Explain Timer 0 operation of AVR microcontroller. [8]
b) Explain the role of UDR (USART Data Register) & the bits shown below of USART Control Register of AVR microcontroller. [8]

RXCIE	TXCIE	UDRIE	RXEN	TXEN			
-------	-------	-------	------	------	--	--	--

OR

- Q10)** a) Explain in detail the TCCR1A of ATmega8535 microcontroller. [8]
b) Explain how the baud rate is defined with the help of UBRR (USART Baud Rate Register) in AVR microcontroller. [8]

COM1A1	COM1A0	COM1B1	COM1B0			PWM11	PWM10
--------	--------	--------	--------	--	--	-------	-------



Total No. of Questions : 10]

SEAT No. :

P2406

[4758] - 568

[Total No. of Pages :2

T.E. (Instrumentation & Control)
CONTROL SYSTEM COMPONENTS
(2012 Course) (Semester - I) (End Semester)

Time : 2.5 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Students have to answer 5 questions.*
- 2) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Assume suitable data if necessary.*

- Q1)** a) Explain in brief the application of temperature switch. **[4]**
b) With the help of a neat diagram explain pneumatic supply. **[6]**

OR

- Q2)** a) Explain the construction and working of Electromechanical Relay. **[5]**
b) Draw pneumatic circuit for implementing speed control of single acting cylinder. **[5]**

- Q3)** a) Explain any one protection circuit for motor. **[5]**
b) Explain application of selector switch and pushbutton. **[5]**

OR

- Q4)** a) Write the differences between a contactor and a relay. **[4]**
b) What purpose does a Quick exhaust valve serve in a pneumatic system? Explain with the help of an application. **[6]**

- Q5)** a) Give properties of good hydraulic oil to be used in hydraulic systems. **[8]**
b) Develop using standard symbols a hydraulic circuit for sequential operation of 2 cylinders. **[10]**

OR

P.T.O.

- Q6)** a) State the advantages and drawbacks of hydraulic systems. [8]
b) With the help of standard symbols draw hydraulic circuit for direction control of hydraulic motor. [10]

- Q7)** a) Explain the standard ISA sequences of alarm annunciator. [8]
b) List different types of feeders explain any one type. [8]

OR

- Q8)** a) Explain the need of the following auxiliary components: [8]
i) Circuit breaker
ii) Damper
b) Explain the construction and working of HRC fuses. [8]

- Q9)** a) Explain applications of fluidic elements. [8]
b) Suggest suitable protection method for different types of hazardous areas. [8]

OR

- Q10)**a) Explain the working of Tesla's tube and Coanda effect in fluidics. [8]
b) Compare any two protection methods based on safety level, maintenance, cost of installation, cost of instrument, and flexibility. [8]



Total No. of Questions : 10]

SEAT No. :

P3673

[4758] - 569

[Total No. of Pages :4

T.E. (Instrumentation and Control)
CONTROL SYSTEM DESIGN
(2012 Course) (Semester -I) (End-Sem.)

Time : 2 ½Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve Que.1 or 2, Que.3 or 4, Que .5 or 6, Que .7or 8, Que.9 or 10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Use of non-programmable Calculator is allowed.*
- 5) *Assume suitable data, if necessary.*

Q1) a) An open loop transfer function of unity feedback system is **[5]**

$$G(s) H(s) = \frac{K}{(s + p_1)(s + p_2)}$$

If we add one zero in the system at $s = -z_1$ which is at left-side of $s = -p_1, -p_2$, explain its effect on the root locus and closed loop transient response of $G(s) H(s)$.

b) A first order plant has a transfer function $\frac{y(s)}{r(s)} = \frac{K_p}{T_p s + 1}$

where $y(s)$ is plant output and $r(s)$ is reference input. A proportional controller K_c is used control the $y(s)$. For step change in $r(s)$, explain the effects of the controller. **[5]**

OR

Q2) a) With the help example explain the advantages and limitation of Lead compensator. **[5]**

P.T.O.

- b) A first order plant has a transfer function $\frac{y(s)}{r(s)} = \frac{K_p}{s}$

where $y(s)$ is plant output and $r(s)$ is reference input. A proportional controller K_c is used control the $y(s)$. For step change in $r(s)$, explain the effects of the controller. [5]

- Q3) a)** Write your comments on effects of Proportional plus Integral controller for a first order plant. [4]

- b) A first order plant has a transfer function $G_p(s) = \frac{3}{10s+1}$

and required closed output trajectory is $\frac{3}{5s+1}$

Determine the controller using direct synthesis. [6]

OR

- Q4) a)** Write your comments on effects of Proportional plus Derivative controller for a first order plant. [4]

- b) A first order plant has a transfer function $G_p(s) = \frac{4}{s(s+1)}$

Design a PI controller so that closed loop poles are $s = -2.2 \pm 3i$ and $K_v = 40$. [6]

- Q5) a)** Determine the expression to convert state space model into transfer function model. [6]

- b) Determine the state space model in observable canonical form for a transfer function given as $G(s) = \frac{s+3}{(s+2)(s+4)(s+5)}$. [10]

OR

- Q6) a)** With an example explain Cayley Hamilton theorem. [6]

b) The state space model is [10]

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -6 & -7 & -8 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}$$

$$y = [1 \quad 0 \quad 0] \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$$

Determine the transfer function model.

Q7) a) The state space model is [10]

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

$$y = [1 \quad 2] \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

Determine the state transition matrix using Laplace transform method.

b) The state space model is [8]

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -3 & -5 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix}$$

$$y = [1 \quad 2] \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

Determine the controllability and observability of the system.

OR

Q8) Determine the output time response for the state space model given below. **[18]**

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

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

$u = 1$ for $t \geq 0$ initial condition is $x(0) = [2 \ 0]^T$.

Q9) The transfer function model of the system is $\frac{1}{s^2 + 5s + 6}$. It is desired to place the system closed loop poles at $s_1 = -1$ and $s_2 = -2$. Determine state feedback gain matrix using Ackerman's method. **[16]**

OR

Q10) The transfer function model of the system is $\frac{1}{s^2 + 6s + 8}$. It is desired to place the observer poles at $s_1 = -1$ and $s_2 = -2$. Determine state observer gain matrix using Ackerman's method. **[16]**



Total No. of Questions : 12]

SEAT No. :

P2322

[4758] - 57

[Total No. of Pages :4

T.E. (Electrical)
CONTROL SYSTEM - I
(2008 Pattern) (Semester - II)

Time : 3Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

Q1) a) Giving an example, explain a feedback control system. List the advantages of feedback. [8]

b) Obtain the transfer function $G(s) = \frac{V_2(s)}{V_1(s)}$ of the network as shown in fig 1b. [8]

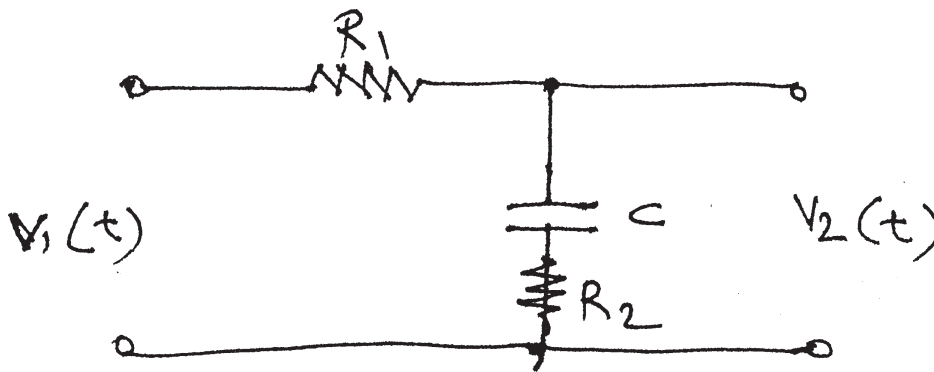


Fig 1

OR

P.T.O.

- 2) a) Find $\frac{C(s)}{R(s)}$ for the system signal flow graph as shown in fig. 2a. [10]

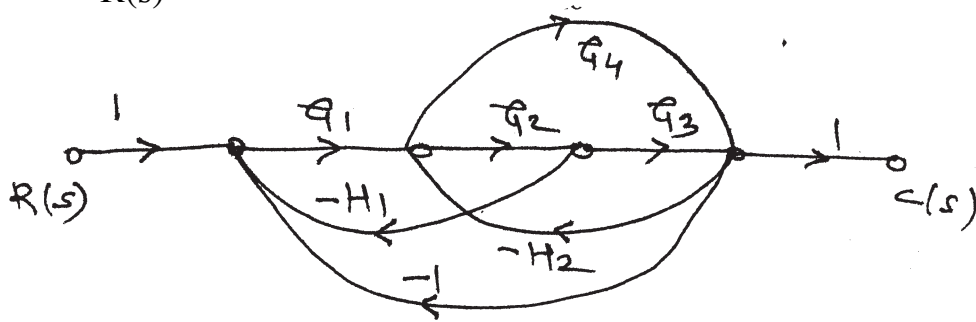


fig 2a

- b) Write the equilibrium equations for the mechanical system as shown in fig 2b. [6]

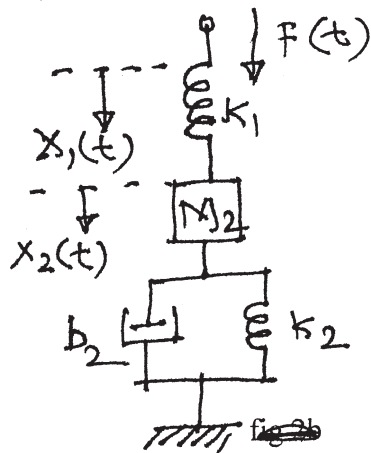


fig 2b

- Q3) a) Discuss the response and steady state errors for a second order system if inputs are: [8]

- i) Step unit signal
- ii) Unit ramp signal and
- iii) Unit parabolic signal

- b) Find steady state error for unit step, unit ramp and unit acceleration inputs for the following systems: [8]

i)
$$G(s) = \frac{10}{s(0.1s+1)(0.5s+1)}$$

ii)
$$G(s) = \frac{1000(s+1)}{(s+10)(s+50)}$$

OR

Q4) a) Define and explain all the time domain specifications for a under damped control system with Unit step input. [8]

b) For the system given by $G(s) = \frac{25}{(s^2 + 6s + 25)}$ find its rise time, peak time and peak overshoot. [8]

Q5) a) State and explain Routh's criterion and Hurwitz criterion. What are the limitations? [8]

b) For a unity feedback system, output is marginally stable and oscillates with frequency 4rad/sec. Find K marginal and 'q' with open loop transfer function [10]

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

OR

Q6) a) Explain magnitude condition and Angle condition for system to be stable. How they are applicable in Root locus sketch.

b) Sketch the root locus for a system with loop transfer function

$$G(s) = \frac{K}{(s^2 + s + 1)}. \text{ Also discuss on stability of the system.}$$

[18]

SECTION - II

Q7) a) Define and explain all frequency domain specifications. [8]

b) The OLTF of unity feedback system is $G(s) = \frac{10(s + 20)}{(s + 1)(s + 2)(s + 3)}$.

Construct Bode plot. Determine Gain margin and Phase margin. Comment on stability. [8]

OR

- Q8) a)** State and explain Nyquist stability criterion. [8]
- b) What is polar plot and how it is used to find stability of control system? Sketch and explain polar plots type '0', '1' and '2' systems. [8]

- Q9) a)** Define and explain: [8]
- i) State
- ii) State Vector
- iii) State Space
- iv) Output equation
- b) Find the transfer function for the system represented as

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{bmatrix} -2 & 1 & 0 \\ 0 & -3 & -1 \\ -3 & -4 & -5 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u$$

$$y = \begin{bmatrix} 0 & 1 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} \quad [8]$$

OR

- Q10)a)** Explain the methods of obtaining state model from the transfer function. [8]
- b) Derive transfer function from state model. [8]

- Q11)a)** Write note on potentiometer. [8]
- b) With neat diagrams, explain the PD, PI, and PID controllers. [10]

OR

- Q12)a)** Write short notes on compensator networks. [10]
- b) Explain and derive transfer function of D.C. Servomotor. [8]



Total No. of Questions : 10]

SEAT No. :

P3922

[Total No. of Pages : 2

[4758] - 570

T.E. (Instrumentation & Control) (Semester - II)
INDUSTRIAL ORGANIZATION AND MANAGEMENT
(2012 Pattern)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q 1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.*
- 2) Neat diagrams must be drawn whenever necessary.*
- 3) Figures to right indicate full marks.*
- 4) Assume suitable data, if necessary.*
- 5) Use of Logarithmic table, slide rule, electronics pocket calculator and Steam table is allowed.*

Q1) Write short notes on — **[10]**

- a) SWOT analysis
- b) Business expansion and diversion

OR

Q2) a) Enlist various functions of management and explain any three of them. **[6]**

b) What are the norms under ISO 14000? **[4]**

Q3) a) What is purchasing? State its need and types. **[5]**

b) Write a short note on 'Inventory Management'. **[5]**

OR

Q4) a) With reference to example explain supply chain concept. **[5]**

b) Derive the equation for economic ordering quantity. **[5]**

P.T.O.

- Q5)** a) What is Job Description? Explain its need for HR manager. [9]
b) Define motivation. Explain Herzberg's motivational theory. [9]

OR

- Q6)** a) Classify the various training methods according to the personnel levels and briefly explain any three of them. [9]
b) What are the different skills required for 'Leadership'. [9]

- Q7)** a) Write a detailed note on 'Balance sheet'. [8]
b) What is the need and functions of money and capital market? [8]

OR

- Q8)** a) What are the different sources of finance? Briefly explain. [8]
b) Explain concept of budget, its objectives and types. [8]

- Q9)** a) What is the need of business and professional ethics in today's competitive market? [8]
b) Write a note on enterprise resource planning (ERP). [8]

OR

- Q10)** a) Write a note on IT and e-business. [8]
b) What is management information system? How it is advantageous to modern industries? [8]



Total No. of Questions : 10]

SEAT No. :

P2407

[4758] - 571

[Total No. of Pages :3

**T.E. (Instrumentation & Control)
DIGITAL SIGNAL PROCESSING**

(2012 Course) (Semester - II) (End Semester)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Write Five Questions.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume suitable data if necessary.*

Q1) a) Compute the Cross correlation of the given two sequence. **[6]**

$$X(n) = \{2, 1, 4, 1\} \quad Y(n) = \{3, 5, 7, 2\}$$

b) Explain the various operations performed on signal. **[4]**

OR

Q2) a) Find stability of the system whose impulse response $h(n) = (1/8)^n u(n)$. **[4]**

b) Determine & sketch the magnitude and phase response of the system **[6]**

$$Y(n) = 1/2 [x(n) + x(n-2)]$$

Q3) a) Find the Z-transform of the term $X(s) = 1/s(s+1)$. **[4]**

b) Find DFT of a sequence for $N = 4$ **[6]**

$$X(n) = 1/2 \quad 0 \leq n \leq 2$$

$$= 0 \quad \text{otherwise}$$

OR

Q4) a) Determine the Circular convolution of the given two sequence using DFT method. **[6]**

$$X_1(n) = \{1, 2, 3, 1\}, \quad X_2(n) = \{4, 3, 2, 2\}$$

b) What is the relation between Z-transform and DFT. **[4]**

P.T.O.

- Q5) a)** Obtain the 8-point IDFT of a given sequence using DIT FFT Algorithm [12]

$$X(k) = \{4, 1 - j2.414, 0, 1 - j0.414, 0, 1 + j0.414, 0, 1 + j2.414\}$$

- b) What is FFT? Why FFT is needed. [4]

OR

- Q6) a)** Obtain the 8-point DFT of a given sequence using DIT FFT algorithm [12]

$$X(n) = \{2, 2, 1, 2, 3, 2, 1, 2\}$$

- b) Sketch Signal flow graph of 4-point Decimation in Frequency (DIF) FFT Algorithm. [4]

- Q7)** Design a low pass filter with 11 coefficients for following specification Pass band frequency edge = 250 Hz, Sampling frequency = 1000Hz. Use Rectangular, Hamming and Hanning Window for Design. [18]

OR

- Q8) a)** Explain the different methods for designing FIR filter. [6]

- b) Design a linear phase FIR filter using Hamming window for desired frequency response [12]

$$H_d(\omega) = e^{-j3\omega}, \quad 0 < |\omega| < \pi/4$$

$$0, \quad \pi/4 < |\omega| < \pi \quad \text{for } N = 7$$

- Q9) a)** Apply Bilinear transformation to the given transfer function. [6]

$$H(s) = \frac{(s+0.1)}{(s+0.1)^2 + 9} \quad \text{where } \omega_r = \pi/4$$

- b) Design a Chebyshev filter with a max pass band attenuation of 2.5 dB at $\Omega_p = 20$ rad/sec & stop band attenuation of 30 dB at $\Omega_s = 50$ rad/sec. [10]

OR

Q10)a) Compare the features of digital Butterworth and Chebyshev type - 1 filter in terms of **[6]**

- i) Filter order
- ii) Transition width

b) Design a Butter worth filter using Impulse invariance method for following specification. **[10]**

$$0.8 \leq |H(e^{j\omega})| \leq 1 \quad 0 \leq \omega \leq 0.2\pi$$

$$|H(e^{j\omega})| \leq 0.2 \quad 0.6\pi \leq \omega \leq \pi$$



Total No. of Questions : 10]

SEAT No. :

P2408

[4758] - 572

[Total No. of Pages :3

T.E. (Instrumentation and Control Engineering)

INSTRUMENT AND SYSTEM DESIGN

(2012 Course) (Semester - II) (End-Sem.)

Time :3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answers Q1 or Q2, Q3 or Q4, Q5 or Q6, Q 7 or Q8, Q9 or Q10.*
- 2) *Neat circuit diagrams should be drawn whenever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary.*

Q1) a) Explain briefly control panel and its types. **[3]**

b) Design signal conditioning circuit for RTD with input from 0°C to 250°C. The output should be 0 to 2.5V. Supply voltage is 5V. Temperature coefficient of the given RTD is $0.0039 \Omega/^{\circ}\text{C}$. Also draw the circuit diagram. **[7]**

OR

Q2) a) With suitable waveforms explain the working of phase angle control IC 785. **[6]**

b) Explain the terms EMI and EMC. Also state the mechanisms to reduce them. **[4]**

Q3) a) What is NEMA standard? Explain Type 1, Type 2 and Type 3 standards. **[5]**

b) Explain with suitable diagram ALARM facility in IC AD 595. **[5]**

OR

Q4) a) Define and classify noise. Explain short noise and popcorn noise. **[6]**

b) Explain the functions of following pins in IC XTR 110- **[4]**

P.T.O.

- i) +Vref
- ii) 16mA span
- iii) Gate drive
- iv) 4mA span

- Q5) a)** Draw the internal diagram of IC CD4046 and explain in detail. [9]
- b) What is IC MT 8870? Explain the functions of following pins in IC MT 8870- [9]
- i) INH
 - ii) PWDN
 - iii) TOE
 - iv) OSC 2

OR

- Q6) a)** Introduce the IC 7107. Enlist its features and applications. Explain the working with the help of three working phases. [9]
- b) IC MCT 2E is to be used to derive a lamp which requires 10V, 100mA of current. The CTR of IC is 0.55 Design and draw the interfacing circuit. [9]
- Q7) a)** Give different types of soldering. Explain dip soldering with suitable figures. [8]
- b) What are the board size constraints? Classify board types and briefly explain. [8]

OR

- Q8) a)** Give the different rules for the design of analog circuit PCBs. [8]
- b) Write a note on 'Soldering metals and Soldering Flux'. [8]

- Q9)** a) Explain the terms MTTF, MTBF and MTTR. [6]
b) Give the importance of documentation from repair and upgrade point of view. [4]
c) Give three main differences between reliability and quality. [6]

OR

- Q10)**a) Explain reliability and its modelling. [8]
b) With suitable example, explain bathtub curve and associated periods. [8]



Total No. of Questions : 10]

SEAT No. :

P3674

[4758]-573

[Total No. of Pages : 2

T.E. (Instrumentation)

UNIT OPERATIONS & POWER PLANT INSTRUMENTATION

(2012 Course) (End-Sem.) (Semester-II)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Neat diagrams must be drawn wherever necessary.*
- 2) Figures to the right indicate full marks.*
- 3) Assume suitable data, if necessary.*
- 4) All questions are compulsory.*

- Q1)** a) Explain construction & working of centrifugal pump. [4]
b) Explain in brief different mass transfer operations. [4]
c) Explain in brief heat transfer operations. [2]

OR

- Q2)** a) Explain the components of shell & tube type heat exchanger. [5]
b) Draw the neat sketch of evaporator & explain its working in brief. [5]
- Q3)** a) What is the difference between evaporation and drying? [5]
b) Explain principle of nuclear power generation in brief. [5]

OR

- Q4)** a) With the help of neat sketch explain moderate solar power plant. [5]
b) Explain the principle & types of Hydroelectric power plant. [5]
- Q5)** a) Explain air to fuel ratio control system with neat sketch. [8]
b) Write note on boiler drum level control system. [9]

OR

P.T.O.

- Q6)** a) Explain BMS in detail. [8]
b) Explain pulverised coal protection system with neat sketch. [9]

- Q7)** a) Explain concept of excess air in detail. [8]
b) Explain turbine supervisory instrumentation in detail. [9]

OR

- Q8)** a) Explain steam pressure control system with neat sketch. [8]
b) Enlist different parameters to be monitored in turbine for its safety. Suggest suitable sensor for the same. [9]

- Q9)** a) Explain factors to be considered in site selection for thermal power plant. [8]
b) What is electrostatic precipitator? Why it is needed in thermal power plant? [8]

OR

- Q10)**a) Compare & contrast wind & nuclear power plant? [8]
b) Write note on pollution monitoring & control in power plant. [8]



Total No. of Questions : 10]

SEAT No. :

P3675

[4758]-574

[Total No. of Pages : 2

T.E. (Instrumentation & Control)
BIOMEDICAL INSTRUMENTATION
(2012 Course) (Semester-II)(306271)(End Semester)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer 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.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume suitable data if necessary.*

Q1) a) Draw & explain the equivalent circuit for two electrodes connected to skin for biopotential measurement. **[6]**

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

OR

Q2) a) Draw & Explain Einthoven Triangle. **[6]**

b) Write a short note on Micro electrodes. **[4]**

Q3) a) Explain the Plethysmography with neat diagram. **[5]**

b) Explain the transient protection circuit used in designing the biomedical equipments. **[5]**

OR

Q4) a) State the cause characteristics, duration & Frequency of generated heart sounds. **[5]**

b) Explain the ultrasonic blood flow measurement along with neat diagram. **[5]**

Q5) a) What is EEG? State the EEG recording modes. List out the various waveforms generated during the EEG along with the frequency range, amplitude. State the significance of each waveform. **[10]**

b) Explain the 10-20 Electrode placement for the EEG recording. **[8]**

OR

P.T.O.

Q6) a) What is Electromyograph? State the type of electrode used for its measurements. Explain electromyography in details. [10]

b) Define the following terms:

1. Efferent Nerve.

2. Afferent Nerve.

3. Biofeedback.

4. Evoked Potential. [8]

Q7) a) Draw & Explain the three main sections of human auditory system? Explain the Middle ear functioning. [8]

b) Explain the various errors in Vision & their method of correction with neat sketch. State the Functions of three layers of eyes. [8]

OR

Q8) a) Define a hearing Threshold. Explain the Bekesy Audiometer with neat diagram. [8]

b) Describe the working of Evoked Response Audiometry system with neat diagram. [8]

Q9) a) What is Spirogram? Draw & Explain the working of basic water sealed Spirometer for Respiration measurements. [8]

b) Draw & Explain the working of Nitrogen Analyzer. [8]

OR

Q10) a) What is Oxygenator? Explain the principle & working of Bubble type Oxygenator. [8]

b) Explain the following terms with respect to Respiration Measurements:-
1) IC, 2) VC, 3) IRV, 4) TV [8]



Total No. of Questions : 10]

SEAT No. :

P3923

[Total No. of Pages : 3

[4758] - 575

T. E. Instrumentation & Control (END SEM)

PROCESS LOOP COMPONENTS

(2012 Pattern)

Time :3 Hours]

[Max. Marks :70

Instructions to the candidates:

- i) Solve Q. 1 or Q.2; Q.3 or Q.4; Q5 or Q6; Q.7 or Q.8; Q.9 or Q10.*
- ii) Neat diagrams must be drawn wherever necessary.*
- iii) Figures to the right indicate full marks.*
- iv) Use of non-programmable calculator is allowed.*
- v) Assume suitable data, if necessary.*

Q1) a) Draw the temperature control loop and define the following terms associated with the loop: **[8]**

- i) Manipulated variable
 - ii) controlled variable
 - iii) Load Variable
- b) State the features of conventional transmitter. **[2]**

OR

Q2) a) Explain process characteristics in detail. **[6]**

- b) Draw the P & ID symbols for: **[4]**
- i) High and Low level alarm
 - ii) Pressure indicating and controller
 - iii) High temperature switch
 - iv) Hand operated valve

Q3) a) Why antireset windup is necessary? Explain it with neat diagrams. **[8]**

- b) Give the limitations of relay based system. **[2]**

P.T.O.

OR

- Q4)** a) Explain the Proportional, Integral and derivative control mode with suitable response. [8]
b) In Z-N method, the critical gain was found to be 4.2 and the critical period was 2.21 min. Find the standard two mode controller settings. [2]

- Q5)** a) Explain the input and output modules of PLC with neat diagram. [12]
b) Develop a ladder diagram for a motor with following; [6]
START and STOP PB to start and stop the motor, Green light is on in running, When bearing Temperature is high motor stops and red light is on.

OR

- Q6)** a) Explain the following terms w.r. to Programmable Logic Controller. [8]
i) Fixed and Modular PLC
ii) Timers
iii) Counters
iv) Scan cycle
b) Define Programmable Logic Controller. Develop the ladder diagram for: Flashing a LED for 10sec. and it should go off after 3 flashes. [6]
c) List out the different Input and Output field devices used in PLC. [4]

- Q7)** a) Explain the need of control valve. An equal % age valve has a maximum flow of $150 \text{ m}^3/\text{s}$ and a minimum flow of $10 \text{ m}^3/\text{s}$. If the full travel is 3cm. Find the flow at a 1cm opening. [8]
b) Explain the control valve accessories with neat diagrams [8]
i) Positioner
ii) Reversing relay

OR

- Q8)** a) Draw and explain the installed and inherent valve characteristics. Draw the plug shapes for three basic characteristics. [8]

- b) Explain the following terms w.r. to control valve: [8]
- i) Fail safe action with suitable example
 - ii) Application of 03 way globe valve

Q9) a) Define valve coefficient (C_v). State its significance Find the proper valve size in inches for a pumping a liquid flow rate of 800gal/min with A maximum pressure difference of 65 psi. The liquid specific gravity is 1.5 Use following data. [8]

C_v	0.3	3	14	35	55	108	174	400	725
Valve size in inches	0.25	0.5	1	1.5	2	3	4	6	8

- b) Explain cavitation and flashing in detail. Draw the pressure profile diagram for the said conditions. [8]

OR

Q10) Write notes on: [16]

- a) Control valve noise.
- b) High temperature service valves.



Total No. of Questions : 10]

SEAT No. :

P3354

[4758] - 576

[Total No. of Pages : 4

T.E. (Computer Engg.)

DATABASE MANAGEMENT SYSTEMS APPLICATIONS

(2012 Course)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume suitable data, if necessary.*

Q1) a) Explain R database model with suitable example. [5]

b) Compare SQL and NOSQL databases. [5]

OR

Q2) a) Define Transitivity dependency. Explain third normal form with suitable example. [5]

b) Explain view and Index objects in SQL with example. [5]

Q3) a) Explain Distinct between the terms serial schedule and serializable schedule with suitable example. [5]

b) Explain MongoDB data modeling with suitable example. [5]

OR

Q4) a) Describe croud-sourcing in MongoDB. [5]

b) Explain different concurrency protocols in Database management systems. [5]

P.T.O.

- Q5)** a) Explain 3- tier web architecture with diagram for online shopping database system. [5]
- b) Explain database administration in MongoDB. [5]
- c) Describe Cassandra database architecture. [7]

OR

- Q6)** a) Describe advantages of Homogeneous and Heterogeneous distributed databases. [5]
- b) Explain speedup and scale up in parallel databases in detail. [5]
- c) Explain Database Connectivity using MongoDB with suitable Example. [7]

- Q7)** a) Consider following DTD for bid [7]

<?xml version= "1.0" encoding="UTF-8"?>

<!ELEMENT bids (bid_tuple*)>

<!ELEMENT bid_tuple (userid, itemno, bid, bid_date)>

<!ELEMENT userid (#PCDATA)>

<!ELEMENT itemno (#PCDATA)>

<!ELEMENT bid (#PCDATA)>

<!ELEMENT bid_date (#PCDATA)>

Create XML document, XML Schemas and solve the following queries in XQuery.

- i) List the item number and description of the item(s) that received the largest number of bids, and the number of bids it (or they) received.
- ii) List item numbers and average bids for items that have received three or more bids, in descending order by average bid.

b) Write a short note on [10]

- i) JSON
- ii) Hive

OR

Q8) a) Consider following DTD for bibliography [7]

<!ELEMENT bib (book*)>

<!ELEMENT book (title, (author+ | editor+), publisher, price)>

<!ATTLIST book year CDATA #REQUIRED >

<!ELEMENT author (last, first)>

<!ELEMENT editor (last, first, affiliation)>

<!ELEMENT title (#PCDATA)>

<!ELEMENT last (#PCDATA)>

<!ELEMENT first (#PCDATA)>

<!ELEMENT affiliation (#PCDATA)>

<!ELEMENT publisher (#PCDATA)>

<!ELEMENT price (#PCDATA)>

Create XML document, XML Schemas and solve the following queries in XQuery on the bibliography fragment.

- i) List books published by Addison-Wesley after 1991, including their year and title.
 - ii) Find pairs of books that have different titles but the same set of authors (possibly in a different order).
- b) Write a short note on : **[10]**
- i) Map Reduce in Hadoop
 - ii) Cloudera

- Q9)** a) Explain BIS Components in detail **[5]**
- b) Explain Recommendations algorithm in detail. **[5]**
- c) Define Association Rule Mining. Explain Apriori Algorithm with suitable example. **[6]**

OR

- Q10)** a) Explain Regression analysis in data mining with suitable example. **[5]**
- b) Define data Mining. Explain decision Tree classification algorithm with suitable example. **[5]**
- c) Explain ETL Data Warehouse. **[6]**



Total No. of Questions : 9]

SEAT No. :

P2409

[4758]-577

[Total No. of Pages : 2

T.E. (Computer Engineering)

**DATA COMMUNICATION AND WIRELESS SENSOR NETWORKS
(2012 Course) (Semester-I) (310243) (End Semester)**

Time : 2 1/2 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Questions 1, 2, 3, 4 (10 marks each). Solve either question 1 or question 2 and question 3 or question 4.*
- 2) *Question 5, 6, 7, 8 (16 marks each). Solve either question 5 or question 6 and question 7 or question 8.*
- 3) *Question 9 (18 marks).*
- 4) *Neat diagrams must be drawn wherever necessary.*
- 5) *Assume suitable data if necessary.*
- 6) *Figures to the right indicate full marks.*

- Q1)** a) Explain Bluetooth frame format. **[5]**
b) Explain various data link layer framing techniques, Apply bit stuffing on the given data string 0100111110111111011111111011. **[5]**

OR

- Q2)** a) Why CSMA/CD is not used in Wireless Networks? How the problems are solved using CSMA/CA? **[4]**
b) Draw following line codes for 1010 0000 0000 1011 0000 1011 0000 AMI, Pseudoternary, Manchester. **[6]**

- Q3)** a) A pure ALOHA network transmits 200-bit frame on a shared channel of 200 kbps. What is the throughput if the system (all stations together) produces **[6]**
i) 1000 frames per second
ii) 500 frames per second
b) Explain Category-I type of sensor networks, list few applications of it. **[4]**

OR

- Q4)** a) Explain typical sensing nodes architecture, how this sensing node is different from the nodes in other networks? **[5]**
b) Explain various multiplexing techniques with their advantages and disadvantages. Justify now a days there is a need of TD-SCDMA and LTE-TDD technologies. **[5]**

P.T.O.

- Q5)** a) Explain with block diagram conceptual view of FEC techniques, also explain interleaving phase with one example. [8]
- b) Explain S-MAC protocol for WSN in detail. [8]

OR

- Q6)** a) Why Naming and addressing is challenging in WSN, explain Content-based and geographic addressing with example. [8]
- b) LEACH is a self organizing, adaptive clustering protocol and it distributes energy consumption at every node in the sensor network uniformly- justify. Also explain with diagram the organization of LEACH rounds. [8]

- Q7)** a) Explain flat based, hierarchical based and location based routing protocols used in WSN with at least one example each. [8]
- b) How proactive and reactive routing protocols for ad hoc networks works? Also compare these protocols based on the way route is established, memory usage, network overhead, delay in establishing route, effect of node movement from route or link failure. [8]

OR

- Q8)** a) Explain Routing Challenges and Design Issues in WSNs, also discuss about data delivery models. [8]
- b) What is the motivation behind designing SPIN routing protocol for WSN? Also discuss its various Deficiencies. [8]

Q9) Write short notes on (Any Three): [18]

- a) The role of every sensor node in information driven sensor querying (IDSQ) method.
- b) Trilateration method used to estimate the position of a sensor node.
- c) Introduction to Internet of Things(IoT).
- d) Comparison of TinyOS with other OS like MATE, MAGNET and MANTIS.



Total No. of Questions : 8]

SEAT No. :

P2410

[4758] - 578

[Total No. of Pages :2

T.E. (Computer Engineering)

COMPUTER FORENSIC & CYBERAPPLICATIONS

(2012 Course) (Semester - I) (End - Sem.)

Time : 3Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.*
- 2) *Neat diagrams must be drawn whenever necessary.*
- 3) *Assume suitable data if necessary.*
- 4) *Figures to the right indicate full marks.*

- Q1)** a) Describe the layers of OSI model with suitable diagram. [8]
b) What are the different digital investigation process models? Describe any one. [6]
c) Explain how intruders make use of social engineering & reverse social engineering to achieve their motive. [6]

OR

- Q2)** a) Explain schedule selection & coordination in S-MAC. [8]
b) What types of behaviors are observed in criminal motive. Describe them. [6]
c) Write short note on Investigative Reconstruction in violent crime. [6]

- Q3)** a) Define cyber stalking & explain how cyber stalkers operates. [8]
b) Explain the following terms with respect to Reconstruction. [8]
i) Functional Analysis.
ii) Relational Analysis.

OR

- Q4)** a) Explain the following terms: [8]
i) Private Key Encryption.
ii) Public Key Encryption.
b) Write short note on: [8]
i) File formats & carving
ii) Digital Stratigraphy.

P.T.O.

- Q5)** a) Describe NTFS File system. [8]
b) Explain how to handle mobile devices as sources of evidence. [8]

OR

- Q6)** a) Describe unix File system. [8]
b) Explain in brief Intellectual Property Rights (IPR). [8]

- Q7)** a) Explain E-mail Forgery & Tracking in detail. [9]
b) Write short note on: [9]
i) Online Anonymity & self-protection.
ii) Searching & Tracking on IRC.

OR

- Q8)** a) How sniffer is placed & configured for preservation, collection & documentation of digital evidence at physical layer. [9]
b) Explain different logs in TCP/IP related digital evidence. [9]



Total No. of Questions : 10]

SEAT No. :

P2411

[4758]-579

[Total No. of Pages : 2

T.E. (Computer Engineering)

OPERATING SYSTEMS DESIGN

(2012 Course) (End - Sem.) (Semester - I) (310242)

Time : 2.30 Hours]

[Max. Marks :70

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

Q1) a) Explain in short - BIOS, MBR and init() process. **[6]**

b) What is kernel? What facility kernel should provide? **[4]**

OR

Q2) a) What are different multithreading models? **[6]**

b) What is TLB? why it is used? **[4]**

Q3) a) Explain following algorithms of file management. **[6]**

i) iget ii) iput

b) Give the details of Uarea field. **[4]**

OR

Q4) a) Why is the principle of locality crucial to the use of virtual memory? Explain with example. **[4]**

b) If the page address stream is {2, 3, 2, 1, 5, 2, 4, 5, 3, 2, 5, 2}, and frame size is 3. Identify the page faults occurred using FIFO, LRU. **[6]**

P.T.O.

- Q5)** a) What are the problems in multiprocessor systems? provide solutions to overcome them. [8]
- b) Explain IPC mechanisms used in System V. [8]

OR

- Q6)** a) What is process tracing? Mention its advantages and disadvantages. [8]
- b) Explain in short - pipe, semaphore, signal and mutex. [8]
- Q7)** a) What is AWK scripting? Write an AWK script to print squares of numbers from 1 to 10. [8]
- b) What is secure boot? State the difference between BIOS and UEFI. [8]

OR

- Q8)** a) What is grep Utility? What are the grep variations? Explain with example. [8]
- b) What is make utility? Explain it with example. Consider your own make file. [8]
- Q9)** a) Enlist different characteristics of real time system and explain. [6]
- b) Explain static priority-driven preemptive approach for real time scheduling. [6]
- c) Compare Hard, soft and Firm real time systems. [6]

OR

- Q10)**a) Explain data structures used in Linux scheduling. [6]
- b) Write short note on frame of references for handheld system. [6]
- c) Compare Windows NTFS and ReFS file systems. [6]

EEE

Total No. of Questions : 12]

SEAT No. :

P2323

[4758]-58

[Total No. of Pages : 3

T.E. (Electrical)

UTILIZATION OF ELECTRICAL ENERGY

(2008 Course) (Semester-II) (303147)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION-I

- Q1)** a) Draw equivalent circuit of arc furnace. Derive the expression for maximum output from arc furnace. [9]
- b) With suitable diagrams explain following methods of controlling temperature of resistance furnace- [9]
- i) Bucking - boosting voltage by transformer.
 - ii) Series reactor method.
 - iii) Variation in 3 phase circuit configuration.

OR

- Q2)** a) A piece of insulating material with relative permittivity of 5 is heated by dielectric heating. The dimensions of the insulating material is 10cm × 3cm × 3cm. The frequency of supply 20 Megacycles/ second. The power absorbed is 400 watt. The power factor of circuit is 0.05. Find the voltage & current. [9]
- b) With suitable diagram explain - spot welding and seam welding. State applications of these welding methods. [9]

P.T.O.

- Q3)** a) State and explain Faradays laws of electrolysis. [8]
b) With suitable diagram explain working of water level controller. [8]

OR

- Q4)** a) Explain construction and working of - limit switch, float switch. [8]
b) With suitable diagram explain electric circuit used in water cooler. [8]

- Q5)** a) Define following terms in case of illumination. [8]
i) Depreciation factor.
ii) Coefficient of utilization.
iii) Space to height ratio.
iv) Luminous efficiency.
b) With suitable diagram explain construction and working of compact fluorescent lamp. State its applications. [8]

OR

- Q6)** a) Give comparison between - Incandescent lamp, fluorescent tube and sodium vapour lamp (minimum 4 points). [8]
b) A drawing hall of 30 meters length and 13 meters width is to be illuminated. The ceiling height is 5 meters. The required illumination is 120 lux. Taking coefficient of utilization as 0.5 and depreciation factor as 1.4 determine the number of fluorescent tubes required. The luminous efficiency of fluorescent tube is 40 lumens/watt for 80 watt tube. Draw suitable plan and show how the fluorescent tubes are arranged. [8]

SECTION-II

- Q7)** a) Draw a diagram showing details of single catenary construction and compound catenary construction. Describe these two in brief. [8]
b) With suitable diagram explain - top contact type and side contact type third rail system of current collection. [8]

OR

- Q8)** a) With suitable diagram explain the working of diesel electric drive for traction. [8]
- b) Describe any two systems of track electrification. [8]
- Q9)** a) Draw quadrilateral speed - time curve and state the expressions for acceleration, braking retardation, maximum speed at the end of acceleration, maximum speed at the end of coasting. [8]
- b) A train runs as per trapezoidal speed-time curve. It has uniform acceleration of 5 kmphs for 30 second followed by free running period of 10 minute, uniform braking at 5 kmphs. The stop time of train is 5 minute. Find - [8]
- i) Distance between the stations.
- ii) Average speed.
- iii) Schedule speed.

OR

- Q10)**a) Derive the expression for specific energy consumption using respective notations. [8]
- b) Compare-urban, suburban, main line traction service and draw speed-time curve for these type of services. [8]
- Q11)**a) State any six desired properties of traction motor. [6]
- b) Explain working of anticollision system. [6]
- c) What are the difficulties in case of regenerative braking in case of DC series motor? [6]

OR

- Q12)**a) State limitations of series parallel control in case of traction. [6]
- b) With suitable diagram explain bridge transition method for DC series motor. [6]
- c) State the importance of route-relay interlock. Describe any one method of route relay interlock. [6]

Total No. of Questions : 10]

SEAT No. :

P2412

[4758] - 580

[Total No. of Pages :3

T.E. (Computer)

THEORY OF COMPUTATION

(2012 Course) (End-Sem.) (310241)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer any five questions.
- 2) Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, wherever necessary.

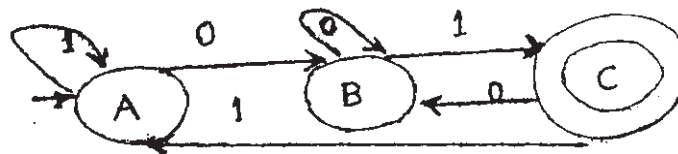
Q1) a) Explain Basic Machines. What are its limitations? How is Finite Automata more capable than Basic Machines? Justify with examples. [6]

b) Write a CFG that generates language L denoted by,

$(a+b)^*.bbb.(a+b)^*$. [4]

OR

Q2) a) Convert the following finite automation into its equivalent regular expression using Arden's Theorem. [6]



b) If $S=\{a,bb\}$, find the set of all strings in S^* with string length less than or equal to 5. Also for given S, prove whether the following is true or false. $(S^*)^+ = (S^+)^*$. [4]

Q3) a) Design Moore Machine and Mealy Machine to find one's complement of a binary number. [6]

P.T.O.

b) Write the CFG for language $L = \{0^i 1^j 0^k \mid j > i + k\}$.

Show the derivation of the string '0111100'. [4]

OR

Q4) a) Define the following and give appropriate examples: [6]

i) Unrestricted Grammar

ii) CFG

iii) Derivation Graph

b) Construct FA for the regular expression: $(11)^* . 010 . (11)^*$. [4]

Q5) a) Design a Turing Machine to recognize an arbitrary string divisible by 4, given $\Sigma = \{0,1,2\}$. [10]

b) Design a Turing Machine that accepts a language $L = \{0^n 1^n 0^n \mid n \geq 1\}$. [8]

OR

Q6) a) Construct a TM that accepts a language $L, a^* b a^* b$. [6]

b) How can Turing Machines be compared to computers? [6]

c) Prove that the halting problem in Turing Machines is undecidable. [6]

Q7) a) Construct transition table for PDA that accepts the language $L = \{a^{2n} b^n \mid n \geq 1\}$. Trace your PDA for the input with $n = 3$. [10]

b) Define push down automata (PDA). What are the different types of PDA? Give the applications of PDA. [6]

OR

Q8) a) Give a grammar for the language $L(M)$, where: [8]

$M = (\{q_0, q_1\}, \{0,1\}, \{z_0, x\}, \delta, q_0, z_0, \Phi)$.

And δ is given by:

$$\delta(q_0, 1, z_0) = (q_0, xz_0) \quad \delta(q_0, \epsilon, z_0) = (q_0, \epsilon)$$

$$\delta(q_0, 1, x) = (q_0, xx) \quad \delta(q_1, 1, x) = (q_1, \epsilon)$$

$$\delta(q_0, 0, x) = (q_1, x) \quad \delta(q_0, 0, z_0) = (q_0, z_0)$$

- b) Construct PDA for the following regular grammar: [8]

$$S \rightarrow 0A \mid 1B \mid 0$$

$$A \rightarrow A0 \mid B$$

$$B \rightarrow c \mid d$$

- Q9)** a) Justify that the SAT Problem is NP-complete. [8]

- b) Explain in detail, the polynomial-time reduction approach for proving that a problem is NP-Complete. [8]

OR

- Q10)**a) Explain the Node-Cover Problem with a suitable example. [8]

- b) Explain Tractable and In-tractable Problem. [4]

- c) Justify whether the Traveling Salesman Problem is a class P or class NP problem. [4]



Total No. of Questions : 10]

SEAT No. :

P2413

[4758] - 581

[Total No. of Pages :3

T.E. (Computer)

**PRINCIPLES OF CONCURRENT AND DISTRIBUTED
PROGRAMMING**

(2012 Course) (Semester - II) (End - Semester)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer 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.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume suitable data if necessary.*

Q1) a) Write and explain a typical program structure used in lex and yacc for lexical analysis and parsing. **[5]**

b) What is Data Flow Computer? Draw and explain data flow graph for the following instruction. **[5]**

$$A = J * C + D / F$$

OR

Q2) a) With reference to concurrent Java, explain the following methods used for multithreading **[5]**

i) sleep ()

ii) suspend ()

iii) wait ()

iv) notify ()

v) notifyAll ()

b) Write an algorithm for parallel quicksort. Explain with suitable example. **[5]**

Q3) a) Write folk theorem 1.1 and 1.2 show the speedup of n processor parallel system is limited as $S \leq n/\log 2^n$. **[5]**

b) Write a program in LISP to find the n^{th} fibonacci number. **[5]**

OR

P.T.O.

- Q4)** Write short note on (any two): **[10]**
- a) Concurrent yacc.
 - b) Parallelism with GPU.
 - c) Systolic Architectures.

- Q5)**
- a) What is DCE? Explain the various components of DCE showing the interdependencies of DCE components. **[5]**
 - b) Explain the difference between Network operating system and Distributed operating system. **[5]**
 - c) Explain the important concepts that a distributed operating system design might use to improve reliability of the system. What are the main problems in matching a system highly reliable. **[7]**

OR

- Q6)**
- a) Explain Work station - Server model with diagram. Enlist Advantages and disadvantages of it. **[5]**
 - b) List major issues in designing distributed Operating System. Explain any two issues in detail. **[5]**
 - c) Suppose a component of a distributed system suddenly crashes. How will this event inconvenience the users when. **[7]**
 - i) The system uses the processor pod model and the crashed component is a processor in the model.
 - ii) The system uses the processor-pool model and the crashed component is a user terminal.
 - iii) The system uses the workstation-server model and the crashed component is a server machine.

- Q7)**
- a) What is virtualization? Explain the advantages of using it. **[5]**
 - b) Differentiate between virtual machine and physical machine. **[4]**
 - c) Draw a diagram showing Xen architecture and explain the various components of it. **[7]**

OR

- Q8)** a) Differentiate between para virtualization and full virtualization. [5]
b) List and explain methods for platform virtualization. [4]
c) Draw a diagram showing asymmetric XEN system stating the differences between symmetric and asymmetric virtual platform. [7]

- Q9)** a) Write a program in CUDA for vector addition. [5]
b) What is Warp? Explain branching and GPU utilization with respect to warp size in CUDA. [5]
c) Explain the task execution model in CUDA with diagram. Also explain threading on GPUs. [7]

OR

- Q10)** a) Explain the mobile computing principles. [5]
b) Describe alternative thread block layouts. Explain how to calculate X and Y thread indexes. [5]
c) Explain thread scheduling in GPU with hardware view. Draw a suitable diagram for scheduling cycles. [7]



Total No. of Questions : 8]

SEAT No. :

P2414

[4758] - 582

[Total No. of Pages :2

T.E. (Computer Engineering)

COMPUTER NETWORKS

(2012 Course) (Semester - II) (End Semester)

Time :3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Figures to the right indicate full marks.*
- 2) *Draw neat diagrams wherever necessary.*
- 3) *Assume suitable data, if necessary.*

- Q1)** a) Explain FTP in detail. [7]
b) What is Qos. Explain Qos parameters. [8]
c) What is significance of priority & flow label fields in Ipv6. [5]

OR

- Q2)** a) Explain functionality of DHCP server, proxy server, file server, Web server. [8]
b) Draw & explain three way handshake process of TCP. [4]
c) Describe in short the importance & working of following commands:[8]
i) Ping
ii) Netstat
iii) Traceroute
iv) IP config

- Q3)** a) Explain WAP protocol stack. [8]
b) Write short note on. [8]
i) Wirless LAN
ii) WML script

OR

P.T.O.

- Q4)** a) Explain all versions of 802.11 standard & compare. [8]
b) Explain WLAN architecture. [8]

- Q5)** a) Draw & explain VOIP network architecture. [8]
b) Explain VANET architecture? What are the challenges in Vehicular Network. [8]

OR

- Q6)** a) What is DTN? Explain different layers of DTN. [8]
b) Explain advantages & disadvantages of VOIP over traditional telephone network. [8]

- Q7)** a) Explain ATM architecture. [8]
b) Write short note on: (any 2). [10]
i) Components of optical network
ii) GMPLS
iii) SDN

OR

- Q8)** a) What is virtualization? Explain its type. [8]
b) Explain SONET frame structure. [6]
c) What are different client layers of optical fiber. [4]



Total No. of Questions : 10]

SEAT No. :

P2415

[4758]-583

[Total No. of Pages : 3

T.E. (Computer Engineering)

EMBEDDED OPERATING SYSTEMS

(2012 Course) (Semester - II) (310250) (End-Sem.)

Time : 2.½ Hours]

[Max. Marks :70

Instructions to the candidates:

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume suitable data, if necessary.*

Q1) a) With the help of a diagram explain the classification of real-time scheduling methods. **[6]**

b) Explain role of barrel shifter in the ARM. **[4]**

OR

Q2) a) Explain how does user space applications communicates with the hardware? **[4]**

b) Write an ARM assembly program to find value of expression $3X + 6Y + 9Z$, where $X = 4$, $Y = 5$, $Z = 3$. **[6]**

Q3) a) Write short notes on (any two): **[6]**

i) LSB

ii) OSDL

iii) Kernel command line processing.

b) Why Embedded Linux is popular as OS for embedded system development? **[4]**

OR

P.T.O.

- Q4)** a) What are the steps involved in ‘subsystem initialization’. [4]
b) Explain the steps involved in initialization flow of control on embedded Linux. [6]

- Q5)** a) Explain the role of bootloader in embedded systems. [4]
b) Give the general steps involved in PCI discovery process and probe function. [7]
c) Enlist device driver module utilities and explain the use of same. [6]

OR

- Q6)** a) What are the challenges for bootloader in embedded system? [7]
b) Explain the JFFS2 file system. [5]
c) Explain about U-boot configurable commands. [5]

- Q7)** a) Explain the tracing and profiling tools used in embedded application development. [6]
b) Write short note on (any two): [6]
i) GStreamer Media framework.
ii) OpenGL ES.
iii) ssh
c) How to debug the kernel using ‘printk’? [5]

OR

- Q8)** a) Draw & explain KGDB setup for kernel debugging. [5]
b) Write short note on (any two): [6]
i) DDD
ii) EGL
iii) Open GL
c) Explain the working of stepper motor? State any two applications of stepper motor in embedded systems. [6]

- Q9)** a) Give the latency components in Linux with neat diagram. [8]
b) Explain in detail, development process of Android applications. [8]

OR

- Q10)** a) What policies are used by Linux to schedule a real time task? [8]
b) Write short notes on (any two): [8]
i) Dalvik VM
ii) Zygote
iii) Activity Manager

EEE

Total No. of Questions : 10]

SEAT No. :

P2416

[4758] - 584

[Total No. of Pages :3

T.E. (Computer Engineering)

DIGITAL SIGNAL PROCESSING APPLICATIONS

(2012 Pattern) (310253) (Semester - II) (End - Sem.)

Time : 3Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Attempt Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Assume suitable data if necessary.*

Q1) a) Define two standard signals $u(n)$ and $\delta(n)$. Show that $u(n) = \sum_{k=0}^{\infty} \delta(n-k)$ by means of convolution operation. **[5]**

b) State Periodicity and Symmetry property of DFT. How can we compute N point Circular Convolution using DFT and IDFT? **[5]**

OR

Q2) a) Perform following circular shifting operations on a given DT signal **[5]**
 $x(n) = \{1, 2, 3, 4\}$ with $N = 5$ and $N = 6$

i) $x((n-3))N$

ii) $x((n+2))N$

b) Discuss the form of an Nth order difference equation used to describe a DT system. How can it be expressed as an FIR and IIR system? **[5]**

Q3) a) Derive the first stage of DIT FFT algorithm. How the computational efficiency is improved in FFT algorithm? **[5]**

b) Obtain the Z Transform of sequence $x(n) = a^n u(-n-1)$ and sketch the ROC. **[5]**

OR

Q4) a) How can we compute Linear Convolution using N point Circular Convolution? **[5]**

b) Define system function $H(Z)$. Obtain it from the Nth order difference equation and express it for All Pole and All Zero System. **[5]**

P.T.O.

- Q5) a)** What are filter structures? Explain how the Direct and Cascade form of FIR filters are obtained and realized from the system function $H(Z)$. [9]
- b) A DT System described by means of system function $H(Z)$ is given by- [9]

$$H(Z) = 3 + \frac{4Z}{Z-1/2} - \frac{2}{Z-1/4}$$

Obtain and Draw Direct Form - I and Direct Form - II IIR filter structure.

OR

- Q6) a)** Obtain and realize Linear Phase FIR filter structure for a DT system. [9]

$$H(Z) = \left(1 + \frac{1}{2}Z^{-1} + Z^{-2}\right) \left(1 + \frac{1}{4}Z^{-1} + Z^{-2}\right)$$

What are the advantages of this filter structure?

- b) Derive the Direct Form - II IIR filter structure from system function $H(Z)$ and represent it using multipliers, adders and delay elements. [9]
- Q7) a)** Draw the block diagram of basic DSP processor. What are the common features of DSP processor? [8]
- b) Explain how SHARC DSP processor supports the multiprocessing capabilities. Give details about different types of ports used for multiprocessing. [8]

OR

- Q8) a)** What is OMAP? Explain the Hardware architecture of OMAP in brief. [8]
- b) Compare between Harvard and Super Harvard Architecture of DSP Processor. List the number of DAGs and supporting memory pointer registers of SHARC DSP Processor. [8]

- Q9) a)** Explain the following terms associated with audio processing: [8]
- i) Timbre
 - ii) Loudness
 - iii) Pitch
- b) What is image enhancement in digital image processing? Explain any two gray level transforms used for image enhancement. [8]

OR

- Q10)a)** What do you mean by Speech Synthesis and Recognition? Draw and explain Human Speech Model in brief. [8]
- b) Explain the operation of CCD (Charge Coupled Device) used in electronic cameras. [8]



Total No. of Questions : 12]

SEAT No. :

P2417

[4758]-585

[Total No. of Pages : 2

T.E. (Computer Engineering)
SOFTWARE ENGINEERING

(2012 Course) (Semester - II) (End - Sem.) (310252)

Time : 3 Hours]

[Max. Marks :70

Instructions to the candidates:

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *Figures to the right side indicate full marks.*
- 3) *Assume suitable data, if necessary.*
- 4) *All questions are compulsory.*

Q1) Discuss the differences between the agile development and clean room approaches in use today? **[7]**

OR

Q2) What is Software process framework? Explain in detail. **[7]**

Q3) What do you mean by CRC? Write the steps for identifying analysis classes using CRC modeling. **[7]**

OR

Q4) What tasks are to be carried out in software requirement engineering? Explain in detail. **[7]**

Q5) What do you understand by refactoring? Give the importance of refactoring in improving quality of software. **[6]**

OR

Q6) What do you mean by Archetypes? Explain various types of Archetypes. **[6]**

P.T.O.

- Q7)** a) What are the main objective of basis path testing? Explain in detail. [9]
b) Differentiate between:- [8]
i) Black box & white box Testing
ii) Regression & Smoke Testing

OR

- Q8)** a) What do you understand by system testing? What are the different kinds of system testing that are usually performed on large software products?[9]
b) What is the difference between test stub and driver? What are the problems associated with Top down approach of testing? [8]
- Q9)** a) Explain in detail software process and project metrics. [9]
b) Explain the role of people, product and process in project management.[8]

OR

- Q10)**a) What is project decomposition? What are the work task for communication process using process decomposition. [9]
b) Explain Principles of Risk management in detail. [8]
- Q11)**a) What is the concept of Software Reliability? Explain different measures of software reliability and availability. [8]
b) What are different elements of distributed systems? Explain in detail.[8]

OR

- Q12)**a) Explain the concept of aspect oriented software engineering in detail.[8]
b) What is software Quality? What are the mechanism to address Quality Software? [8]

EEE

Total No. of Questions : 10]

SEAT No. :

P2418

[4758] - 586

[Total No. of Pages : 3

T.E. (Chemical)

CHEMICAL ENGINEERING MATHEMATICS
(2012 Course) (End Semester) (Semester - I) (309341)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket Calculator and steam tables is allowed.*
- 4) *Assume suitable data, if necessary.*

Q1) a) Solve the following system of equations using gauss elimination method [5]

$$2x + y + z = 10$$

$$3x + 2y + 3z = 18$$

$$x + 4y + 9z = 16$$

b) Apply Newton Raphson method to find a root of the equation $x^4 - x - 10 = 0$ correct up to four decimal places. Do two iterations only. [5]

OR

Q2) a) Solve the following equations by gauss seidal method. (upto 2 iterations only) [5]

$$4x + y + z = 5$$

$$x + 6y + 2z = 19$$

$$-x - 2y + 5z = 10$$

P.T.O.

- b) Solve the following equations using Thomas Algorithm. [5]

$$x + 2y = 3$$

$$2x + 3y + z = 4$$

$$2y - z = 1$$

- Q3)** a) Evaluate $\log_e 7$ (logarithm of 7 to base e) by Simpson's 1/3rd rule. [5]

- b) Find the integration of $(4x + 2)$ in the limits 1 to 4 by Trapezoidal rule using six steps. [5]

OR

- Q4)** a) Using Lagrange's formula, find a unique polynomial $P(x)$ of degree 2 or less such that $P(1) = 1$, $P(3) = 27$, $P(4) = 64$ and hence evaluate $P(1.5)$. [5]

- b) Prepare a Newton's backward difference table and hence calculate $y(2.2)$ for the following set of data. [5]

x	-2	-1	0	1	2	3
y	8	-3	0	-3	8	45

- Q5)** a) Solve the following differential equation using modified Euler's method for the given boundary condition $\frac{dy}{dx} = \sqrt{x + y}$, $y(0) = 0.36$ find $y(0.2)$ upto accuracy of 0.001. [8]

- b) Use Taylor's series method, for the equation $\frac{dy}{dx} = 2y + 3e^x$ and $y(1) = 0$, to find the value of y at $x = 0.3$. Take step size = 0.1. [8]

OR

- Q6)** a) Using Euler's method solve the following differential equation

$\frac{dy}{dx} = x + 2y$ for the given boundary condition that at $x = 1$, $y = 1$ find y at $x = 1.4$. Take step size $h = 0.1$. [8]

- b) Using Runge-Kutta 4th order method solve $\frac{dy}{dx} - y = 0$. Given $y(0) = 2$, $h = 0.1$. Find y at $x = 0.2$. [8]

Q7) Using the finite difference method solve the boundary value problem

$$x^2 \frac{d^2 y}{dx^2} + x \frac{dy}{dx} = 1 \text{ with } y(1) = 0, y(1.4) = 0.0566. \text{ Find } y(1.1), y(1.2), y(1.3). [16]$$

OR

Q8) Solve $\frac{\partial u}{\partial t} = \frac{\delta^2 u}{\delta x^2}$, for the following condition using crank-Nicolson method.

At $x = 0$ and $x = 3$, $u = 0$ for all values of t .

At $t = 0$, $u = x^2$ for $0 < x < 3$.

Take increment in x as 1 and increment in t as 0.1. Find all values of u for $t = 0$ to $t = 0.3$. [16]

Q9) Suppose that a gas processing plant receives a fixed amount of raw gas each week. The raw gas is processed into two grades of heating gas, regular and premium quality. These grades of gas are in high demand and yield different profit to the company. However their production involves both time and on-site constraints. For example only one grade can be produced at a time and the facility is open for only 80 hrs/week. Further there is limited on site storage for each of the products. All factors are listed below. Find optimal solution to maximize profit. [18]

	Products		
Resource	Regular	Premium	Resource Availability
Raw gas	7m ³ /tonne	11m ³ /tonne	77m ³ /week
Production time	10 hr/tonne	8 hr/tonne	80 hr/week
Storage	9 tonnes	6 tonnes	
Profit	150/tonne	175/tonne	

OR

Q10) a) Explain numerical methods for optimizing a function of one variable? [10]

b) What is the optimal solution & what are the six steps of optimization? [8]



Total No. of Questions : 10]

SEAT No. :

P2419

[4758]-587

[Total No. of Pages : 4

T.E. (Chemical Engineering)
CHEMICAL ENGINEERING THERMODYNAMICS-II
(2012 Course) (Semester-I) (End-Semester)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer five questions.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicates 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.*

Q1) a) For the binary system shows that any thermodynamic solution property is related with its component partial molar property **[6]**

$$\overline{M}_1 = M + x_1 \frac{dm}{dx_1}$$

$$\overline{M}_2 = M - x_1 \frac{dm}{dx_1}$$

- b) Define and derive the equation for property changes of mixing. Write the equations for change of mixing in case of Gibbs energy, entropy, molar volume and enthalpy. **[4]**

OR

Q2) a) Derive the equation for modified Raoult's law in the case of vapor liquid equilibrium. **[4]**

- b) The data for methyl ethyl ketone (1) /toluene(2) at 50°C is given as below. Calculate $\ln \gamma_1$, $\ln \gamma_2$ and G^E/RT **[6]**

P(N/m ²)	12.30	15.51	18.61	21.63	24.01	25.92	29.96	30.12	31.75	34.15	36.09
x ₁	0.00	0.09	0.20	0.32	0.42	0.51	0.61	0.71	0.79	0.91	1.00
y ₁	0.00	0.27	0.46	0.59	0.68	0.74	0.80	0.86	0.90	0.96	1.00

P.T.O.

- Q3) a)** Determine the fugacity coefficients for nitrogen and methane in a $N_2(1)/CH_4(2)$ mixture at 200 k and 30 bar if the mixture contains 40 mole % N_2 . Experimental virial-coefficient data are as follows:

$$B_{11} = -35.2, \quad B_{22} = -105.0, \quad B_{12} = -59.8 \text{ cm}^3/\text{mol} \quad [4]$$

- b) For the system methanol(1)/Methyl Acetate (2) the following equations provide a reasonable correlations for the activity coefficients: [6]

$$\ln\gamma_1 = Ax_2^2, \quad \ln\gamma_2 = Ax_1^2, \quad \text{where, } A = 2.7771 - 0.00523T$$

The Antoine equations are

$$\ln P_1^{\text{sat}} = 16.59158 - [3643.31/(T-33.424)]$$

$$\ln P_2^{\text{sat}} = 14.25326 - [2665.54/(T-53.424)]$$

where T is in K and the vapor pressures are in kPa. Assuming the validity of Raoult's law.

Calculate, P and y_i , for $t/T = 45^\circ\text{C}/318.15 \text{ K}$ and $x_1 = 0.25$.

OR

- Q4) a)** Explain in detail Chemical potential as a criterion of phase equilibrium. [5]

- b) Explain and derive the equation for Phase rule for non reaction system. [5]

- Q5) a)** Derive the following relationships for criteria of phase equilibrium [8]

$$dS_{U,V} \geq 0$$

$$dA_{T,V} \leq 0$$

$$dG_{T,P} \leq 0$$

- b) Define and derive the equation for the osmotic pressure. [8]

OR

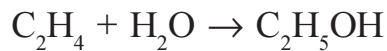
- Q6) a)** Explain in detail binary liquid-liquid equilibrium system with the help of T-X diagram. [8]

- b) Deduce the Clapeyron equation using the criteria of equilibrium. [8]

- Q7) a)** Derive the relationship between mole fraction and reaction coordinate with stoichiometric coefficient of reaction components. [6]

- b) Calculate the equilibrium constant for the vapor phase hydration of ethylene at 145°C from the data given below [10]

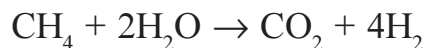
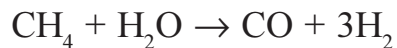
$$C_p/R = A + BT + CT^2$$



Component	ΔG° (25°C) (J/mole)	ΔH° (25°C)	A	B	C
C_2H_4	68460	52510	1.424	14.394×10^{-3}	-4.392×10^{-6}
H_2O	-228570	-241810	3.470	1.450×10^{-3}	-
C_2H_5OH	-168490	-235100	3.518	20.001×10^{-3}	-6.002×10^{-6}

OR

- Q8)** a) For the following reactions obtain the relation between mole fraction and reaction coordinate for 2 moles of CH_4 and 3 moles of H_2O initially present. [8]



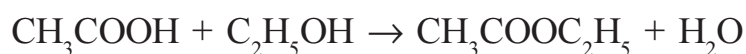
- b) Derive the equation

$$\Delta G^\circ = -RT \ln k \quad [8]$$

- Q9)** a) Explain and derive the relation between equilibrium constant and composition in case of liquid phase reactions. [6]
- b) Derive the equation for phase rule in case of reacting systems. [6]
- c) Explain fuel cell with its types. [6]

OR

- Q10)** a) Explain and derive the relation between equilibrium constant and composition in case of gas phase reactions. [6]
- b) Acetic acid is esterified in the liquid phase with ethanol at 100°C & at atmospheric pressure to produce ethyl acetate & water according to the reaction [8]



If initially there is 1 mole of each acetic acid and ethanol. Estimate the mole fraction of ethyl acetate in the reacting mixture at equilibrium with the help of following data.

Component	$\Delta H^\circ_f_{298}$ (J/mol)	ΔG°_{298} (J/mole)
CH_3COOH	-484500	-389900
$\text{C}_2\text{H}_5\text{OH}$	-277690	-174780
$\text{CH}_3\text{COOC}_2\text{H}_5$	-463250	-318280
H_2O	-285830	-237130

c) Explain the Duhem's Theorem for reacting systems.

[4]



Total No. of Questions : 10]

SEAT No. :

P2420

[4758] - 588

[Total No. of Pages :2

T.E. (Chemical)

CHEMICAL PROCESS TECHNOLOGY

(2012 Course) (Semester - I) (End - Sem.)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer any five questions.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary.*

Q1) Describe 'Unit operations' and 'Unit processes' by giving four examples with schematic representations. **[10]**

OR

Q2) Explain any two: **[10]**

- a) Differentiate between Solvay and Dual Process.
- b) Explain production of Bromine from sea water.
- c) What do you mean by process Flow diagrams and Major Engineering problems?

Q3) Discuss production of urea with its major Engineering problems. **[10]**

OR

- Q4)** a) Explain the preparation of wood pulp by sulphate process.
b) Explain starch and give its manufacturing process from maize.

[10]

- Q5)** a) Explain destructive distillation of coal and carbonization processes.
b) Explain oils and fats. Also discuss about Chemical composition & physical properties of vegetable oils.

[10]

OR

P.T.O.

Q6) Explain hydrogenation of oil by neat PFD and give its major engg. problems. [10]

Q7) a) Explain production of water gas & producer gas.

b) Explain polymerization and Reforming.

[20]

OR

Q8) a) Explain Alkylation and Isomerisation.

b) Explain Fuel cell and Hydro alkylation.

[20]

Q9) a) Explain production of cumene.

b) Explain manufacturing of acetone.

[20]

OR

Q10)a) Explain manufacturing of formaldehyde.

b) Explain production of vinyl chloride.

[20]



Total No. of Questions : 10]

SEAT No. :

P2421

[4758]-589

[Total No. of Pages : 2

T.E. (Chemical)

INDUSTRIAL ORGANISATION AND MANAGEMENT

(2012 Pattern) (Semester - I) (End - Sem.) (New)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *Figures to the right indicate full marks.*
- 3) *Assume suitable data, if necessary.*
- 4) *Attempt Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.*

Q1) a) Explain Joint Stock Company with advantages and disadvantages. [6]

b) Write a note on Partnership Deed. [4]

OR

Q2) Explain in detail Selection Process. [10]

Q3) a) Explain different types of Wages. [6]

b) Explain in detail Merit Rating. [4]

OR

Q4) Explain in detail: [10]

a) Comparative Statement.

b) Job Evaluation.

Q5) a) Write an explanatory note on Marketing Mix. [8]

b) Explain any two Pricing Strategies in detail. [8]

OR

P.T.O.

- Q6)** a) Explain in detail Sales Promotion. [8]
b) Write an explanatory note on Advertising. [8]

- Q7)** a) Write notes on: [8]
i) ISO
ii) International Trade
b) Explain in detail Quality Circle. [8]

OR

- Q8)** a) Explain Total Quality Management of a process industry. [8]
b) Explain in detail various factors affecting international trade. [8]

- Q9)** Write short notes on: [18]
a) FERA and FEMA.
b) Monopolies Restrictive Trade Practices (MRTP).
c) Flow Chart and Flow Diagram.

OR

- Q10)** a) Explain the term Agreement in Contract Act. Explain the various types of Contract according to enforceability, formation and performance. [12]
b) Write note on SIMO Charts. [6]

EEE

Total No. of Questions : 12]

SEAT No. :

P2324

[4758] - 59

[Total No. of Pages : 5

T.E. (Electronics)
FEEDBACK CONTROL SYSTEMS
(2008 Course) (Semester - I)

Time : 3 Hours]

[Max. Marks : 100

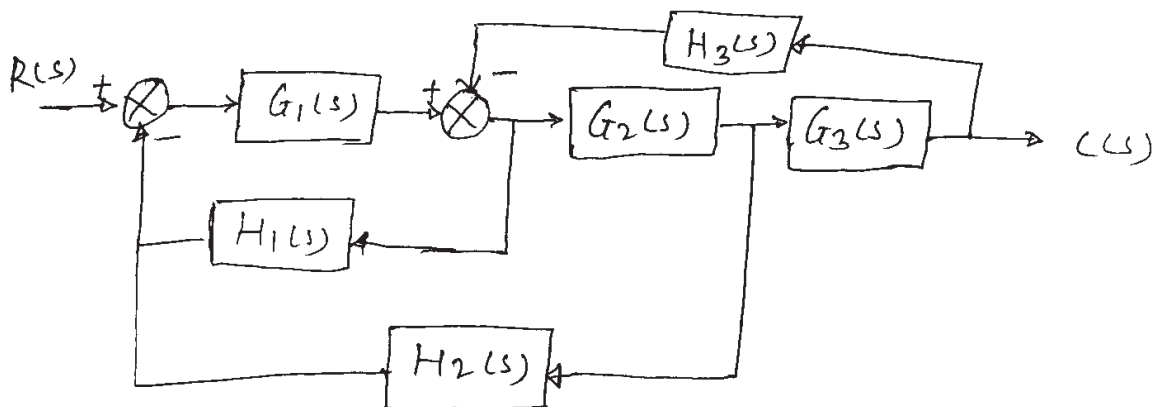
Instructions to the candidates:

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

SECTION - I

Q1) a) Explain linear and Non-linear control systems with suitable example of each. [8]

b) Obtain $\frac{C(S)}{R(S)}$ of the system shown in Fig.Q.1(b) using block diagram reduction technique. [8]



Q. 1(b)

OR

P.T.O.

- Q2) a)** Obtain the transfer function $\frac{C(S)}{R(S)}$ using Mason's gain formula for the system shown in Fig. Q.2(a) by signal flow graph. [8]

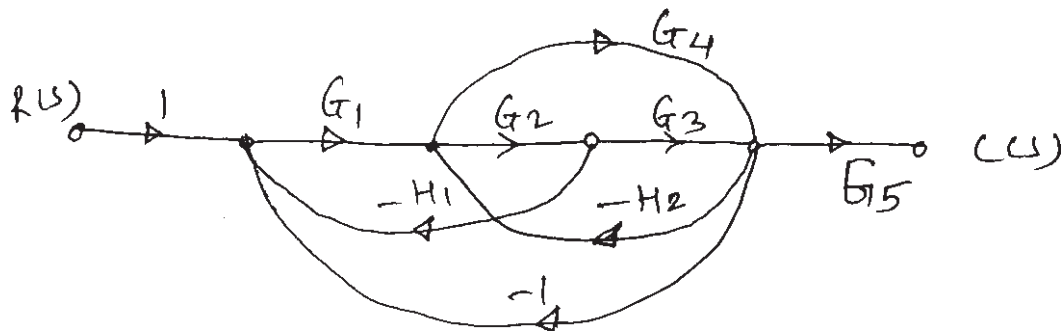


Fig.Q.2(a)

- b) Explain basic elements of feedback control system with temperature control of a room as a practical example. [8]

- Q3) a)** A unity feedback system has open loop transfer function $G(s) = \frac{16}{s(s+6)}$. Find [8]

- i) undamped natural frequency,
- ii) damping factor,
- iii) damped natural frequency,
- iv) rise time,
- v) peak time,
- vi) peak overshoot,
- vii) settling time,
- viii) steady state gain.

- b) The characteristic equation of feedback control system is

$Q(s) = s^5 + 2s^4 + 3s^3 + 4s^2 + 5s + 6 = 0$ using Routh's criteria, comment on stability of system. [8]

OR

Q4) a) Sketch the root locus of $G(s) = \frac{k}{s(s+1)(s+3)}$ and comment on stability. [8]

- b) Find steady state error for unit step, unit ramp and unit acceleration inputs for the following system [8]

$$G(s) \cdot H(s) = \frac{10}{s(0.1s+1)(0.5s+1)} \text{ with } H(s) = 1.$$

Q5) a) Design a lag compensator for the unity feedback system with [12]

$G(s) = \frac{k}{s(s+2)}$ to satisfy the condition: $K_v = 10$, $PM \geq 32^\circ$. Also draw the Bode plot of compensated system.

- b) Explain: stability analysis using Nyquist plot. [6]

OR

Q6) a) Draw Bode plot and determine gain margin, phase margin, gain crossover frequency and phase crossover frequency if

$$G(s) = \frac{1}{s(0.5s+1)(0.05s+1)} \text{ \& } H(s) = 1. [12]$$

- b) Write short note on 'Time domain analysis versus frequency domain analysis'. [6]

SECTION - II

Q7) a) Obtain the transfer function for **[12]**

$$\text{i) } \dot{x} = \begin{bmatrix} 0 & 1 \\ -3 & -2 \end{bmatrix} x + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u$$

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

$$\text{ii) } \dot{x} = \begin{bmatrix} 1 & 0 \\ -2 & -3 \end{bmatrix} x + \begin{bmatrix} 1 \\ 0 \end{bmatrix} u$$

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

b) Obtain state space representation in physical variable form if the system is represented by $\frac{y(s)}{u(s)} = \frac{1}{s^3 + 6s^2 + 11s + 6}$. **[6]**

OR

Q8) a) Obtain state transition matrix for the system $\dot{x} = \begin{bmatrix} -3 & 1 \\ 0 & -1 \end{bmatrix} x + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u$. **[8]**

b) State the properties of state transition matrix. **[4]**

c) What are the advantages of state space techniques over transfer function. **[6]**

Q9) a) Draw the diagram of architecture of PLC and explain it's working in short. **[8]**

b) Design a signal conditioning circuit for RTD such that at 0°C temperature output should be 0V and at 100°C temp. output should be 5V. **[8]**

OR

Q10)a) Explain P, PI, PD and PID modes of controller with mathematical equations. [8]

b) Explain ladder diagram for application to bottle filling plant. [8]

Q11)Write short note on [16]

a) Fuzzy logic concept and its control scheme.

b) Application of fuzzy controller for temperature control system.

c) Neural network based controller.

OR

Q12)Explain the following. [16]

a) Concept of neural network.

b) Fuzzification and Defuzzification methods.

c) Application of neural network in control system.



Total No. of Questions : 10]

SEAT No. :

P2422

[4758] - 590

[Total No. of Pages :3

T.E. (Chemical)

MASS TRANSFER - I

(2012 Course) (Semester - I) (End Semester) (Theory) (309342)

Time : 2 ½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary.*

Q1) a) State & explain Ficks law of diffusion. [4]

- b) Ammonia gas (A) is diffusing through a uniform tube 0.10m long containing Nitrogen gas (B) at 1.0132×10^5 Pa pressure & 298K. At point one $P_{A1} = 1.013 \times 10^4$ Pa & at point two $P_{A2} = 0.507 \times 10^4$ Pa. [6]

The diffusivity $D_{AB} = 0.23 \times 10^{-4} \text{m}^2/\text{sec}$. Calculate the flux at steady state.

($R = 8.314 \text{ kPa m}^3/\text{kmol K}$).

OR

Q2) a) Explain selection criteria for absorbent. [4]

- b) In a mass transfer operation operating at 1 atm., the individual mass transfer coefficients have the following values, $k_x = 22 \text{ kgmol/m}^2\text{h}$, $k_y = 1.07 \text{ kgmol/m}^2\text{h}$. The equilibrium composition of gaseous and liquid phases are characterized by Henry's law $p^* = 0.08 \times 10^6 x \text{ mm Hg}$. [6]

- i) Determine the overall mass transfer coefficients
- ii) Determine the resistance in liquid and gas phases.

P.T.O.

- Q3) a)** A tube 1cm in inside diameter that is 20cm long is filled with carbon dioxide (A) & hydrogen (B) at 2 atm total pressure at 0° C. The diffusion coefficient under these conditions is 0.275cm²/sec. If the partial pressure of carbon dioxide is 1.5 atm at one end & 0.5 atm. at the other end. Find the rate of diffusion for steady state diffusion of carbon dioxide through stagnant hydrogen? [6]
- b) Give significance of Schmidt Number and Sherwood Number in mass transfer. [4]

OR

- Q4) a)** Explain Absorption & Stripping? What is significance of minimum liquid to gas ratio for absorption? [6]
- b) Describe Higbie penetration theory of mass transfer. [4]

- Q5) a)** Define following terms, [10]
- i) Absolute humidity
 - ii) Wet bulb Temperature
 - iii) enthalpy
 - iv) humid volume
 - v) Percentage saturation humidity
- b) Moist air at 310K has WBT of 300K. The latent heat of vaporization of water at 300K is 2440 kJ/kg, estimate the humidity of the air and the percentage relative humidity. The total pressure is 105kPa and the vapor pressure of water vapor at 300K is 3.60kPa and 6.33 kPa at 310K. Psychrometric ratio $h_G/k_Y = 1000\text{J/kg K}$. [6]

OR

- Q6) a)** Derive the relation for the determination of height of packing of counter current cooling tower. [8]
- b) Write Short notes on [8]
- i) Lewis Relation
 - ii) Adiabatic Saturation Curve

- Q7)** a) Explain the tray tower and operating characteristics of the tray tower. [8]
b) Explain the different types of packing used in packed towers? [4]
c) Explain tray towers Vs packed towers. [4]

OR

- Q8)** a) Explain different types of tray efficiencies. [4]
b) Explain venturi scrubber and wetted wall column gas-liquid contact. [6]
c) What are various equipments used for gas-liquid contact. Explain sparged vessel & mechanically agitated vessels with neat diagram. [6]

- Q9)** a) A wet solid is to be dried from 20% to 10% moisture (wet basis) under constant drying conditions in 2 hours. If the equilibrium moisture content is zero. How long will it take to dry solids to 4% moisture under the same conditions? Assume that no constant rate period is encountered and falling rate period is linear. [8]
b) Draw and explain the Rate of Drying Curve. [6]
c) Define moisture content in the solid on wet and dry basis. [4]

OR

- Q10)** a) Describe the mechanism of moisture movement within the solids during drying. [4]
b) Derive the equation for determination of constant rate and falling rate of drying period. [8]
c) Describe the Rotary Dryer with neat sketch. [6]



Total No. of Questions : 10]

SEAT No. :

P2423

[4758] - 591

[Total No. of Pages :2

T.E. (Chemical)

TRANSPORT PHENOMENA

(2012 Course) (309349) (End Semester) (Semester - II)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 4) *Assume suitable data, if necessary.*

Q1) a) Find the radius of the capillary from the following data: **[5]**

Length of capillary = 50.02 cm

Kinematic viscosity of fluid = $4.03 \times 10^{-5} \text{ m}^2 \text{ sec}^{-1}$

Density of fluid = 955.2 kg/m^3

Pressure drop across (horizontal capillary) tube = $4.829 \times 10^5 \text{ Nm}^{-2} = 4.766 \text{ atm}$

Mass rate of flow through tube = $2.997 \times 10^{-3} \text{ kg sec}^{-1}$

b) Derive Newton's law of viscosity. Write a short note on Newtonian and Non-newtonian fluids along with examples. **[5]**

OR

Q2) a) Explain thermal energy balance equation. **[4]**

b) A copper wire has a radius 2mm and length 5m. For what voltage drop would the temperature rise at the wire axis be 10°C if the surface temperature of the wire is 20°C . For copper, Lorenz number is $2.23 \times 10^{-8} \text{ volt}^2\text{K}^{-2}$. **[6]**

Q3) Derive expression of concentration profile and molar flux of A for homogeneous chemical reaction. **[10]**

OR

Q4) a) Explain Ellis model of non-Newtonian fluids. **[4]**

b) State boundary conditions used in heat transfer problems. **[3]**

c) Explain Fick's law of diffusion. **[3]**

P.T.O.

- Q5) a)** Derive equation of motion in a Cartesian co-ordinate system for a flow of fluid through a control volume of size $\Delta x \Delta y \Delta z$. [12]
- b) What do you mean by partial time, total time and substantial time derivative. [6]

OR

- Q6) a)** Derive the equation of continuity in three dimensional Cartesian coordinate system through a control volume of size $\Delta x \Delta y \Delta z$. [12]
- b) What are scale factors. What do you mean by dynamic similarity between systems. [6]

- Q7) a)** Derive expression of fanning friction factor for flow of fluid in a tube. [8]
- b) Derive Ergun equation for flow of fluid in a packed column. [8]

OR

- Q8) a)** An incompressible fluid flows turbulently in a circular tube of cross sectional area S_1 which empties into a large tube of cross sectional area S_2 . Use macroscopic balances and derive expression for pressure rise and friction loss due to the sudden expansion. [12]
- b) Explain macroscopic mass balance equation. [4]

- Q9) a)** A spherical water droplet, 0.05 cm in diameter is falling at velocity of 215 cm/sec through dry, still air at 1 atm pressure. Estimate the instantaneous rate of evaporation from the drop if the drop surface is at 21°C and air at 60 °C. The vapor pressure of water at 21 °C is 0.0247 atm. Assume Pseudo steady state condition and $k_{xm} = 1.35 \times 10^{-3} \text{ mol s}^{-1} \text{ cm}^{-2}$. [8]
- b) Explain Martinnelli's analogy. [8]

OR

- Q10) a)** Derive the correlation of binary mass transfer coefficient in one phase at low mass transfer rates. [8]
- b) Explain in detail about Reynold's, Prandtl's and Chilton-colburn J-Factor Analogy. [8]



Total No. of Questions : 10]

SEAT No. :

P3355

[Total No. of Pages : 3

[4758] - 592

T.E. (Chemical) (Semester - VI)
CHEMICAL REACTION ENGINEERING - I
(2012 Pattern)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6, Q. 7 or 8, Q. 9 or Q. 10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data if necessary.

- Q1)** a) Derive the temperature dependency of rate constant from collision theory. [6]
- b) Using the integral method of analysis, obtain a relationship for determining 'k' for a first order irreversible reaction. [4]

OR

- Q2)** In a homogeneous isothermal liquid polymerization, 20% of the monomer disappears in 34 minutes for initial monomer concentration of 0.04 and also for 0.8 mol/liter. What rate equation represents the disappearance of the monomer.

- Q3)** a) Derive the relation for constant volume irreversible second order reaction $A + B \rightarrow \text{product}$ using integral method of analysis. [6]
- b) Compare. MFR and PFR. [4]

OR

- Q4)** An aqueous feed containing A (1 mol/liter) enters a 2-liter plug flow reactor and reacts away ($2A \rightarrow R$, $-r_A = 0.05 C_A^2$ mol/liter.s.) Find the outlet concentration of A for a feed rate of 0.5 liter/min. [10]

- Q5)** a) Derive an expression for the concentration in the N^{th} reactor, if N equal sized stirred tank reactors are assembled in series. Assume first order reaction. [8]

P.T.O.

- b) An aqueous reactant stream (4 mol A/liter) passes through a mixed flow reactor followed by a plug flow reactor. Find the concentration at the exit of the plug flow reactor if in the mixed flow reactor $C_A = 1$ mol/liter. The reaction is second-order with respect to A, and the volume of the plug flow unit is three times that of the mixed flow unit. [8]

OR

- Q6)** a) Give the qualitative discussion about product distribution in parallel reaction. [8]
- b) At present the elementary liquid-phase reaction $A + B \rightarrow R + S$ takes place in a plug flow reactor using equimolar quantities of A and B. Conversion is 96%, $C_{A0} = C_{B0} = 1$ mol/liter. If a mixed flow reactor ten times as large as the plug flow reactor were hooked up in series with the existing unit, which unit should come first and by what fraction could production be increased for that setup? [8]

- Q7)** a) Discuss optimum temperature progression (OTP) needed for optimum reactor performance. [8]
- b) For aqueous reaction $A \leftrightarrow R$, between the temperature range 0° to 100°C , determine the equilibrium conversion as a function of temperature in graphical form. What should be the maximum temperature so that the conversion of A achieved is 75% or higher? [8]

For $C_R^\circ = C_A^\circ = 1$ mol/liter,

$$\Delta G_{298}^\circ = -3375 \text{ cal/mol}$$

$$\Delta H_{r, 298} = -18,000 \text{ cal/mol.}$$

OR

- Q8)** a) Explain in detail the effect of temperature on equilibrium conversion of reactant at constant pressure. [8]
- b) Derive the relation between conversion and temperature for an adiabatic reactor using the energy balance and explain how you determine the reactor size for adiabatic operation of a plug flow and a stirred tank reactor. [8]

- Q9)** a) Explain E, F and C curve and find the relationship between them. [10]
 b) Calculate the mean residence time and the variance for a vessel from the following data : [8]

t, min	0	1	2	3	4	5	6	7	8	9	10	12	14
E, min ⁻¹	0	0.02	0.10	0.16	0.20	0.16	0.12	0.08	0.06	0.044	0.03	0.01	0

OR

- Q10)** a) A reactor with a number of dividing baffles is to be used to run the reaction $A \rightarrow R$ with $-r_A = 0.05 C_A$ mol/liter. min

A pulse tracer test gives the following output curve : [10]

Time, min	0	10	20	30	40	50	60	70
Concentration reading	35	38	40	40	39	37	36	35

- i) Calculate the variance of the E curve.
 ii) Calculate X_A assuming plug flow.
 iii) Calculate X_A assuming the tanks - in series model.
- b) Write notes on - Tank in series model, and Dispersion model. [8]



Total No. of Questions : 10]

SEAT No. :

P3356

[4758] - 593

[Total No. of Pages : 3

T.E. (Chemical) (End - Semester)
CHEMICAL ENGINEERING DESIGN - I
(2012 Pattern)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume suitable data if necessary.*

Q1) a) What are the various types of roof used for storage vessels? **[5]**

b) What are wind girders? Sketch different structure of wind girders. **[5]**

OR

Q2) A tall vertical vessel 1.5 m in diameter and 13 m in high is to be provided with skirt support. Weight of the vessel with all its attachments is 80,000 kg. Diameter of skirt is equal to diameter of the vessel. Height of skirt is 2.2 m. Wind pressure acting over vessel is 100 kg/m². Seismic coefficient=0.08, permissible tensile stress of skirt material=960 kg/m², permissible compressive stress is 1/3 of yield stress of material. Yield stress is 2400 kg/m². Estimate the thickness of the skirt support. **[10]**

Q3) Describe construction and working of double pipe heat exchanger. Also mention advantages and disadvantages. **[10]**

OR

Q4) Write short note on (Any two) **[10]**

- a) Horton sphere
- b) Types of vessel support
- c) Fouling in Heat exchanger

P.T.O.

- Q5) a)** Explain various methods of feeding for multiple effect evaporators. [8]
- b) A single effect evaporator is to be operated at absolute pressure of 0.13 bar. Estimate the heat transfer area necessary to concentrate 4500 kg/hr of caustic soda solution from 10% to 40% (by weight) using saturated steam at 117 °C as heating media. The overall heat transfer coefficient may be taken as 1.25 KW/m²°C.

Data : Specific heat of feed=4000 J/kg °C, Specific heat of product=3260 J/kg °C, Feed temperature = 18 °C, BPR=30°C, Density of boiling liquid =1390 kg/m³, The liquid level in the evaporator is 1200 mm above the heating surface. [10]

OR

- Q6) a)** Write short note on types of reboiler. [8]
- b) Suggest a suitable thermal design for a condenser to be used for condensing 4.2 kg/s of steam. Steam will be condensed at pressure of 4.13 KN/m² Steam has a dryness fraction of 0.92. Cooling water is available at 17°C and for economic reason temperature rise has to be limited upto 1.2 m/s through the tubes. The exchanger has two passes on tube side. Tubes of 19.05 mm OD and 15.75 mm ID can be used. Estimate the number of tubes, their length, tube bundle diameter and the shell diameter. Overall heat transfer coefficient based on external areas of tubes=3400 W/m²°K. [10]

- Q7) a)** Describe any three types of agitators giving their range of rpm, functioning and application. [8]
- b) A pitched blade turbine impeller running at 90 rpm is used for agitating 5000 liter of liquid with a density of 900 kg/m³ and viscosity 100 cP. The tank diameter is 1m and the ratio of agitator diameter to tank diameter is 0.4. Find the power required for mixing. [8]

N_{Re}	1000	2000	3000	4000
N_p	1.1	1.2	1.3	1.4

OR

Q8) a) Explain different types of jacket with neat sketch. **[6]**

b) A jacketed agitator reactor consists of a vertical cylinder 1.5 m in diameter with a hemispherical base and a flanged flat top. Jacket is fitted to the cylindrical section only and extends to height of 1m. The spacing between the jacket and the vessel wall is 75 mm. the jacket is fitted with a spiral baffle. The pitch between the spirals is 200 mm. the jacket is used to cool the reactor contents with chilled water at 10 °C @32,500 kg/h and exit temperature 20 °C. Estimate the heat transfer coefficient at the outside wall of the reactor and the pressure drop in the jacket.

The value of $j_h = 3.2 \times 10^{-3}$.

Physical Properties at mean temperature 15°C.

Density=999kg/m³, viscosity=1.136mN.S/m², $M_{Pr}=7.99$,

$K_f=595 \times 10^{-3}$ W/m °C.

[10]

Q9) a) What safety devices are used in pressure vessel to prevent pressure build up? Explain any one in details. **[8]**

b) Design a decanter to separate light oil from water. Oil is dispersed phase. Oil flow rate is 1000 kg/h, density of oil is 900 kg/m³, viscosity of oil is 3 mNs/m². Water flow rate is 5000 kg/h, density of water is 1000 kg/m³ viscosity of water is 1 mN s/m². **[8]**

OR

Q10 a) Write about reflux drum; knock out drums and role of demister pads.**[8]**

b) Design steam water separator for the following conditions **[8]**

Steam flow rate : 2000 kg/h

Water flow rate : 1000 kg/h

Density of water : 926.4 kg/m³

Density of vapour : 2.16 kg/m³

Operating pressure : 4 bar



Total No. of Questions : 10]

SEAT No. :

P2424

[4758]-594

[Total No. of Pages : 3

T.E. (Chemical)

PROCESS INSTRUMENTATION & CONTROL

(2012 Pattern) (Semester - II) (End - Sem.) (309352)

Time : 3 Hours]

[Max. Marks :70

Instructions to the candidates:

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *Figures to the right indicate full marks.*
- 3) *Your answers will be valued as a whole.*
- 4) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 5) *Assume suitable data, if necessary.*
- 6) *Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.*

- Q1)** a) Explain static and dynamic characteristics of measuring instruments. [6]
- b) Distinguish between self operated and power operated instrument. [4]

OR

- Q2)** a) Explain the importance of Instrumentation the process industries. [6]
- b) Differentiate between Analog and Digital instrument. [4]

- Q3)** a) Write short notes on: [6]
- i) Thermocouple
 - ii) RTD
- b) Explain with diagram, construction and working Bourdon Pressure Guage. [4]

OR

P.T.O.

- Q4)** a) Explain Seebeck effect and its application in working of a temperature measuring instrument. Name the instrument with its working diagram. [6]
- b) Describe working of LVDT. [4]
- Q5)** a) Explain the principle, construction and working of orifice meter. [8]
- b) Write short notes on: [8]
- i) Ultrasonic Level method.
- ii) Radiation Method.

OR

- Q6)** a) Explain construction and working of Rotameter with Industrial applications. [8]
- b) Write short notes on: [8]
- i) Air Purge Method.
- ii) Sight Glass Method.

- Q7)** Write short notes on: [16]
- a) pH meter
- b) Liquid chromatography.
- c) HPLC
- d) Refractometry.

OR

- Q8)** a) Explain principle, construction and working of Gas Chromatography. [8]
- b) Write a short note of Mass spectroscopy. [8]

- Q9)** a) State differences between first order and second order system. [9]
b) Give classification of process variable with respect to process control. [9]

OR

- Q10)** a) With the help of block diagram explain working of feedback control system. [9]
b) Explain features of controller action. [9]
i) Auto/Manual Switch.
ii) Direct/Reverse action.

EEE

Total No. of Questions : 10]

SEAT No. :

P2425

[4758]-595

[Total No. of Pages : 4

T.E. (Chemical Engg.)

MASS TRANSFER - II

(2012 Course) (Semester - II) (End - Semester)

Time : 2½ Hours]

[Max. Marks :70

Instructions to the candidates:

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *Assume suitable data, if necessary.*
- 3) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is permitted.*

Q1) a) What is distillation? What are the types of distillation? Discuss steam distillation in brief. **[5]**

b) In A feed of 50-mole% n-heptane and 50-mole% n-octane is fed into a pipe still through a pressure reducing valve and then into a flash disengaging chamber. The vapor and liquid leaving the chamber are assumed to be in equilibrium. If the fraction of feed converted to vapor is 0.5, find the compositions of top and bottom products the equilibrium data is as follows **[5]**

X-	1.00	0.69	0.40	0.192	0.045	0.00
Y-	1.00	0.932	0.78	0.538	0.1775	0.00

OR

Q2) a) For a mixture of n-heptance (A) and toluene (B) at 273°K and 101.3 kN/m², PA° = 106 kN/m², PB° = 73.7 kN/m², find the compositions in vapor and liquid phase. **[3]**

b) Explain relative volatility. **[2]**

c) What do you mean by reflux ratio? Derive Fenske equation for number of theoretical plates at total reflux. **[5]**

P.T.O.

Q3) a) A continuous fractionating column is to be designed for separating 10000 kg per hour of a liquid mixture containing 40 mole% methanol and 60 mole% water in to an overhead product containing 97 mole% methanol and bottom product having 98 mole% water. A mole reflux ratio of 3 is used. Calculate i) number of ideal plates and location of feed plate if the feed is at its bubble point. Equilibrium data: **[5]**

x	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
y	0.417	0.579	0.669	0.729	0.78	0.825	0.871	0.915	0.952	1.0

b) Discuss the graphical method for finding number of stages in counter current liquid-liquid extraction. **[5]**

OR

Q4) A solution of nicotine in water containing 1 % nicotine is to be extracted with kerosene at 293 °K (20°C) Water and Kerosene are essentially insoluble. The equilibrium data is **[10]**

X = 0	0.001011	0.00246	0.00502	0.00751	0.00998	0.0102
Y = 0	0.000807	0.001961	0.00456	0.00686	0.00913	0.00935

Where

$$Y = \text{kg nicotine / kg kerosene}$$

$$X = \text{kg nicotine / kg water}$$

- a) Determine the percentage extraction of nicotine if 100 kg of a feed solution is extracted with 150 kg of solvent (Kerosene)
- b) Repeat for three theoretical extractions using 50 kg solvent each time.

Q5) a) Oil is to be extracted from meal by means of benzene using continuous countercurrent extraction unit. The unit is expected to treat 1000kg of meal per hour. The untreated meal contains 365 kg of oil and 30 kg of benzene. The solvent used contains 14 kg of oil and 590 kg of benzene. The exhausted solids are to contain 55 kg of unextracted oil. **[14]**

Experimental data on the extraction of oil from meal are as

Solution composition kg oil/kg solution	0	0.10	0.20	0.30	0.40	0.50	0.60	0.70
Solution retained kg oil/kg solid	0.5	0.505	0.515	0.530	0.550	0.571	0.595	0.620

Find the number of ideal stages required.

- b) Give factors affecting the rate of leaching. [2]

OR

Q6) a) Derive an expression: $n = \frac{\log(1 + (R-1)^{*1} / f)}{\log R} - 1$ for finding the number of stages under the condition of constant underflow. [8]

- b) Give detail graphical procedure with material balance equations, for finding the number of stages in multistage counter current leaching. [8]

Q7) a) Explain in brief: [8]

- i) Break through curve,
- ii) Adsorption isotherm.

- b) Write principles of ion exchange process and rate of ion exchange. [8]

OR

Q8) a) A solution of washed raw cane sugar is colored by the presence of small amounts of impurities. The solution is to be decolorized by treatment with an adsorptive carbon in a contact filtration plant. The original solution has an adsorptive carbon in a contact filtration plant. The original solution has a color concentration of 9.6 measured on an arbitrary scale and it is desired to reduce color of 0.96. Calculate the necessary dosage of the fresh carbon per 1000 kg solution for a single stage process. The data for an equilibrium isotherm is as follows: [14]

kg carbon/kg solution	0	0.001	0.004	0.008	0.02	0.04
Equilibrium color	9.6	8.6	6.3	4.3	1.7	0.7

b) State equilibrium in ion exchange. [2]

Q9) a) A Solution contains 2500 kg of water and 500 kg Na_2SO_4 salt. It is cooled from 333 K to 283 K in an agitated mild steel vessel. Weight of the vessel is 750 kg. 2.0% water is lost by evaporation during cooling and crystals of $\text{Na}_2\text{SO}_4 \cdot 10 \text{H}_2\text{O}$ are formed. Calculate the yield of crystals and the heat to be removed? [10]

Data: Solubility At 283K: 8.9 kg/100 kg water.

Heat capacity of solution: 3.6 kJ / kg K.

Heat capacity of M.S: 0.5 kJ / KgK.

Heat of Solution: 78.5 MJ / kMol.

Latent heat of Vaporization: 2395 kJ /kg.

b) Explain working and construction of Swenson walker crystallizer. [8]

OR

Q10)a) What are different membrane modules? Define membrane fouling. [5]

b) Explain reverse osmosis for water purification. [5]

c) A saturated solution of MgSO_4 at 353°K is cooled to 303°K in a crystallizer. During cooling 4% of the water is lost by evaporation. Estimate the quantity of original saturated solution to be fed to the crystallizer per 1000kg of $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ crystals. Data: solubility of MgSO_4 at 353°K = 64.2kg/100kg, water solubility of MgSO_4 at 303°K = 40.8kg/100kg water. At wt Mg = 24, S=32, H=1, O=16. [8]

EEE

Total No. of Questions : 10]

SEAT No. :

P2426

[4758] - 596

[Total No. of Pages :3

T.E. (I.T.)

DATABASE MANAGEMENT SYSTEMS
(2012 Course) (Semester - I) (End-Sem.) (314443)

Time : 2 ½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Use of Calculator is allowed.*
- 5) *Assume suitable data, if necessary.*

Q1) a) Explain ACID properties. [4]

- b) Construct an E-R diagram for a car insurance company that has a set of customers each of whom owns one or more cars. Each car has associated with it zero to any number of recorded accidents. [6]

OR

Q2) a) Explain different anomalies with example. [6]

- b) What is cursor? Explain cursor in PL/SQL with suitable example. [4]

Q3) a) Consider a relational database [8]

Supplier (Sid, Sname, address)

Parts (Pid, Pname, color)

Catalog (Sid, Pid, cost)

Write SQL queries for the following:-

- i) Find the names of suppliers who supply some red parts.

P.T.O.

- ii) Find the names of all parts whose cost is more than Rs. 250.
 - iii) Find name of all parts whose color is green.
 - iv) Find number of parts supplied by each supplier.
- b) Write short note on Embedded SQL. [2]

OR

Q4) When do dead lock happen? How to prevent them, how to recover if dead lock takes place. [10]

- Q5)** a) Why it is necessary to have client-server architecture for database management system. [6]
- b) Explain and state difference between centralized and client-server architecture. [8]
- c) Explain different issues in design of parallel system. [4]

OR

- Q6)** a) Explain need of partitioning techniques used in I/O parallelism. Explain techniques in detail. [8]
- b) What is distributed database. Discuss different approaches used for data storage in distributed database. [8]
- c) What are internet databases. [2]

- Q7)** a) Explain with example DTD. [6]
- b) Discuss HBase data Model. [5]
- c) Explain with syntax JSON data type and object. [5]

OR

- Q8)** a) Write a short note on. [6]
- i) X path
 - ii) X Query
- b) What is Hadoop Framework and on what concept the Hadoop Framework works. [8]
- c) Explain NOSQL databases. [2]

- Q9)** a) What is data preprocessing? Explain data preprocessing techniques. [8]
- b) Explain architecture of data mining system. [8]

OR

- Q10)** Write a short note on [16]
- i) Machine learning for Big data
 - ii) Mobile databases
 - iii) Data Mart
 - iv) KDD



Total No. of Questions : 10]

SEAT No. :

P3676

[4758]-597

[Total No. of Pages : 3

T.E. (Information Technology)

SOFTWARE ENGINEERING

(Semester - I) (2012 Course) (End - Semester)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q.No.1 or 2, Q.No.3 or 4, Q.No.5 or 6, Q.No.7 or 8, Q.9 or Q.10.*
- 2) *Draw neat diagrams wherever necessary.*
- 3) *Assume suitable data if necessary.*

Q1) a) Explain different aspects of software process model. **[5]**

b) Elaborate how software engineering is a layered technology. **[5]**

OR

Q2) a) What is extreme programming? List the drivers which are treated as XP values. **[5]**

b) Explain agile process model. **[5]**

Q3) a) Describe the steps of scenario based modeling with a suitable example. **[5]**

b) What is requirements engineering. **[5]**

OR

Q4) a) Explain activities and the steps used for negotiating software requirements. **[5]**

P.T.O.

- b) What is data modeling? Explain following term in data modeling. [5]
- i) Data objects
 - ii) Data attributes
 - iii) Relationships

- Q5)** a) Explain following concepts in the context of software design. [8]
- i) Abstraction
 - ii) Modularity
 - iii) Information Hiding
 - iv) Functional Independence
- b) Illustrate how requirements model is translated to design model. [8]

OR

- Q6)** a) Explain software design model with reference to process and abstraction dimension. [8]
- b) What is data-centered architecture? Explain with an example. [8]
- Q7)** a) Discuss the user-centered design process. [8]
- b) Explain Shneiderman's Golden Rules of UI design. [8]

OR

- Q8)** a) Discuss in details. [8]
- i) Fitt's law.
 - ii) Hick's law.
- b) Explain the analysis and design process of user-interfaces. [8]

- Q9)** a) What is the goal of cleanroom testing? Discuss in brief the statistical use testing. How do we certify a software component in cleanroom testing[10]
- b) What is software configuration management repository? Discuss role and features of SCM repository. [8]

OR

Q10) Write short notes on ANY THREE: [18]

- a) CASE tools
- b) Technology evolution
- c) Test driven development
- d) Model driven development

EEE

Total No. of Questions : 10]

SEAT No. :

P2427

[4758] - 598

[Total No. of Pages :2

T.E. (I.T.)

COMPUTER NETWORK TECHNOLOGY

(2012 Course) (End - Sem.) (Semester - I)

Time : 2.30 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *Figures to the right indicate full marks.*
- 3) *Your answers will be valued as a whole.*
- 4) *Assume suitable data, if necessary.*

Q1) a) What is the significance of ARP and RARP Protocols? **[6]**

b) Explain operation of ICMP with suitable example. **[4]**

OR

Q2) a) For a given class B network 144.155.0.0 with default subnet mask, how can you divide it into 8 subnets? Write the **[6]**

- i) range of each subnet
- ii) network IP for 7th subnet
- iii) broadcast IP for the 7th subnet
- iv) subnet mask in subnets.

b) What is silly window syndrome problem. **[4]**

Q3) a) Describe 3-way handshake for connection establishment in TCP. **[6]**

b) Explain email architecture & its services. **[4]**

OR

Q4) a) What is FTP? Where & when is it used? Why does it require two ports. **[6]**

b) Describe SMTP header format. **[4]**

P.T.O.

- Q5)** a) Explain architecture of 802.11. [10]
b) Describe bluetooth protocol stack. [8]

OR

- Q6)** a) Explain in detail architecture of Bluetooth. [10]
b) What are different technical issues to implement WLAN? [8]

- Q7)** a) Explain different design constraints of WSN. [8]
b) Explain the difference between Pure ALOHA & slotted ALOHA. [8]

OR

- Q8)** a) Which are different task & characteristics of transceiver? [8]
b) What are different design issues of MAC protocol of WSN? [8]

- Q9)** a) Differentiate between content based & geographic routing. [8]
b) Describe SPIN routing protocol. [8]

OR

- Q10)** Write short note on (Any two): [16]
a) Addressing in WSN.
b) 100 Gigabit Ethernet.
c) Software defined networking.



Total No. of Questions : 10]

SEAT No. :

P2428

[4758]-599

[Total No. of Pages : 2

T.E. (Information Technology)

WEB ENGINEERING & TECHNOLOGY

(2012 Course) (Semester - I) (314445) (End - Semester)

Time : 2 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume suitable data, if necessary.*

- Q1)** a) Write difference between software engineering and Web engineering. **[5]**
- b) How to Publish a Web Site? Explain process of Web Publishing. **[5]**

OR

- Q2)** a) Write HTML code which include table. What's the difference between `<tr>` and `<td>`? **[5]**
- b) Explain how frames are constructed in HTML document. **[5]**
- Q3)** a) Differentiate between HTTP versus FTP. **[4]**
- b) Explain in detail HTTP protocol, purpose and operation? **[6]**

OR

- Q4)** a) Give the list with definition of HTML components. How CSS can be used to change the view. **[5]**
- b) Explain Image Map with example. **[5]**

P.T.O.

- Q5)** a) Explain PHP GET and PHP POST variables. [8]
b) Explain Session management technique in PHP. [8]

OR

- Q6)** a) What are Cookies? Explain Cookies in PHP. [8]
b) Explain PHP - Two-dimensional Arrays using example. [8]

- Q7)** a) How to create arrays in JavaScript? [8]
b) Difference between java and JavaScript? [8]

OR

- Q8)** a) How to access the value of a textbox using JavaScript? [8]
b) Explain how can you access a database from a JSP page? Give the database connectivity issues in details. [8]

- Q9)** a) Write a short note on - WordPress. [9]
b) What is WordPress Caching and why is it Important? [9]

OR

- Q10)**a) Write a short note on - Drupal. [9]
b) What are the advantages and limitations of content management system? [9]

EEE

Total No. of Questions : 12]

SEAT No. :

P3639

[4758] - 6

[Total No. of Pages :4

T.E. (Civil)

HYDROLOGY AND WATER RESOURCES ENGINEERING

(2008 Pattern) (Semester - II)

Time :3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

Q1) a) Explain with sketch the hydrological cycle. **[8]**

b) State various methods to measure evaporation. Discuss the factors affecting infiltration. Explain flooding type of infiltrometer. **[10]**

OR

Q2) a) In a year the annual rainfall recorded by the rainguages are as follows:**[10]**

Station	L	M	N	O
Rainfall in mm	700	500	300	440

If an error of 10% in the estimation is permissible. Determine the optimum number of rainguages.

b) Explain with graph the 'Intensity-Duration-frequency' relationship. **[8]**

Q3) a) Distinguish between evaporation and expotranspiration. Also state Dalton's equation and explain different terms in it. **[8]**

P.T.O.

- b) Rainfall of magnitude 3.8cm and 2.8cm occurring on two consecutive four hours duration on a catchment of area 27km², produce falling hydrograph. Estimate rainfall excess and ϕ index. [8]

Time from start of rainfall (hrs)	-6	0	6	12	18	24	30	36	42	48	54	60	66
observed flow (cumecs)	6	5	13	26	21	16	12	9	7	5	5	4.5	4.5

OR

- Q4) a)** State various formulae to estimate flood and explain any two methods. [8]
- b) With the help of concept sketch of hydrograph, name different components of hydrograph. Also explain base flow separation and its significance. [8]

- Q5) a)** What is meant by reservoir sedimentation? State factors affecting reservoir sedimentation. How will you reduce it? [8]
- b) Write a note on various zones of reservoir with a neat sketch. [8]

OR

- Q6) a)** The mean monthly discharge at dam site is given below. To meet a constant discharge of 60m³/sec; calculate the minimum amount of storage required. [8]

Month	J	F	M	A	M	J	J	A	S	O	N	D
Discharge m ³ /s	80	65	55	40	35	45	70	100	125	110	100	90

- b) What is apportionment of total cost of reservoir? Explain various methods of it. [8]

SECTION- II

Q7) a) Define: [8]

- | | |
|-----------------------|----------------------|
| i) Kor depth, | ii) Capacity factor |
| iii) C.C.A. | iv) Delta |
| v) Duty | vi) Base period |
| vii) Paleo irrigation | viii) Catchment area |

b) Determine the capacity of a reservoir if its cultivable area is 1,00,000 hectares. Following are details of crop pattern. [10]

Crop	Base period (Days)	Duty (ha/cumec)	Intensity of Irrigation (%)
Rice	120	1000	10
Wheat	120	1500	20
Sugarcane	330	2500	40

Assume 10% as reservoir losses and 5% canal losses.

OR

Q8) a) Find duration in days between two watering if [10]

- 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

b) Explain the factors affecting duty of crop. [8]

Q9) a) Explain Dupits and Thiems theory and state the assumptions made. [8]

b) In Recuperation Test of an open well, water level was depressed by 3.5m and pumping was stopped. After 90 minutes, the water level recuperated by 1.5m. Find [8]

- i) Specific yield
- ii) Diameters of the well, that will give the yield of 350 LPM, under the depression head of 2m.

OR

Q10)a) Enlist different types of tube wells and dug wells. Explain strainer type with a neat sketch. [8]

b) Explain with a neat sketch 'lift Irrigation'. [8]

Q11)a) Derive the expression for spacing for tile drain. [6]

b) Explain the methods of application of water to crops. [10]

OR

Q12)a) What is water logging? State its ill effects. Explain any one method to improve the sub-surface drainage? [8]

b) Write a short note on- [8]

i) Use of G.I.S. in crop pattern

ii) Warabandi.



Total No. of Questions : 12]

SEAT No. :

P2325

[4758]-60

[Total No. of Pages : 3

T.E. (Electronics)

DATA COMMUNICATION

(2008 Course) (Semester-I) (304202)

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 whenever 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) Define cross correlation function. State and explain any three properties of cross correlation function. [8]
- b) Explain noise reduction techniques Low Pass Filter and Matched Filters. [8]

OR

- Q2)** a) Explain in brief the different types of random processes with suitable examples. [8]
- b) Explain different properties of CDF and PDF for discrete and continuous random variables. [8]

- Q3)** a) For the sequence 10011011, sketch the waveform using the following data formats: [10]
- i) Unipolar R_z
 - ii) Polar NR_z
 - iii) Alternate Mark Inversion
 - iv) Split phase Manchester coding. Draw the corresponding spectrum of the above formats and explain.
- b) What is synchronizer? Explain any one type of bit synchronizer. [6]

OR

P.T.O.

- Q4)** a) Why synchronization is necessary in data communication? Explain bit and frame synchronization using suitable sketch. [8]
- b) What is inter symbol interference? Explain its cause and remedies to avoid it. [8]
- Q5)** a) For a (6, 3) systematic LBC, three parity bits are given as, $C4 = d1 + d2$, $C5 = d1 + d3$, $C6 = d1 + d2 + d3$. [10]
- i) Determine generator matrix.
- ii) Construct code generated by this matrix.
- iii) Determine error capacity of the code.
- iv) Prepare syndrome decoding table.
- v) If received vector is 101011, determine message word.
- b) Explain in detail Viterbi decoding algorithm with an example. [8]

OR

- Q6)** Write short notes on: [18]
- a) Binomial, Poisson's.
- b) Eye diagram.
- c) Linear block codes.
- d) Error correction and detection techniques.

SECTION-II

- Q7)** a) What is mutual information? How channel capacity is related to mutual information? Explain with mathematical support. [8]
- b) Explain Huffman coding and decoding with example. [8]
- OR
- Q8)** a) What is entropy? For a discrete memory less source what is the upperbound on entropy. Show that equiprobable messages results to maximum entropy. [8]
- b) Explain Shannon - Fano coding with example. [8]

- Q9)** a) Explain the transmission and reception of BPSK with mathematical expression. [8]
- b) In a digital communication system, the bit rate of NRZ data stream is 1 Mbps and carrier frequency of transmission is 100 MHz. Find the symbol rate of transmission and band width requirement of the channel in the following cases. [8]
- i) BPSK
- ii) QPSK

OR

- Q10)** a) Explain the necessity of continuous PSK. State and explain the basic principles of MSK with block schematic and suitable waveforms. [8]
- b) Explain Phase diagrams and signal constellations diagrams of QPSK. [8]
- Q11)** a) Design a 4-bit PN sequence generator and verify the properties of maximum length sequence. Assume that initial state is 1000. [8]
- b) What is the difference between multiplexing and multiple access techniques? Compare TDMA, FDMA and CDMA. [10]

OR

- Q12)** Write short notes on: [18]
- a) Binary symmetric channel.
- b) Continuous and slotted ALOH.
- c) Frequency Hopped Spread Spectrum.
- d) DS-SS.



Total No. of Questions : 10]

SEAT No. :

P2429

[4758] - 600

[Total No. of Pages :4

T.E. (I.T.)

THEORY OF COMPUTATION

(2012 Course) (End- Sem.) (Semester - I) (314442)

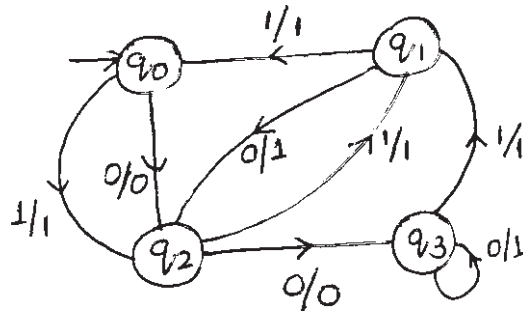
Time : 2 ½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Neat diagrams must be drawn wherever necessary.
- 2) Figures to the right indicate full marks.
- 3) Assume suitable data, if necessary.

Q1) a) Construct Moore machine equivalent for the given Mealy machine. [6]



b) Let $\Sigma = \{a,b\}$. Write RE to define language consisting of strings such that [4]

- i) Strings without substring bb
- ii) Strings that have exactly one double letter in them.

OR

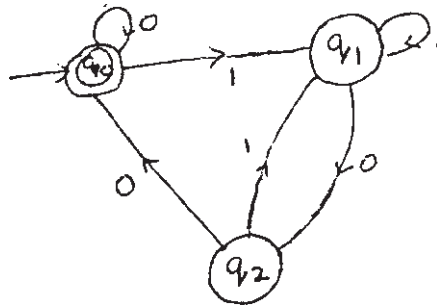
Q2) a) Design a DFA for accepting L over $\{0,1\}$ such that every substring of length 4 contains at least three 1's. [4]

- b) Define Finite Automata and justify why palindrome strings cannot be checked for by FSM. [4]
- c) With examples define Regular Expression. [2]

P.T.O.

Q3) a) Construct NFA accepting language represented by $0^*1^*2^*$ and convert it into DFA. [6]

b) Find RE for the following DFA using Arden's theorem. [4]



OR

Q4) a) Give the CFG for $\Sigma = \{a,b\}$. [4]

i) To generate strings in which no consecutive b's can occur but a's can be consecutive.

ii) Language is $\{a^x b^y / x \neq y \text{ and } x, y > 0\}$.

b) Convert the given grammar into GNF: [4]

$$S \rightarrow AB$$

$$A \rightarrow BS|b$$

$$B \rightarrow SA|a$$

c) Write a note on applications of CFG. [2]

Q5) a) Construct a PDA to accept the language $\{a^n b^m c^{(n+m)} / \text{where } n, m \geq 1\}$. [6]

b) Construct PDA equivalent to the given CFG: [8]

$$S \rightarrow OA1/OBA$$

$$A \rightarrow S01/0$$

$$B \rightarrow 1B/1$$

c) Compare PDA and FA. [4]

OR

- Q6)** a) Construct a post m/c to accept the language $\{a^n b^{n+1} / \text{where } n \geq 1\}$. [8]
 b) Construct a CFG equivalent to PDA

$$M = (\{q_0, q_1\}, \{0, 1\}, \{B, R\}, \{\delta, q_0, R, \phi\}) \text{ where } \delta \text{ is} \quad [8]$$

$$\delta(q_0, 0, R) = (q_0, BR)$$

$$\delta(q_0, 0, B) = (q_0, BB)$$

$$\delta(q_0, 1, B) = (q_1, B)$$

$$\delta(q_1, 1, B) = (q_1, B)$$

$$\delta(q_1, 0, B) = (q_1, \epsilon)$$

$$\delta(q_1, \wedge, R) = (q_1, \epsilon)$$

- c) Define Post Machine. [2]

- Q7)** a) Design a TM that computes the function [12]

$$f(x, y) = x + y \text{ if } x \geq y \\ = 0 \text{ if } x < y \text{ where } x \text{ \& } y \text{ are unary.}$$

Simulate the working of the TM for $x = 2, y = 2$.

- b) Explain the diff. types of turing machines. [4]

OR

- Q8)** a) Define Turing Machine and construct a TM which recognizes strings consisting of equal no. of 0's and 1's. [8]

- b) Compare FA, PDA and TM. [4]

- c) Explain the halting problem of turing machines. [4]

- Q9)** a) Explain with example Turing Reducibility. [6]

- b) Prove that the following decision problems are recursive. **[10]**
- i) Two DFA' s are equivalent or Not.
 - ii) NFA accepts a word or not.

OR

- Q10**a) Define and differentiate recursive languages and recursively enumerable languages. **[6]**
- b) P.T. the following decision problems are recursive **[10]**
- i) DFA accepts a word or not
 - ii) CFG G generates the string w or not.



Total No. of Questions : 10]

SEAT No. :

P2430

[4758] - 601

[Total No. of Pages :4

T.E. (I.T.)

SYSTEMS PROGRAMMING

(2012 Course) (314450) (Semester - II) (End - Semester)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Your answers will be valued as whole.*
- 5) *Assume suitable data, if necessary.*

Q1) a) For the 'C' code given below, give the different tables that would be generated as output of lexical analysis. **[8]**

```
main ( )  
{  
    int i, sum, n;  
    float avg;  
    n=10;  
    sum=0;  
    for(i= 1; i<=10 ;i++)  
        sum =sum + i;  
    avg = sum / (float)n ;  
}
```

b) Define macroprocessor and assembler and give examples for each. **[2]**

OR

Q2) a) Give the various data structures in the design of pass-1 of a Two-pass direct linking loader. **[4]**

b) What are the assembler directives? Explain how assembler directives LTORG, ORIGIN and EQU are processed in first pass. **[6]**

P.T.O.

- Q3) a)** For the following piece of assembly language code, show the contents of symbol table, literal table and pool-tab. Assume size of instruction equal to one. **[5]**

```
START 202
MOVER AREG, =5
MOVEM AREG, A
LOOP MOVER AREG, A
MOVER CREG, B
ADD CREG, = '1'
MOVEM CREG, B
SUB CREG, A
BC ANY, NEXT
LTOrg
ADD CREG, B'
BC LE LOOP
NEXT SUB AREG, = '1'
BC LT, BACK
STOP
ORIGIN 219
MULT CREG, B
A DS 1
BACK EQU LOOP
B DS 1
END
```

- b) Define loader and enlist the basic functions of loader. **[5]**

OR

- Q4) a)** Explain the first three phases of compiler w.r.t. the following statement: **[6]**

$$r = a - 10 / (c * d^e)$$

Note: \wedge is exponentiation operator

- b) Explain different parameter passing mechanisms in macro-processor. **[4]**

Q5) a) Consider the grammar [4]

$$E \rightarrow E-E$$

$$E \rightarrow E * E$$

$$E \rightarrow \text{id}$$

Perform shift Reduce parsing of i/p string “id-id * id”

b) Define table driven predictive parser. For the following grammar. [10]

$$S \rightarrow AaBb$$

$$A \rightarrow \epsilon$$

$$B \rightarrow \epsilon$$

Construct table-driven predictive parser and parse the string “ab”.

c) Compare bottom up and top down parser. [4]

OR

Q6) a) Consider the following grammar [10]

$$S \rightarrow (L)|a$$

$$L \rightarrow L, S|S$$

Construct SLR parser and parse for the string (a,(a,a))

b) Explain YACC file structure. [4]

c) Explain problem of left factoring in top down parser. [4]

Q7) a) Optimize the following code [8]

$$a = x^2$$

$$b = 3$$

$$c = x$$

$$d = c * c$$

$$e = b + 2$$

$$f = a + d$$

$$g = e * f$$

b) Write short note on activation record. [4]

c) Explain in brief run time storage allocation. [4]

OR

- Q8)** a) Explain any one technique of machine dependent code optimization. [6]
 b) Comparison between static, stack & heap allocation. [6]
 c) Explain machine dependent optimization issues. [4]

- Q9)** a) Design dependency graph for the following grammar. [4]

$S \rightarrow T \text{ List}$

$T \rightarrow \text{int}$

$T \rightarrow \text{float}$

$T \rightarrow \text{char}$

$T \rightarrow \text{double}$

$\text{List} \rightarrow \text{List } 1/\text{id}$

- b) Translate the following C fragment into the three address code. [6]

`int i;`

`int a[10][10];`

`i = 0;`

`while (i < 10)`

`{`

`a[i][i]=1;`

`i++;`

`}`

- c) Write quadruple and triple for the expression. [6]

$-(a*b)+(c+d)-(a+b+c+d)$

OR

- Q10)**a) For the following statement, Generate intermediate code in the format: [8]

i) Postfix notation

ii) Quadruple

iii) Parse tree

iv) Triple

$S = (a+b) / (c-d)$

- b) Explain concept of type checking. [4]

- c) Generate three address code for [4]

`while (i < 10)`

`{`

`x=0;`

`i=i+1;`

`}`

Total No. of Questions : 10]

SEAT No. :

P3924

[Total No. of Pages : 3

[4758] - 602

T.E. (Information Technology) (Semester - II)

OPERATING SYSTEMS

(2012 Pattern)

Time :3 Hours]

[Max. Marks :70

Instructions to the candidates:

- 1) *Answer Q 1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.*
- 2) *Figures to the right hand indicate full marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Assume suitable data, wherever necessary.*

Q1) a) Describe the evolution of Operating Systems. [5]

b) Explain fork and execve system calls. Also state their relationship. [5]

OR

Q2) a) Differentiate between kernel-level and user-level threads. [5]

b) Explain Traditional UNIX Scheduling with example. [5]

Q3) a) How can a programming language be used to provide mutual exclusion? Explain with example. [5]

b) What are different requirements for mutual exclusion? [5]

OR

Q4) a) Write and explain the deadlock-free solution for a dining Philosophers Problem. [5]

b) Explain any two ways of creating unnamed pipes in Linux with example. [5]

P.T.O.

- Q5)** a) What are the distinctions among logical, relative, and physical addresses? [6]
- b) Why is the capability to relocate processes desirable? Explain in detail. [6]
- c) Explain two-level page table organization for implementing virtual memory. [6]

OR

- Q6)** a) Write a short note on Buddy system. [6]
- b) For the following page reference string 5, 6, 7, 8, 5, 6, 9, 5, 6, 7, 8, 9, show and count the number of page faults that occur with three frames using FIFO, LRU and optimal page replacement methods. [12]

- Q7)** a) Define following terms. [6]
- i) Seek time
- ii) Rotational Latency
- iii) Transfer time
- b) Assume the disk head is initially positioned over track 100. For the disk track request 27, 129, 110, 186, 147, 41, 10, 64, 120 how disk scheduling is done for FIFO Scan algorithms. Calculate average seek length and show the tracing of request. [6]
- c) Explain different I/O buffering techniques. [4]

OR

- Q8)** a) List and briefly define any two file allocation methods. [6]
- b) What are the functions of a file management system? [6]

- c) What are typical operations that may be performed on a directory? [4]
- Q9)** a) Write a pseudo - code for simple kernel module and explain procedure of inserting a new module in existing kernel with all necessary steps. [8]
- b) With neatly labelled diagram explain architecture of embedded OS. [8]

OR

Q10) Write features of the following (any three) [16]

- a) NACH OS
- b) Ubuntu EDGE
- c) Embedded Linux
- d) Android OS
- e) Service Oriented OS



Total No. of Questions : 10]

SEAT No. :

P2431

[4758]-603

[Total No. of Pages : 3

T.E. (Information Technology)
MULTIMEDIA TECHNOLOGIES

(2012 Course) (Semester - II) (314452) (End - Sem.)

Time : 2½ Hours]

[Max. Marks :70

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicates full marks.*
- 4) *Assume suitable data, if necessary.*

Q1) a) Explain the concept of “Distributed Multimedia System” alongwith suitable applications. **[5]**

b) For each of the media types: audio, graphics, images and video; briefly discuss how sampling affects the quality of the data. **[5]**

OR

Q2) a) Why is data compression necessary for multimedia activities? Explain why lossy data compression is sometimes preferred over lossless. Give suitable example to justify your answer. **[5]**

b) Explain the Shanon Fano Encoding method with example. **[5]**

Q3) a) Explain Reflection, Diffraction and Interference with respect to sound wave. **[5]**

b) Draw and explain different chunks of WAVE file format. **[5]**

OR

P.T.O.

Q4) a) List two psychological phenomena that are exploited in MPEG audio compression. Briefly explain their meanings. [5]

b) GIF and JPEG are two commonly used image representations. Do they usually use lossless or lossy compression? State the major compression algorithm (for lossless) or the lossy steps of the algorithm (for lossy) for each. [5]

Q5) a) What are different types of frames in MPEG? How are these frames encoded? [8]

b) Explain the advantages of YC format over RGB format in video transmission also describe how RGB signals are converted into YC signals using register bridges. [8]

OR

Q6) a) Explain H.261 and H.263 video file formats. [8]

b) State and explain in brief Multimedia supported video formats on android. [8]

Q7) a) What are the 12 principles of animation? Explain any 3 in detail. [8]

b) What is OpenGL? State and explain an essential GLUT functions of OpenGL. [8]

OR

Q8) a) Explain OpenGL rendering pipeline with key stages. Draw suitable diagrams. [8]

b) What is animation? How it differs from the video? Enlist some tools used to create the animation. [8]

Q9) a) What is virtual reality? Describe the input and output devices used in Virtual Reality. [6]

- b) Explain GStreamer Based Multimedia Framework with suitable diagram. [6]
- c) Explain the following terms briefly: [6]
- i) Multimedia over IP
 - ii) Media on Demand

OR

- Q10**a) What is multimedia synchronization? State and explain important parameters associated with multimedia synchronization. [6]
- b) Differentiate between the Virtual Reality and Augmented Reality by taking example. [6]
- c) Briefly explain following broadcast schemes for video on demand. [6]
- i) Staggered broadcasting
 - ii) Pyramid broadcasting

EEE

Total No. of Questions : 10]

SEAT No. :

P2432

[4758]-604

[Total No. of Pages : 2

T.E. (Information Technology)

INFORMATION TECHNOLOGY PROJECT MANAGEMENT

(2012 Pattern) (Semester - II) (314453) (End-Semester)

Time : 3 Hours]

[Max. Marks :70

Instructions to the candidates:

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

- Q1) a)** Explain Macgregor's theory of X and Y for motivation. **[4]**
- b) Explain Maslow's need hierarchy theory of motivation. **[6]**

OR

- Q2) a)** What is the difference between programmed and non programmed decision? **[4]**
- b) What are various career fields possible for engineering graduates? **[6]**
- Q3) a)** Explain the process of requirement analysis and specification process with the help of diagram. **[4]**
- b) Write short note on: **[6]**
- i) ISO 9000
 - ii) Six sigma

OR

- Q4) a)** State the difference between: **[4]**
- i) High level design and detailed design.
 - ii) Unit testing and integration testing.
- b) List contents of project proposal. **[6]**

P.T.O.

- Q5)** a) Explain four major sections of project management plan. [8]
b) Explain in short importance of cost management and time management in project execution. [8]

OR

- Q6)** a) Explain configuration management process in detail. [8]
b) Explain activities tracking, defect tracking and issues tracking with respect to project tracking. [8]

- Q7)** a) What are the various functional modules of an ERP system? Explain. [8]
b) Explain any two implementation strategies for ERP in an organisation. [8]

OR

- Q8)** a) Explain ERP implementation Life Cycle. [8]
b) List down 4 advantages and 4 myths of an ERP system. [8]

- Q9)** a) Write short note on: [12]
i) Trends in SCM
ii) Software maintenance
iii) Reverse engineering
b) What is software project auditing process and why it is essential? [6]

OR

- Q10)** a) Write short note on: [12]
i) Reengineering
ii) Business process management
iii) Project management tools.
b) What is Software Process Improvement? [6]

EEE

Total No. of Questions : 10]

SEAT No. :

P2433

[4758]-605

[Total No. of Pages : 4

T.E. (Information Technology)

DESIGN AND ANALYSIS OF ALGORITHMS

(2012 Pattern) (Semester - II) (end - Sem.) (314449)

Time : 2½ Hours]

[Max. Marks :70

Instructions to the candidates:

- 1) *Answers 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.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume suitable data if necessary.*

Q1) a) Solve following recurrence relation: **[5]**

$$T(n) = T(n/2) + 1$$

$$T(1) = 1$$

b) Analyze merge sort and find time complexity of merge sort. **[5]**

OR

Q2) a) Write an algorithm to find factorial using recursion. Find the time complexity. **[5]**

b) Consider following instance for simple knapsack problem. find the solution using greedy method. **[5]**

$$N=8$$

$$P = \{11, 21, 31, 33, 43, 53, 55, 65\}$$

$$W = \{1, 11, 21, 23, 33, 43, 45, 55\}$$

$$M=110$$

P.T.O.

- Q3) a)** Write Kruskal's algorithm to find minimum spanning tree. [5]
- b) Write Floyd's algorithm for all pairs shortest path and find time complexity. [5]

OR

- Q4) a)** Solve the following job sequencing problem using greedy algorithm. [5]

$N(\text{Number of jobs}) = 4$

Profits associated with jobs $(P_1, P_2, P_3, P_4) = (100, 10, 15, 27)$. Deadline associated with jobs $(d_1, d_2, d_3, d_4) = (2, 1, 2, 1)$.

- b) What is Principle of optimality? Differentiate between greedy and dynamic method. [5]

- Q5) a)** Write recursive backtracking algorithm for sum of subset problem. [8]

- b) Write an algorithm for 0/1 knapsack problem using backtracking method. [8]

OR

- Q6) a)** What is backtracking? Write general iterative algorithm for backtracking. [8]

- b) Write short note on: [8]

- i) State space tree
- ii) Live node
- iii) Expanding node (E-node)
- iv) Bounding function

Q7) a) Explain the term:

[10]

- i) Least cost branch and bound.
- ii) Compare backtracking and branch and bound method.

b) Consider 0/1 Knapsack instance $n=4$ with capacity 10 kg. such that **[8]**

Item	Profit (in Rs.)	Weight (in kg)
1	40	4
2	42	7
3	20	5
4	12	3

Find maximum profit using first in first out branch and bound (FIFOBB) method. Use fixed size formation for state space tree.

OR

Q8) What is travelling salesman problem? Find the solution of following travelling salesman problem using branch and bound method. **[18]**

Cost Matrix =

∞	20	30	10	11
15	∞	16	4	2
3	5	∞	2	4
19	6	18	∞	3
16	4	7	16	∞

- Q9)** a) Prove that Clique problem is NP complete. [8]
- b) Explain how parallel computations are possible using complete binary tree. [8]

OR

- Q10)**a) Specify one example of NP-hard problem. Also mention that why it is NP hard. [8]
- b) Explain in detail models for parallel computing. [8]

EEE

Total No. of Questions : 12]

SEAT No. :

P2326

[4758] - 61

[Total No. of Pages :4

T.E. (Electronics)

NETWORK SYNTHESIS AND FILTER DESIGN

(2008 Pattern) (Semester - I) (304203)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Define poles and zeros of a transfer function. With suitable example explain the responses corresponding various locations of poles in s plane. **[8]**
- b) State with reason whether the following functions are physically realizable or not? **[4]**
- i) $Z(s) = s + j$
 - ii) $Z(s) = s^2 + 1$
- c) Test whether the given polynomials are Hurwitz. **[6]**
- i) $G1(s) = S^4 + S^3 + 4S^2 + 2S + 3$
 - ii) $G2(s) = S^5 + S^3 + S$

OR

- Q2)** a) What is the significance of positive real function? Give necessary and sufficient conditions for a function to be positive real function. **[6]**
- b) Synthesis a positive real function $Z(s) = (6S^3 + 3S^2 + 3S + 1) / (6S^3 + 3S)$ by removing min $[\text{Re } Z(j)]$. **[6]**
- c) Determine whether the following functions are positive real or not and justify the same. **[6]**
- i) $(S^2 + S + 6) / (S^2 + S + 1)$
 - ii) $(S^2 + 6S + 5) / (S^2 + 9S + 14)$

P.T.O.

- Q3) a)** From the pole-zero plots shown below in figure 1 (a), (b), (c) identify the plot indicating RL impedance and synthesize it using foster - I form. Assume $K = 1$. [8]

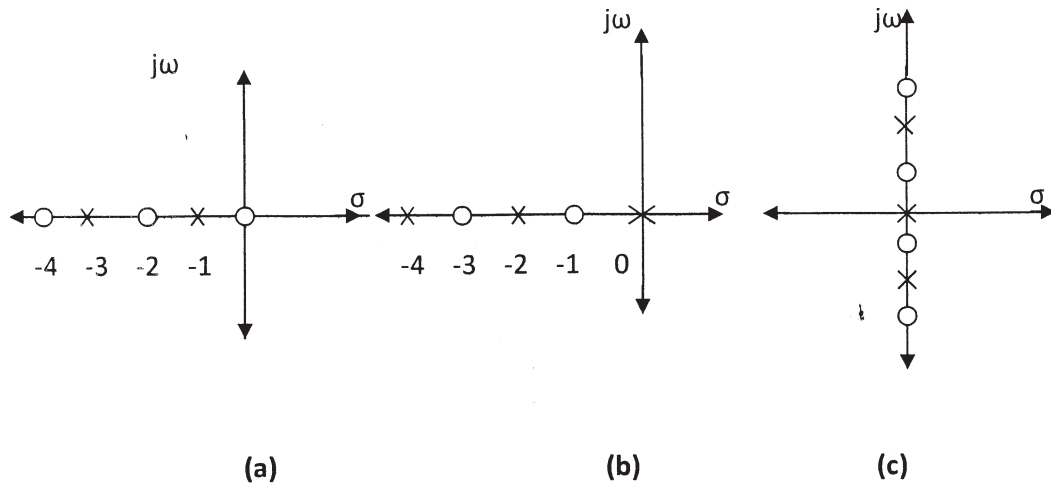


Figure 1 (a),(b),(c)

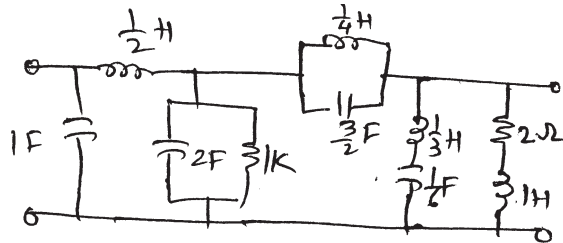
- b) State the properties of LC driving point immittance function and hence explain the nature of reactance curve for LC network along with suitable diagram. [8]
- i) with a pole at origin
 - ii) with a zero at origin

OR

- Q4) a)** A network is to be designed such that the value (real and non repeated) of complex frequency at which system function becomes maximum is at -2 and -6 whereas at -3 and -7 system function becomes minimum. If $Z(0) = 20\Omega$, find the network equivalent to [8]

- i) RC High pass filter
 - ii) RC Low pass filter
- b) Realize the given network impedance function using Foster I and Cauer I form $Z(s) = \frac{(s+1)(s+4)}{s(s+2)}$. [8]

- Q5) a)** Synthesize the given voltage transfer function in terms of constant resistant lattice network terminated in 1Ω resistance = $(S^2 - S + 1) / (S^2 + S + 1)$. [6]
- b) Explain the concept and significance of zeros of transmission in network synthesis. Identify the zeros of transmission for the following network and hence write the transfer function (generalized) for this network. [10]



OR

- Q6) a)** Synthesize the open circuit voltage ratio transfer function $\frac{V_2}{V_1} = \frac{K}{(S+2)(S+4)}$ using RC ladder network. [8]
- b) Synthesize $Y_{21} = \frac{S^3}{S^3 + 3S^2 + 3S + 2}$ as LC ladder terminated by 1Ω . [8]

SECTION - II

- Q7) a)** Realize a third order low pass Butterworth filter and hence using frequency transformation technique, convert it into high pass filter for cut-off frequency $\omega_c = 10^4$ rad/sec and load resistance of 500Ω . [12]
- b) Explain the concept and necessity of magnitude and frequency scaling as used in filter designing. [6]

OR

- Q8) a)** Write a short note on Chebyshev approximation. [4]
- b) Find the attenuation at $\omega_s = 50$ rad/sec for 5th order low pass Butterworth filter which has a maximum loss of 1 db at the edge of pass band frequency $\omega_p = 10$ rad/sec. Assume $R_1 = R_2 = R$ and $C_1 = C_2 = 1F$. [10]
- c) Determine the order of the filter if attenuation $\alpha_{max} = 1$ db, $\alpha_{min} = 30$ db, pass band $\omega_p = 250$ rad / sec and stop band $\omega_s = 600$ rad/sec. [4]

- Q9) a)** Explain the negative feedback topology used in active filter design. Derive the equation for its transfer function. [8]
- b) Design second order high pass filter with cut-off frequency 5 KHz. [8]

OR

- Q10)a)** Design a second order low pass Sallen Key filter with Butterworth approximation having upper cut-off frequency of 1 KHz. [8]
- b) Write a short note on: [8]
- RC - CR transformation
 - Coefficient matching technique for obtaining elements values.

- Q11)a)** The op-amp used in the inverter circuit has $R_1 = 10\text{K}\Omega$ and $R_f = 10\text{K}\Omega$. It has input bias current 500nA and an input offset current that can range between $\pm 100\text{nA}$. Find resulting output offset voltage. [8]
- b) Explain the effect of following on active filter performance. [8]
- The slew rate and dynamic range of op-amp.
 - Op-amp frequency response characteristics.

OR

- Q12)a)** What is multi element deviation? Define variability and derive the expression for per unit change in parameter P due to simultaneous variation in all elements. [10]
- b) The input to the opamp inverter is a sine wave of an amplitude 5 volts. If the slew rate of opamp is $1\text{V}/\mu\text{sec}$, find the frequency at which the slew rate limiting occurs. $R_1 = 5\text{K}\Omega$ and $R_f = 10\text{K}\Omega$ for the given circuit. [6]



Total No. of Questions : 12]

SEAT No. :

P2327

[4758]-62

[Total No. of Pages : 3

T.E. (Electronics Engineering)

MICROCONTROLLERS

(2008 Course) (Semester - I) (304204)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

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

SECTION - I

Q1) a) Explain architecture of 8 bit microprocessor. **[10]**

b) Compare microprocessor and microcontroller. **[6]**

OR

Q2) a) Explain architectures of 8051 microcontroller. **[10]**

b) Compare Harvard and Von Neumann Architecture. **[6]**

Q3) a) Draw & explain the Internal RAM organization of 8051 microcontroller. **[8]**

b) Write a program to find smallest number in an array of seven numbers (stored in internal RAM location 40H onwards) and store result at 50H. **[8]**

OR

P.T.O.

- Q4)** a) Draw and explain the PSW Register and give the application difference between Carry and Overflow flag. [6]
- b) Explain the following instructions [10]
- i) CALL
 - ii) SJMP
 - iii) MOVC
 - iv) CJNE
 - v) ANL
- Q5)** a) Assume that ROM Space starting at 250H contain “PUNE”, write an ALP of 8051 to transfer the byte into RAM location starting at 40H. [8]
- b) Draw an interfacing diagram of 16X2 LCD with 8051 microcontroller. Write an Assembly language program to displaying “Pune” on first line first position. [10]

OR

- Q6)** a) Draw an interfacing diagram of DAC 0808 with 8051 microcontroller and write an ALP for generating Sine Waveform. [9]
- b) Draw an interfacing diagram of 4X4 keypad to 8051 microcontroller and explain the help of flowchart how the scanning the key is performed by microcontroller. [9]

SECTION - II

- Q7)** a) Explain I2C communication protocol with timing diagram. [9]
- b) Write a program for 8051 to transfer letter “A” serially at 9600 baud rate, continuously. Also explain SCON register. [9]

OR

- Q8)** a) Explain RS232 standard. Why MAX 232 is required in serial communication. [9]
- b) Explain CAN bus in detail. [9]

- Q9)** a) Explain architecture of PIC 18FXX with suitable block diagram. [10]
b) Explain the pipelining in PIC 18FXX microcontroller. [6]

OR

- Q10)**a) Explain the architecture of ATMEGA 32. [10]
b) Draw and explain the working register (W) of PIC 18FXX with suitable example. [6]

Q11) Explain the data acquisition system. What are the design consideration of DAS explain with suitable block diagram. [16]

OR

- Q12)**a) Design microcontroller based path follower. [12]
b) Explain the typical characteristics of thermister temperature sensor. [4]

EEE

Total No. of Questions : 12]

SEAT No. :

P2328

[4758] - 63

[Total No. of Pages :3

**T.E. (Electronics)
POWER ELECTRONICS
(2008 Pattern) (Semester - I)**

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer 3 questions from Section -I and 3 questions from Section -II.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *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 the operation of 3ϕ fully controlled bridge converter with resistive load. Describe in detail the following modes of operation with associated waveforms. **[12]**
- i) Discontinuous conduction mode
 - ii) Continuous conduction mode.
- b) For 3ϕ fully controlled bridge converter with resistive load derive an equation for rms output voltage. **[6]**

OR

- Q2) a)** What is dual converter? Explain in detail the operation of dual converter with Circulating current. List the advantage and disadvantage of the same. **[12]**
- b) What is triggering? Give types of triggering? Explain any one type of it. **[6]**

P.T.O.

Q3) a) What is DC to DC converter? Explain with circuit diagram & waveforms working of chopper? Why it is preferred over phase controlled converters. [10]

b) A step down chopper has resistive load of $R = 15\Omega$ and input voltage $E_{dc} = 200V$. When the chopper remains in ON, its voltage drop is 2.5V. The chopper frequency is 1kHz. If the duty cycle is 50%, determine [6]

i) average output voltage

ii) RMS output voltage

iii) chopper efficiency.

OR

Q4) a) What are Cycloconverter? Explain with diagram & waveforms, 3 pulse cycloconverter. State its advantages & disadvantages. [10]

b) What is SMPS? Explain in brief. [6]

Q5) a) What is resonant converter? Explain the need of resonant converter. [4]

b) Explain 3-pulse and 6-pulse cycloconverter. [6]

c) Write a short note on SLR half bridge DC to DC converter. [6]

OR

Q6) Write short notes on any three, [16]

a) 4 Quadrant chopper

b) μP based firing circuit for triggering.

c) Inverse Cosine Method

d) Matrix converter.

SECTION - II

Q7) a) What are inverters? Explain with circuit diagram & waveforms, working 3ϕ voltage source inverter operating in 180° mode with R-load. [10]

- b) Draw the schematic of a 3ϕ CSI and describe its operation with current waveforms. [8]

OR

Q8) a) What is the need of cooling in industries? Suggest the remedies for reducing heating & power Dissipation in the Semi-conductor devices. [10]

- b) What is auto sequential current fed PWM inverter? Explain. [8]

Q9) a) What is electric ballast? Explain with diagram and characteristics. [8]

- b) What is the difference between soldering & welding? Explain at least one type of welding techniques. [8]

OR

Q10) a) What is HVDC? Explain with its application. [10]

- b) What is CTPT? Explain. [6]

Q11) a) What is power quality? Explain different types of power line disturbances, preventive & nullifying measurement techniques. [10]

- b) What is the need of 12 pulse inverter in industry? Explain. [6]

OR

Q12) a) What is necessity of power quality? Explain with different types of power line disturbances. [8]

- b) What is energy audit? Explain the required procedure for energy audit. [8]



Total No. of Questions : 12]

SEAT No. :

P2329

[4758] - 64

[Total No. of Pages :3

T.E. (Electronics)

DRIVES & CONTROLS

(2008 Course) (304207) (Semester - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1) a)** Draw the circuit diagram and explain the operation of 3-Phase full converter drive. Also sketch the output voltage and output current waveform at firing angle of 90 degree and 120 degree. **[10]**
- b) Explain with associated waveforms how factor can be improved with symmetrical angle control scheme. **[8]**

OR

- Q2) a)** What is braking? Explain Regenerative braking of DC machine. Mention its advantages & disadvantages. **[8]**
- b) Draw the circuit & waveforms of single-phase full converter drives for continuous & discontinuous motor current. **[10]**

- Q3) a)** Explain open loop & closed loop control of dc drives with transfer function. **[10]**
- b) Explain the principle of phase locked loop control of dc drives with block diagram. **[6]**

OR

- Q4) a)** Explain the basic principle of operation of an Induction Motor with references to its equivalent circuit diagram. **[8]**
- b) With the help of diagram explain use of CSI for speed control of Induction Motor. **[8]**

P.T.O.

- Q5) a)** With the help of block diagram explain close loop control of Induction Motor. [10]
- b) Explain the necessity of soft acceleration & soft deceleration in case of Induction Motor. [6]

OR

- Q6)** Write short notes on following: [16]
- a) 2-Quadrant dc drive using chopper.
- b) Microprocessor/microcontroller based dc drive.
- c) Induction motor performances characteristics.
- d) Braking of Induction motor.

SECTION - II

- Q7) a)** Draw & explain torque versus torque angle characteristics of Synchronous motor with cylindrical rotor. [8]
- b) With neat diagram explain Switched reluctance motor. [10]

OR

- Q8) a)** List the drive requirements for A C drive. [8]
- b) With neat block diagram explain microprocessor based Synchronous motor drive. [10]

- Q9) a)** Explain operation of a stepper motor driver circuit with diagram. Mention advantages. [8]
- b) With the help of diagrams & waveforms explain ac motor drive. [8]

OR

- Q10)a)** Explain operation of variable reluctance stepper motor with diagram.[8]
- b) Compare between ac & dc drive. [8]

- Q11)a)** Explain harmonic reduction techniques in inverters. [8]
b) Explain Tuning of a controller for a drive system. [8]

OR

- Q12)a)** Explain Torque-Speed characteristics with volts/hertz control in AC drives. [8]
b) With diagram explain static scherbius drive for Induction Motor control. [8]



Total No. of Questions : 12]

SEAT No. :

P2330

[4758] - 65

[Total No. of Pages :3

T.E.

ELECTRONICS

Sensors and Interfaces

(2008 Pattern) (Semester - II) (304208)

Time :3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Explain various types of optical proximity sensors. [8]
- b) List various temperature sensors. Explain any two. [8]

OR

- Q2)** a) Explain incremental and absolute rotary encoders for angular velocity measurement. [8]
- b) Explain the use of load cell for force measurement and its type. [8]

- Q3)** a) Explain with neat diagram voltage to frequency and frequency to voltage converters. [8]
- b) State important features of a SMART transmitter and explain its working with a block diagram. [8]

OR

- Q4)** a) Explain with neat diagram I/P converter and also explain its input output characteristics. [8]
- b) Explain the passive circuits used in analog signal conditioning. [8]

P.T.O.

- Q5) a)** List the features of PIC micro controller. Draw and explain interface of 4×4 matrix keyboard with PIC 16F 84. [10]
- b) Describe working of R-2R ladder type DAC. How it is advantageous over weighted resistor DAC. [8]

OR

- Q6) a)** Draw and explain interfacing of 89C51 microcontroller with LCD and relay. [10]
- b) Explain selection criteria for ADCs related to sensor interfacing. [8]

SECTION- II

- Q7) a)** Explain HART communication protocol along with its modes of operation. [8]
- b) Write short note on I²C bus. [8]

OR

- Q8) a)** Write short note on foundation field bus. [8]
- b) Explain with block diagram multichannel data logger system. [8]

- Q9) a)** Explain with neat diagram pressure control valves. [8]
- b) Explain principle of operation of D.C. motor. State various types of D.C. motor. [8]

OR

- Q10)a)** Draw and explain symbols of following pneumatic valves. [8]
- i) 2×2 Valve
 - ii) 3×2 Valve
 - iii) 4×2 Valve
 - iv) Pressure limiting valve

- b) Explain lift system to move the load up and down using pneumatic actuators. [8]

Q11)a) Develop a ladder diagram for a circuit that can be used to start a motor and then after delay of 100sec. Start a pump. When the motor is switched off there should be a delay of 10 sec. before the pump is switched off. [8]

- b) With block diagram explain PLC architecture. State important specifications of PLC. [10]

OR

Q12)a) Explain the PLC operating cycle. [8]

- b) With suitable assumptions draw the block diagram of a bottle filling plant and develop a PLC ladder diagram for the automatic operation of bottle filling plant. [10]



Total No. of Questions : 12]

SEAT No. :

P2331

[4758]-66

[Total No. of Pages : 4

T.E. (Electronics)

MICROCOMPUTER BASED SYSTEM

(2008 Pattern) (Semester - II)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Explain the architecture of 8086 microprocessors with suitable block diagram. **[10]**
- b) Explain following addressing modes with suitable example. **[8]**
- i) Immediate
 - ii) Direct
 - iii) Register indirect
 - iv) Register Relative

OR

- Q2)** a) Draw and explain interaction between 8087 coprocessor and 8086 microprocessor. **[8]**
- b) Explain the functions of following pins. **[10]**
- i) ALE
 - ii) READY
 - iii) NMI
 - iv) INTR
 - v) $\overline{MN}/\overline{MX}$

P.T.O.

- Q3) a)** Explain the following instructions with suitable example. **[8]**
- i) RCL
 - ii) INT N
 - iii) JP
 - iv) CMPS
- b) Write an ALP to display the message “HAPPY NEW YEAR 2015” on the computer screen. **[8]**

OR

- Q4) a)** Draw the interrupt vector table. Explain the conditions which causes 8086 to perform following interrupts. **[8]**
- i) Type 0
 - ii) Type 1
 - iii) Type 2
 - iv) Type 3
- b) Write an ALP to find out smallest number from a given unordered 10 bytes of array stored in the location starting from known address 4000:5000H. **[8]**
- Q5) a)** Draw and explain architecture of 80386 processor. **[8]**
- b) Draw and explain the structure of 80386 descriptor. **[8]**

OR

- Q6) a)** Explain the multitasking concept in 80386 processor with the help of TSS and TR. **[8]**
- b) With the help of suitable figure explain the translation look-aside buffer (TLB) to speed up the paging operation. **[8]**

SECTION - II

- Q7)** a) Describe with block diagram typical pentium motherboard. [10]
b) State and explain features of USB interface. Enlist the different transfer types in USB interface. [8]

OR

- Q8)** a) Write a short note on [10]
i) Serial port
ii) Parallel port
b) With the suitable block diagram explain the PCI bus interface to the PC. [8]

- Q9)** a) What is the role of Barrel shifter. List different Barrel shifter operations carried out in ARM core. [8]
b) Draw & explain the instruction of ARM core with example. [8]
i) LDRBT
ii) SBC
iii) TST
iv) SWI

OR

- Q10)** a) Explain register model of ARM 7. [8]
b) Explain the following software interrupt exceptions for ARM processor. [8]
i) Interrupt request
ii) Fast interrupt request
iii) Data abort
iv) Prefetch abort

Q11) Draw interfacing diagram for 8086/ARM 7 based electronic weighing machine and discuss following design issues: **[16]**

- a) Foundation and mechanical structure desing.
- b) Load cell selection.
- c) Signal conditioning.
- d) Flow chart.

OR

Q12) Design 8086 / ARM 7 based closed loop control circuit for DC motor using PWM control. **[16]**

- a) Draw the complete interfacing diagram.
- b) Explain important design steps.
- c) Draw flowchart.

EEE

Total No. of Questions : 12]

SEAT No. :

P2332

[4758] - 67

[Total No. of Pages :3

T.E. (Electronics)
INDUSTRIAL MANAGEMENT
(2008 Course) (Semester- II) (304210)

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) *Black 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 how today's managers use General Administration Theory. [8]
b) Compare Private and public limited companies. Discuss advantages of joint stock organization. [8]

OR

- Q2)** a) Describe the characteristics of an organization.
How the concept of an organization is changing? [8]
b) Explain how today's managers use Scientific Management. [8]

- Q3)** a) Explain Porter's Generic Business Strategy. How we could classify Business Strategies. [8]
b) Explain military origins of strategy. [8]

OR

- Q4)** a) Explain Mintzberg's 5 Ps of strategy. How these will be useful in developing a robust business strategy. [8]
b) Prepare the Environmental Threat and Opportunity profile (ETOP) for an automobile company. [8]

P.T.O.

- Q5)** a) Explain the basic philosophy of Total Quality Management (TQM). What are the Limitations of this technique? [10]
b) Explain the Six sigma Quality Management Standards. [8]

OR

- Q6)** a) Explain the importance of ISO 9001:2000 Standards in detail with suitable examples on application of this standard [10]
b) Explain the basic philosophy of 'Kaizen'. State its advantages and limitations [8]

SECTION - II

- Q7)** a) Draw the standard graph of Break Even Analysis and define the following terms [8]
i) Break even point
ii) Contribution per unit
iii) Margin of Safety
iv) Marginal Cost
b) Explain the role of SEBI. [8]

OR

- Q8)** a) Explain the techniques of capital Budgeting [8]
b) Write Short notes on:
i) PERT
ii) Project crashing and resource leveling [8]

- Q9)** a) Why Talent Acquisition is always on top priority in the role of HR? [8]
b) what are the functions involved in HRM? [8]

OR

- Q10)** a) Discuss the competencies and responsibilities of HR professional in an organization. [8]
b) what would be your mix of selection methods for the selection of middle level managers and why? [8]

- Q11)** a) List different types of e- Commerce. Explain C2C in detail. [8]
b) What is information System? Differentiate between information System and MIS. [10]

OR

- Q12)**a) Explain how MIS can help to increase the productivity of workers in an organization. [10]
b) What is meant by Decision Support System? What are its benefits? [8]



Total No. of Questions : 12]

SEAT No. :

P2333

[4758]-68

[Total No. of Pages : 4

T.E. (Electronics)

DISCRETE TIME SIGNAL PROCESSING

(2008 Pattern) (Semester - II) (304211) (Theory) (BOS)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

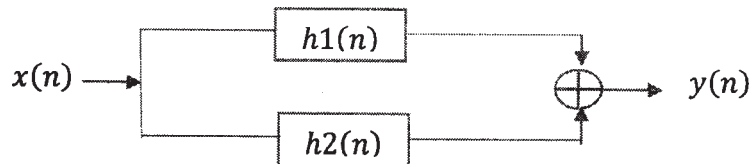
- 1) Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12.
- 2) Answers to the two sections should be written in separate answer books.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Figures to the right side indicate full marks.
- 5) Use of electronic pocket calculator is allowed.
- 6) Assume suitable data, if necessary.

SECTION - I

- Q1)** a) Two signals $x_1(t) = \cos(20\pi t)$ and $x_2(t) = \cos(100\pi t)$ with sampling frequency 40 Hz. Obtain the associated discrete time signals & comment on result. [8]
- b) Explain Stability & causality of LTI system in terms of its impulse Response. [8]

OR

- Q2)** a) Find out the particular solution for [6]
 $y(n) + 3y(n-1) = x(n)$ Assume $x(n) = u(n)$
- b) If LTI system is described as [6]



If $x(n) = \{1, 2, 4\}$ & $h_1(n) = \{1, 2, 0, 1\}$, $h_2(n) = \{2, 1, 1, 2\}$

- c) Explain the basic elements of DSP with the help of block diagram. [4]

P.T.O.

- Q3)** a) Explain the Relation between DTFT & DFT. [4]
 b) Determine 2-point & 4-point DFT of $x(n) = u(n) - u(n-2)$ [6]
 c) Explain overlap save method in detail. [8]

OR

- Q4)** a) Compute the DFT $x(n) = \cos(n\pi/2)$ for $N=4$ using DIF-FFT Algorithm. [8]
 b) Obtain the Circular convolution of $x_1(n) = \{1, 2, 3, 1\}$ & $x_2(n) = \{4, 3, 2, 2\}$ By using matrix multiplication method. [4]
 c) Explain cyclic Property of Twiddle Factor for $N=4$. [6]

- Q5)** a) If $x(z) = 2 + 3z^{-1} + 4z^{-2}$ find the initial & final values of the cross ponding sequence $x(n)$. [6]
 b) Given that [10]

$$H(z) = \frac{-4 + 8z^{-1}}{1 + 6z^{-1} + 8z^{-2}} \text{ is casual system find}$$

- i) Transfer function Representation
 ii) Difference Equation Representation
 iii) Impulse Response Representation.

OR

- Q6)** a) Determine the Z-transform of the following sequence using Properties only [10]
 i) $u(n-4)$
 ii) $\delta(n-5)$
 iii) $e^{jn\pi/4} u(n)$
 iv) $(1/3)^n u(-n)$
 v) $3^n u(n-2)$
 b) Find the convolution of $x(n) = \{1, 2, 3, 1, -1, 1\}$ & $h(n) = \{1, 1, 1\}$ using Z-Transform. [6]

SECTION - II

- Q7)** a) Define the terms Related to FIR filter [6]
- i) Phase Delay
 - ii) Group Delay
 - iii) Symmetric filter
 - iv) Antisymmetric filter
 - v) Linear phase filter
 - vi) Order of filter
- b) Design an FIR Digital filter to approximate an LPF with Pass band gain unity, cut of frequency of 850 HZ and working at a sampling frequency of 5000HZ. The length of impulse response should be 5. use Hamming Window. [12]

OR

- Q8)** a) For the analog filter $H(S) = \frac{1}{(S+1)(S+2)}$. Convert above analog filter into Digital Filter by using [10]
- i) Impulse invariance method.
 - ii) BLT method
- b) Prove along with mathematical expression “*Stable Analog filter is converted into stable Digital Filter using BLT method*”. [8]
- Q9)** a) Explain the Application of Multirate sampling in Data Acquisition System along with Block diagram. [8]
- b) Explain the Role of Antialiasing Filter in Decimator & Role of Anti-imaging filter in interpolator in Detail. [8]

OR

Q10)a) Design two stage decimator with sampling rate to be reduced from 10KHz to 500 Hz. Passband edge of 150 Hz, stopband edge of 180 Hz, Passband ripple 0.002 & stopband ripple 0.001 & $D_1 = 10$, $D_2 = 2$. [10]

b) Explain sampling rate conversion By I/D factor. [6]

Q11)a) Explain the architecture of TMS320C28XX in detail. [8]

b) Differentiate between General Purpose Microprocessor & DSP processor. [8]

OR

Q12)a) Explain Related to DSP processor. [8]

i) DAG

ii) Barrel Shifter

b) Explain any four addressing Modes of for DSP processor in detail. [8]

EEE

Total No. of Questions : 12]

SEAT No. :

P2334

[4758] - 69

[Total No. of Pages :3

T.E. (Instrumentation & Control)
INSTRUMENTATION FOR CHEMICAL ANALYSIS
(2008 Course) (Semester - I)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Explain Qualitative analysis and Quantitative analysis. Give examples of different analytical methods. What is trace analysis? [8]
- b) Write a note on "Role of Instrumentation in chemical analysis". [8]

OR

- Q2)** a) Explain principle and instrumentation used for Electrophoresis. [8]
- b) Explain principle and instrumentation used for potentiometry. [8]

- Q3)** a) Write a note on "Deviation of Beer-Lambert's law". [8]
- b) Explain with a neat diagram principle and working of Atomic Absorption Spectrometer. [8]

OR

- Q4)** a) Explain with a neat diagram 'sputtering in hollow cathode lamp'. [8]

P.T.O.

- b) Differentiate [8]
- i) Single beam instrument and double beam instrument
 - ii) Photocolorimeter and UV-VIS spectrophotometer.

Q5) a) Explain the principle of Atomic Emission Spectroscopy. With a neat diagram explain working of Flame Photometer. [9]

b) With a neat diagram, explain working of FTIR spectrometer.. [9]

OR

Q6) Write notes on [18]

- a) Plasma Excitation
- b) IR detectors
- c) Beer-Lambert's law.

SECTION - II

Q7) a) Explain with a neat diagram working of a Gas Chromatograph (GC). Also explain how retention time can be manipulated in GC. [10]

b) Enlist various types of GC detectors and explain one GC detector in detail. [6]

OR

Q8) a) Explain with a block diagram working of Mass Spectrometer. [8]

b) Enlist various types of Mass Analyzers and explain one Mass Analyzer in detail. [8]

Q9) a) Explain working of NMR spectrometer. How sensitivity can be increase in NMR spectrometer. [8]

- b) What is fluorescence. Explain with a neat diagram principle and working of a Spectrofluorimeter. [8]

OR

- Q10)**a) Explain working of CO₂ analyzer. Also explain importance of gas analyzers. [8]

- b) What is Raman effect? Explain working of Raman Spectrometer. [8]

- Q11)**a) Explain Bragg's law and also explain working of X-ray diffractometer. [9]

- b) What is Auger electron? Explain Auger spectroscopy. [9]

OR

- Q12)** Write notes on. [18]

- a) HPLC detectors.
b) Scintillation counter.
c) Carrier gas in GC



Total No. of Questions : 12]

SEAT No. :

P2250

[4758] - 7

[Total No. of Pages :3

T.E. (Civil)

FOUNDATION ENGINEERING

(2008 Pattern) (301010) (Semester - II)

Time :3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Explain the purpose of subsoil exploration. [6]
b) How will you decide the depth of exploration and the number of borings? Discuss the guide rules. [6]
c) Discuss Pressure meter test. [6]

OR

- Q2)** a) Explain the following: [6]
i) Area Ratio
ii) Inside clearance
iii) Chunk sampling
b) Enlist the different geophysical methods and describe any one in detail. [6]
c) Write a note on Standard Penetration Test. [6]

- Q3)** a) Compare General & Local modes of Shear failures. [6]
b) A 2m wide strip footing is founded at a depth of 1.5m below the ground level in a homogeneous bed of dense sand, having the following properties: $\phi = 36^\circ$, $\gamma = 1.85\text{t/m}^3$, $N_c = 60$, $N_q = 42$, $N_\gamma = 47$. Factor of safety = 3. Determine the Ultimate, net ultimate and safe bearing capacity of the footing. [6]
c) Write a note on effect of eccentricity of loading on bearing capacity. [4]

OR

P.T.O.

- Q4)** a) Explain Plate load test in detail. [6]
b) Explain effect of water table on bearing capacity of soil. [6]
c) Write a note on Floating foundation. [4]

- Q5)** a) Define the following terms: [6]
i) Normal consolidation
ii) Over consolidation
iii) Pre consolidation pressure
b) What are the different types of foundation settlement? Explain in detail. [6]
c) A square footing on sand at 2 m depth shows an elastic settlement of 5.5mm. Under a loading of 200kN/m². How much a footing would settle if it has to carry a load of 150kN/m²? [4]

OR

- Q6)** a) Distinguish between consolidation and elastic settlement. Explain how they are determined? [6]
b) Explain Terzaghi's theory of one dimensional consolidation. [6]
c) Draw contact pressure distribution diagram for sandy and clayey soil. [4]

SECTION- II

- Q7)** a) Enlist the methods of determining pile capacity. Explain any two methods in short. [6]
b) An RRC pile of 18m overall length is driven into a deep stratum of soft clay having an unconfined compressive strength of 3.5t/m². The diameter of the pile is 30cm. Determine the safe load that can be carried by the pile with a factor of safety 3. Take ($\alpha = 0.95$). [6]
c) Explain the following: [6]
i) Negative skin friction
ii) Feld's Rule.

OR

- Q8)** a) Write a short note on Group capacity of pile. [6]
b) Explain the Cyclic pile load test. [6]
c) State the advantages and disadvantages of piers in comparison of pile foundation. [6]

- Q9)** a) What is Caisson? How Caissons are classified based on methods of construction? [6]
b) State the characteristics of BC soil and explain the role of 'Montmorillonite'. [6]
c) What is pier? Explain methods of installation of pier. [4]

OR

- Q10)** a) Sketch and describes the various components of well foundation, indicating functions of each component. [6]
b) Discuss the earth pressure distribution for cantilever sheet pile wall. [6]
c) Explain Differential free swell test. [4]

- Q11)** a) Explain with neat sketches various functions of Geotextiles. [8]
b) Write a detail note with sketches on Geosynthetic application in civil engineering. [8]

OR

- Q12)** Write a short note on: [16]
a) Types of earthquake
b) Surface rupture
c) Liquefaction
d) Reinforced earth wall.



- Q5)** a) With a neat sketch explain the interfacing of ADC0808 with 8051 microcontroller. [8]
- b) Interface 16×2 LCD to 8051 and write an assembly language program to display "WEL-COME" from 5th character position on first line using 8 data lines. [8]

OR

- Q6)** a) Write a short note on RS-232 standard. [8]
- b) Interface a flow meter which gets a 0-100 mV for its range of flow (0-10m³/Hr). Draw a interfacing diagram & also write a program for flow measurement. [8]

SECTION - II

- Q7)** a) Explain Timer-1 operation of AT Mega8535 microcontroller. [8]
- b) Draw & explain the Architecture of AT Mega8535 AVR microcontroller. [8]

OR

- Q8)** a) Explain the stack operation in AVR microcontrollers. [8]
- b) Explain Architectural features to AT Tiny 2313. [8]

- Q9)** a) Explain the RS232 communication link of AVR microcontroller. [8]
- b) Explain the function of port D of AT Tiny2313 AVR microcontroller with the help of PORTD, DDRD & PIND registers. [10]

OR

- Q10)** a) Explain the different clock sources which can be used with AVR microcontroller. [8]
- b) Explain the following instructions of AVR microcontroller. [10]
- | | |
|-----------------|----------------|
| i) LDI Rd, Rs | ii) EOR Rd, Rs |
| iii) SBI Rd, Y+ | iv) ST -X, Rs |
| v) SLEEP | |

- Q11)** a) With a neat schematic, explain the interfacing of stepper motor to AVR microcontroller. [8]
- b) With a neat diagram, explain the interfacing of 16×2 LCD display with 8 data lines to the AVR microcontroller. [8]

OR

Q12) Discuss the design of Data Acquisition system with AVR microcontroller based on the following points.

- a) Block diagram [4]
- b) Description [4]
- c) Selection of ICs for the system [4]
- d) A general algorithm [4]



Total No. of Questions : 12]

SEAT No. :

P2335

[4758] - 71

[Total No. of Pages :3

T.E. (Instrumentation & Control)
CONTROL SYSTEM COMPONENTS
(2008 Course) (Semester - I)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Section I and Section II are to be written in 2 separate answer books.*
- 2) Answer 3 questions from Section I and 3 questions from Section II.*
- 3) Assume suitable data if necessary.*

SECTION - I

- Q1)** a) Explain the features of reed relay. **[8]**
- b) Explain the construction, working & application of following types of switches. **[10]**
- i) Rotary switch
 - ii) Pressure switch

OR

- Q2)** a) Give important specifications of industrial grade contactor. **[6]**
- b) Give the application of following types of switches. Draw standard symbols. **[12]**
- i) SPST
 - ii) Limit switch
 - iii) Level switch
 - iv) Push button

OR

- Q3)** a) Draw and explain any two protection circuits for motor. **[8]**
- b) Explain the working of Thermal overload relay. **[8]**

P.T.O.

- Q4)** a) State the advantages and typical layout of MCC. [8]
b) Using standard symbols, draw electrical wiring diagram for DOL starter. [8]

- Q5)** a) Explain with neat block diagram pneumatic supply. [8]
b) Draw pneumatic circuit for extending a single acting pneumatic cylinder with speed control only in forward direction. [8]

OR

- Q6)** a) Draw pneumatic symbols for the following and give the applications. [8]
i) FRL
ii) 4/3 DCV (Direction control valve)
iii) 3/2 NC Direction control valve
iv) Compressor
b) Draw pneumatic circuit for Automatic reciprocation of a double acting pneumatic cylinder. [8]

SECTION - II

- Q7)** a) Explain meter-in and meter-out hydraulic circuits. Also give applications. [10]
b) Give classification of hydraulic pumps. Explain any one type of pump. [8]

OR

- Q8)** a) What are the characteristics of the oil used in hydraulic systems. [8]
b) Using standard symbols, draw sequential operation of two hydraulic cylinders. [10]

- Q9)** a) Explain the construction, working, and application of any one type of feeder. [8]
b) What are the front panel controls of industrial grade alarm annunciator. [8]

OR

- Q10)a)** Write the differences between a circuit breaker and fuse. [8]
- b) Explain the construction and working of any one type of fluidic component. [8]

- Q11)a)** What is purging? What are different types of purging and the application. [8]
- b) Explain 4 components used in tube fittings. [8]

OR

- Q12)a)** What precautions are taken for sanitary pipe fittings. [8]
- b) Explain intrinsic safety method of protection. [8]



Total No. of Questions : 12]

SEAT No. :

P2336

[4758]-72

[Total No. of Pages : 2

T.E. (Instrumentation & Control Engg.)

ELECTRONIC INSTRUMENTATION

(2008 Course) (Semester - I)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

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

SECTION - I

Q1) a) Explain RMS detecture in DMM. [8]

b) Give significance of crest factor and form factor. [8]

OR

Q2) a) Explain series and parallel connections of Q-meter. [10]

b) Explain ATE. [6]

Q3) a) Explain sampled sinewave synthesizer. [10]

b) Explain different types of pulse jitters. [6]

OR

Q4) a) Explain indirect type of frequency synthesizer. [10]

b) Draw and explain pulse generator. [6]

P.T.O.

- Q5)** a) Draw the diagram of CRT and explain. [10]
b) Draw neat block diagram of sampling oscilloscope and explain briefly. [8]

OR

- Q6)** a) Draw block diagram and explain in detail, DSO. Explain baby sitting mode. [10]
b) How phase and frequency can be measured by CRO? [8]

SECTION - II

- Q7)** a) Explain V to F converter. [8]
b) Draw diagram of 8-bit parallel ADC & explain. Also give advantages & disadvantages. [8]

OR

- Q8)** a) State and justify which type of ADC is used in DMM and DSO. [8]
b) Explain the characteristics of analog to digital converters. [8]
- Q9)** a) Describe totalizing mode and time interval mode of universal counter. [10]
b) Explain with neat diagram digital frequency meter. [8]

OR

- Q10)** a) Explain reciprocal counting method. [8]
b) What are the different measurement errors in universal counter? [10]
- Q11)** a) Write a short note on THD analyzer. [8]
b) Write a note on virtual Instrumentation. [8]

OR

- Q12)** Write short notes on: [16]
a) Spectrum analyzer
b) Wave analyzer

EEE

Total No. of Questions : 12]

SEAT No. :

P3643

[4758] - 73

[Total No. of Pages :2

**T.E. (Instrumentation & Control)
INDUSTRIAL MANAGEMENT
(2008 Course) (306265)**

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Enlist various functions of management. Also explain strategic planning. **[8]**
- b) Write short notes on: **[10]**
- i) Business Process Re-Engineering
 - ii) BCG Matrix

OR

- Q2)** a) Explain with the help of neat diagram, Porter's 5 forces of competition. **[10]**
- b) Explain Cause & Effect diagram. **[8]**
- Q3)** a) Explain with importance Quality Circle. **[6]**
- b) Briefly explain salient features of ISO 9001 standard. Explain the clauses- Internal Audit, Statistical process control and Design & Data control. **[10]**

OR

P.T.O.

- Q4)** Write notes on- [16]
- a) Industry Institute interaction
 - b) Business expansion in relation with global market.

- Q5)** a) Derive an equation for Economic ordering quantity. Also write the various assumptions for it. [10]
- b) What is outsourcing? Give its advantages and disadvantages. [6]

OR

- Q6)** a) Define 'Inventory'. Explain how inventory control is important in today's era? [10]
- b) Explain Store keeping and Material handling. [6]

SECTION - II

- Q7)** a) Explain the responsibilities of Human Resource Manager. [8]
- b) What is Motivation? Explain Maslow's theory. [10]

OR

- Q8)** a) Explain in detail Training. [12]
- b) What is the role of Job description in manpower selection? [6]

- Q9)** Explain CPM and PERT as project network analysis techniques. [16]

OR

- Q10)**a) Write a note on Capital Structure. [8]
- b) What is finance? Explain various sources of raising finance. [8]

- Q11)** Write short notes on- [16]
- a) ISO 14000
 - b) Global Warming

OR

- Q12)** Explain in detail 'Disaster Management'. [16]



Total No. of Questions : 12]

SEAT No. :

P2337

[4758] - 74

[Total No. of Pages :4

T.E. (Instrumentation & Control)
DIGITAL SIGNAL PROCESSING FUNDAMENTALS
(2008 Course) (Semester - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer 3 questions from Section I and 3 questions from Section II.*
- 2) *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) Consider the signal, $x(n) = \{2, 3, 1, 4\}$. Determine and sketch the autocorrelation of the signal $x(n)$. [8]
- b) State and explain the following properties of discrete-time system: [8]
- i) Stability
 - ii) Causality
 - iii) Time-invariant
 - iv) Recursive

OR

- Q2)** a) Determine the linear convolution of following sequences: [8]
 $x(n) = \{2, 3, 1, 4\}$, $h(n) = \{4, 3, 2, 4\}$
- b) Explain stability and causality conditions of discrete-time system. [4]
- c) What are the advantages of digital signal processing over analog signal processing? [4]

- Q3)** a) Sketch the magnitude response of the ideal frequency selective filters. [6]
- b) Determine and plot the frequency response of the discrete-time system described by, $y(n) - 2y(n - 1) + y(n - 2) = x(n)$ to unit-step input. Use $\omega = 0, \pm \frac{\pi}{4}, \pm \frac{\pi}{2}, \pm \pi$. [10]

Also, sketch its pole-zero plot.

OR

P.T.O.

Q4) a) Explain in detail the frequency selective filters with it's neat sketch of magnitude responses. [10]

b) Obtain the direct-form II structure of discrete-time system described by: [6]

$$2y(n) + y(n - 1) - 4y(n - 3) = x(n) + 3x(n - 5).$$

Q5) a) Explain the symmetry properties of discrete-time Fourier transform (DTFT). [6]

b) State and prove differentiation in frequency domain property DTFT. [6]

c) Determine the inverse discrete Fourier transform (DFT) of: [6]

$$X(k) = \{5, -j, -1, j\}.$$

OR

Q6) a) State and prove following properties of DFT: [7]

i) Circular time shift of a sequence.

ii) Time reversal of a sequence.

b) Compute the circular convolution of the sequences: [6]

$$x_1(n) = \{2, 3, 1, 4\}, x_2(n) = \{4, 3, 2, 4\}$$

c) Determine 4-point DFT of $x(n) = (-1)^n$ [5]

SECTION - II

Q7) a) Compute the 8-point DFT of the sequence

$$x(n) = \cos\left(\frac{\pi}{2}n\right)$$

Using the radix-2 decimation-in-time (DIT) algorithm. [8]

b) Derive the radix-2 decimation-in-frequency (DIF) FFT algorithm for $N = 8$. [8]

OR

Q8) a) Compute the 8-point DFT of the sequence

$$x(n) = \cos\left(\frac{\pi}{2}n\right)$$

Using the radix-2 DIF FFT algorithm [8]

b) Derive the radix-2 DIT FFT algorithm for $N = 8$. [8]

Q9) Design a FIR linear-phase, digital filter approximating the ideal frequency response

$$H_d(\omega) = \begin{cases} 1 & \text{for } |\omega| \leq \frac{\pi}{6} \\ 0 & \text{for } \frac{\pi}{6} < |\omega| \leq \pi \end{cases}$$

a) Determine the coefficients of a 11-tap filter based on window method with a rectangular window. [10]

b) Repeat part (a) using Hamming window. [6]

OR

Q10) Design a FIR linear-phase, digital filter approximating the ideal frequency response

$$H_d(\omega) = \begin{cases} 1 & \text{for } |\omega| \leq \frac{\pi}{5} \\ 0 & \text{for } \frac{\pi}{5} < |\omega| \leq \pi \end{cases}$$

a) Determine the coefficients of a 11-tap filter based on window method with a rectangular window. [10]

b) Repeat part (a) using Hamming window. [6]

Q11) A digital low-pass filter is required to meet the following specifications:

Passband ripple: ≤ 1 dB

Passband edge: 4 kHz

Stopband attenuation: ≥ 40 dB

Stopband edge: 6 kHz

Sampling frequency: 24 kHz

This filter is to be designed by performing a bilinear transformation on Chebyshev analog design.

- a) Determine the order analog filter. [6]
- b) Determine the analog poles of the filter. [6]
- c) Convert the analog system function into a digital filter system function. [6]

OR

Q12)a) Convert the analog filter with system function [6]

$$H_a(s) = \frac{s+0.1}{(s+0.1)^2 + 16}$$

into a digital IIR filter by means of the bilinear transformation. Use $T \frac{1}{2}$.

- b) Explain following w.r.t. IIR digital filter design. [8]
 - i) Approximation of derivatives.
 - ii) Impulse invariance.
- c) Compare the FIR filter design methods and IIR digital filter design methods. [4]



Total No. of Questions : 12]

SEAT No. :

P2338

[4758] - 75

[Total No. of Pages :2

T.E. (Instrumentation and Control)
INSTRUMENTATION SYSTEM DESIGN
(2008 Pattern) (Semester - II)

Time :3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

Q1) a) What is the need of specifications? What are the types of the specifications? [8]

b) What is the significance of “Index of Protection”? Explain IP 56. [8]

OR

Q2) a) Explain Bureau of Indian Standard and NEEMA Standard. [8]

b) Explain the various phases of product life designing. [8]

Q3) a) With the help of one example, explain the necessity of Shielding. [8]

b) How ESD protection is achieved in the equipment design? [8]

OR

Q4) a) Explain Human Body Model for electrostatic discharge. [8]

b) Explain the multi point and hybrid grounds. [8]

P.T.O.

- Q5) a)** What are the features of HCNR201? Explain operation of HVNR201 with the help of neat diagram. [9]
- b) What are the features of voltage to current converter XTR110? Explain any one application in detail. [9]

OR

- Q6) a)** Explain how ECG measurement is possible using AD620? [9]
- b) How the cold junction compensation works in AD595? Explain AD595 as Celsius Thermometer. [9]

SECTION- II

- Q7) a)** What is concept of an isolation? Draw and explain with neat diagram one application of MCT2E. [9]
- b) Explain CD4046B as frequency multiplier. [9]

OR

- Q8) a)** Design digital voltmeter using ICL7107 for input voltage range of 0-2V full scale. [9]
- b) Explain display driver section of ICM7217A. [9]

- Q9) a)** Explain general considerations of layout check. [8]
- b) Explain the thumb rules to place the components on the PCB. [8]

OR

- Q10)a)** Explain wave soldering in detail. [8]
- b) Explain the designing rules for analog circuit PCB. [8]

- Q11)a)** Explain “Bath Tub Curve” with neat diagram. [8]
- b) Explain the causes of unreliability. [8]

OR

- Q12)a)** Explain the term availability and maintainability. [8]
- b) Write short note on virtual instrumentation. [8]



Total No. of Questions : 12]

SEAT No. :

P2339

[4758]-76

[Total No. of Pages : 2

T.E. (Instrumentation & Control)

POWER PLANT INSTRUMENTATION

(2008 Course) (Semester - II) (Theory) (306268)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) What is unit operation? Explain with neat sketch refrigeration. [10]
b) Differentiate between distillation and extraction unit operation. [8]

OR

- Q2)** a) Explain drying unit operation. What are the different types of dryers? Explain any one type of dryer in details. [10]
b) List different types of Pumps. Compare Centrifugal Pump and Reciprocating Pump. [8]
- Q3)** a) Explain in details cooling tower with neat sketch. [8]
b) What are the different processes involved in water treatment plant. [8]

OR

- Q4)** a) Explain in detail Conduction, Convection & Radiation modes of heat transfer. [8]
b) Explain with neat sketch 2-4 type Heat exchanger. [8]

P.T.O.

- Q5) a)** What are the advantages and disadvantages of wind power plant. [8]
b) Explain with the block diagram working of Thermal Power plant. [8]

OR

- Q6) a)** What are the advantages and application of solar power generation. [8]
b) What is smoke detector? Explain working of smoke detector. [8]

SECTION - II

- Q7) a)** What are the different types of Boiler? Explain with neat sketch CFBC boiler. [10]
b) What is start up and shut down procedure for boiler. [8]

OR

- Q8) a)** Explain with neat sketch 3-element drum level control for boiler operation. [10]
b) List out different interlocks for Boiler for safety? [8]

- Q9) a)** Explain the procedure of startup and shutdown operation for turbine. [8]
b) Explain with neat sketch working of steam turbine. [8]

OR

- Q10) a)** Explain flue gas oxygen analyzer in power plant with neat diagram. [8]
b) Explain with neat diagram working principle of fly ball governor. [8]

- Q11) a)** Explain with neat diagram working of tidal power plant. [8]
b) Classify in detail renewable and non renewable energy sources. [8]

OR

- Q12) a)** Explain importance of instrumentation for wind power plant. [8]
b) Explain with neat diagram working of Diesel power plant. [8]

EEE

Total No. of Questions : 12]

SEAT No. :

P2340

[4758] - 77

[Total No. of Pages :4

T.E. (Instrumentation and Control)
CONTROL SYSTEM DESIGN
(2008 Pattern) (Semester - II)

Time : 3Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagram must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of logarithmic tables, electronic Pocket calculator and steam table is allowed.*
- 6) *Your answer will be valued as a whole.*
- 7) *Assume suitable data if necessary.*

SECTION - I

Q1) a) For a system having open loop transfer function. **[14]**

$$G(s) = \frac{4}{s(s+2)} \text{ and the feedback is unity.}$$

Design a lead compensator for having $\zeta = 0.5$ and undamped natural frequency $\omega = 4$ rad/sec.

b) What is the effect of addition of poles on the root locus. **[4]**

OR

2) a) The open-loop transfer function of feedback control system is given: **[14]**

$$G(s)H(s) = \frac{k}{s(s+5)}$$

The specifications are as follows:

- i) % overshoot for a unit step input = 25%
- ii) e_{ss} for unit ramp input : <0.25 rad.
- iii) peak time : $t_p = 1.71$ sec.

Design a phase-lead compensator.

b) Why compensators are required? List types of compensator. **[4]**

P.T.O.

Q3) a) Draw Bode plot of lead, lag, lead-lag compensator and explain their properly. [6]

b) The unity feed back system whose open-loop transfer function is

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

Design a suitable lead-lag compensator to get desired specifications:

$$PM = 50^\circ$$

GM be 10db.or more

and static velocity error constants $k_V = 10/\text{sec}$. [10]

OR

Q4) Apply Bode plot method to design a lag compensator for unity feedback system having transfer function. [16]

$$G(s) = \frac{k}{s(s+2.5)(s+25)}$$

Such that P.M. $\approx 35^\circ$ G.M. > 12.5 dB and $e_{ss} = 0.05$ rad for unit ramp input.

Q5) The transfer function of unity feedback system is given below: [16]

$$G(s) = \frac{k}{s(s+2)(s+3)}$$

Find the parameters for P, PI and PID using Ziegler-Nicholas method.

OR

Q6) The following transfer function is obtained from step response of the system. [16]

$$G(s) = \frac{3e^{10s}}{(5s+1)}$$

Find the parameters for P, PI and PID using Cohen-Coon method.

SECTION - II

- Q7) a)** Design a PD Controller so that a unity feedback system with open loop transfer function. **[9]**

$$G(s) = \frac{10}{s(s+1)(s+3)}$$

Will have phase margin equal to 35° and natural frequency of oscillation is 2rad/sec.

- b)** Design a controller for the following first order system: **[9]**

$$G(s) = \frac{2}{(3s+1)}$$

Using direct synthesis method for desired close loop response

$$Q(s) = \frac{1}{(5s+1)}$$

OR

- Q8)** Design a PID Controller so that a unity feedback system with open loop transfer function. **[18]**

$$G(s) = \frac{100}{(s+3)(s+2)(s+5)}$$

So that the phase margin of the system will be 45° and 4 rad/sec and steady state error will be 10% for unit ramp input.

- Q9) a)** The state space representation of a system is given by **[10]**

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 4 \end{bmatrix} u; \quad \begin{bmatrix} x_1(0) \\ x_2(0) \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$$

Compute the state transition matrix and obtain state response for homogenous condition only.

- b)** Determine whether following system is controllable and observable or not **[6]**

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -4 & -6 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 2 \end{bmatrix} u;$$
$$y = \begin{bmatrix} 1 & 4 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

OR

Q10)a) Give derivation for the necessary and sufficiency condition for complete state controllability. **[10]**

b) Explain the Lyapunov Stability criteria in detail. **[6]**

Q11) Design full order state observer that the system

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -6 & -11 & -6 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u$$

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

Assume that the desired eigen values of the observer are $-2 + j 3.464, -2 - j 3.464, -5$ **[16]**

OR

Q12) Obtain the state feedback gain matrix for the system shown

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -1 & -5 & 6 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u$$

The location of desired poles are $-1 + j2, -1 - j2, -10$ **[16]**



Total No. of Questions : 12]

SEAT No. :

P2341

[4758]-78

[Total No. of Pages : 4

T.E. (Instrumentation Engineering)
PROCESS LOOP COMPONENTS
(2008 Course) (Semester - II)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Draw level control loop using standard symbols and explain its components in brief. **[8]**
- b) Resistances in a bridge circuit are $R_1 = R_2 = R_3 = 120\Omega$. $R_4 = 121\Omega$. If the supply voltage is 12 V. Find the offset voltage. Also design a signal conditioning circuit to get output 0 to 5V. **[10]**

OR

- Q2)** a) Draw P & ID symbols for the following components & also explain the use of each components. **[10]**
- i) Pneumatic control Valve
 - ii) Pneumatic signal Line
 - iii) Alarm Annunciator
 - iv) Flow Indicator and Controller
 - v) Temperature Transmitter
- b) Explain zero elevation and zero suppression with respect to DPT for level measurement. **[8]**

P.T.O.

- Q3)** a) Draw the response of P, PI, & PID controller for step change in the error. [8]
- b) Draw front panel of PID controller. Give the advantages of PID controller. [8]

OR

- Q4)** a) Explain the following terms w.r.t. to controllers. [8]
- i) Proportional Band,
- ii) Distance velocity lag.
- b) Explain ON-OFF control action in detail. Give its suitable application. Also write its advantages and disadvantages. [8]

- Q5)** a) What is mean by tuning of controller? List various methods of controller tuning. Explain Ultimate cycle method (Ziegler and Nichols). [8]
- b) What is reset windup? How to overcome reset windup. [8]

OR

- Q6)** a) Write & explain the equations for position & velocity algorithm for digital controller. [8]
- b) Explain various criteria used for tuning of controllers. [8]

SECTION - II

- Q7)** a) Draw and explain architecture of PLC and give its specification. [10]
- b) State the advantages and limitations of a relay based system as compare to PLC based system. [8]

OR

Q8) a) Develop physical ladder diagram for a motor with following: NO start P.B, NC stop P.B., thermal over load limit switch opens on high temperature, green light when running and red light for thermal overload. Assume suitable data if required. **[10]**

b) Explain in brief w.r.t. PLC. **[8]**

i) Rung,

ii) DI-DO,

iii) Scan time,

iv) AI-AO.

Q9) a) What do you mean by “Installed characteristics of control valve”? Why they are different than inherent characteristics. **[8]**

b) Draw and explain the various control valve characteristics. (Min 3 characteristics) **[8]**

OR

Q10)a) Explain w.r.t. control valve **[8]**

i) Valve positioned,

ii) Rangeability,

iii) Yoke,

iv) Plug

b) State the importance of failsafe condition. Draw and explain fail safe action - {Air to Open (ATO) and Air to Closed (ATC) valve applications}. **[8]**

Q11)a) Explain effects and remedies for cavitations and flashing. **[8]**

b) What are different selection criteria for control valve. **[8]**

OR

Q12)a) Why sizing is necessary in control valve? List the different criteria's for control valve selection. **[8]**

b) Compare cavitation and flashing? List techniques to reduce it. **[8]**

EEE

Total No. of Questions : 12]

SEAT No. :

P2342

[4758] - 79

[Total No. of Pages :3

T.E. (Computer)
DATABASE MANAGEMENT SYSTEMS
(2008 Pattern) (Semester - I) (310241)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

Q1) a) Write short note on Multi-User DBMS Architecture and System Catalogs. **[9]**

b) Explain Data abstraction with different levels of abstractions. **[9]**

OR

Q2) a) Explain Structure of D.B.M.S. **[10]**

b) Explain extended ER features. Specialization, Generalization and Aggregation. **[6]**

c) What is physical and logical data independence? **[2]**

Q3) a) Explain concept of Stored Procedures, Cursors, Triggers, assertions. **[8]**

b) Write short note DDL, DML and DCL. **[8]**

OR

Q4) a) What is need of embedded SQL? List various embedded commands. **[6]**

P.T.O.

- b) Explain Views with suitable example. [4]
- c) Explain any four operations in Relational Algebra with example. [6]

- Q5)** a) What is normalization? Explain First Normal form and Second Normal Form with Example. [8]
- b) Write short note on Transitive dependency and Third Normal Form 3NF. [8]

OR

- Q6)** a) What is decomposition? Explain lossless decomposition and dependency preserving decomposition with suitable example. [8]
- b) What are the different Anomalies in databases? [6]
- c) What is Canonical Form? [2]

SECTION - II

- Q7)** a) What is ordered indices? Explain the types of Ordered indices with suitable example. [8]
- b) Write short note on estimation of cost of query. [4]
- c) What is role of relational algebra in query processing? [4]

OR

- Q8)** a) What are the steps involved in query processing. Explain each in brief with diagram. [8]
- b) Explain static Hashing and Dynamic Hashing with suitable examples. [8]
- Q9)** a) Explain Two Phase Locking Protocol and rigorous Two Phase Locking Protocol. [6]

- b) How concurrency control is achieved using Graph Based protocol? Explain in detail with Example. [6]
- c) What are the properties of transaction? Explain each in short. [4]

OR

- Q10)**
- a) Write Short note on Log-Based Recovery: Deferred and Immediate. [6]
 - b) Explain recoverable and cascade less schedules. [4]
 - c) Explain deadlock prevention and Recovery. [6]

- Q11)**
- a) Explain OO Data Models. [4]
 - b) Draw Architecture of Data warehouse and explain in detail. [8]
 - c) Write Short Note on 1. Pointer Swizzling techniques 2. Persistent Programming Languages. [6]

OR

- Q12)**
- a) What is data mining? Explain in short association rule mining. [8]
 - b) Write Short Note on distributed databases? [6]
 - c) What are the different methods for horizontal Partitioning of data in distributed Databases? [4]



Total No. of Questions : 12]

SEAT No. :

P2251

[4758] - 8

[Total No. of Pages :4

T.E. (Civil)

ENVIRONMENTAL ENGINEERING - I

(2008 Pattern) (Semester -II)

Time :3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Solve Question I or Q2, Q3 or Q4, Q5 or Q6 from Section I and Question 7 or Q8, Q9 or Q10, Q11 or Q12 from Section II.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicates full marks.*
- 4) *Your answers will be valued in a whole.*
- 5) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket, calculator and steam tables is allowed.*
- 6) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Draw a detailed conventional water treatment plant. [6]
- b) What is design period? State the factors effecting design period. [4]
- c) Estimate the population of a town after 4 decades by incremental increase method. [8]

Years	1940	1950	1960	1970
Population in thousands	50	58	67	89

OR

- Q2)** a) Explain Bell Spigot Joint and draw labeled sketch. [4]
- b) Write a note on:- [6]
- i) Temporary and Permanent Hardness
 - ii) PH and its determination
 - iii) MPN
- c) Find out the fire demand for the town having population 2,25,000 using various formulae. [8]

P.T.O.

- Q3)** a) What are various processes involved during treatment of water and explain the impurities removed by each process? [6]
- b) Explain different methods of aeration. [4]
- c) Design aeration fountain for maximum daily demand of 114 MLD. [6]

OR

- Q4)** a) Explain the terms and give their units. [6]
- i) Detention Period
- ii) Overflow Rate
- iii) Weir Loading
- iv) Flow Through Velocity
- v) Displacement Velocity
- vi) Mean Gradient Velocity
- b) Prove theoretically that the surface loading (Q/A) and not the depth is a measure of effective removal of particles in sediment tank. [6]
- c) Enlist different coagulants used why alum is universally used. [4]

- Q5)** a) Explain what do you understand by: [4]
- i) Dual media Filters
- ii) Mixed media Filters
- b) Explain the terms: [6]
- i) Plain Chlorination
- ii) Post Chlorination
- iii) Super Chlorination
- iv) Break point Chlorination
- c) Design a set of rapid sand filter for treating water required for a population of 80,000. Rate of water supply = 200 lit/hr/day. The filters are rated to work at 5,000 lit/hr/m². Show the arrangement of filter units. [6]

OR

- Q6)** a) Compare slow sand filters and rapid sand filters. [6]
- b) Explain the theory of Chlorination. What are different forms of application of chlorine? [4]
- c) Calculate the quantity of disinfectant required to disinfect the 20 million liters of water per day. The dose of chlorine is 0.7mg/lit to maintain the residual of 0.2mg/lit. The disinfectant used may be bleaching powder or sodium hypochlorite which contains 30% and 95% available chlorine. [6]

SECTION- II

- Q7)** a) Explain demineralization of water softening. Differentiate clearly between a cation exchanger and an anion exchanger. [6]
- b) Explain Reverse Osmosis. [4]
- c) Analysis of water shows the following free CO₂:3 ppm, alkalinity: 65ppm, non-carbonate hardness 90ppm, total magnesium: 10 ppm. Assume that it is possible to remove all but 30 ppm of carbonate hardness with lime and that the finished water is to have total hardness of 80 ppm. Determine the amount of chemical required per million liter of water. [8]

OR

- Q8)** a) Explain the adsorption process for odor and color removal. [6]
- b) Explain advantages and disadvantages of lime soda process of water softening. [4]
- c) Explain the Ion exchange method of water softening. [8]
- Q9)** a) Define rain water harvesting. Write different types of rain water harvesting system and explain any one in detail. [6]
- b) State the requirements which are considered while designing the distribution system. [4]
- c) Explain in detail the following layout system for distribution: [6]
- i) Dead end system
- ii) Radial system

OR

- Q10)a)** What are the functions of ESR. [4]
- b) Elaborate components of domestic rain water harvesting system. [6]
- c) Differentiate between continuous and intermittent system. [6]

- Q11)a)** Write short note on: [6]
- i) Green House Effect
- ii) Acid Rain
- b) Explain the source of noise. [6]
- c) Define: [4]
- i) Ecology
- ii) Air Pollution

OR

- Q12)a)** Define: [4]
- i) Sound Intensity
- ii) Decibel Sound Pressure Level
- b) What are the different methods of Noise control. [6]
- c) Determine the cumulative SPL for a factory having four machines with 70db, 63db, 75db, 76db SPL's respectively. [6]



Total No. of Questions : 12]

SEAT No. :

P2343

[4758]-80

[Total No. of Pages : 3

**T.E. (Computer Engineering)
DATA COMMUNICATIONS
(2008 Course) (Semester-I) (310242)**

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION-I

- Q1)** a) Explain Modem and differentiate between Analog and digital Modulation. **[8]**
- b) Explain in detail digital Communication System. **[6]**
- c) Explain the different frequency components present in 1 kHz sine and 1 kHz square waveform. **[4]**

OR

- Q2)** a) Explain the operation of phase locked loop circuit. Why it has an important significance in Analog Modulation. **[8]**
- b) Explain statistical TDM with diagram. What are issues in TDM? **[6]**
- c) Explain difference in Bit rate and baud rate. **[4]**

- Q3)** a) Explain following terms related to codes (Any Four): **[8]**
- i) Code word.
 - ii) Code rate.
 - iii) Hamming weight of code word.
 - iv) Code efficiency.
 - v) Hamming distance.

P.T.O.

- b) Explain cyclic redundancy check code. [4]
- c) Explain why error detection & correction required. [4]

OR

- Q4)** a) Explain Frequency Division Multiplexing (FDM) and Time Division Multiplexing (TDM) along with their suitable applications. [8]
- b) Explain in short what is Crosstalk and Guard Time. [4]
 - c) Using Shannon's theorem compute the maximum bit rate for a channel having Bandwidth 3100 Hz and signal to noise ratio 20 dB. [4]

- Q5)** a) What is the significance of quantization in A/D Conversion? What is uniform Quantization? What is the drawback associated with it & how to overcome this drawback. [10]
- b) The probabilities of five symbols of a discrete memory less source are 0.35, 0.25, 0.2, 0.15, 0.05. Encode them using Huffman encoding algorithm & find the entropy of above source. [6]

OR

- Q6)** a) Explain persistent & non persistent CSMA. [4]
- b) Write short notes on stop-and-wait protocol. [6]
 - c) Describe limited contention protocol in details. [6]

SECTION-II

Q7) Write short note on (Any Three): [18]

- i) PSTN.
- ii) Frame Relay.
- iii) Virtual LAN.
- iv) SONET.

OR

Q8) a) Explain differences between ISO-OSI reference model and TCP/IP model. [6]

- b) Explain classification of DSL technologies. [6]
- c) Explain advantages and disadvantages of Bluetooth network. [6]

- Q9)** a) Compare circuit switching, packet switching and message switching. [8]
- b) Define digital hierarchy used by telephone companies. List and explain different levels of hierarchies. [8]

OR

- Q10)**a) Explain functions of [8]
- i) Bridge
 - ii) Switch
 - iii) Repeaters
 - iv) NICs.
- b) Explain guided and unguided transmission media. [8]

- Q11)**a) Explain difficulties in static and dynamic channel allocation. [8]
- b) What is framing? Explain error control & flow control. [8]

OR

- Q12)**a) Explain how sliding window protocol is used for flow control. [8]
- b) Write a note on: [8]
 - i) ALOHA.
 - ii) Virtual LAN.



Total No. of Questions : 12]

SEAT No. :

P3644

[4758] - 81

[Total No. of Pages :3

T.E. (Computer)

MICROPROCESSORS AND MICROCONTROLLERS

(2008 Pattern) (310243)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer Question No.1 or 2, 3 or 4, 5 or 6 from Section I and Q.No. 7 or 8, 9 or 10 and 11 or 12 from Section II.*
- 2) *Answers to the two sections must be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Assume suitable data if necessary.*

SECTION - I

- Q1)** a) Which features make the Pentium a superscalar processor? Give details of every feature. **[6]**
- b) Describe cache organization of the Pentium. **[4]**
- c) Explain following pins of the Pentium. **[6]**
- i) ADS #
 - ii) D/C#
 - iii) RESET

OR

- Q2)** a) Is the Pentium RISC or CISC or both? Justify your answer. **[4]**
- b) What is branch prediction? Explain in detail. **[4]**
- c) Explain Floating Point Unit of the Pentium? **[8]**

P.T.O.

- Q3)** a) What do you mean by bus cycle? Draw and explain burst read cycle in Pentium. [8]
- b) Explain flag register of Pentium in detail. [8]

OR

- Q4)** a) What is bit manipulation instruction? Explain any two bit manipulation instruction. [6]
- b) Explain addressing modes of the Pentium [8]
- c) Describe any one instruction [2]
- i) CMPXCHG
- ii) PUSH

- Q5)** a) How linear address is generated in the Pentium. [8]
- b) Describe PDE and PTE formats. [6]
- c) Draw & explain the structure of a call gate. [4]

OR

- Q6)** a) Name protected mode registers of the Pentium. [4]
- b) What are the selectors in the Pentium? Explain their use in segmentation. [6]
- c) Explain rules designed to protect data or code of the Pentium. [8]

SECTION - II

- Q7)** a) What is I/O permission bit map? When it is referred? [6]
- b) Explain task switch operation through task gate. [6]
- c) Write any six difference between 8086 and virtual 86 mode. [6]

OR

- Q8)** a) Explain IDT in Pentium in details. How interrupt handling in protected mode is dependent on contents of IDT? [6]
- b) Explain steps in entering Virtual mode. [6]
- c) Explain nested task in Pentium. [6]

- Q9)** a) Draw and Explain internal RAM organization of 8051. [12]
- b) Explain the function of following pins [4]
- i) T1
- ii) T0

OR

- Q10)**a) Explain port 0 to port 3 of 8051. [8]
- b) Explain following 8051 instructions [8]
- i) POP
- ii) ANL
- iii) MUL AB
- iv) LCALL

- Q11)**a) Write features of 8096 microcontroller. [4]
- b) Explain addressing modes of 8051 microcontroller. Explain with suitable example. [8]
- c) Explain any two modes of timer operation in 8051. [4]

OR

- Q12)**a) What are the different sources of interrupts in 8051? Explain interrupt handling mechanism in 8051. [8]
- b) Explain IE register of 8051 microcontroller. [4]
- c) Explain PCON of serial port of 8051 microcontroller. [4]



Total No. of Questions : 12]

SEAT No. :

P2344

[4758]-82

[Total No. of Pages : 4

T.E. (Computer)

DIGITAL SIGNAL PROCESSING

(2008 Course) (Semester - I)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

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

SECTION - I

Q1) What is discrete time system? Explain any four classification of discrete time system with example. **[18]**

OR

Q2) a) Determine the values of power and energy of the following signals. Find whether the signals are power, energy or neither energy nor power signals. **[15]**

i) $x(n) = (1/3)^n u(n)$

ii) $x(n) = \text{sign}(\pi/4 n)$

iii) $x(n) = e^{2n} u(n)$

b) Write note on: Quantization error. **[3]**

P.T.O.

Q3) a) Define Fourier Transform, obtain it for $x(n): a^n u(n)$, $|a| < 1$ and state necessary conditions for existence of FT. [8]

b) Compute the circular convolution of the following sequence: [8]

$$x_1(n) = \{1, 1, 2, 1\}; x_2(n) = \{1, 2, 3, 4\}$$

OR

Q4) a) What is zero padding? What are its uses? [4]

b) State and prove periodicity property of DFT. [8]

c) Find the sequence $x(n)$ if its fourier transform $X(e^{j\omega}) = 1$. [4]

Q5) a) State and prove linearity property of Z- transform. Determine the ZT and ROC of the signal $x(n) = [3(2^n) - 4(3^n)] u(n)$ [10]

b) What is meant by radix-2 FFT? How many multiplications and additions are required to compute N-point DFT using radix-2 FFT? Draw the 4-point radix-2 DIT FFT butterfly structure for DFT. [6]

OR

Q6) a) State and prove convolution property of Z-transform. Compute the convolution $x(n)$ of the signals $x_1(n) = \{1, -2, 1\}$ and $x_2(n) = \{1, 1, 1, 1, 1, 1\}$ [10]

b) Calculate DFT of the sequence $x(n) = \cos(\pi n/2)$ where $N = 4$ using DIFFFT algorithm. [6]

SECTION - II

Q7) a) An impulse response of discrete time system is $u(n)$. What will be output of the system if the input is [8]

i) $\delta(n)$ and

ii) $u(n)$? Whether this system is stable?

- b) A system has unit sample response $h(n)$ given by $h(n) = -1/4\delta(n+1) + 1/2\delta(n) - 1/4\delta(n-1)$ [8]
- i) Is the system BIBO stable?
- ii) Is the filter causal?
- iii) Compute the frequency response and plot it.

OR

- Q8)** a) LTI system is described by $h(n) = (0.9)^n u(n)$. Calculate and plot magnitude response of the system. [8]
- b) State and prove time delay property of unilateral Z transform. [8]
- Q9)** a) Determine the unit sample response of the ideal low pass filter. Why it is not realizable? [8]
- b) Justify: stable analog filter always gives stable digital filter. [6]
- c) $H_a(s)$ is given as, $H_a(s) = \frac{1}{(s+1)^2}$ and $T_s = 0.1$ sec. Find $H(z)$ using bilinear transform. [4]

OR

- Q10)** a) State the characteristics of ideal filter. What are the advantages and disadvantages of digital filter over analog filter. [8]
- b) The system function of the analog filter is given as $H_a(s) = \frac{(s+0.1)}{(s+0.1)^2 + 16}$. Obtain the system function of the digital filter using bilinear transformation which is resonant at $\omega_r = \pi/2$. [10]

Q11)a) Obtain the system function $H(z)$ and difference equation for $h(n) = \{1, -2, -2, 3\}$. Draw a direct form FIR filter structure. [8]

b) Compare DSP processor and general purpose processors. [8]

OR

Q12)a) What is the use of DAG1 and DAG2 in ADSP 21XX family? With example explain the use of various memory pointer registers of DAG1 and DAG2. [8]

b) Write a note on applications of DSP in image processing. [8]

EEE

Total No. of Questions : 12]

SEAT No. :

P2345

[4758] - 83

[Total No. of Pages :4

T.E. (Computer Engineering)
THEORY OF COMPUTATION
(2008 Pattern) (310245)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

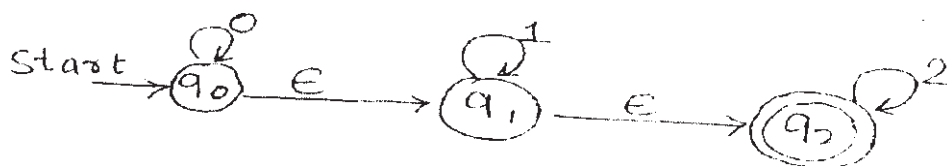
- 1) *Answers to the two sections should be written in separate answer books.*
- 2) *Assume suitable data if necessary.*

SECTION - I

- Q1)** a) Construct NFA and DFA for accepting all possible strings of zeroes and ones not containing 011 as a substring. [6]
- b) Define the following terms with example. [4]
- i) Symbol
 - ii) Alphabet
 - iii) NFA
- c) For $w = \{a,b\}^*$, design a Mealy machine that gives an output of 1 if the input string w ends in aba , otherwise output 0. [6]

OR

- Q2)** a) Design Mealy and Moore machine for the following processes. For input from $(0,1)^*$, if input string ends in 110, output x , if input string ends in 101, output y otherwise output z . [10]
- b) Consider the following NFA with ϵ -transitions. Convert this NFA to DFA. [6]



P.T.O.

- Q3)** a) Explain the closure properties and decision properties of regular languages. [6]
- b) Let $L = \{0^n \mid n \text{ is prime}\}$ show that L is not regular. [6]
- c) Design the finite automata and then equivalent regular expression using Arden's theorem that accepts the set of all strings over the alphabet $\{a,b\}$ with an equal number of a's and b's. such that each prefix has atmost one more a than b's and atmost one more b than a's. [6]

OR

- Q4)** a) Prove: [6]
- i) $\Phi^* = \epsilon$ (Φ is null)
- ii) $(r^*s^*) = (r+s)^*$
- b) For each of the following draw DFA, [8]
- i) $(11 + 00)^*$
- ii) $(111 + 100)^*.0$
- c) Explain the application of regular expressions in unix with any one example. [4]

- Q5)** a) Find a CFG for each of the following languages: [10]
- i) The set of odd length strings in $\{a, b\}^*$ with middle symbol a
- ii) The set of even length strings in $\{a,b\}^*$ with the two middle symbols equal.
- iii) The set of odd length strings in $\{a,b\}^*$ whose first, middle and last symbols are all same.
- b) Prove that $L = \{a^i b^i c^i \mid i > 1\}$ is not a CFL. [6]

OR

- Q6)** a) Convert the following grammar to Griebach Normal form. [6]
- $S \rightarrow ABA \mid AB \mid BA \mid AA \mid A \mid B$
- $A \rightarrow aA \mid a$
- $B \rightarrow bB \mid b$

- b) Define Normal Forms in grammars with the help of suitable examples. [4]
- c) For the right linear grammar given below, obtain an equivalent left linear grammar. [6]

$$S \rightarrow 10A \mid 01$$

$$A \rightarrow 00A \mid 1$$

SECTION - II

- Q7)** a) Design push down automata (PDA) for accepting the set of all strings over $\{a, b\}$ with an equal number of a's and b's. The string should be accepted both by [10]
- i) Final state
 - ii) Empty stack
- b) Construct push down automata (PDA) for accepting $L = \{a^n b^m a^n \mid m, n \geq 1\}$. [6]

OR

- Q8)** a) Prove "Let L be a language accepted by deterministic PDA, then the complement of L, can also be accepted by a DPDA". [4]
- b) Show that if L is accepted by a PDA in which no symbols are removed from the stack, then L is regular. Justify with appropriate example. [6]
- c) Give a PDA and FA, which of these machines is capable of accepting a palindrome string? Justify your answer for both machines. [6]
- Q9)** a) Show that the language $L = \{a^n b^n c^n \mid n \geq 0\}$ is Turing - decidable. [6]
- b) Construct POST machine for the language $\{a^n b^n \mid n \geq 0\}$. [6]
- c) Design a Turing machine for accepting the strings with an equal number of 0's and 1's. [6]

OR

- Q10)a)** Explain following Turing Machine. [6]
- i) Single infinite length TM
 - ii) Multi-tape TM
- b) Write a short note on universal TM. [6]
- c) Design Post Machine that accepts the strings of 'a' and 'b' having odd length and the element at the center is 'a'. [6]

- Q11)a)** Show that the set of languages L over $\{0,1\}$, so that neither L and L' is recursively enumerable, is uncountable. [6]
- b) What is un-decidability? How do you prove that a problem is un-decidable? Prove that the blank tape halting problem is un-decidable. [6]
- c) Prove that the set of real numbers R is not countable. [4]

OR

- Q12)a)** Write a short note on Post Correspondence Problem. [4]
- b) Show that if L_1 and L_2 are recursive languages and if L is defined as: [6]
- $$L = \{w \mid w \text{ is in } L_1 \text{ and not in } L_2 \text{ or } w \text{ is in } L_2 \text{ and not in } L_1\},$$
- then prove or disprove that L is recursive.
- c) Show the following problem is un-decidable. "Given a TM T , there exist some string on which T halts". [6]



Total No. of Questions : 12]

SEAT No. :

P2346

[4758] - 84

[Total No. of Pages :3

T.E. (Computer Engg.)

PRINCIPLES OF PROGRAMMING LANGUAGES

(2008 Pattern) (Semester - II) (310249)

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 side indicate full marks.*
- 4) *Assume suitable data if necessary.*

SECTION - I

- Q1) a)** What are the characteristics of good programming language. [8]
- b) Explain data objects, variables and constants with the help of example. What do you mean by data object binding? [8]

OR

- Q2) a)** How data types are classified? Explain in brief structure data type. [8]
- b) Explain how swapping of two numbers using call by reference is done. [8]

- Q3) a)** Explain the basic elements of PASCAL programming language. [8]
- b) Write suitable example demonstrate how nested procedures and functions acts as a efficient program design construct? [8]

OR

- Q4) a)** What is the use of local and global variable in a program? With the help of sample 'C' program explain the concept. [8]
- b) With the help of suitable example discuss the function and procedures in PASCAL. [8]

P.T.O.

- Q5)** a) Explain different access mechanism in Java. [8]
- b) What do you mean by multithreading. With the help of suitable example explain with respect to Java. [10]

OR

- Q6)** a) Differentiate Swing and AWT. State any 2 functions of each. [8]
- b) Write short notes on [10]
- i) JDBC
 - ii) Inheritance
 - iii) Exception handling
 - iv) Java Packages

SECTION - II

- Q7)** a) Explain in brief advantages and disadvantages of .NET framework with respective Java. [8]
- b) Explain value type and reference type variable with respect to C#. [6]
- c) Describe the structure of C# program. [4]

OR

- Q8)** a) Explain early binding and late binding with example. [6]
- b) What is Microsoft .NET technology? What are web services and their importance from business perspective? List web services protocols supported by industry. [10]
- c) Explain significance of Namespaces with respect to C#. [2]

- Q9)** a) What are different searching techniques supported by logic programming. [8]
- b) Why recursions are so naturally applies to defining relations in PROLOG? Justify with suitable example. [4]
- c) Write a short note on Prolog facilities and deficiencies. [4]

OR

- Q10)**a) Describe the control structure of Prolog with example. [6]
- b) List applications of Logic programming. [4]
- c) How resolution and unification algorithm works to match the proper pair in database to achieve the goal? Explain with suitable example. [6]

- Q11)**a) Write short note on Free and Bound identifiers support with respect to Lambda calculus. [6]

- b) Explain Shallow binding and Deep binding with respect to LISP. [6]
- c) What is output of following LISP functions. [4]

- i) (setq a(cons 'b(cons 'c nil)))
- ii) (cdar '((a b) c d e))
- iii) (not (and (eq (+1 2) 3) (< 4 3) (/5 0)))
- iv) (mapcar 'atom '(1 2(a b) 3))

OR

- Q12)**a) Write a LISP program to compute the nth Fibonacci number (i.e. 1,1,2,3,5,8,13,...). [4]

- b) State and explain key features and design goals of LISP. [4]
- c) Explain following expression evaluation techniques with proper examples. [8]

- i) Innermost evaluation
- ii) Selective evaluation
- iii) Outermost evaluation
- iv) Short circuit evaluation



Total No. of Questions : 12]

SEAT No. :

P2347

[4758] - 85

[Total No. of Pages :3

**T.E. (Computer Engineering)
COMPUTER NETWORKS
(2008 Pattern) (Semester - II)**

Time :3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answers 03 questions from each section.*
- 2) *Answers to the two sections should be written in separate answer -books.*
- 3) *Neat diagrams must be drawn whenever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Consider you are accessing a web page. Explain what different things happen at client and server side, at each layer. Assume that both are using TCP/IP protocol stack. **[8]**
- b) What is the difference between persistent and non persistent HTTP? Also explain HTTP message format. **[8]**

OR

- Q2)** a) What is internet? Explain protocol layers & service model in The Internet in detail. **[8]**
- b) Compare file transfer using FTP and HTTP methods. **[8]**
- Q3)** a) Explain connection oriented and connection-less service. Which protocols at each layer in TCP/IP protocol stack supports these services? **[9]**
- b) Explain significance of following flags in TCP header SYN, RST, FIN, PSH. **[9]**

OR

P.T.O.

- Q4)** a) What is socket? List and explain various socket primitives required in TCP socket program on client and server side. [9]
- b) Differentiate between TCP and UDP protocol. Also comment on the applications supported by them. [9]

- Q5)** a) Explain significance and working of RSVP protocol. [8]
- b) What is QoS? Explain it with respect to reliability, delay, jitter and bit rate. [8]

OR

- Q6)** a) Describe in brief Integrated Services and Differentiated services. [8]
- b) What is traffic shaping? How is it used in congestion control? [8]

SECTION- II

- Q7)** a) Compare IPv4 and IPv6. Draw and Explain IPv6 header format. [8]
- b) Explain network layer design issues. [8]

OR

- Q8)** a) Compare IP and ICMP. Explain header format of ICMP V6 protocol. [8]
- b) Identify class, subnet mask, network address and broadcast address of following IP addresses: [8]
- i) 214.25.6.3
 - ii) 191.5.8.9.
 - iii) 5.6.45.4
 - iv) 230.45.89.63

- Q9)** a) Explain Distance Vector Routing. What are the advantages and disadvantages of DVR? [8]
- b) Explain RIP and OSPF in details. [8]

OR

Q10)a) Classify routing algorithms. Also compare link state and distance vector routing. [8]

b) Describe in brief ICMP messages. [8]

Q11)a) Explain the following internetworking devices. [6]

i) Switches

ii) Routers

b) What is PPP? Explain with transition state diagram. [6]

c) Explain the working of PPP. Is it based closely on HDLC which uses bit stuffing to prevent accidental flag bytes within the payload from causing confusion? Give the reason why PPP uses character stuffing instead. [6]

OR

Q12)a) Explain working of MPLS. [6]

b) Explain the HDLC protocol with its frame format. [6]

c) Compare and contrast between HDLC and PPP. [6]



Total No. of Questions : 12]

SEAT No. :

P2348

[4758]-86

[Total No. of Pages : 4

T.E. (Computer Engg.)

SYSTEM PROGRAMMING & OPERATING SYSTEMS

(2008 Course) (Semester - II) (310252)

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 features of assembly language makes it mandatory to design a two pass assembler? Explain with example. [6]
- b) What is forward reference? How it is handled in a single pass assembler? [6]
- c) Give format of different databases that are used for design of PASS -I of two pass assembler. [6]

OR

- Q2)** a) In an assembly language program, certain action is required at 'n' places in the program. Under what condition would you code this action as macro or subroutine. [8]
- b) Draw a flow chart for pass-I of two pass assembler design & explain.[10]
- Q3)** a) What is loader? What are it's basic functions. [6]
- b) Write a note on MS-DOS linker. [6]
- c) Explain the difference between .EXE and .DLL files. [4]

OR

P.T.O.

Q4) a) What are the databases required for design of direct link loader? Give their formats. [8]

b) Draw flow chart for pass-I of two pass direct linking loader. [8]

Q5) a) Write short note on: [10]

i) Distributed operating system.

ii) Multiprogramming.

iii) Real time scheduling.

iv) Library functions

v) System calls.

b) Define the essential properties of the following operating system [6]

i) Batch

ii) Time sharing

iii) Real time.

OR

Q6) a) Comment on: A program and process are two different concepts. [6]

b) Consider the following set of processes, with the length of the CPU burst time given in milliseconds: [10]

Process	Burst time	Priority
P1	10	3
P2	1	1
P3	2	5
P4	1	4
P5	5	2

The processes are assumed to have arrived in the order P1, P2, P3, P4, P5, all at time 0.

- i) Draw four Gantt charts illustrating the execution of these processes using FCFS, SJF, a non pre-emptive priority (a smaller priority number implies a higher priority), and RR (quantum = 1) scheduling.
- ii) What is the turn around time and waiting time of each process for each scheduling algorithm?
- iii) Which of the scheduling results in the minimal average waiting time (overall processes)?

SECTION - II

- Q7)** a) What is mutual exclusion? What are hardware approaches for mutual exclusion. [8]
- b) Explain deadlock detection algorithm with suitable example. [8]

OR

- Q8)** a) Describe the producer consumer problem and give solution for it. [6]
- b) Consider the following snapshot of a system: [10]

	Allocation				Max				Available			
	A	B	C	D	A	B	C	D	A	B	C	D
P0	0	0	1	2	0	0	1	2	1	5	2	0
P1	1	0	0	0	1	7	5	0				
P2	1	3	5	4	2	3	5	6				
P3	0	6	3	2	0	6	5	2				
P4	0	0	1	4	0	6	5	6				

Answer the following questions using the banker's algorithm.

- i) What is the content of the matrix need?
- ii) Is the system in a safe state? If yes give the safe sequence.

- Q9) a)** Write short note on demand paging. [8]
- b) Discuss and compare with example various page replacement policies. [8]

OR

- Q10)a)** What is variable partitioning scheme? Differentiate between external and internal fragmentation. [8]
- b) Explain the best fit algorithm used for memory allocation. What are advantages and disadvantages of this algorithm. [8]
- Q11)a)** Write an algorithm for disk scheduling algorithm using “shortest seek time first”. [10]
- b) Write and explain file structure and file attributes. [8]

OR

- Q12)a)** Explain RAID and it's different levels. [10]
- b) Why I/O buffering is necessary? State and explain different I/O buffering techniques. [8]

EEE

Total No. of Questions : 12]

SEAT No. :

P2349

[4758] - 87

[Total No. of Pages :3

T.E. (Computer)

FINANCE AND MANAGEMENT INFORMATION SYSTEMS

(2008 Course) (Semester- II) (310251)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) How management thoughts are evolved from ancient age to modern age? state and explain. [8]
- b) What is mean by quality? What are the primary uses of term quality in Industry [8]

OR

- Q2)** a) What is mean by planning? How planning helps to reach to an organizations goal? what are the objectives of planning? [8]
- b) What is Human resource management (HRM)? Explain the functionalities performed by HRM. [8]

- Q3)** a) What is financial management? State and explain the principles of financial management. [8]
- b) What is meant by profit and loss statement referred in income Statement? Explain with suitable example. [8]

OR

- Q4)** a) State and explain the difference between capital and revenue expenditure with suitable examples. [8]
- b) What are debentures? What are the different types of debentures? State and explain the advantages and disadvantages of debentures. [8]

P.T.O.

- Q5)** a) What is Management information system (MIS) ? Explain the design process of MIS? [9]
- b) What is mean by decision making? State and explain the steps involved in decision making. [9]

OR

- Q6)** Explain any three [18]
- a) Knowledge management system
- b) Organizational decision making
- c) Business process reengineering
- d) Programmed and non-programmed decision

SECTION - II

- Q7)** a) How an organization can do business in digital form? State and explain the digital model of an organization [9]
- b) What is mean by e-commerce? Explain the different activities involved in e-commerce. [9]

OR

- Q8)** a) Explain the security vulnerability in e-business. Explain few security measures that can be taken against security vulnerability in e-business.[9]
- b) What is enterprise content management(ECM)? Explain the different components of ECM. [9]

- Q9)** a) What is enterprise resource planning (ERP) ? State the evolving story of ERP from an accounting software to full fledged business management system. [8]
- b) What are the objectives and outcome of supply chain management (SCM)? Explain in detail. [8]

OR

- Q10)** a) What is meant by customer relationship management (CRM)? Explain phases of CRM. [8]
- b) Explain the cultural, and political challenges involved in global IT Management. [8]

Q11) a) Explain different statutory provisions made in Indian law against cybercrime in detail. **[8]**

b) What is right to information act? Explain in detail. **[8]**

OR

Q12)a) State and explain ethical, moral, and political issues in development and uses of information technology in any IT industry. **[8]**

b) Enlist and explain different challenges that need to be overcome to ensure proper implementation of right to information act. **[8]**



Total No. of Questions : 12]

SEAT No. :

P2350

[4758]-88

[Total No. of Pages : 3

T.E. (Computer Engineering)

SOFTWARE ENGINEERING

(2008 Course) (Semester - II) (310253)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) What is the necessity of building software using a software engineering model. How does Agile process fulfill this necessity? [8]
- b) Explain an incremental model with workproduct of each activity. [8]

OR

- Q2)** a) Explain the following terms in brief: [8]
- i) Software myths
 - ii) Spiral model
- b) Compare the process flow of waterfall model and evolutionary process models. [8]

- Q3)** a) Explain the importance of requirements engineering and list the tasks involved. [6]
- b) Give examples of scenario-based models. How are they used in modeling requirements? [8]
- c) What are the work products of requirement elicitation activity. [4]

OR

P.T.O.

- Q4)** a) Discuss generic elements found in most requirements modeling approaches. [6]
- b) How are data objects modeled? [4]
- c) Create a CRC model for “user account management in intranet of an organization”. [8]
- Q5)** a) Explain the following design concepts. [8]
- i) Patterns
- ii) Information hiding
- iii) Architecture
- iv) Refinement
- b) Explain any two architectural styles. [8]

OR

- Q6)** a) What is Architecture? Explain the architecture context diagram. [8]
- b) Explain design model elements. [8]

SECTION - II

- Q7)** a) List the attributes of a good test. Explain white-Box testing with an example. [8]
- b) Explain in brief the web App testing strategies. [8]

OR

- Q8)** a) Explain the steps involved in deriving test cases for basic path testing. [8]
- b) How are OOA and OOD models tested. [4]
- c) Define the following: [4]
- i) Smoke testing
- ii) Alpha-beta testing

- Q9)** a) List out the constituents of stake holders in a software process. Explain role of team leaders and coordination issues in a software team. [8]
- b) What are empirical estimation models used for? Explain any one model. [6]
- c) How is the decision to outsource software development taken? [4]

OR

- Q10)** a) What is software quality and how is it measured? Explain a quality metric that is beneficial at process and project level . [8]
- b) Explain the following: [6]
- i) Software scope
 - ii) Resources and its estimation
- c) Write a brief note on project metrics. [4]
- Q11)** a) Explain the use of task networks and timeline charts with examples. [8]
- b) Explain the following in brief: [8]
- i) Proactive risk management
 - ii) Product metrics
 - iii) SCM
 - iv) RMMM

OR

- Q12)** a) Explain risk projection and risk refinement. [8]
- b) Discuss a technique for quantitative analysis of progress. [8]

EEE

Total No. of Questions : 12]

SEAT No. :

P3344

[4758] - 89

[Total No. of Pages : 4

T.E. (Chemical) (Semester - I)
CHEMICAL ENGINEERING MATHEMATICS
(2008 Pattern)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates :

- 1) *Assume suitable data, if necessary.*
- 2) *Neat figures to the right side indicate full marks.*
- 3) *Attempt section I and section II on two separate answer books.*
- 4) *Use of scientific calculator is allowed.*

SECTION - I

- Q1)** a) Derive Secant formula [6]
- b) Obtain the root of following equation by using Newton Raphson formula
 $f(x) = x \log x - 1.2 = 0$ [6]
- c) What are various types of errors involved in numerical methods. Define and explain each with suitable examples. [6]

OR

- Q2)** a) Derive Newtons formula [6]
- b) Obtain the roots of following equation using Mullers method
 $f(x) = x^3 - 13x - 12.$
With guess of x_0, x_1 and x_2 as 4.5, 5.5 and 5 respectively.
Note that the roots of this equation are -3, -1 and 4. [6]
- c) State and explain graphical interpretation of Regula falsi method. [6]

P.T.O.

Q3) a) Solve following system of equations using LU decomposition method

$$2x + 3y + z = 9$$

$$x + 2y + 3z = 6$$

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

b) Solve the following system of equations using Gauss Seidal method

$$9x + 2y + 4z = 20$$

$$2x + 4y + 10z = -15$$

$$x + 10y + 4z = 6 \quad [8]$$

OR

Q4) a) Solve the following system of equations using Cholesky method

$$10x + y = 1$$

$$X + 9y + z = 3$$

$$Y + 9z - t = 0$$

$$-z + 16t = 0 \quad [8]$$

b) Use gauss elimination method to solve following system of equations

$$x + 20y + z = 22$$

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

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

Q5) a) Explain the procedure of nonlinear regression. [5]

- b) Construct the difference table from the following data.

X	50	51	52	53	54
F(X)	39.1961	39.7981	40.3942	40.9843	41.5687

obtain $f(50.5)$ using newtons formula [5]

- c) From the given data find the value of Y at X = 4.5

X	1	2	3	4	5
Y	2.38	3.65	5.85	9.95	14.85

[6]

OR

- Q6)** a) Using stirling formula of interpolation calculate y at $x = 12.2$. The given data is shown below.

X	10	11	12	13	14
Y	0.23967	0.28060	0.31788	0.35209	0.38368

[8]

- b) For the following data find root 1.1 using Langrages interpolation. Determine the accuracy of interpolation.

X	1	1.2	1.3	1.4
Y	1	1.095	1.140	1.183

[8]

- Q7)** a) Derive equation of Eulers method. [6]

- b) Using Modified Eulers method to solve

$$y' = x - y \text{ given that } x_0=0, y_0=1 \text{ at } x = 0.6 \text{ taking } h = 0.2. \quad [10]$$

OR

Q8) a) Using fourth order Runge Kutta method to integrate following equation to determine y at $x = 1$. Give $F(x,y) = -2x^3 + 12x^2 - 20x + 8.5$ [8]

b) Write short note on : [8]

- i) Euler method
- ii) RK 4 method
- iii) Modified Eulers method
- iv) Taylors series method

Q9) Use explicit method to solve for temperature distribution of a long thin rod with length of 10 cm and the following values $k' = 0.49 \text{ Cal}/(\text{s.cm.}^\circ\text{C})$, $\Delta X = 2 \text{ cm}$ and $\Delta t = 0.1 \text{ sec}$. 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 $T(10) = 50 \text{ deg C}$. Note that the rod is of aluminium with $C = 0.2174 \text{ cal/g. deg C}$ and $\rho = 2.7 \text{ gms/cm}^3$, $K = 0.835 \text{ cm}^2/\text{sec}$ and $\lambda = 0.020875$. Find the temperature distribution in a long thin rod using explicit method. [16]

OR

Q10) Explain implicit method and its advantages and disadvantages in detail. [16]

Q11)a) Explain numerical methods for optimizing a function of one variable. [9]

b) Explain scanning and bracketing procedures for optimization of unconditional functions of one dimensional search. [9]

OR

Q12)a) Use quadratic interpolation to approximate the maximum of $f(x) = 2\sin x - x^2/10$ with initial guesses of $x_0 = 0$, $x_1 = 1$ and $x_2 = 4$. [9]

b) What are six steps of optimization? Enlist and explain. [9]



Total No. of Questions : 8]

SEAT No. :

P2252

[4758] - 9

[Total No. of Pages :7

T.E. (Civil Engineering)

STRUCTURAL DESIGN - II

(2008 Course) (Semester - II) (301008)

Time : 4Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Attempt Q.1 or Q.2 and Q.3 or Q.4 in section - I.*
- 2) *Attempt Q.5 or Q.6 and Q.7 or Q.8 in section - II.*
- 3) *Answers to the two sections should be written in separate books.*
- 4) *Figures to the right indicate full marks.*
- 5) *Neat diagrams must be drawn wherever necessary.*
- 6) *Use of IS 456-2000 and non programmable calculator is allowed.*
- 7) *Mere reproduction from IS code as answer, will not be given full credit.*
- 8) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Explain with sketches, why do continuous T-beam at support have to be designed as rectangular section? Draw the cross section of continuous T-beam at support and midspan. [9]
- b) Explain the circumstances under which doubly reinforced section is provided. [6]
- c) A tee beam of effective flange width 1500 mm, thickness of slab 120 mm, width of rib 300 mm and effective depth of 500 mm is reinforced with 4 nos. 25 mm diameter bars. Calculate the factored moment of resistance. The materials are M25 grade concrete and HYSD reinforcement of grade Fe 415. [10]

OR

- Q2)** a) Explain with neat sketch Balanced, Under reinforced and Over reinforced section as per WSM and LSM. [8]
- b) Calculate the design constants for the following materials considering the balanced design for singly reinforced section. The materials are grade M 30 concrete and Fe 500 grade steel reinforcement. Use LSM. [6]

P.T.O.

- c) Calculate moment of resistance and safe superimposed UDL that the beam can carry by WSM for following details: Effective simply supported span = 5 m, width of beam = 230 mm, overall depth of beam = 550 mm, 4 nos. 20 mm diameter on tension side and 2 nos. 16 mm diameter on compression side, Effective cover = 40 mm. Material M20, Fe 415. [11]

Q3) Design floor slabs S7 and S9 only for flexure and torsion. Refer the centerline structural plan given in Figure 1. Width of all beams is 230 mm. Consider live load = 4kN/m^2 , Floor finish = 1.5kN/m^2 .

Use M25 grade of concrete and Fe 415 grade of steel. Draw neat sketches showing details of main reinforcement and torsional reinforcement in two way slab. [25]

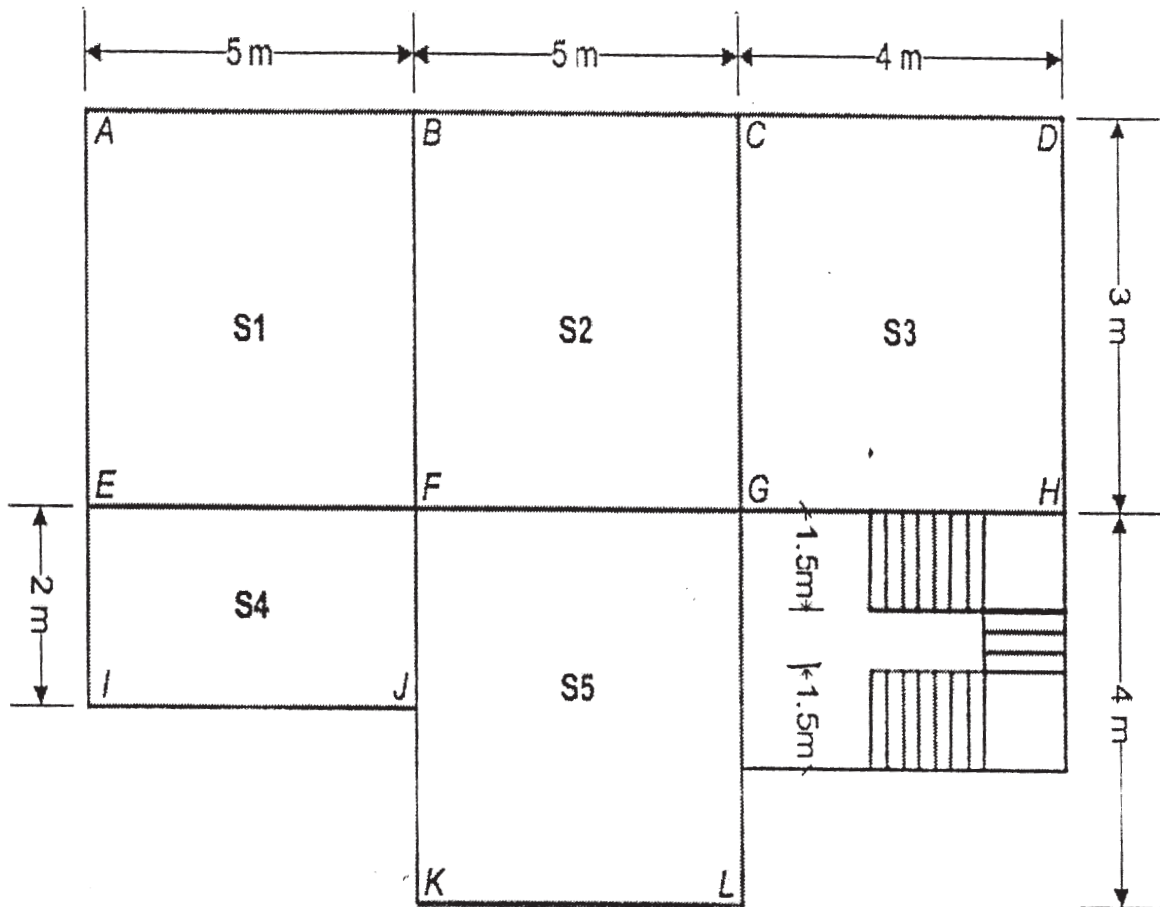


Figure 1

OR

Q4) Design a open well staircase for following data: **[25]**

Floor to floor height : 3.00 m

Riser = 150 mm, Tread = 300 mm, Width of stair = 1500 mm

No. of risers:

Flight I : 8 nos.

Flight II : 4 nos.

Flight III : 8 nos.

Material M25 & Fe500.

Refer the centerline structural plan given in Figure 1. Width of all beams is 230 mm. Draw the reinforcement details in sectional elevation for both flights.

SECTION - II

Q5) a) Design a continuous beam ABCD of span total span 12m for flexure and shear using IS Code method. AB = BC = CD = 4.0m. The beam carries dead load of 18 kN/m (including its self-weight) and live load of 12 kN/m. Take material M20 and Fe500. Show the reinforcement detail in longitudinal section and cross-section at continuous supports and at mid spans. **[20]**

b) Find out the shear capacity of beam section 300 mm wide × 600 mm deep (overall depth). Clear cover to the reinforcement is 25 mm. The support is reinforced with 3 bars of 25 mm diameter on tension side and 8 mm diameter - 2 legged vertical stirrups @150 mm C/C used as shear reinforcement. Materials M25 and Fe 500. **[5]**

OR

Q6) Continuous RC beam ABC of rectangular section is simply supported at A and C and continuous over support B. Span AB = 4.0m and BC = 5.0m. The beam carries dead load of 20 kN/m (including its self weight) and live load of 18 kN/m. Calculate design moments at central support B and near mid span of AB after 20% redistribution of moments. Show the bending moment envelop. Draw the reinforcement details at mid span and at continuous support. Design shear reinforcement only for span AB. **[25]**

- Q7)** a) Explain in detail interaction diagram used for design of column. [5]
- b) Design an axially loaded rectangular short column with material M25 and Fe 415 to carry a working load of 700 kN. The unsupported length of column is 3.5 m. The column is held in position and not restrained against the rotation at both ends. Also design the footing for this column. Take $SBC = 160 \text{ kN/m}^2$. Show detailed design calculations and reinforcement details in plan and sectional elevation. [20]

OR

- Q8)** Design a bi-axial short column by limit state method with material M25 and Fe 500 to carry a working load of 900 kN. Working moment of 80 kN-m about major axis bisecting the depth of column and 40 kN-m about minor axis bisecting the width of column. The unsupported length of column is 4.0 m. The column is fixed at one end and hinged at the other. Also design the footing for this column considering axial load and moment about major axis only. Take $SBC = 250 \text{ kN/m}^2$. Show detailed design calculations and reinforcement details in plan and sectional elevation. [25]

Chart - 13 Interaction Diagram for Combined Bending and Compression Rectangular Section - Equal Reinforcement on All Sides.

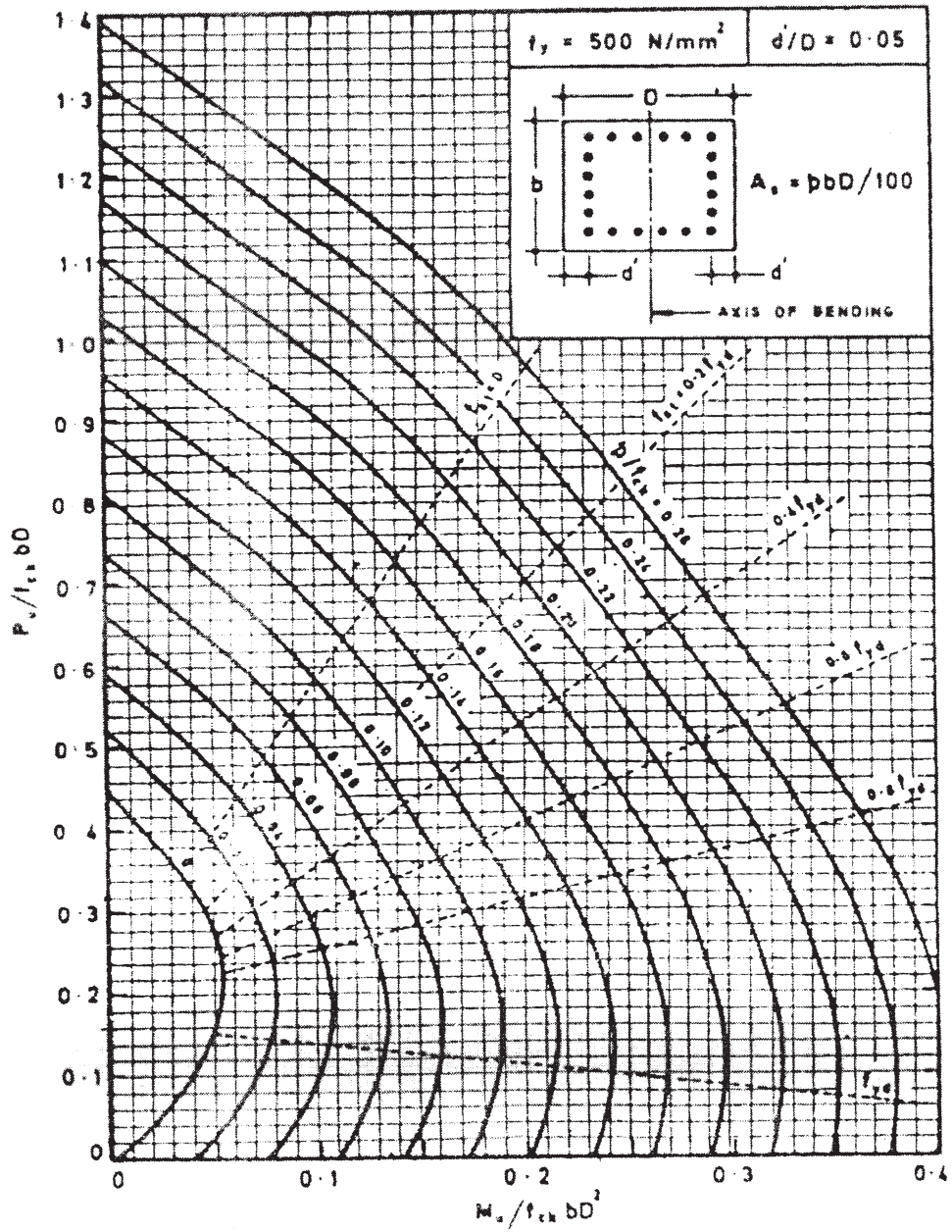


Chart - 14 Interaction Diagram for Combined Bending and Compression Rectangular Section - Equal Reinforcement on All Sides.

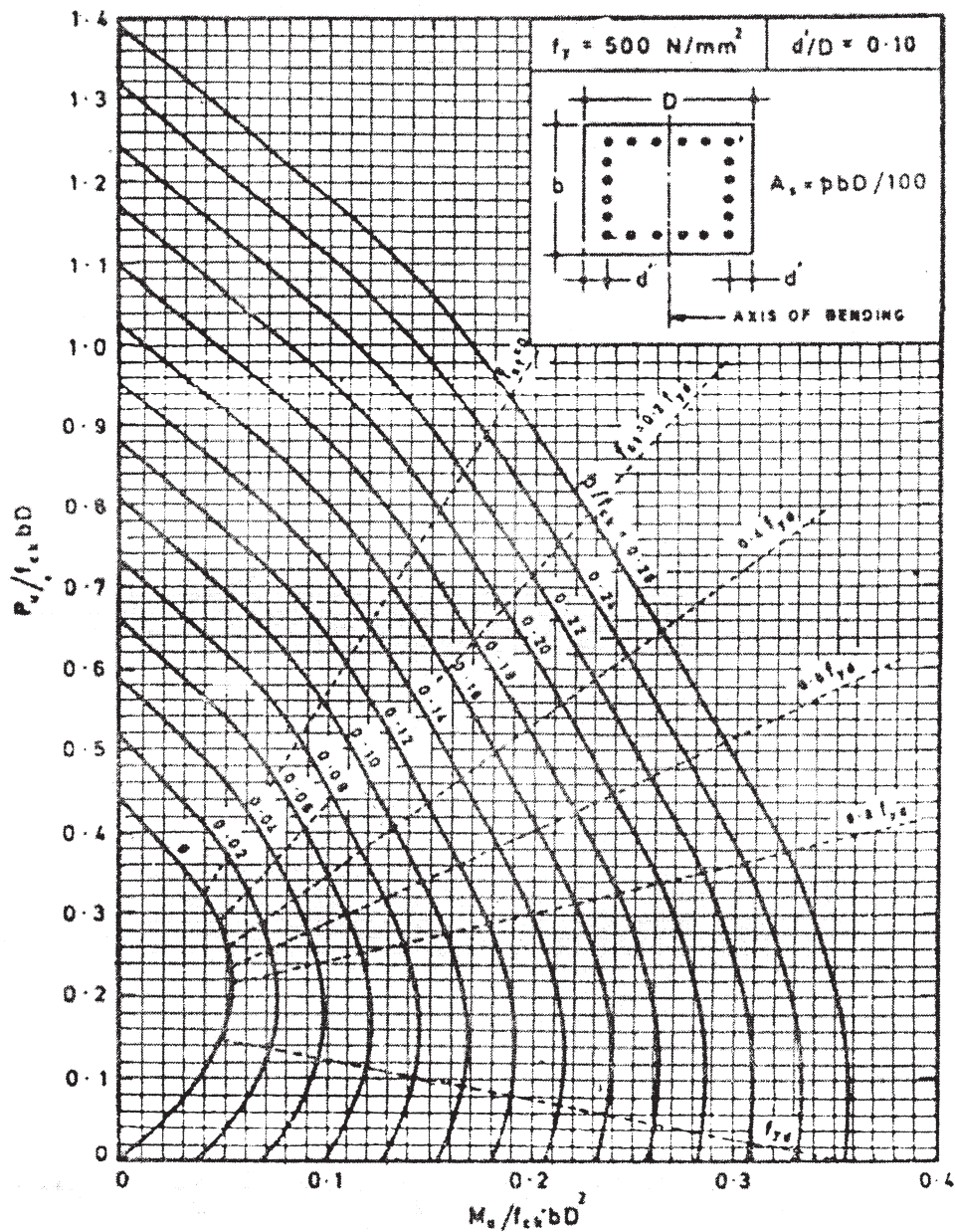
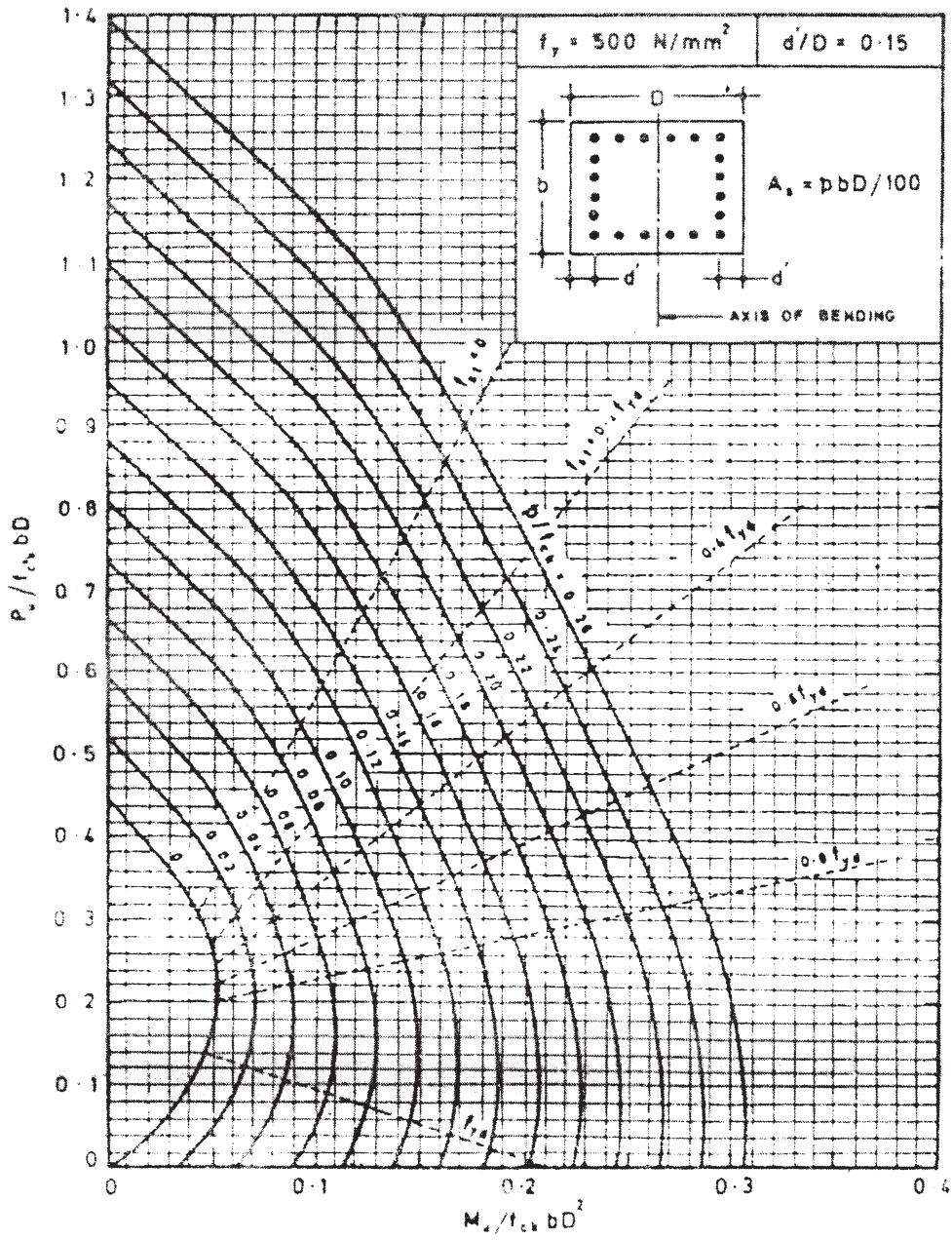


Chart - 15 Interaction Diagram for Combined Bending and Compression Rectangular Section - Equal Reinforcement on All Sides.



Total No. of Questions : 12]

SEAT No. :

P2351

[4758]-90

[Total No. of Pages : 4

T.E. (Chemical Engineering)
THERMODYNAMICS-II
(2008 Course) (Semester-I) (309344)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answers Q. No. 1 or 2, Q. No. 3 or 4, Q. No. 5 or 6 from Section-I and Q. No. 7 or 8, Q. No. 9 or 10 and Q. No. 11 or 12 from Section-II.*
- 2) *Answers to the two section should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use 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 fugacity and fugacity coefficient? [6]
- b) Derive an expression for the fugacity coefficient of a gas obeying the equation of state $P(V - b) = RT$ and estimate the fugacity of the gas at 100 bar and 298 K when $b = 3.707 \times 10^{-5} \text{ m}^3/\text{mol}$. [5]
- c) Show how chemical potential is a criterion for equilibrium. [5]

OR

- Q2)** a) What is an ideal solution? Derive equations for G^{id} , S^{id} , V^{id} and H^{id} . [8]
- b) Calculate the fugacity of nitrogen at 800 bar and 273 K from the following data: [8]

P, bar	50	100	200	400	800	1000
PV/RT	0.9846	0.9914	1.0365	1.2557	1.7959	2.0641

- Q3)** a) Explain any two models for estimating excess Gibbs Free Energy. [9]
- b) A container is divided into two parts. One contains 3 moles of hydrogen at 298 K and 1 bar and the other contains 1 mol of nitrogen at 298 K and 3 bar. Calculate the free energy of mixing of mixing when the partition is removed. [9]

OR

P.T.O.

- Q4) a)** What are the three methods for determining partial molar properties?[8]
- b) The enthalpy change of mixing for a binary mixture at 298 K and 1 bar is given by $\Delta H = x_1 x_2 (40x_1 + 20x_2)$ J/mol, x_1 and x_2 are mol fractions of the two components. The enthalpies of the pure liquids at the same temperature and pressure are 400 and 600 J/mol for components 1 and 2 respectively. Determine the numerical values of the partial molar enthalpies at infinite dilution \bar{H}_1^∞ and \bar{H}_2^∞ at 298 K and 1 bar. [10]

- Q5) a)** State and explain the Duhem's theorem. [4]
- b) The vapor pressures of acetone (1) and acetonitrile (2) are calculated by the Antoine equations: $\ln P_1^s = 14.5463 - \frac{2940.46}{T - 35.93}$ and

$$\ln P_2^s = 14.2724 - \frac{2945.47}{T - 49.15}$$

Where T is in K and P is in kPa. Assuming the mixture to be ideal calculate [8]

- i) x_1 and y_1 at 327 K and 65 kPa;
- ii) P and y_1 at 327 K and $x_1 = 0.4$;
- iii) P and x_1 at 327 K and $y_1 = 0.4$.
- c) What are azeotropes? [4]

OR

- Q6) a)** Construct the P – x, y diagram for the cyclohexane (1) – benzene (2) system at 313 K given that at 313 K the vapour pressures are $P_1^s = 24.62$ kPa and $P_2^s = 24.41$ kPa. The liquid phase activity coefficients are given by $\ln \gamma_1 = 0.458 x_2^2$ and $\ln \gamma_2 = 0.458 x_1^2$ [12]
- b) Explain the effect of pressure on T-x, y diagram. [4]

SECTION-II

- Q7) a)** Explain the criterion for equilibrium and stability in phase equilibrium. [8]

- b) The activity coefficient for component 1 in a binary mixture is given by the expression $\ln \gamma_1 = ax_2^2 + bx_2^3 + cx_2^4$ where a , b and c are concentration independent constants. Derive an equation for $\ln \gamma_2$ in terms of x_1 . [8]

OR

- Q8)** a) Describe any two methods for finding thermodynamics consistency. [8]
b) Explain liquid-liquid equilibrium. What is LCST and UCST? [8]

- Q9)** a) What is reaction coordinate? Derive an equation correlating reaction coordinate and mole fractions in a reacting mixture. [8]
b) For a system in which the following reaction occurs $\text{CH}_4 + \text{H}_2\text{O} \rightarrow \text{CO} + 3\text{H}_2$ assume there are 2 mol CH_4 , 1 mol H_2O , 1 mol CO and 4 mol H_2 present initially. Determine the expressions for the mole fractions of each component as a function of reaction coordinate. [6]
c) Explain how the Gibbs criterion for equilibrium applies to reacting systems. [4]

OR

- Q10)** a) Derive the relation $\Delta G = -RT \ln K$. [6]
b) Consider a reaction $\text{H}_2\text{O} \rightarrow \text{H}_2 + 1/2\text{O}_2$ occurring in a closed vessel with n_0 moles of water vapor initially. Derive an expression for the mole fractions of all the components and the fractional decomposition of water in terms of the reaction coordinate. [6]
c) Derive an expression giving the effect of temperature on reaction equilibrium constant. [6]

- Q11)** a) Derive an expression giving the relation between equilibrium constant and composition for gas phase reactions and state the effect of presence of inerts in the reactant mixture. [8]
b) One mole of steam undergoes the water gas shift reaction at 1100 K and 1 bar. $\text{CO}(\text{g}) + \text{H}_2\text{O}(\text{g}) \rightarrow \text{CO}_2(\text{g}) + \text{H}_2(\text{g})$. The equilibrium constant for the reaction $K = 1$. Assuming ideal behavior calculate the fractional dissociation of steam when CO is supplied in 100% excess of theoretical requirement. [8]

OR

- Q12)a)** Derive an expression relating mole fractions of components to reaction coordinate for a multiple reaction system. **[8]**
- b) The water gas shift reaction is carried out at 1100 K and 1 bar with 1 mol of CO and 1 mol of water initially. The value of $K = 1$. Assuming the gas behaves ideally calculate the fractional decomposition of steam. The reaction: $\text{CO(g)} + \text{H}_2\text{O(g)} \rightarrow \text{CO}_2\text{(g)} + \text{H}_2\text{(g)}$. Calculate the fractional decomposition at 10 bar and when 2 moles of N_2 are present in the reacting mixture, all other conditions remaining same as above. Comment on the effect of increasing pressure and presence of inerts. **[8]**



Total No. of Questions : 12]

SEAT No. :

P3677

[4758] - 901

[Total No. of Pages :4

T.E. (E & TC)

**DIGITAL DESIGN AND COMPUTER ORGANIZATION
(2003 Course)**

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

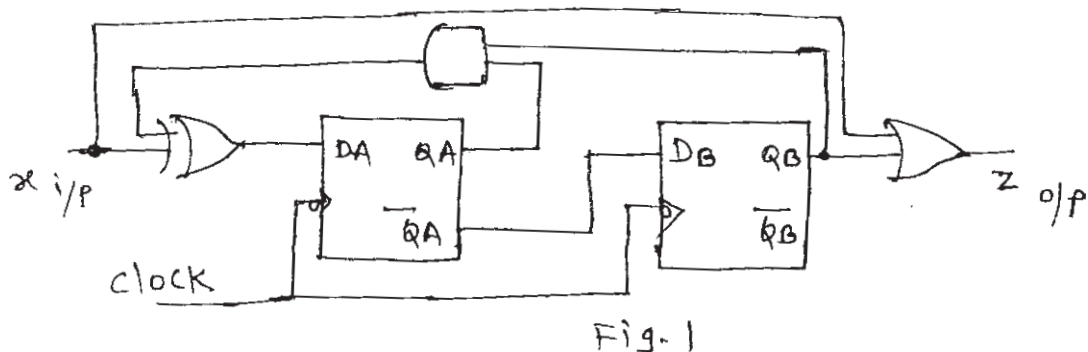
- 1) Answer any 3 questions from section-I and 3 questions from section -II.
- 2) Answers to the two sections should be written in separate answer-book.
- 3) Figures to the right indicate full marks.
- 4) Neat diagrams must be drawn wherever necessary.
- 5) Use of logarithmic tables, slide rule, Mollier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

SECTION - I

- Q1)** a) Design and implement a 3 bit synchronous counter which goes through the following states 1-3-5-7-1. [8]
- b) Analyze 'D' latch as an asynchronous circuit constructed with NAND gates. [8]

OR

- Q2)** a) Draw an ASM chart and state diagram for the circuit shown in fig. (1). [8]



P.T.O.

- b) Explain following terms [8]
- i) Structural modeling
 - ii) Behavioral Modeling

Q3) a) Write VHDL code in structural modeling style for full subtractor using two 4:1 Mux. [8]

b) Write vhdl code for 4 bit bidirectional shift register. [8]

OR

Q4) a) Write VHDL code for synchronous and asynchronous reset D flip flop. [8]

b) Explain following statements used in VHDL with suitable example: [8]

- i) IF
- ii) Case
- iii) process
- iv) with select

Q5) a) Explain Booth's algorithm for 2's compliment multiplication with the help of suitable example. [10]

b) Multiply the following numbers using bit pair recoding method [8]

Multiplicand 0111 (15)

Multiplier 10110 (-10)

OR

Q6) a) Explain IEEE excess-127 floating point single precision format and convert the Following decimal number in the above format. [8]

- i) -69
- ii) 59.8741

b) Explain detail integer division, restoring and non restoring division algorithm using suitable example. [10]

SECTION - II

- Q7)** a) What is subroutine nesting? What is parameter passing? Explain one of the methods to pass parameter. [8]
- b) Write control sequence for execution of the instruction. ADD (R3), R1 using single bus Organization. [8]
- c) What is assembler command? Write two examples. [2]

OR

- Q8)** a) Explain the following: [8]
- i) Branching
- ii) Conditional code
- b) Explain the following in brief with suitable examples: [8]
- i) Indirect addressing
- ii) Indexed addressing
- c) Explain immediate addressing mode with suitable 1 example. [2]

- Q9)** a) Draw and explain I/O interface for an input device. [8]
- b) Explain Direct Memory Access in detail. [8]

OR

- Q10)**a) Explain the interrupts in handling multiple devices modes in following: [8]
- i) Vectored interrupt
- ii) Interrupt nesting
- b) Explain keyboard interface circuit in detail. [8]

Q11)a) Explain with neat diagram and timing diagram the synchronous DRAM. **[8]**

b) Explain memory interleaving and explain one of the methods to address multiple module memory system. **[8]**

OR

Q12)a) Draw and explain organization of $64K \times 8$ memory module, using $16K \times 1$ static memory Chip. **[8]**

b) Write short note on memory Hierarchy and Direct mapping. **[8]**



Total No. of Questions : 12]

SEAT No. :

P4286

[4758] - 902

[Total No. of Pages :4

T.E. (E& T.C.)

**ANALOG INTEGRATED CIRCUITS DESIGN AND APPLICATIONS
(2003 Course)**

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) *Assume suitable data if necessary.*

SECTION - I

Q1) a) Explain the following related to Dual input balanced output differential amplifier **[8]**

- i) Operation in Common mode and Difference mode
- ii) Transfer Characteristics

b) The dual input balanced output difference amplifier has following specifications. $R_c = 2.5k\Omega$, $R_E = 4.8k\Omega$, $R_{b1} = R_{b2} = R_b = 50\Omega$, $+V_{cc} = +10V$, $-V_{EE} = -10V$, $\beta = 100$, $V_{BE} = 0.8V$. Assume $h_{ie} = 1.1k\Omega$. **[8]**

Calculate:

- i) Q-point values
- ii) Voltage gain
- iii) Input & Output Resistance

OR

Q2) a) Explain any two level shifter circuits used in op-amp.

[6]

P.T.O.

- b) Write short notes on [10]
- i) V_{BE} Multiplier Circuit
 - ii) Widlar Current Source

- Q3)** a) An Op-Amp has a slew rate of $5V/\mu s$. Find the rise time for an o/p voltage of 10V amplitude resulting from a rectangular pulse input if the op-amp is slew-rate limited. [6]
- b) Define the following characteristics of an Op-Amp. [4]
- i) CMRR
 - ii) Input Bias Current
 - iii) Slew Rate
 - iv) Input Offset voltage
- c) Explain the frequency response of op-amp. [6]

OR

- Q4)** a) Explain the differential amplifier using op-amp with derivation of output voltage. [8]
- b) What is the need of frequency compensation? Explain any two methods of frequency compensation. [8]

- Q5)** a) Design a practical integrator using Op-Amp IC 741C to satisfy the following specifications: Assume $V_{cc} = +15V$. [8]

- i) 3-dB cut-off frequency = 1.5kHz
- ii) DC gain = 10

Sketch the frequency response of the circuit.

- b) Explain grounded load V to I converter with necessary derivation. [6]
- c) Explain Clipper circuits using op-amp. [4]

OR

- Q6)** a) Design a practical differentiator to differentiate an input signal that varies in frequency From 10Hz to 500Hz. Draw its frequency response. [8]
- b) Compare the salient features of an Integrator and Differentiator using Op-Amp. [4]
- c) Draw a neat diagram of three inputs inverting summing amplifier using op-amp & obtain expression for output voltage. [6]

SECTION - II

- Q7)** a) Explain the operation of inverting comparator with appropriate output waveforms. [6]
- b) Explain Peak detector using op-amp. [6]
- c) Design an inverting Schmitt Trigger circuit whose V_{UT} and V_{LT} are $\pm 5V$. Draw input and output waveforms. Assume op-amp saturates at $\pm 13.5V$. [6]

OR

- Q8)** a) Explain the requirements of an Instrumentation amplifier. [4]
- b) Derive the output voltage for 3 Op-Amp Instrumentation amplifier. [6]
- c) Explain the positive precision Full wave rectifier using op-amp with appropriate waveform. What modifications should be done in the above circuit to get negative output? [8]

- Q9)** a) Design a wide band pass filter for the following specifications Quality factor $Q = 3$, Pass band gain = 04, Centre Frequency = 1 KHz. [8]
- b) Explain the working principle of an oscillator. Explain Wein-bridge oscillator using op-amp. [8]

OR

- Q10)** a) Explain how the comparator can be used as a square and triangular function generator. Derive the equation of output frequency. [8]
- b) Draw the neat diagram of F to V converter using IC9400 and explain its operation. [8]

Q11)a) Explain the operation of PLL using a neat block diagram. Define the terms Centre frequency and capture time related to PLL. [8]

b) Write a short notes on [8]

i) Log Amplifier

ii) Frequency synthesizer using PLL.

OR

Q12)a) Calculate output frequency f_o , lock range and capture range of PLL if the timing parameters are $C_T = 0.1 \mu f$, $R_T = 1k\Omega$. The filter capacitor is $10 \mu f$. [6]

b) Write a short note on Sallen and Key second order active Low Pass Filter. [6]

c) Compare active and passive filters. [4]



Total No. of Questions : 12]

SEAT No. :

P4287

[4758] - 903

[Total No. of Pages :3

T.E. (E & TC)

ADVANCED MICROPROCESSORS

(2003 Course) (End Semester) (304188)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answers the Q.1 or Q.2 and Q.3 or Q.4 and 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 should be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of calculator is allowed.*
- 6) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Draw and explain 8086 architecture in detail. [8]
b) Write a 8086 microprocessor assembly program to reverse the accepted user string. also find the length of string. [8]

OR

- Q2)** a) Explain need of memory segmentation. [4]
b) Explain the different addressing modes of 8086 microprocessor. [6]
c) Write a 8086 microprocessor assembly program to convert the user input string into upper case letter. [6]

- Q3)** a) State the important features of virtual and protected mode of 80386 microprocessor. [8]
b) What is pipeline hazards? Explain branch prediction. [8]

OR

P.T.O.

- Q4)** a) Explain virtual memory, also describe paging mechanism. [8]
b) Draw and explain 80386 programmers model in protected mode detail. [8]

- Q5)** a) Draw and explain functional block diagram of DMA controller in detail. [10]
b) Explain keyboard interfacing in detail. [8]

OR

- Q6)** a) Describe block diagram of PC hardware-mother board. [10]
b) Explain CDROM interfacing in detail. [8]

SECTION - II

- Q7)** Write short notes on any three. [18]
a) USB
b) EISA
c) PCI
d) VXI

OR

- Q8)** a) Draw and explain 8 bit DAC interfacing to a parallel port. Also write program for the same. [10]
b) List the specification of EISA bus. [8]
- Q9)** a) What is shell and shell programming? [8]
b) Explain device driver, also explain the structure of MS DOS device driver. [8]

OR

- Q10)a)** What is TSR? Explain TSR with suitable example. [8]
- b) Explain file management in OS. Explain file attribute and file structure in detail. [8]

- Q11)a)** Compare RISC and CISC microprocessors. [8]
- b) What are the features of ARM7? [8]

OR

- Q12)a)** Draw and explain ARM architecture. [8]
- b) Explain ARM programmers model. [8]



Total No. of Questions : 12]

SEAT No. :

P3678

[4758] - 904

[Total No. of Pages :5

T.E. (E & TC/Electronics)

ELECTROMAGNETIC WAVES & RADIATING SYSTEMS (EWRS)

(2003 Course)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answers to the two sections should be written in separate books.*
- 2) *Figures to the right indicate full marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator is allowed.*
- 5) *Assume suitable data, if necessary.*
- 6) *Attempt Q.1 or 2, Q.3 or 4, Q.5 or 6 from section I and Q.7 or 8, Q.9 or 10, Q.11 or 12 from section II.*

SECTION - I

- Q1)** a) Define Electric flux density \bar{D} . State & prove the differential form of Gauss's law. [8]
- b) Derive the relationship between magnetic flux density \bar{B} & vector magnetic potential \bar{A} . [8]

OR

- Q2)** a) What is Laplace equation? Derive expression for parallel plate capacitor using Laplace's equation. [8]
- b) What is continuity equation. Derive it's integral & differential form. Explain its significance. [8]

- Q3)** a) State & explain Maxwell's equations in differential & integral form. [8]
- b) A parallel -plate capacitor with plate area of 5cm^2 and plate separation of 3mm has a voltage $50 \sin 10^3 t$ volts applied to its plates. Calculate the displacement current assuming $\epsilon = 2\epsilon_0$. [10]

OR

P.T.O.

Q4) a) Explain the terms conduction current density & displacement current density. Derive the expression of $\nabla \times \mathbf{H} = \mathbf{J} + \frac{\partial \mathbf{D}}{\partial t}$. [8]

b) The E & H field in free space are given by [10]

$$\mathbf{E} = \frac{50}{\rho} \cos(10^6 t + \beta z) \mathbf{a}_\phi \text{ V/m}$$

$$\mathbf{H} = \frac{H_0}{\rho} \cos(10^6 t + \beta z) \mathbf{a}_\phi \text{ A/m}$$

Express these in phasor form & determine the constants H_0 & β such that the fields satisfy Maxwell's equations.

Q5) a) Define & explain in detail. [8]

- i) Intrinsic impedance
- ii) Loss tangent
- iii) Attenuation constant
- iv) Phase constant

b) In a lossless dielectric for which $\eta = 60\pi$, $\mu_r = 1$ and $\mathbf{H} = -0.1 \cos(\omega t - z) \mathbf{a}_x + 0.5 \sin(\omega t - z) \mathbf{a}_y$ A/m, calculate ϵ_r & ω . [8]

OR

Q6) a) Explain the following terms. [8]

- i) Skin effect
- ii) Skin depth
- iii) Skin resistance
- iv) dc resistance

b) In a nonmagnetic medium $\mathbf{E} = 4 \sin(2\pi \times 10^7 t - 0.8x) \mathbf{a}_z$ V/m. [8]

Find

- i) ϵ_r, η
- ii) The time-average power carried by the wave.

SECTION - II

Q7) a) Explain the following terms. **[8]**

- i) Single stub & Double stub
- ii) Impedance transformer using $\lambda/4$ line.

b) A certain transmission line 2m long operating at $\omega = 10^6$ rad/s has $\alpha = 8$ dB/m, $\beta = 1$ rad/m, & $Z_0 = 60 + j40 \Omega$. If the line is connected to a source of $10 \angle 0^\circ$ Volts, $z_g = 40 \Omega$ & terminated by a load of $20 + j50 \Omega$, determine **[10]**

- i) The input impedance
- ii) The sending - end current

OR

Q8) a) Explain the following terms **[8]**

- i) Reflection coefficient
- ii) Transmission coefficient
- iii) Characteristic Impedance
- iv) Series & shunt Impedance

b) A lossless transmission line with $Z_0 = 50 \Omega$ is 30m long & operate at 2MHz. The line is terminated with a load $Z_L = 60 + j40 \Omega$. If $U = 0.6C$ on the line, find **[10]**

- i) the reflection coefficient r
- ii) the standing wave ratios

Q9) a) An electric field strength of $10\mu\text{ V/m}$ is to be measured at an observation point $\theta = \pi/2$, 500km from a half-wave (resonant) dipole antenna operating in air at 50MHz. **[8]**

- i) What is the length of the dipole?
- ii) Calculate the current that must be fed to the antenna.

b) Explain the following antenna parameters **[8]**

- i) Directivity
- ii) Gain
- iii) HPBW & FNBW
- iv) Radiation efficiency

OR

Q10)a) A magnetic field strength of $5\mu\text{ A/m}$ is required at a point on $\theta = \pi/2$, which is 2km from an antenna in air. Neglecting ohmic loss, how much power must the antenna transmit if it is **[8]**

- i) A Hertzian dipole of length $\lambda/25$?
- ii) A half-wave dipole?

b) Explain the following. **[8]**

- i) Near and far field
- ii) Antenna regions

Q11)a) Explain the following. **[8]**

- i) Broad side array
- ii) End fire array

b) Explain in detail Microstrip patch antenna. [8]

OR

Q12) Write a short on (any 4). [16]

- a) Slot antenna
- b) Horn antenna
- c) Parabolic antenna
- d) Yagi-Uda antenna
- e) Helical antenna



Total No. of Questions : 12]

SEAT No. :

P3679

[4758] - 905

[Total No. of Pages :3

T.E. (E & TC)

INFORMATION THEORY AND CODING TECHNIQUES

(2003 Course) (304192) (Semester -II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Ans Two sections in separate Books.*
- 2) *Solve Q.1 or Q.2, Q.3 or Q.4 and Q.5 or Q.6 from Section -I and solve Q.7 or Q.8, Q.9 or Q.10, and Q.11 or Q.12 from Section -II.*
- 3) *Figures to the right indicates full marks.*
- 4) *Assume suitable data, if required.*

SECTION - I

- Q1)** a) A zero memory source emits six messages with probabilities of {0.20, 0.35, 0.16, 0.15, 0.12, 0.02} find code sequence for Huffman code, entropy of sources, average code word length, efficiency and redundancy. [9]
- b) Draw channel Diagram and determine the probabilities associated with equiprobable inputs Also find the mutual information if the channel matrix is $P[Y/X] = [0.9, 0.1: 0.2, 0.8]$. [9]

OR

- Q2)** a) Determine the Lampel ziv code for the following bit stream 0100111110010100000101010110011. Recover the original sequence from the encoded stream. [9]
- b) State and explain all shannons theorem with respect to Information theory. [9]

- Q3)** a) Explain with block diagram steps in Data compression. [8]
- b) Explain M-ary PSK & M-ary FSK system with reference to Shannon's limit. [8]

OR

P.T.O.

- Q4) a)** Explain any two properties of mutual information and Show that Shannon's limit for AWGN Channel is -1.6dB. [8]
- b) Explain the rate distortion Theory and Sphere tracking problem. [8]

- Q5) a)** Find the generator polynomial $g(x)$ for a systematic (7,4) cyclic code and find code words for the following data vectors: 1011, 1110 and 1111, 1010. Given that $x^7 + 1 = (x + 1)(X^3 + x + 1)(X^3 + x^2 + 1)$. [8]
- b) Explain Features of Golay code and comment on error detection probability of CRC code. [8]

OR

- Q6) a)** Obtain the code words for the (6,3) LBC which has the generator matrix of $G = [1\ 1\ 0\ 1\ 0\ 0 : 0\ 1\ 1\ 0\ 1\ 0 : 1\ 0\ 1\ 0\ 0\ 1]$, If code word $C = 1\ 0\ 1\ 1\ 1\ 0$ is transmitted and received code word is $r = 0\ 0\ 1\ 1\ 1\ 0$ obtain the correct code word by use of syndrome polynomial. [8]
- b) What is mean by burst? How burst error correction takes place? Explain with example. [8]

SECTION - II

- Q7) a)** For the Convolution encoder shown in figure below, sketch the state diagram and Trellis diagram. Find the output data sequence for the input data sequence 10111. [8]

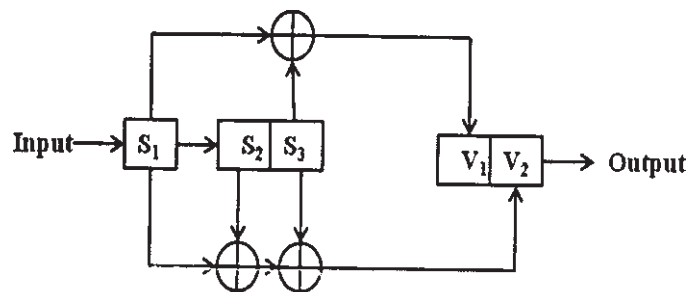


Figure (1) convolution encoder

- b) What are turbo codes, Explain the necessity of interleaver in turbo codes. [8]

OR

- Q8)** a) Compare the performance of Binary systematic channel and Binary AWGN channel with respect to Asymptotic coding gain. [8]
- b) Find the output data sequence of viterbi algorithm to decode the encoded sequence 11,01,01,00,01. The convolution encoder used have the outputs as $g_1(111)$ and $g_2 = 101$. [8]

- Q9)** a) Design BCH code with block length $n = 15$ & error correcting capability $t_c = 1,2,3$. [9]
- b) What are data encryption Standards Discuss about systematic and A-systematic Cryptography. [9]

OR

- Q10)**a) Find minimal polynomial of $GF(2^3)$ whose trans field if $GF(2)$ with the primitive polynomial $x^3 + x + 1$. [9]
- b) Discuss in detail about RSA algorithm. Encode the word 'CODE' using the key generated by two prime numbers 5 and 11. [9]

- Q11)**a) Draw and explain the block diagram of space diversity technique. Enlist different Types. [8]
- b) Compare TDMA, CDMA, FDMA and SDMA wireless Techniques. [8]

OR

- Q12)**a) Explain various Keplers law with respect to satellite communications. [8]
- b) Explain the following terms related to mobile communications. [8]
- i) Frequency reuse,
- ii) Hand-off



Total No. of Questions : 8]

SEAT No. :

P4721

[Total No. of Pages : 4

[4758]-906

T.E. (Civil)

STRUCTURAL DESIGN - I
(2003 Pattern)

Time : 4 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) *Figures to the right indicate full marks.*
- 4) *Neat diagrams must be drawn wherever necessary.*
- 5) *Use of electronic pocket calculator IS: 800 and steel table is allowed.*
- 6) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) What are the advantage and disadvantage of construction in structural steel. [5]
- b) An I-section use as a bracket connected to flange of column as shown in fig. 1 b. Column is carrying a load of 120 kN at free end at a distance of 250 mm from the column flange. Design the welded connection. [12]
- c) A tie member of a roof truss carries a load of 200 kN. Design a section using unequal angle with longer leg connected to gusset plate. Also design the bolted connection. [8]
- Q2)** a) Differentiate between black bolt and HSFG bolts. Explain in details with sketches. [7]
- b) An ISLB 300 @ 37.7 kg/m secondary beam transmits an end reaction of 125 kN to the web of ISHB 400 @ 77.4 kg/m main beam. Design bolted framed connection. Top flange of both the beams are at same level. Draw the neat sketch showing design details. [10]

P.T.O.

- c) A strut of a tower carries an axial load of 200 kN resulting due to wind load. The unsupported length of member is 3 m. Design a single angle section with welded connection and draw the sketch with design details. [8]

Q3) a) State and explain the design steps for the design of gantry girder. [9]

- b) A simply supported beam of 5 m effective span carries uniformly distributed load of 30 kN/m on entire span along with a central point load of 50 kN. Compression flange of beam is laterally supported only at ends and centre of beam. The ends are restrained against torsion. Design a cross section of beam and apply usual checks. [16]

Q4) a) Calculate the moment resisting capacity of a built up beam comprising of ISMB 450 @ 72.4 kg/m with a flange plate of 250 mm × 12 mm one each on both flange. Also calculate maximum superimposed uniformly distributed load the beam can carry on simply supported span of 6m. The compression flange is laterally restrained throughout the length. [12]

- b) Design cross section of a welded plate girder carrying uniformly distributed load of 120 kN/m on entire span of 18 m. The compression flange is laterally restrained throughout the length. Also design the end bearing stiffener. [13]

SECTION - II

Q5) a) A truss as shown in Fig. 5 a is used for an industrial building situated at Pune. The truss is covered with AC sheet. Calculate Panel point dead load, live load and wind load for the truss. Assume $k_1 = 1$, $k_2 = 0.9$, $k_3 = 1$, $c_{pe} = -0.7$ $c_{pi} = + 0.5$ and spacing of truss = 3 m. [15]

- b) A foot over bridge as shown in Fig. 5 b is subjected to live load of 5 kN/m² and dead load of 1.2 kN/m². The clear available width is 2.8 m and height of truss is 2 m. Design the cross beam for the bridge. [10]

Q6) a) For the truss shown in Fig. 5 a, panel point dead load, live load and wind load are as follows. Design members U4U5, L4L5 and U5L4. [13]

S.N.	Type of load	Intermediate panel point load in kN
01	Dead load	03
02	Live load	02
03	Wind load	05 (suction)

- b) For the foot over bridge shown in Fig. 5 b, design the members U4U5, L4L5 and U5L4. RCC slab of 120 mm thick is provided as flooring. Clear width is 2.8 m and live load is 4 kN/m². [12]
- Q7)** a) A column consists of two channel sections placed face to face subjected to an axial force of 800 kN. The unsupported length is 10 m. Assuming column to fixed at both ends, design the section. Also design suitable lacing system and draw the design sketches. [20]
- b) Explain merits and demerits of cold formed light gauge section. [5]
- Q8)** a) Design a column base for an axial load of 400 kN and bending moment of 75 kNm. A section ISHB 400 @ 77.4 kg/m is used as a column. The bearing stress in concrete is 4 N/mm². [20]
- b) Explain following term with respect to light gauge section. [5]
- i) Stiffened element.
 - ii) Unstiffened element.
 - iii) Multiple stiffened element.
 - iv) Flat width ratio.
 - v) Effective design width.

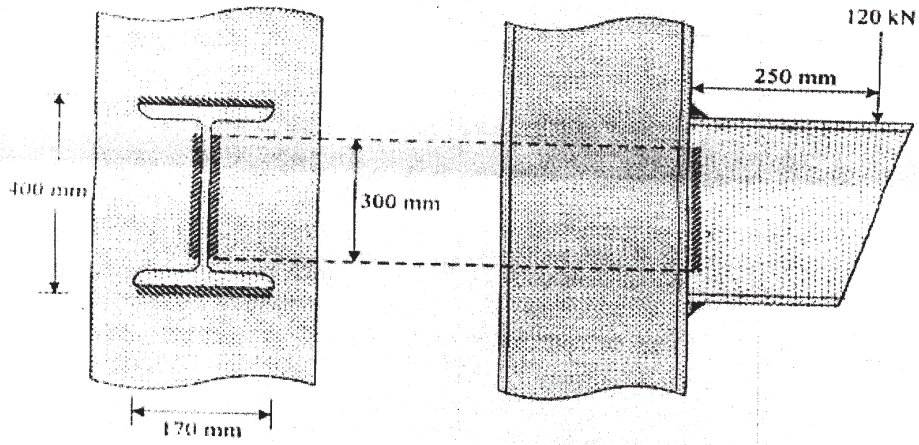


Fig. 1 b

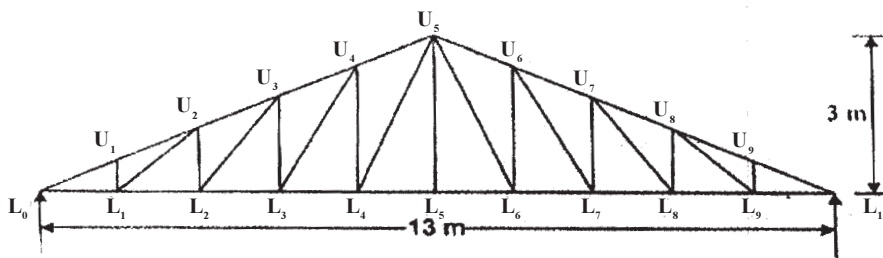


Fig. 5. a

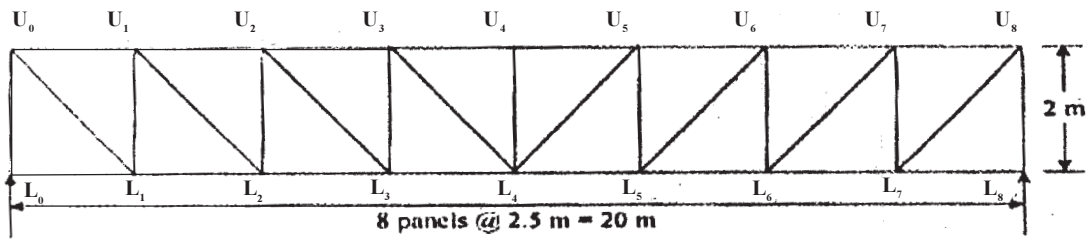


Fig. 5. b



Total No. of Questions : 12]

SEAT No. :

P3863

[Total No. of Pages : 2

[4758] - 91

T.E. (Chemical)

CHEMICAL PROCESS TECHNOLOGY

(2008 Pattern)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Describe Solvay process with detail Process flow diagram. [10]
b) Explain Unit operations & unit processes by giving three examples of each. [8]

OR

- Q2)** a) Explain various types of process diagrams. [6]
b) Explain manufacturing of bromine. [4]
c) Describe production of salt from sea water & give its major engineering problems. [8]

- Q3)** a) Explain manufacturing of Nitric acid. [8]
b) Explain frosch Process for manufacturing of sulphur. [8]

OR

- Q4)** a) Explain manufacturing of urea with its major Engineering problems. [9]
b) Discuss production of Ammonium Nitrate. [7]

- Q5)** a) Explain Kraft Pulp process. [8]
b) Explain Production of dextrin (starch derivative) [8]

P.T.O.

OR

- Q6)** a) Discuss sugar production with neat sketch. [8]
b) Explain manufacturing of Penicillin. [8]

SECTION - II

- Q7)** a) Explain destructive distillation of coal. [8]
b) Describe Hydrogenation of oil. [8]

OR

- Q8)** a) Describe production of soap & glycerine. [8]
b) Explain solvent Extraction process. [8]

- Q9)** Explain any two refinery operations in detail. [16]

OR

- Q10)** Discuss production of any two industrial gases with their applications and compositions. [16]

- Q11)** a) Describe production of Isopropyl alcohol. [8]
b) Describe production of styrene. [10]

OR

- Q12)** Describe any three from the following with diagram. [18]
a) Production of methanol.
b) Production of cumene.
c) Production of Ethylene.
d) Production of Phenol.
e) Production of Acetone.

❧❧❧❧

Total No. of Questions : 6]

SEAT No. :

P2352

[4758]-92

[Total No. of Pages :3

T.E. (Chemical Engineering)
INDUSTRIAL ORGANISATION & MANAGEMENT
(2008 Course) (Semester - I) (307351)

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 must be written in separate books.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Figures to the right indicate full marks.*

SECTION - I

Q1) Explain the following:

[16]

- a) Unity of Command & Direction.
- b) Authority and Responsibility
- c) Administration.
- d) Division of Labour.

OR

- a) Planning is looking ahead and Control in looking back. Comment. **[6]**
- b) Define Management. Explain in details various functions of Management. **[10]**

Q2) a) What is manpower planning? What are the objectives and techniques of Manpower Planning? **[8]**

- b) What is Performance Appraisal? Explain the importance and need of performance appraisal. **[8]**

OR

P.T.O.

- a) Define job evaluation and explain any methods of job evaluation. [8]
- b) Explain the functions of Trade Unions. [8]

Q3) Write short notes on the following: [18]

- a) Inspection and Quality Control.
- b) Vendor Development.
- c) EOQ.

OR

- a) Inventory Control.
- b) Functions of Store Keeper.
- c) Purchase Process.

[18]

SECTION - II

- Q4)** a) How it helps an enterprise to position its business in a competitive business Environment? Explain. [8]
- b) State and explain objectives and importance of advertising. [8]

OR

- a) What is Market Research? Explain various methods of market research. [8]
- b) Explain the following: [8]
 - i) Distinguish between marketing and selling.
 - ii) Distribution channels.

- Q5)** a) Explain the concept of TQM. [8]
- b) What is anti dumping duty? Explain the impact of anti dumping duty in International business. [8]

OR

a) What is International Trade? How it helps in developing and supporting Indian Economy. Explain in brief. [8]

b) Distinguish between Product Patent and Process Patent. How patent rights are different from copyright? Explain. [8]

Q6) Write short notes on: [18]

a) Flow process chart.

b) Law of contract.

c) FERA and FEMA.

OR

a) Explain the concept of Guarantee and Warrantee. [10]

b) What is work measurement? Explain the need and advantages of Work Measurement. [8]

EEE

Total No. of Questions : 12]

SEAT No. :

P2353

[4758] - 93

[Total No. of Pages :4

T.E. (Chemical)
MASS TRANSFER - I
(2008 Course) (Semester - I) (Theory)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

Q1) a) State and explain Maxwell's law of diffusion. **[8]**

- b) Calculate the amount of diffusion of acetic acid (A) in 2 hours across a film on non diffusing water (B) solution, 1 mm thick at 17°C, when concentration on opposite side of the film are 9 and 3 weight % acid respectively. The diffusivity of acetic acid in solution is $0.95 \times 10^{-9} \text{ m}^2/\text{sec}$. **[10]**

Data: At 17°C:

Density of 9% solution = 1012 kg/m³

Density of 3% solution = 1003 kg/m³

Molecular weight of acetic acid = 60

Molecular weight of water = 18

OR

- Q2) a)** A volatile organic compound benzene costing Rs. 45 per kg is stored in a tank 10m diameter and open at top. A stagnant air film 10mm thick is covering the surface of the compound beyond which the compound is absent. If the atmospheric temperature is 25°C. Vapor pressure of the compound is 150mm Hg and its molar diffusivity is 0.02m²/hr. Calculate the loss of benzene in Rs/day. **[10]**

P.T.O.

- b) Derive the expression to calculate the flux of steady state diffusion of A through non diffusing B. [4]
- c) What is mass transfer? Define molecular diffusion and Fick's law of diffusion. [4]

- Q3)** a) Explain penetration theory and surface renewal theory. [8]
- b) Explain in short the concept of mass transfer coefficient in laminar flow and turbulent flow. [4]
- c) What are mass, heat and momentum analogies, discuss in brief. [4]

OR

- Q4)** a) Ammonia is absorbed by water in a wetted wall column using operating temperature 20°C and 1 atm.pressure . The overall gas coefficient is 1 kmol/m².atm. At one point in the column the gas contains 10 mole% NH₃ and the liquid phase contains 0.155 mole NH₃/m³ of solution, 96% of total resistance is in the gas phase. Assume Henry's law constant at 293°K = 4.247 × 10⁻³ atm/mol/m³. Determine individual film coefficients and the molar flux. [8]
- b) Derive an expression for overall resistance to mass transfer in gas and liquid phase. [8]

- Q5)** a) Write a short note on: [8]
- i) Minimum Gas-liquid ratio for absorber
- ii) Murphee stage efficiency
- b) A packed tower is designed to recover 98% CO₂ from a gas mixture containing 10% CO₂ and 90% air using water. The equilibrium relation is given as $y = 14x$, where y is kg CO₂/kg dry air and x is kg CO₂/kg H₂O. The water to gas rate is kept 30% more than the minimum value. Calculate the height of tower if (HTU) OG = 1m. [8]

OR

- Q6) a)** Ammonia gas is to be removed from its mixture with air by scrubbing with water in a packed tower. A gas mixture entering the column contains 6% NH_3 (Vol %) and rest air (Vol.), water free of NH_3 enters in the column in countercurrent direction. If 90% of the ammonia is to be removed using NH_3 free water at the rate of 2 mole water per mole of air. Determine the exit concentration of ammonia. The gas-liquid equilibrium relationship is $Y = 0.08X$,
 where, Y = moles of NH_3 /mole of air,
 X = moles of NH_3 /mole of water. **[8]**
- b) Discuss the factors to be considered for the selection of a suitable solvent for gas absorption process. **[4]**
- c) Define absorption, absorption factor and stripping factor. **[4]**

SECTION - II

- Q7) a)** The air entering into a cooling tower with characteristic as follows: Dry Bulb Temperature = 30°C wet bulb temperature = 25°C and 1 standard atmospheric pressure. Find **[10]**
- i) absolute humidity,
 - ii) percentage humidity,
 - iii) percentage relative humidity,
 - iv) dew point and
 - v) total enthalpy
- b) What are the different types of cooling towers? Explain any one in brief. **[6]**

OR

- Q8) a)** In a vessel at 300°K and 101.3kN/m^2 the relative humidity of water vapor in air is 25. If the partial pressure of water vapor when air is saturated with vapor at 300°K is 3.6kN/m^2 . Calculate, **[8]**
- i) partial pressure of water vapor,
 - ii) humidity of air and
 - iii) percentage humidity

- b) Define wet bulb temperature and derive an expression relating wet bulb temp with absolute humidity and psychometric ratio. [8]

Q9) a) What is the role of different types of trays used in plate column? Explain bubble cap and sieve tray in brief. [8]

- b) Give comparison between packed columns and tray columns. [8]

OR

Q10) a) Explain role of packing's in packed column. Give detail classification of packing's. [8]

- b) What are the various equipments used for gas-liquid contact. With neat sketch explain [8]

i) Venturi Scrubber,

ii) Spray Towers

Q11) a) Derive an expression for calculating total time required for drying. [10]

- b) A wet solid is to be dried from 35% to 10% moisture under constant drying conditions in five hours. If the equilibrium moisture content is 4% and critical moisture content is 14% how long it will take to dry solids to 6% moisture under same conditions? [8]

OR

Q12) a) Data on drying rate curve of a particular solid is given below. The weight of the dry material in the solid is 48kg/m². Calculate the time required to dry the material from 25% to 8% moisture (dry basis) [12]

kg/kg dry solid (X): 0.30 0.20 0.18 0.15 0.14 0.11 0.07 0.05

kg/hr.m² (N) : 1.22 1.22 1.14 0.90 0.80 0.56 0.22 0.05

- b) Explain rate of drying curve with neat sketch. [6]



Total No. of Questions : 12]

SEAT No. :

P2354

[4758] - 94

[Total No. of Pages :3

T.E. (Chemical)
TRANSPORT PHENOMENA
(2008 Course) (Semester - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answers to the two sections should be written in separate answer books.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side 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) Derive the velocity profile and momentum profile for a Newtonian fluid through a circular pipe inclined at angle β . Find the ratio of maximum velocity to the average velocity. **[18]**

OR

Q2) a) Stating clearly all the assumptions, derive equation of continuity in three dimensional co-ordinate, for a flow of fluid through isothermal systems. **[8]**

b) Calculate the required torque in N-m and power consumption in H.P. to run the shaft in the friction bearing. The length of bearing surface on the shaft is 5.08cm, that the shaft is turning at 200 r.p.m., the velocity of the lubricant is 200cp, and the fluid density is 243.8Kg/m³. Inner radius = 2.54×10^{-2} m, outer radius = 0.02545m. **[10]**

Q3) a) Compare the friction factor for flow in tubes and flow around sphere. **[8]**

P.T.O.

- b) A hollow steel sphere, 5.00mm in diameter, with a mass of 0.05gm is released in a column of liquid and attains a terminal velocity of 0.500cmsec⁻¹. The liquid density is 0.900gm cm⁻³. The local acceleration of gravity is 980.7 cm sec⁻². The sphere is far enough from the containing walls so that their effect may be neglected. [8]

- i) compute the drag force in dynes
ii) Compute the drag coefficient (friction factor).

OR

- Q4)** a) Explain Buckingham's PI theorem. [4]

- b) Pressure drop is 10Psi over 100ft of small pipe, 1.5 in ID having viscosity of 5CP and density of 960 kg/m³. Calculate velocity and flow region. [6]

- c) What pressure drop is required in order to pump water at 20°C through a pipe 25cm in diameter and length 1234m at rate of 1.97 m³/sec. The pipe is horizontal and contains four standard-radius 90° elbows and two 45° elbows. Viscosity of water at 20° C = 1CP. [6]

- Q5)** a) Explain theory of thermal conductivity of gases at low density. [8]

- b) Calculate the thermal conductivity of molecular oxygen at 300K and low pressure

Data: Heat capacity of oxygen at 300° K and low pressure = 7.019 cal/g mole K, $\sigma = 3.433 \text{ \AA}$, $\Omega_{\mu} = 1.074$. [8]

OR

- Q6)** a) Derive the expression for heat conduction with a chemical heat source. [10]

- b) A thick walled cylindrical tubing of hard rubber having an inside radius of 5mm and an outside radius of 20mm is being used as a temporary cooling coil in a bath. Ice water is flowing rapidly inside, and the inside wall temperature is 274.9K. The outside surface temperature is 297.1K. A total of 14.65 W heat must be removed from the bath by the cooling coil. How many m of tubing are needed. The thermal conductivity is 0.151 W/mK. [6]

SECTION - II

- Q7)** a) What are semiempirical expressions for turbulent energy flux and what are their applications. [10]
b) Explain Deisslers Empirical formula for the region near the wall. [6]

OR

- Q8)** a) State and explain comparison of forced and free convection in nonisothermal systems. [8]
b) What are time smoothing energy equations. State its utility. [8]

- Q9)** a) The Value of D_{AB} for a dilute solution of methanol in water at 15°C is $1.28 \times 10^{-5} \text{cm}^2/\text{sec}$. Calculate D_{AB} for the same solution at 100°C, using Wilke-Chang equation, μ_1 at 15°C = 1.14cp, μ_2 at 100°C = 0.284 cp. [8]
b) Explain the procedure for setting up and solving mass flow problems. [8]

OR

- Q10)** Show that $N_{AZ}|_{z=z_1} = \frac{CD_{AB}}{(z_2 - z_1)x_{B_{lm}}}(x_{A_1} - x_{A_2})$. If the rate of mass transfer is related to a characteristic concentration driving force $x_{A_1} - x_{A_2}$ for diffusion through a stagnant gas film. [16]

- Q11)** a) Write analogies among mass, heat and momentum transfer. [9]
b) Explain correlations of binary mass transfer coefficients in one phase at low mass transfer rates. [9]

OR

- Q12)** A spherical drop of water, 0.05cm in diameter is falling at a velocity of 215cm/sec through dry, still air at 1 atm pressure. Estimate the instantaneous rate of evaporation from the drop if the drop surface is at 21°C and air at 60°C. The vapor pressure of water at 21°C is 0.0247 atm. Assume pseudo steady state condition. [18]



Total No. of Questions : 12]

SEAT No. :

P3911

[Total No. of Pages : 4

[4758]- 95
T.E. (Chemical)
CHEMICAL REACTION ENGINEERING - I
(2008 Pattern)

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 answer books.*
- 3) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 4) *Assume suitable data if necessary.*

SECTION - I

- Q1)** a) Discuss about molecularity, order of reaction and rate constant. [6]
- b) On doubling the concentration of the reactant the rate of reaction triples. Find the reaction order. [6]
- c) Differentiate between elementary and nonelementary reactions. [6]

OR

- Q2)** a) Experimental analysis shows that the homogeneous decomposition of ozone proceeds with a rate. [8]

$$-r_{O_3} = K [O_3]^2 [O_3]^{-1}$$

- i) Suggest a two step mechanism to explain this rate.
 - ii) What is the overall order of reaction?
- b) Phosphine decomposes when heated according to following reactions.
- $$4PH_3 \rightarrow P_4(g) + 6H_2(g)$$
- at given instant the rate at which phosphine decomposes is 2.4×10^{-3} mol /lit.s. Express the rate in three different ways using differential notation and show relationship between them.

What is the rate of formation of

- i) P_4 and
- ii) H_2

[10]

P.T.O.

Q3) a) Explain differential method of analysis for first order and unimolecular second order reaction. [4]

b) At certain temperature, the half life period and initial concentration for a reaction are

$$t_{1/2} = 400 \text{ sec, } C_{A_0} = 0.415 \text{ mol/lit}$$

$$t_{1/2} = 300 \text{ sec, } C_{A_0} = 0.65 \text{ mol/lit}$$

Find the rate constant of reaction. [6]

c) Derive integrated rate expression for first order reaction $A \rightarrow \text{products}$ with variable volume system which is as follows.

$$-\ln(1 - X_A) = -\ln\left(1 - \frac{\Delta V}{\epsilon_A V_0}\right) = K t \quad [6]$$

OR

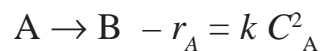
Q4) a) Aqueous A at a concentration $C_{A_0} = 1 \text{ mol/lit}$ is introduced into a batch reactor where it reacts away to form product R according to stoichiometry. $A \rightarrow R$. The concentration of A in the reactor is monitored at various times as shown below.

t min	0	100	200	300	400
CA mol/m ³	1000	500	333	250	200

For $CA_0 = 500 \text{ mol/m}^3$ find the conversion of reactant after 4.5 hours in batch reactor. [10]

b) Find first order rate constant for disappearance of A in the gas reaction, $A \rightarrow 1.6 R$. If the volume of reaction mixture starting with pure A increases by 75% in 8 minutes, the total pressure within the system stays at 1.2 atm and the temperature is 25°C. [6]

Q5) A homogeneous liquid phase reaction with the stoichiometry and the kinetics [16]



Takes place with 50% conversion in mixed flow reactor.

- Find the conversion if this reactor is replaced by another mixed flow reactor having volume 5 times that of original reactor.
- Find the conversion if original reactor is replaced by a plug flow reactor of the same size all else remain unchanged.

OR

Q6) a) Derive performance equations for mixed flow reactors of different sizes in series. [8]

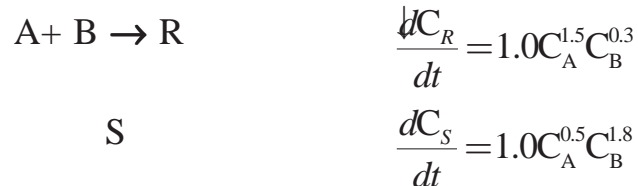
a) Derive performance equation of plug Flow Reactor. [8]

SECTION - II

Q7) a) Explain quantitative treatment of mixed flow reactor for a first order reaction in series. [18]

OR

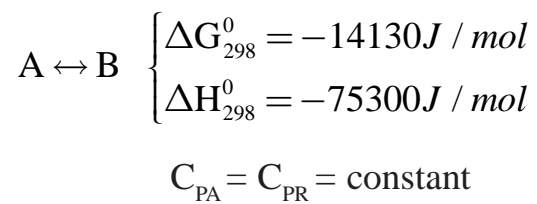
Q8) Consider the following aqueous reaction [18]



For 90% conversion of A find the concentration of R in the product stream. Equal volumetric flow rates of the A and of B stream are fed to the reactor, and each stream has a concentration of 20 mol/lit of reactant. The flow in the reactor follow:

- Plug flow
- Mixed flow
- Plug flow with low concentration of B when plug flow A with mixed flow B.

- Q9)** a) Draw and explain energy balance equation line for adiabatic operations. [4]
 b) Between 0°C and 100 °C determine the equilibrium conversion for the elementary aqueous reaction



Present the results in the form of temperature versus conversion. What restriction should be placed on the reactor operating isothermally if we are to obtain a conversion of 75% or higher? [12]

OR

- Q10)** a) Explain optimum temperature progression for exothermic reversible reaction. [6]
 b) Draw and explain energy balance equation line for adiabatic operations. [4]
 c) Explain effect of temperature, pressure and inerts on equilibrium conversions for exothermic and endothermic reactions. [6]

- Q11)** a) A pulse of tracer of amount 3.0 mg is injected to stirred vessel through feed stream. The following table shows the measured concentration in the outflow stream. Calculate the mean residence time and generate 'E' curve. The volumetric flow rate and residence time are 1.5 L/S and 50 sec respectively. [16]

Time (sec)	0	10	20	30	40	50	60	70	80	90	100	110
Concentration mg/L	0	0.1	0.3	0.6	0.7	0.65	0.6	0.4	0.1	0.08	0.04	0.02

OR

- Q12)** Write notes on (any three): [16]
 a) C and E,F curves.
 b) Dispersion model.
 c) Examples of non ideality in reactors.
 d) Tank in series model.



Total No. of Questions : 12]

SEAT No. :

P2355

[4758]-96

[Total No. of Pages : 5

T.E. (Chemical)

CHEMICAL ENGINEERING DESIGN -I

(2008 Pattern)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) Answer to the two sections should be written in separate answer books.*
- 2) Neat diagrams must be drawn wherever necessary.*
- 3) Use of calculator and steam table is allowed.*
- 4) Assume suitable data, if necessary.*
- 5) Figures to the right indicates full marks.*

SECTION - I

- Q1)** a) Discuss the material of construction for chemical process equipment. **[8]**
- b) Discuss in brief nondestructive tests for process vessels. **[8]**

OR

- Q2)** a) Describe optimization techniques in details. **[8]**
- b) Explain plastic as material of construction for chemical plants. **[8]**
- Q3)** a) With neat sketches explain the constructional features of different types of heads and give their design equations. **[8]**
- b) Explain types of pressure vessels and various stresses developed in the wall of pressure vessels with neat sketches. **[8]**

OR

P.T.O.

Q4) a) A vessel is to have one end closed by a blind flange. Calculate the minimum thickness of blind flange. Design data: **[10]**

- Design pressure = 170 kg/cm², Design Temperature = 121°C
- Allowable bolt stress at gasket seating and operating conditions = 1306 kg/cm²
- Allowable flange stress at gasket seating and operating condition = 1190 kg/cm²
- Inside dia of gasket = 34.4 cm
- Width of gasket = 2.5 cm, m=3
- $Y_a = 680.3 \text{ kg/cm}^2$, BCD = 56.2 cm

(50 mm diameter, 16 bolts are used)

b) Explain different types of gaskets. What are criteria for selection of gaskets? **[6]**

Q5) a) A tank is to store 26,000kg of liquid having density 980 kg/m³. Due to space limitations the maximum tank diameter can be 2.4 m. Calculate height of the tank if liquid is filled upto roof to shell junction. No corrosion allowance is necessary. Welded joint efficiency is 85%. The permissible stress of the material is 1020 kg/cm². Also calculate various course thicknesses. **[10]**

b) Explain various types of losses during storage of volatile liquids. **[8]**

OR

Q6) a) A high pressure vessel fabricated by shrink fit construction has three concentric shells. The ratio of outer radius to inner radius for all shells is 1.4. The vessel is subjected to an internal pressure of 150 kg/cm². Pressure outside the vessel is atmospheric

Estimate:

- i) The maximum combined stress at the interfaces of concentric shells
- ii) Interface pressure resulting from internal pressure and shrinkage stresses

Data: Modulus of elasticity = 2×10^6 kg/cm².

Internal diameter of vessel = 400 mm. [10]

- b) Explain construction of multilayered vessel. [8]

SECTION - II

Q7) a) Write design procedure for skirt support with relevant sketches and equation. It should include [10]

- Thickness of skirt
- Period of vibration
- Base bearing plate
- Anchor bolt

- b) Explain saddle support design with neat diagram. [6]

OR

Q8) a) A tall vertical vessel 1.5 m in diameter and 13 m high is to be provided with vertical skirt support. Weight of the vessel with all its attachments is 80,000 kg. Diameter of skirt is equal to the diameter of vessel. Height of skirt is 2.2 m, wind pressure acting over the vessel is 100 kg/m². Seismic coefficient = 0.08, permissible tensile stress of skirt material = 960 kg/m², permissible compressive stress is 1/3rd of yield stress of material. Yield stress is 2400 kg/cm². Estimate the thickness of skirt support. [10]

- b) With neat sketches explain the leg support and lug support for vertical vessel. [6]

Q9) 1800 kg/hr of ethylene glycol is to be cooled from 100°C to 60°C by water available at 15°C. The maximum temperature to which water can be heated is 42°C. **[16]**

Ethylene glycol is circulated through the tubes while water flows through the annulus of concentric tube of heat exchanger,

Inside tube is of copper while outside tube is of steel.

Inside diameter of copper tube = 12.5 mm

Outside diameter of copper tube = 14.5 mm

Inside diameter of outer steel tube = 22 mm

Fouling resistance and metal wall resistance can be neglected.

Suggest suitable design of a concentric tube heat exchanger,

The properties of ethylene glycol and water at mean temperature are

	Ethylene Glycol	Water
Density, kg/m ³	1078	995
Viscosity, N-s/m ²	3.2x10 ⁻³	0.853x10 ⁻³
Specific heat, J/kg. K	2650	4180
Thermal conductivity, W/m.K	0.261	0.614

OR

Q10)a) Discuss design of double pipe heat exchanger. **[10]**

b) What do you mean by LMTD? Why is it used in heat exchanger design? **[6]**

Q11)a) Explain the forward feed and backward feed multiple effect evaporators with neat sketches. Mention their advantages and disadvantages. [9]

b) With neat sketches explain working of plate heat exchanger (PHE). Write down advantages and disadvantages of PHE. [9]

OR

Q12) 5 kg/sec of an aqueous solution containing 12% solute is to be concentrated to 40% by weight. The feed solution at 21°C enters the last effect of a backward feed arrangement triple effect evaporator. Pressure of the heating steam is 4 kg/cm² and corresponding temperature is 143°C. Vacuum in last effect is 0.2 kg/cm² which correspond to a boiling temperature of 60°C. Overall heat transfer coefficients in individual units are as follows: [18]

$$U_1 = 1800 \text{ W/m}^2\cdot\text{K}; \quad U_2 = 1000 \text{ W/m}^2\cdot\text{K}; \quad U_3 = 600 \text{ W/m}^2\cdot\text{K}$$

Heat capacity of the liquor may be assumed as constant = 3700 J/kg.K

Latent heat of steam = 2241 kJ/kg:

Latent heat of vapor = 2357 kJ/kg.

Calculate

- Total heat transfer area.
- Steam required for evaporation.
- Total water evaporated.
- Mass of Water required for condenser.

EEE

Total No. of Questions : 12]

P2356

SEAT No. :

[Total No. of Pages :3

[4758] - 97

T.E. (Chemical)

PROCESS INSTRUMENTATION AND CONTROL

(2008 Course) (Semester- II) (309351)

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) *Your answers will be valued as a whole*
- 5) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 6) *Assume suitable data, if necessary.*

SECTION-I

- Q1)** a) Define Instrumentation and explain the purpose of instrumentation in Chemical process industries. [6]
- b) Describe the classification of instruments in detail. [8]
- c) Differentiate between analog and digital instruments. [4]

OR

- Q2)** a) Explain static and dynamic characteristics of measuring instruments. [8]
- b) Evaluate the temperature at which Fahrenheit and Centigrade Scale coincide [6]
- c) Explain the importance of Instrumentation the process industries [4]

- Q3)** a) Describe the operating principle, construction and working of radiation pyrometer. [8]
- b) Explain working of Industrial mercury in glass thermometer, with the help of a neat diagram. [8]

OR

P.T.O.

- Q4)** a) Write Short notes on. [8]
i) Themister
ii) RTD
b) Explain Seebeck effect and its application in working of a temperature measuring instrument. Name the instrument with its working diagram [8]

- Q5)** a) Enumerate the desirable characteristics of manometric liquids. Name some of the manometreic liquids and point their fields of application, advantages and limitations. [10]
b) Explain inclined leg manometer [6]

OR

- Q6)** a) Explain any one type of high pressure sensor in detail [8]
b) Explain construction and working of pirani vacuum guage [8]

SECTION - II

- Q7)** a) Explain the principle, construction and working of Orifice meter [8]
b) Discuss Pitot Tube in detail [8]

OR

- Q8)** a) Describe the principle, construction and working of Electromagnetic flow meter. [10]
b) Describe Coriolis flow meter [6]

- Q9)** a) Explain construction and working of Bubbler method and its application [8]
b) Write short notes on: [8]
i) Bob and tape method
ii) Air purge Method

OR

- Q10)** a) Explain with neat diagram, Air trap system for liquid level measurement? [8]
b) What are the objectives to use of Sight Glass and float glass for level measurement? [8]

- Q11)** a) Describe various viscosity measuring devices. [8]
b) Explain Chromatography in detail. [10]

OR

- Q12)**a) Write short notes on: [18]
i) HPLC
ii) Mass Spectroscopy
iii) Conductivity Cell
iv) I.R. Absorption Spectroscopy.



Total No. of Questions : 12]

SEAT No. :

P2357

[4758]-98

[Total No. of Pages : 6

T.E. (Chemical)
MASS TRANSFER - II
(2008 Course) (Semester - II)

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

SECTION - I

Q1) a) Write short notes on **[8]**

i) Steam distillation

ii) Azeotropic distillation

b) In A feed of 50-mole% n-heptane and 50-mole% n-octane is fed into a pipe still through a pressure reducing valve and then into a flash disengaging chamber. The vapor and liquid leaving the chamber are assumed to be in equilibrium. If the fraction of feed converted to vapor is 0.5, find the compositions of top and bottom products the equilibrium data is as follows; **[8]**

X- 1.00 0.69 0.40 0.192 0.045 0.00

Y- 1.00 0.932 0.78 0.538 0.1775 0.00

OR

P.T.O.

- Q2) a)** The system of chlorobenzene and water, If steam is blown in the still containing a mixture of these two components and the total pressure is 130 mmHg, estimate the temperature of boiling and the composition of distillate, the two components are immiscible in the liquid. [8]

Vapor pressure of chlorobenzene and water are

Vapor pressure (mmHg)	100	50	30	26
Temperature (°C chlorobenzene)	70.4	53.7	42.7	34.5
Temperature (°C water)	51.7	38.5	29.9	22.5

- b) What is distillation? Define differential distillation and derive Rayleigh equation. [8]

- Q3) a)** Partially vaporized feed of composition 42 mole% heptanes and 58 mole% ethyl benzene is to be fractionated at 1 atm to give distillate containing 95 mole% heptanes and bottom containing 95 mole% ethyl benzene. The feed is 40% liquid and 60% vapor (all in mole basis). Calculate [10]

i) Value of q and slope of q -line,

ii) min. reflux ratio,

iii) Number of plates at $R=2.5$, the equilibrium data is

X-	0	0.08	0.25	0.485	0.79	1.0
Y-	0	0.23	0.514	0.730	0.904	1.0

- b) What is reflux ratio? Derive Fenske equation for number of theoretical plates at total reflux. [6]

OR

- Q4) a)** Derive an equation for q -line. [6]

b) A continuous column having both rectifying and stripping section is to be designed to separate a binary mixture containing 50 mole% n-heptane with a distillate containing 98 mole% n-heptane and bottom containing 98 mole% n-octane. The feed is at boiling point and tower operates to one atmosphere. Using equilibrium data given below, calculate [10]

- i) minimum reflux ratio,
- ii) minimum number of theoretical plates,
- iii) if a reflux ratio of greater than the minimum reflux by 50 percent is used, how many number of theoretical plates will be required?

X	0.10	0.30	0.50	0.70	0.90	1.00
Y	0.195	0.585	0.690	0.840	0.950	1.00

Q5) a) A solution of nicotine in water containing 1% nicotine is to be extracted with kerosene at 293°K (20°C) Water and Kerosene are essentially insoluble. The equilibrium data is [10]

X = 0	0.001011	0.00246	0.00502	0.00751	0.00998	0.0102
Y = 0	0.000807	0.001961	0.00456	0.00686	0.00913	0.00935

Where

$$Y = \text{kg nicotine} / \text{kg kerosene}$$

$$X = \text{kg nicotine} / \text{kg water}$$

- i) Determine the percentage extraction of nicotine if 100 kg of a feed solution is extracted with 150 kg of solvent (kerosene)
 - ii) Repeat for three theoretical extractions using 50 kg solvent each time
- b) Derive an equation to calculate height of packed column in terms of HTU & NTU. [8]

OR

Q6) a) 1000 kg of pyridine - water solution containing 50% pyridine is to be extracted with equal amount of pure chlorobenzene. The raffinate from the first extraction is to be extracted with a weight of solvent equal to raffinate weight and so on ($S_2=R_1$, $S_3=R_2$). **[16]**

- i) What is the exit concentration and percentage recovery of pyridine after three stages.
- ii) If all the solvent is used in single stage what is the percentage recovery and exit concentration. The equilibrium data and tie line data is as given below.

Chlorobenzene Layer (C.B.)			Water Layer		
Pyridine	C.B.	Water	Pyridine	C.B.	Water
0.0	99.95	0.05	0	0.08	99.92
11.05	88.28	0.67	5.02	0.16	94.82
18.95	79.90	1.15	11.05	0.24	88.71
24.10	74.28	1.62	18.90	0.38	80.72
28.60	69.15	2.25	25.50	0.58	73.92
31.55	65.58	2.87	36.10	1.85	62.05
35.05	61.00	3.95	44.95	4.18	50.81
40.60	53.00	6.40	53.20	8.50	37.90
49.00	37.8	13.2	49.00	37.8	13.20

b) Define tie line and plait point. **[2]**

SECTION - II

- Q7)** a) Give detail procedure for finding the number of stages in multistage countercurrent leaching. [8]
- b) Derive an expression for finding the number of stages under the condition of constant underflow. [8]

OR

- Q8)** a) Oil is to be extracted from meal by means of benzene using continuous countercurrent extraction unit. The unit is expected to treat 1000 kg of meal per hour. The untreated meal contains 365 kg of oil and 30 kg of benzene. The solvent used contains 14 kg of oil and 590 kg of benzene. The exhausted solids are to contain 55 kg of unextracted oil. [14]

Experimental data on the extraction of oil from meal are as

Solution composition kg oil/kg solution	0	0.10	0.20	0.30	0.40	0.50	0.60	0.70
Solution retained kg oil/kg solid	0.5	0.505	0.515	0.530	0.550	0.571	0.595	0.620

Find the number of ideal stages required.

- b) Give factors affecting the rate of leaching. [2]
- Q9)** a) Give detail material balance and its application to Freundlich adsorption isotherm for multistage crosscurrent adsorption. [8]

- b) Explain in brief [8]
- i) Break through curve,
- ii) Adsorption isotherm.

OR

Q10)a) The equilibrium relation for the decolourisation operation is $y = 0.5 x^{0.5}$ where y = gm colour removed/gm of adsorbent and x = gm colour in oil/1000 g color free oil. 100 kg oil containing 1 part of colour to 3 parts of oil is agitated with 25 kg of adsorbent. Calculate the % colour removed if all 25 kg of adsorbent is used in one stage. [8]

b) State equilibrium in ion exchange and explain ion-exchange process. [8]

Q11)a) A saturated solution of $MgSO_4$ at 353 °K is cooled to 303 °K in a crystallizer. During cooling 4% of the water is lost by evaporation. Estimate the quantity of original saturated solution to be fed to the crystallizer per 1000kg of $MgSO_4 \cdot 7H_2O$ crystals. Data: solubility of $MgSO_4$ at 353°K = 64.2kg/100kg, water solubility of $MgSO_4$ at 303°K = 40.8 kg/100kg water. At wt Mg = 24, S = 32, H=1, O=16. [10]

b) Give classification of crystallization equipments. Explain construction and working of Swenson-Walker Crystallizer. [8]

OR

Q12)a) Explain reverse osmosis for water purification. [10]

b) Give classification of membrane processes. [4]

c) What are different membrane modules? [4]

EEE

Total No. of Questions : 12]

SEAT No. :

P2358

[4758] - 99

[Total No. of Pages :5

T.E. (I.T.)

DATABASE MANAGEMENT SYSTEMS

(2008 Course) (Semester - I)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1) a)** What is layered architecture of DBMS systems? How does it achieve logical, Physical independence? **[8]**
- b) Consider a database of car insurance company whose customers own one or more cars each. Each car has associated with it zero or any number of recorded accidents. That database should provide following details to the users **[10]**
- i) identify all entities
 - ii) identify all relationships
 - iii) ER diagram
 - iv) Relational model

OR

- Q2) a)** It is said that file systems lack of data independence. Give your comments? **[2]**
- b) Explain the functions of database administrator. **[6]**

P.T.O.

- c) What is need by mapping cardinality? For a binary relationship set what are the possible mapping cardinalities? Explain with diagrams. [6]
- d) Consider the following database: [4]

Emp (emp _name, street, city)

Works (emp _name, Company_name, Salary)

Company (Company_name, city)

Manager(emp_name, manager_name)

Draw an ER diagram for above database.

- Q3)** a) Explain with example the concept of trigger and assertion. [8]

- b) Consider the relational database given below [8]

Employee (emp _name, street, city)

Work (emp_name, company_name, salary)

Company (company _name, city)

manager (emp_name, manager_name)

Give all expressions in SQL for each of the following:

- i) Find those companies whose employee earns a higher salary, on all average than the average salary at ABC Ltd.
- ii) Find all the employees who lives in the city and on the same street as do the manager.
- iii) Find the names of employees who do not work for ABC Ltd.
- iv) Find the company with the most employees.

OR

Q4) a) Consider the following Relations **[8]**

Person (Id_no, Name, Street, City, Bldgrp, Rh)

donated(id_no, donate_date)

Write Sql statement each of the following.

i) Get names and address of persons with blood group 'B' Rh-'Ve' who have donated blood more than once.

ii) Get number of persons with blood group AB Rh'+Ve'.

b) Write short note on. **[8]**

i) Stored procedures and triggers.

ii) Dynamic and embedded SQL.

Q5) a) What is normalization? Explain difference between 2NF and 3NF with suitable example? **[8]**

b) Describe the concept of transitive dependency and explain how this concept is used to define 3NF. **[8]**

OR

Q6) a) State and prove Armstrong Axioms for functional dependencies? **[8]**

b) When two sets of functional dependencies are said to be equivalent?[4]

Given:

$F = \{A \twoheadrightarrow C, AC \twoheadrightarrow D, E \twoheadrightarrow AD, E \twoheadrightarrow H\}$

$G = \{A \twoheadrightarrow CD, E \twoheadrightarrow AH\}$

Check if F and G are equivalent.

c) Write Short note on Lossless Decomposition? **[4]**

SECTION - II

- Q7)** a) Construct a B+ Tree for following set of key values (2,3,5,7,11,17,19,23,29,31) Assume order to be 4. [6]
- b) Explain Query Optimization. [6]
- c) Describe in brief dynamic hashing/extensible hashing? [4]

OR

- Q8)** a) Describe structure of B+ tree. How does it differ from B-tree. How do implement dynamic multilevel indexes. [8]
- b) Explain different database system architecture? [8]
- Q9)** a) Explain time-stamp based and lock based protocols? [6]
- b) When do deadlocks happen, how to prevent them and how to recover if deadlock takes place? [8]
- c) Check whether given schedule is view serializable. [4]

T1	T2	T3
Read(Q)		
	Write (Q)	
Write (Q)		
		Write (Q)

OR

Q10)a) Define serializability. Give test for conflict serializability check whether following schedule is conflict serializable. **[8]**

T1	T2
Read (A)	
Write (A)	
	Read (A)
	Write (B)
Read (A)	
Write (A)	
	Read (B)

b) What is Recoverable schedule? Why is it desirable? **[6]**

c) Explain how deadlock detection and prevention is done? **[4]**

Q11)a) Explain how a persistent pointer is implemented. Compare this implementation with that of Pointers as they exist in general purpose language such as 'C'. **[8]**

b) Explain why ambiguity potentially exist with multiple inheritance, illustrate with example. **[8]**

OR

Q12) Write a short notes on: (any 4). **[16]**

- a) Distributed database system.
- b) Persistent programming language.
- c) Centralized and client server architecture.
- d) Need of Backup and replication
- e) Data warehouses.

