

Total No. of Questions : 12]

SEAT No. :

P956

[Total No. of Pages : 2

[4263] - 229

T.E. (Automobile)

AUTOMOTIVE TRANSMISSION

(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) *Use of calculator is allowed.*
- 6) *Assume suitable data if necessary.*

SECTION - I

- Q1)** a) Explain front engine front wheel drive chassis layout. Compare it with front engine rear wheel drive layout. [8]
- b) Sketch a chassis of any four wheelers and mark various parts on it and state function of each. [8]

OR

- Q2)** a) Draw a neat sketch and explain Hotchkiss drive. [8]
- b) Explain with neat sketch torque tube drive. [8]

- Q3)** a) Explain Single plate clutch with neat sketch. [8]
- b) Explain with neat sketch working of diaphragm clutch. [8]

OR

- Q4)** a) Explain working principle of clutch and what is function of clutch. [8]
- b) What are requirements of lining material? Explain in brief electromagnetic clutch. [8]

- Q5)** a) Explain construction and working of synchronizing unit with neat sketch? [9]
- b) What is gear selector mechanism? Explain one of gear selector mechanism. [9]

OR

P.T.O.

- Q6)** a) Explain constant mesh gear box with neat sketch compare it with sliding mesh gearbox. [6]
 b) What are requirements of gearbox? [6]
 c) Explain in brief lubrication of gear box. [6]

SECTION - II

- Q7)** a) Explain with neat sketch working of final drive and differential unit used in automobiles. [8]
 b) What are the types of rear axle? Explain function of rear axle in brief? [8]

OR

- Q8)** a) Explain briefly, with neat sketches, [12]
 i) Half floating rear axle
 ii) Three quarter floating rear axle
 iii) Fully floating rear axle
 b) Explain final drive lubrication. [4]

- Q9)** a) Explain with neat sketch operating principle, construction and working of torque converter. [8]
 b) Explain with neat sketch, operating principle, construction and working of fluid flywheel? [8]

OR

- Q10)** a) What do you mean by epicyclic gear train? How the gear ratios are calculated. [8]
 b) Explain construction and operation of Wilson epicyclic gear train? [8]

- Q11)** a) Compare manual transmission and automatic transmission? [9]
 b) Explain with neat sketch construction and operating principle of automatic transmission? [9]

OR

- Q12)** a) Draw a schematic layout of CVT and explain its working? [9]
 b) What do you mean by hydromantic transmission explain in detail with a neat sketch. [9]



Total No. of Questions : 12]

SEAT No. :

P786

[Total No. of Pages : 2

[4263] - 274

T.E. (E & TC)

MICROCONTROLLERS AND APPLICATIONS

(2008 Pattern) (Sem. - I)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

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

SECTION - I

Q1) a) What are the different selection criteria of microcontroller. [8]

b) Compare Von Neumann & Harvard architecture. [8]

OR

Q2) a) Give the difference between Microprocessor and Microcontroller. [8]

b) Explain the need of power saving mode in Microcontroller. Explain power down & idle mode in details. [8]

Q3) a) Explain structure of internal memory organization of 8051 & why the stack pointer is initialized to 07h after a reset. [9]

b) Explain port structure of 8051 in detail and configure ports as input and output. [9]

OR

Q4) a) Explain the format of Tmod register of 8051 μ c. in detail. [9]

b) Explain the significance of PSW register with the help of example, write assembly code to select R7 register from bank3 to store hex value 08h available in RAM memory location 20h. [9]

Q5) a) Write assembly Language program to find positive & negative number form given\ array. [8]

b) Write a program to transfer message "PUNE" serially at baud rate of 4800 in mode 1, also explain the technique how to double a baud rate.[8]

OR

P.T.O.

- Q6)** a) Write an ALP to generate square wave of 5 kHz using timer 1, on port pin P2.1 in mode 1, when interrupt occurs. [8]
b) Explain following tools: [8]
i) Simulator
ii) Assembler
iii) Logic Analyzer

SECTION - II

- Q7)** a) Interface 4*4 hex keypad to 8051, write program to read key and store its ASCII value to RAM memory. [8]
b) Write short note on RS232 and RS 485 also explain timing diagram of 12C protocol for START & STOP operation. [8]

OR

- Q8)** a) Interface 8 bit LCD module to 8051, write an ALP to display "UNIVERSITY" on 2nd line from fifth column. [8]
b) Interface 4K of RAM & 4K of EPROM to 8051 with starting address 5000h. [8]

- Q9)** a) State features of the PIC 18F458. Also explain status register of PIC. [8]
b) Write an Embedded C program to blink LED connected to PIC after every 250 us. [8]

OR

- Q10)** a) Explain Program & data memory organization of PIC in detail. [8]
b) Explain instruction pipeline structure of PIC with the help of example. [8]

- Q11)** Design 89C51 based embedded system useful for general data acquisition system, having common interfaces like ADC, DAC, RS 232, 4×4 keypad & LCD. Explain and draw necessary diagram for the same. Draw an algorithm and flow chart of same. [18]

OR

- Q12)** a) Design a 8051/PIC based system to measure temperature. Display the temperature on LCD. Draw the interfacing diagram. Also develop flowchart and program for the same. [10]
b) Design microcontroller based path follower robot. [8]



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T.E. (Electronics & Telecommunication)
SIGNAL CODING & ESTIMATION THEORY
(2008 Pattern) (Semester - II)

Time : 3 Hours]

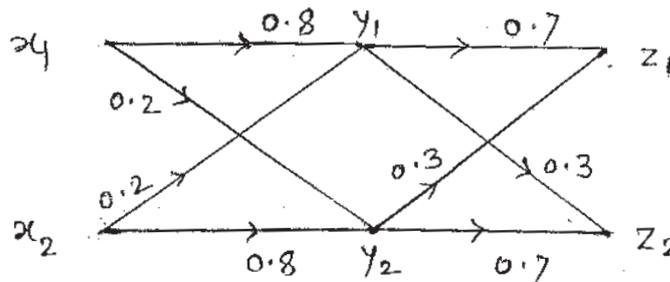
[Max. Marks :100

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) Assume suitable data if necessary.
- 5) Use electronic pocket calculator is allowed.
- 6) Figures to the right indicate full marks.

SECTION - I

- Q1)** a) Two BSC's are connected in cascade as shown in Fig-1
- i) Find channel Matrix of resultant channel
 - ii) Find $P(Z_1)$ and $P(Z_2)$ if $P(X_1) = 0.6$, $P(X_2) = 0.4$



[8]

- b) A discrete memory less source consists of three symbols x_1, x_2, x_3 with probabilities 0.55, 0.25 and 0.2 respectively. Determine minimum variance Huffman codes for the source for following two alternatives:
- i) Considering symbol by symbol occurrence.
 - ii) Considering second order block extension of the source.
- Determine the code efficiency for two alternatives and comment on efficiency.

[10]

OR

P.T.O.

Q2) a) Determine the Lempel Ziv code for the following bit stream.

01001111100101000001010101100110000

Recover the original sequence from the encoded stream. [8]

b) Consider that two sources S_1 and S_2 transmit messages X_1, X_2, X_3 , and Y_1, Y_2, Y_3 with a joint probability of $P(X, Y)$ as shown in the matrix. Calculate $H(X)$, $H(Y)$, $H(X/Y)$ and $H(Y/X)$ and $I(X; Y)$.

$$P(X, Y) = \begin{bmatrix} 3/40 & 1/40 & 1/40 \\ 1/20 & 3/20 & 1/20 \\ 1/8 & 1/8 & 3/8 \end{bmatrix} \quad [10]$$

Q3) a) Define

- i) The Shannon limit
- ii) Shannon's third theorem
- iii) Optimal linear code
- iv) Hamming code [8]

b) Sketch the encoder and syndrome calculate for the generator polynomial $g(x) = (x^3 + x^2 + 1)$ and obtain the syndrome for the received codeword 1001011 [8]

OR

Q4) a) Explain [8]

- i) Bandwidth efficiency diagram
- ii) Fire code
- iii) Golay code
- iv) Perfect code

b) The parity check bits of a (7,4) block code are generated by [8]

$$C_5 = d_1 \oplus d_2 \oplus d_3$$

$$C_6 = d_1 \oplus d_2 \oplus d_3$$

$$C_7 = d_2 \oplus d_3 \oplus d_4$$

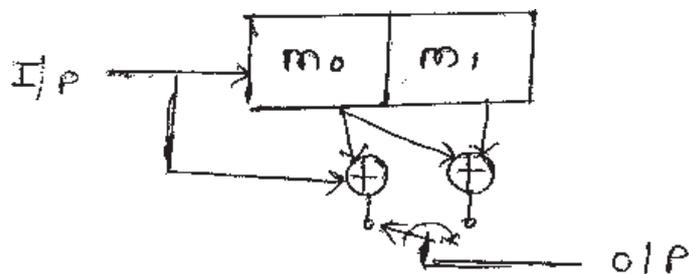
Where d_1, d_2, d_3 , and d_4 are the message digits.

- i) Find the generated matrix and parity check matrix for this code
- ii) Find the minimum weight of this code.
- iii) Find error detecting capability of this code.
- iv) Show through an example that this code can detect three errors. [8]

- Q5)** a) A rate 1/3 convolution coder with constraint length of three uses the generating vectors $g_1 = (1,1,1)$, $g_2 = (1, 1, 1)$ and $g_3 = (1, 0, 1)$. [10]
- Sketch encoder configuration and prepare the logic table
 - Draw the state diagram for the coder
 - Determine the “dfree” distance for the coder.
- b) What is the ungerboeck’s TCM design rule? Explain asymptotic coding gain? [6]

OR

- Q6)** a) Explain distance notions for convolution codes. [6]
- b) For the convolution encoder shown in fig 2 use viterbi algorithm to decode the encoded sequence 10, 11, 11, 11, 01. [10]



SECTION - II

- Q7)** a) Design generator polynomial for (15, 5) BCH triple error correcting code Find transmitted code vector for message bit= 11010 [10]
Take primitive polynomial = $x^4 + x + 1$
- b) What are substitution & transposition ciphers? Explain with example.[8]
- OR
- Q8)** a) Find Generator polynomial for Reed Solomon code using $GF(2^3)$ for double error correcting with Primitive polynomial $x^3 + x + 1$. Also find systematic code for (011, 001, 110). [10]
- b) Draw & explain block diagram of AES Encryption and Decryption.[8]
- Q9)** a) Define and explain following terms with respect to estimation. [8]
- Parameterized PDF
 - Bias
 - Estimator
 - Classical estimator

- b) Suppose that three measurements of signal $S_k = \theta \exp(k/2)$, Where θ is the parameter to be Estimated, are given by $y_1 = 1.5, y_2 = 3$ and $y_3 = 5$. Find the least square estimate of θ [8]

OR

Q10) a) Explain least square estimation & Kalman filters. [8]

- b) Let $\{y[0], y[1], y[2], \dots, y[N-1]\}$ be a random sample of exponential random variable y with Unknown parameter λ . Assume that λ is itself to exponential random variable with parameter α . Find Bayes estimator of λ . [8]

Q11) a) Explain M-ary hypothesis testing [8]

- b) Consider the problem where the conditional density functions under each hypothesis are [8]

$$f(y/H_0) = \frac{1}{\sigma_0 \sqrt{2\pi}} e^{-y^2 / 2\sigma_0^2}$$

and

$$f(y/H_1) = \frac{1}{\sigma_1 \sqrt{2\pi}} e^{-y^2 / 2\sigma_1^2}$$

Where $\sigma_1^2 > \sigma_0^2$

- i) Determine the decision rule
 ii) Assuming we have K independent observations, what would the decision rule be?

OR

Q12) a) What is generalized Likelihood Ratio Test (GLRT) ? Write decision rule for GLRT. [8]

- b) What is Bayes criteria? Derive the expression for Bayes decision rule. Under what condition Bayes Criteria reduces to LRT and MAP. [8]



Total No. of Questions : 12]

SEAT No. :

P789

[Total No. of Pages : 3

[4263] - 279

T.E. (E & TC)

INDUSTRIAL MANAGEMENT

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

SECTION - I

- Q1)** a) Define Management and Discuss the characteristics of management. [8]
b) Explain the F. W Taylor's Theory of management. How does it differ by Henry Fayol. [8]

OR

- Q2)** a) Discuss various forms of organization. Explain any one in detail. [8]
b) Explain the merits and Demerits of (Any two) : [8]
i) Partnership
ii) Proprietorship
iii) Joint stock
iv) Cooperative society

- Q3)** a) Define strategy. Explain military origine of strategy. [8]
b) Write short notes on : [10]
i) Corporate Level of strategy
ii) Business Level of strategy
iii) Functional Level of strategy

P.T.O.

OR

Q4) a) Explain the necessity of ETOP. Environmental Threat & Opportunity profile for Industry Analysis with example and diagram. [10]

b) Draw and explain GE Nine Cell Model. [8]

Q5) a) What are the types of Quality and phases of quality management. Explain. [8]

b) Draw and explain Ishikawa diagram with a proper example from Industry. [8]

OR

Q6) a) Write short notes on : (Any Two) [8]

i) Pareto Analysis

ii) Pokka yoke

iii) Five 'S'

b) Explain the importance of 14001 : 2004 Environmental Management System Standard. [8]

SECTION - II

Q7) a) Explain the difference between fixed capital and working capital, money market and capital market. [10]

b) What do you mean by Break - Even Analysis with a proper diagram, explain its terms. [8]

OR

Q8) a) Explain the techniques of capital Budgeting. [10]

b) Write short notes on : [8]

i) CPM

ii) Project crashing and Resource Levelling.

Q9) a) What is the necessity of maintaining inventory. Explain various costs associated with inventory. [8]

b) Impellers are procured by the water pump manufacturer from a local firm and are consumed at an average rate of 550 nos. per month. If the procurement cost is Rs. 40 per order & the cost of holding it in stock is Rs. 1.50 per unit per year, Determine the quantity that should be procured at a time to optimise the costs involved.

If the consumption of above item increases to 50 numbers per day & its actual inventory cost is Rs. 0.50 per unit per day. Calculate its revised EOQ quantity. [8]

OR

Q10) a) Explain the concept of 3 PL and 4 PL logistics. [8]

b) Explain 'ABC' Analysis in detail. [8]

Q11) a) Explain MIS and its components with diagram. [8]

b) Explain decision making models & types of Decisions? How DSS differs with MIS. [8]

OR

Q12) a) Explain the "Business Process Re-engineering." [8]

b) What is e-commerce? Explain its types with suitable example. [8]

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Total No. of Questions : 12]

SEAT No. :

P790

[Total No. of Pages : 4

[4263] - 280

T.E. (E & TC)

WAVE THEORY & ANTENNAS

(2008 Pattern) (Semester - II)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) Answer Q 1 or Q 2, Q 3 or Q 4, Q 5 or Q 6 from section - I and Q 7 or Q 8, Q 9 or Q 10, Q 11 or Q 12 from section - II.
- 2) Answers to the two sections should be written in separate 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) An uniform plane wave travelling in the $-X$ direction in a lossy medium ($\epsilon_r = 2$, $\mu_r = 3$, $\sigma = 5 \times 10^{-2}$ mhos/m) has:

$$\mathbf{E}(x,t) = 20 \cos(10^{-9}\pi t + \pi/3)\mathbf{a}_z \text{ V/m at } x = 0.$$

Find

- a) α Np/m
- b) β rad/m
- c) η Ω
- d) v m/sec
- e) \mathbf{E} at $x = -1.5$ m, $t = 3$ ns
- f) \mathbf{H} at $x = -1$ m, $t = 2$ ns
- g) Distance travelled by the wave to have a phase shift of 20° .
- h) Distance travelled by the wave to its amplitude reduced to 12 V/m.

[18]

OR

P.T.O.

- Q2)** a) What do you understand by Poynting's vector? Derive the expressions for the instantaneous and average Poynting vectors for an uniform plane wave. [8]
- b) Starting from Maxwell's equations in phasor form, derive the wave equation for the magnetic field \mathbf{H} and solve it to obtain an expression for the magnetic field of an uniform plane wave propagating in the $-Y$ direction in a lossy dielectric medium with parameters μ_r , ϵ_r and σ . [10]
- Q3)** a) Derive the fundamental equation for free space propagation (Friis equation) for the power P_R 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_{MHz} . [8]
- b) Explain in detail the characteristics of the different ionized regions of the ionosphere. [8]

OR

- Q4)** a) Distinguish between space wave and surface (ground) wave, highlighting the frequency range and distance over which radio wave propagation is possible using each of the above modes. [8]
- b) A VHF communication system is to be operated at 60 MHz using a 25 W transmitter. If the receiving antenna is at a height of 30m, calculate the height of the transmitting antenna if the required range is 50 Km. Also obtain the strength of the magnetic field at the receiving antenna. [8]
- Q5)** a) Prove that the far electric and magnetic fields produced by a short dipole are one-half of the corresponding fields produced by an infinitesimal (Hertzian) dipole having the same length and current. What will be the radiation resistance of the short dipole as compared to that of the infinitesimal dipole? [8]
- b) For a lossless horn antenna with directivity of 20dB. At a frequency of 10 GHz calculate : [8]
- i) The maximum effective aperture
 - ii) The maximum power received when incident power density is $2 \times 10^{-3}(\text{W/m}^2)$.

OR

- Q6)** a) Derive the formula relating the effective length l_e and effective area A_e of an antenna having a loss resistance R_L and radiation resistance R_r . Assume a matched load. [6]
- b) A half-wave dipole having a radiation resistance of 75Ω and loss resistance of 15Ω is connected to the load through a transmission line such that the reflection coefficient is 0.75. Calculate the effective area given that the operating frequency is 100 MHz. [6]
- c) Distinguish clearly between : [4]
- Radiation power density and radiation intensity
 - Directivity and gain for antennas.

SECTION - II

- Q7)** a) Calculate the radiation resistance of a 12 turn small circular loop having a radius of $\lambda/40$ in free space. Also obtain the open circuit induced voltage if the loop is exposed to a plane wave of field strength of 1 mV/m at 100 MHz. [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) A linear broadside Binomial array has 8 radiating elements. If the current in the second element from either end is 1 A, calculate the required excitation currents in the remaining elements. Derive any formula that is used. [8]
- b) A vertical transmitting Hertzian dipole antenna of length $\lambda/50$ operates with peak current of 10 A at 100 MHz. Calculate : [10]
- The electric field at a distance of 1 Km at an elevation of 60° (polar angle $\theta = 30^\circ$).
 - The radiated power.
 - 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 antenna.
- c) Ferrite-rod antenna.
- d) Loop antenna.
- e) Whip antenna.

OR

Q10) a) Explain in detail the effect of ground and antenna height on antenna performance. [8]

- b) Explain in detail the difference between resonant and non-resonant antennas. Also describe constructional details, features, applications and radiation pattern of a travelling wave antenna. [8]

Q11) a) Find the directivity of a circular parabolic dish having a radius of 230mm at 12.5 GHz. Assume aperture efficiency of 75%. [8]

- b) Explain with diagram working principle of parabolic reflector. Also explain various feed systems with diagrams for the parabolic reflector. State applications of dish 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. :

P1231

[Total No. of Pages : 3

[4263] - 282

T.E. (Instrumentation and Control)

EMBEDDED SYSTEM DESIGN

(2008 Pattern) (Semester - I)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Describe the internal structure of the port pins of Port 0 and Port 2 of 8051. [8]
- b) Explain the use of pins XTAL1 and XTAL2 of 8051. What role do they play in generating the timing? Also show the connections done to these two pins. [8]

OR

- Q2)** a) What is Mode 2 of timers in 8051? Explain with example. [8]
- b) Compare the 8051 and 89C2051 microcontrollers. [8]

- Q3)** Write a program to measure an unknown frequency using 8051. The range of the unknown frequency is 100 Hz to 50 KHz. Store the measured frequency in registers R0 and R1. [6]
- Show any calculations done in detail. [4]
- Explain the connections done. [2]
- Draw the flowchart for the same. [2]
- Explain all the SFRs used in the program and their configuration bits. [4]
- Assume $F_{osc} = 11.0592\text{MHz}$.

OR

P.T.O.

- Q4)** a) Explain the different modes of communication of UART of 8051. What count should be loaded in the timer register to set a baud rate of 4800, when $F_{osc} = 11.0592$ MHz and the SMOD bit is clear? Show the calculations and mention the formula used. [10]
- b) Hundred ASCII characters are stored in the internal data memory of 8051. Count the number of times ASCII character 't' appears in it. Store this count in register R5. [8]

- Q5)** a) With a neat sketch explain the interfacing of 16 X 2 LCD display to 8051. [8]
- b) Compare RS 232 and RS 485 communication standard. [8]

OR

- Q6)** a) With a neat sketch explain the interfacing of 4 seven segment LED digits to 8051, using minimum number of pins. [8]
- b) With a neat sketch explain the interfacing of 8 bit parallel DAC to 8051. [8]

SECTION - II

- Q7)** a) Explain the role of watchdog timer in AVR. [8]
- b) List the architectural features of ATTiny 2313. [8]

OR

- Q8)** a) Explain the Stack operation in AVR microcontrollers. Explain the situations/ Instructions when the stack memory is used. [8]
- b) Explain the interrupt structure of AT Mega 8535 microcontrollers. [8]

- Q9)** a) Explain the RS232 communication link of AVR microcontrollers. [8]
- b) Explain the following instructions of AVR microcontrollers : [8]
- i) LDI Rd, Rs
 - ii) OUT Rd
 - iii) SBI Rd, Y +
 - iv) SLEEP

OR

- Q10)** a) Which register is used to set baud rate for serial transmission in ATTiny2313? Explain the calculations used for generating various baud rates. [8]
- b) Explain the master and slave modes of SPI in AT Mega 8535. [8]

Q11) Discuss the Design of Dual Channel Voltmeter, with a 3 digit LED seven segment display, with RS 232 interface using AVR microcontroller based on the following points :

- a) Block diagram [4]
- b) Description [4]
- c) Selection of ICs for the system [6]
- d) A general algorithm [4]

OR

- Q12)** a) With a neat diagram, explain the interfacing of 16×2 LCD display with 8 data lines to the AVR microcontroller. [8]
- b) With a neat schematic, explain the interfacing of stepper motor to AVR microcontroller. [10]



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T.E. (Instrumentation and Control)**DIGITAL SIGNAL PROCESSING FUNDAMENTALS****(2008 Pattern) (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 books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 6) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Define system. Explain how the discrete time systems are classified. [8]
 b) State and justify, whether the following signals are periodic or non-periodic. [10]

If periodic, find the fundamental period.

$$\text{i) } x_1(n) = \cos\left(\frac{2\pi n}{5}\right) + \cos\left(\frac{2\pi n}{7}\right)$$

$$\text{ii) } x_2(n) = e^{j7\pi n}$$

OR

- Q2)** a) State the properties of linear convolution. [8]
 b) Determine the linear convolution of the following signals.

$$x(n) = \{1, 2, 1, 1\}$$

$$h(n) = \{3, 2, 1, 1\}$$

[10]

- Q3)** a) A causal discrete time LTI system is described by

$$y(n) = \frac{3}{4}y(n-1) + \frac{1}{8}y(n-2) = x(n)$$

Where, $x(n)$ and $y(n)$ are the input and output of the system respectively. Determine the system function $H(z)$ and the impulse response of the system. [8]

P.T.O.

- b) Realize the following filter function using Direct form I structure and Direct form II structure

$$y(n) = y(n-1) - \frac{1}{2}y(n-2) + x(n) - x(n-1) + x(n-2) \quad [8]$$

OR

- Q4)** a) Determine the structures of realizations for the following discrete time system $y(n) = -0.1y(n-1) + 0.7y(n-2) + 0.6x(n) - 0.2x(n-2)$ [8]

Using

- i) Direct form I structure
 ii) Direct form II structure
- b) Plot the magnitude and phase response of the system described by

$$y(n) + \frac{1}{2}y(n-1) = x(n) - x(n-1) \quad [8]$$

- Q5)** a) State the properties of Discrete Fourier Transform. (any four) [8]

- b) Determine the circular convolution of [8]

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

$$y(n) = \{4, 3, 2, 1\}$$

OR

- Q6)** a) State the properties of Discrete Time Fourier Transform. (any four)[8]

- b) Determine 8-point DFT of the sequence, $x(n) = \{0.5, 0.5, 0.5, 0.5\}$ [8]

SECTION - II

- Q7)** a) Sketch the signal flow graph of 8 point decimation in time FFT algorithm. [8]

- b) Determine the DFT of $x(n) = \{1, 1, 1, 1\}$ using decimation in frequency FFT algorithm. [8]

OR

- Q8)** a) Sketch the signal flow graph of 8 point decimation in frequency FFT algorithm. [8]

- b) Determine the 8 point DFT of $x(n) = \cos(2\pi n)$ using decimation in time FFT algorithm. [8]

- Q9)** Design the causal linear phase FIR filter for following specifications (Low Pass Filter) [18]

Cut-off frequency = 100 Hz

Sampling frequency = 1000 Hz

Length of filter = 7

Use the window functions :

- a) Rectangular window
- b) Bartlett window
- c) Hanning window
- d) Hamming window

OR

- Q10)** a) What is a linear phase filter? What are the necessary conditions for linear phase filter? [6]
- b) What are the various types of window functions? [4]
- c) Design the band pass FIR filter for following specifications : [8]
- Lower cut-off frequency = 200 Hz
 Higher cut-off frequency = 300 Hz
 Sampling frequency = 1000 Hz
 Length of filter = 7
 Use rectangular window

Q11) To specify an analog Chebyshev filter three parameters viz. cut-off frequency Ω_c , the order of filter N and the ripple parameter ϵ are required. If for a Chebyshev filter,

$$N = 2$$

$$\Omega_c = 0.789 \text{ rad/sec}$$

$$\epsilon = 0.5089$$

Obtain its transfer function $H_a(s)$.

Transform this analog filter $H_a(s)$ to a digital Chebyshev filter $H(z)$ using impulse invariance method. Assume $T = 1$ sec. [16]

OR

- Q12)** a) A Butterworth analog filter has the cut-off frequency $\Omega_c = 0.707$ rad/sec and order $N = 3$.
- i) Plot the poles on the Butterworth circle. [3]
 - ii) Obtain the transfer function of this analog filter i. e. $H(s)$ [2]
 - iii) Using the impulse invariance method, transform this an analog filter $H(s)$ to a digital filter $H(z)$. Write the transfer function $H(z)$ and state whether this transfer function $H(z)$ is a stable filter or otherwise Assume $T = 1$ sec. [5]
- b) Compare the FIR filter and IIR filter. [6]



Total No. of Questions : 6]

SEAT No. :

P796

[Total No. of Pages : 4

[4263] - 294

T.E. (Printing)

DESIGN OF PRINTING MACHINE COMPONENTS

(2008 Pattern) (Semester - I)

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, if necessary.*

SECTION - I

Unit-I

- Q1)** a) Explain the basic procedure of machine design. [8]
b) Explain use of standards in design and types of standards. [10]

OR

- a) Define 'Mechanical Property' of an engineering material. State any six mechanical properties, give their definitions and one example of the material possessing the property. [10]
b) Explain the B.I.S. designation of steels. [8]

Unit-II

- Q2)** a) Define factor of safety. Explain the factors to be considered while selecting the factor of safety. [10]
b) State the advantages and applications of Cottor Joint. [6]

OR

Two rods, required to withstand a tensile force of 25kN, are connected by means of a knuckle joint. The rods and the pin are made of plain carbon steel 40C8 ($S_{yt} = 380 \text{ N/mm}^2$). The yield strength in compression is twice of tensile yield strength. The yield strength in shear is 50% of tensile yield strength. The factor of safety is 6. Using the empirical relations and the standard proportions, design the knuckle joint. [16]

P.T.O.

Unit-III

- Q3)** a) Explain ASME code for shaft design. [4]
- b) A mild steel shaft transmits 20 kW power at 200 r.p.m. It carries a central load of 900N and is simply supported between the bearings 2.5m apart. Determine the size of shaft, if the allowable shear stress is 42MPa and the maximum tensile or compressive stress is not to exceed 56MPa. What size of the shaft will be required, if it is subjected to gradually applied loads? [12]

OR

- a) What is coupling? State the purposes served by the couplings. [6]
- b) Design a muff coupling to connect two mild steel shafts to transmit 35kW at 1440 r.p.m. The C. I. sleeve connects the shafts through two mild steel sunk keys. The maximum torque transmitted is 25% greater than the average torque
- Assume
Allowable shear stress for mild steel = 65 N/mm²
Allowable shear stress for cast iron = 15 N/mm²
Allowable crushing stress for mild steel = 135 N/mm² [10]

SECTION - II

Unit-IV

- Q4)** a) Discuss construction and applications of re-circulating ball screws. [6]
- b) The nominal diameter of a tripple start square threaded screw of a fly press is 59 mm and pitch is 8 mm. The handwheel comes in contact with the frame when the screw is at its lower position. The outer diameter of the collar is 110 mm and inner diameter is 60 mm. The co-efficient of friction at the collar is 0.15 and between the screw and nut is 0.13. The screw is loaded with 10kN axial load. Using uniform wear theory for collar friction, calculate, [10]
- Torque required to raise the load,
 - Torque required to lower the load,
 - The force required to raise the load, if applied at the handwheel of 1-2 m diameter.

OR

- a) What are the different types of stresses induced in power screws. [6]
- b) Prove that maximum efficiency of square threads is given by [10]

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

Where θ is pressure angle.

Unit-V

- Q5)** a) What do you understand by 'over-hauling' and self locking of the screw? Show that the efficiency of self locking screw is less than 50%. [6]
- b) The pull in the tie rods of a turnbuckle used in the roof truss is 50kN. Design a suitable adjustable screwed joint. The permissible stresses are 75 MPa in tension, 37.5 MPa in shear and 90 MPa in crushing. [10]

OR

- a) State the advantages and disadvantages of welded joints over other joints. [8]
- b) A circular bar of 50 mm diameter is welded to a steel plate by an annular fillet weld. The force of 5kN is applied on the bar at a distance of 400 mm from the plane of the weld. If the allowable shear stress in the weld material is 94 MN/m², determine the size of weld. [8]

Unit-VI

- Q6)** a) Draw and explain following types of springs: [12]
- Helical compression and tension spring.
 - Conical spring
 - Helical torsion spring
 - Spiral spring
 - Leaf spring
 - Bellevile springs
- b) A mechanism used in printing machinery consists of a tension spring assembled with a preload of 30N. The wire diameter of spring is 2 mm with a spring index of 6. The spring has 18 active coils. The spring wire has following material properties. [6]
- Design shear stress = 680 N/mm²
 - Modulus of rigidity = 8×10^4 N/mm²
- Determine
- The initial torsional shear stress in the wire
 - Spring rate
 - The maximum force the spring can take.

OR

- a) Explain with the help of a neat diagram following terms of the spring and also write formula to obtain it. **[12]**
- i) Free Length
 - ii) Solid Length
 - iii) Spring Rate
 - iv) Active and inactive coils
 - v) Spring Index
 - vi) Pitch
- b) Prove that in a spring, using two concentric coil springs made of same material, having same length and compressed equally by an axial load, the loads shared by two springs are directly proportional to the square of the diameters of the wires of the two springs. **[6]**



Total No. of Questions : 11]

SEAT No. :

P1238

[Total No. of Pages : 3

[4263] - 312

T.E. (Petroleum)

PETROLEUM GEOLOGY - I

(2008 Pattern) (Sem. - I)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) *Attempt 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 should be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*

SECTION - I

- Q1)** a) Describe volume percent and weight percent distribution of igneous, sedimentary and metamorphic rocks in the earth. [9]
- b) What are cohesive and incohesive clay minerals? How these are recognized in the field? Discuss their significance in sedimentary rocks.[6]

OR

- Q2)** a) Draw and explain in brief, processes involved in the formation of sedimentary rocks. [10]
- b) Explain the relationship between grain size and velocity of water in relation to erosion, transportation and deposition of sediments. [5]

- Q3)** a) How mass movement is classified based on moisture content, grain size variation and velocity? [9]
- b) Explain hydration and hydrolysis with the help of suitable examples.[6]

OR

- Q4)** Answer any five from the following with suitable diagrams. [15]
- a) Continental shelf
 - b) Convergent plate boundary
 - c) Earthquake waves and classification
 - d) Magnitude and Intensity of earthquakes
 - e) Hazards associated with earthquakes
 - f) Hypsographic curve
 - g) Mid Oceanic Ridge

P.T.O.

b) How is cyclicity recognized in sedimentary sequence? [5]

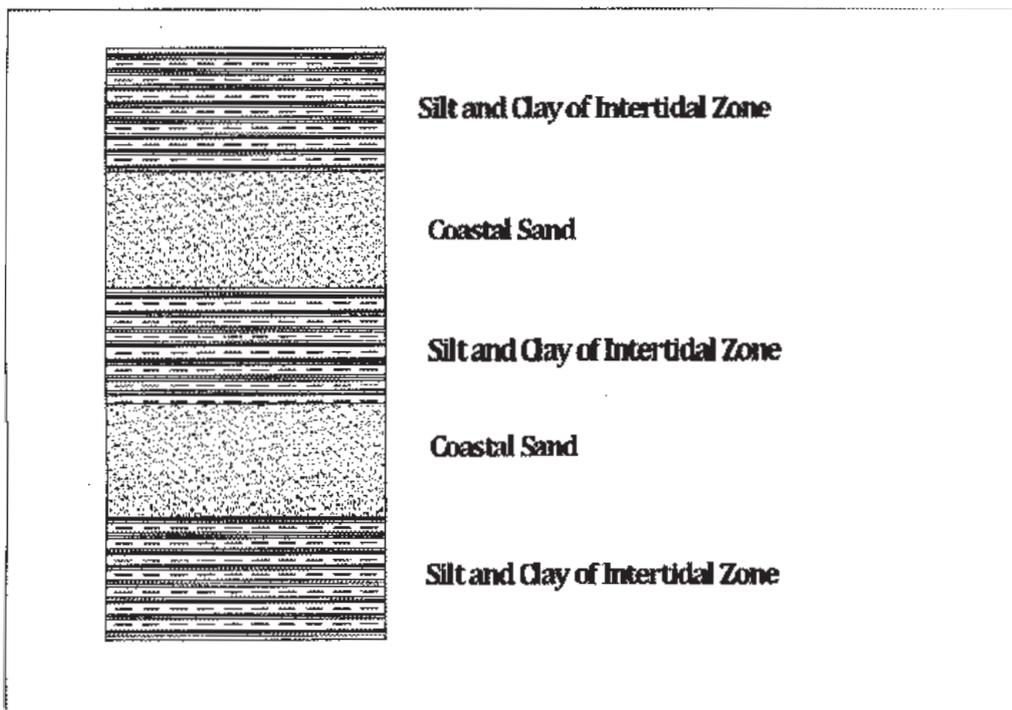
OR

Q10) Answer the following : [15]

- a) Dolomitization
- b) Matrix supported framework in clastic sedimentary rocks
- c) Marine Depth Zones
- d) Use of microfossils for time correlation
- e) Geological Correlation

Q11) a) Write Geological Time Scale in a tabular form with important event in each era. [10]

b) Following sedimentary sequence is encountered in a well during wildcat drilling. A break in sedimentation exists between two successive units. [10]



Reconstruct chronology of events based on emergence and submergence of coast. Provide brief explanation in support of your reconstruction. What is progradation and retrogradation?

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Total No. of Questions : 12]

SEAT No. :

P803

[Total No. of Pages : 4

[4263] - 314

T.E. (Petroleum)

HYDROCARBON PROPERTIES AND THERMODYNAMICS

(2008 Pattern) (Semester - I)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Explain reversible process and irreversible process with examples. [6]
- b) A special manometer fluid has a specific gravity of 3.65 and is used to measure a pressure of 1.25 bar at a location where barometric pressure is 760 mm Hg. What height will the manometer register? [4]
- c) Derive an expression for the first law of thermodynamics for steady state flow process. [8]

OR

- Q2)** a) With the help of a neat sketch, explain the operation of a Carnot cycle.[6]
- b) Calculate the change in internal energy, change in enthalpy, work done and the heat supplied in the following processes :
- i) An ideal gas is expanded from 5 bar to 4 bar isothermally at 600 K.
 - ii) An ideal gas contained in a vessel of 0.1 m³ capacity is initially at 1 bar and 298 K. It is heated at constant volume to 400 K. [8]
- c) Explain Gibbs Paradox. [4]

- Q3)** a) Define :
- i) Compressibility factor. ii) Acentric factor. [4]
- b) Write any two equations of state for real gases and explain the terms involved in it. [4]

P.T.O.

- c) Calculate the pressure developed by 1 kmol of gaseous ammonia contained in a vessel of 0.6 m³ capacity at a constant temperature of 473 K by the following methods. [8]
- i) Using the Van der Waals equation given that 'a' = 0.4233 Nm⁴/mol² and 'b' = 3.73 × 10⁻⁵ m³/mol.
- ii) Using Redlich-Kwong equation given that P_c = 112.8 bar and T_c = 405.5 K.

OR

- Q4)** a) Draw a typical phase envelope for a multicomponent system and hence explain : Cricondentherm, Cricondenbar, Critical point, Dew point curve and bubble point curve. [8]
- b) Determine the molar volume of gaseous methane at 300 K and 600 bar by using the Van der Waals equation given that 'a' = 0.2285 Nm⁴/mol² and 'b' = 4.27 × 10⁻⁵ m³/mol. [8]
- Q5)** a) State the Lewis Randall rule, Raoult's law and Henry's law. Give the significance of each. [8]
- b) Mercury has density of 13.69 × 10³ kg/m³ in the liquid state and 14.193 × 10³ kg/m³ in the solid state, both measured at the melting point of 234.33 K at 1 bar. If the heat of fusion of mercury is 9.7876 kJ/kg, what is the melting point of mercury at 10 bar? [8]

OR

- Q6)** a) Explain any two methods for estimating the fugacity of a gas. [8]
- b) Calculate the fugacity of CO at 50 bar if the following data is applicable at 273 K. [8]

P, bar	25	50	100	200	400	800	1000
Z	0.989	0.979	0.974	1.019	1.248	1.806	2.082

SECTION - II

- Q7)** a) What is meant by a tie line? How does it help in determining the amount of liquid and vapour in equilibrium? [8]
- b) The vapour pressures of acetone (1) and acetonitrile (2) can be evaluated by the Antoine equations [10]

$$\ln P_1^s = 14.5463 - \frac{2940.46}{T - 35.93}$$

$$\ln P_2^s = 14.2724 - \frac{2945.47}{T - 49.15}$$

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

- i) T and y_1 at 65 kPa and $x_1 = 0.4$.
- ii) P and y_1 at 327 K and $x_1 = 0.4$.

OR

- Q8)** a) Give the procedure for the evaluation of dew point and bubble point of a multicomponent mixture. **[8]**
- b) A hydrocarbon mixture contains 25% (mol) propane, 40% (mol) n-butane and 35% (mol) n-pentane at 1447.14 kPa. Assume ideal solution behaviour and calculate : **[10]**
- i) Bubble point temperature.
 - ii) Dew point temperature.

Use the following data for K values (Intermediate values can be found by interpolation)

	K values			
	T = 355K	T = 366 K	T = 377 K	T= 388 K
Propane	2	2.3	2.6	2.9
n-Butane	0.78	0.9	1.1	1.3
n-Pentane	0.33	0.4	0.5	0.61

- Q9)** a) Define : Permeability and Capillary pressure. Give its significance in Petroleum engineering. **[8]**
- b) Explain the process of imbibitions and drainage with the help of saturation curves. **[8]**

OR

- Q10)** a) Write a note on the types of diffusion in porous solids and hence elaborate on Knudsen diffusion. **[8]**
- b) Derive the Young Laplace equation for capillary pressure. **[8]**

Q11) a) What are the factors affecting wax precipitation? Give the significance of wax precipitation in dealing with flow assurance problems in deep sea oil transportation. **[8]**

b) What are gas hydrates? Give the types and properties of gas hydrates. **[8]**

OR

Q12) a) What are asphaltenes? Discuss the properties of asphaltenes. **[4]**

b) Draw and explain a typical Asphaltene Precipitation Envelope (APE). **[6]**

c) Discuss a typical solid-liquid equilibrium diagram. **[6]**

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Total No. of Questions : 12]

SEAT No. :

P849

[Total No. of Pages : 3

[4263] - 339

T.E. (Polymer)

POLYMER PROCESSING OPERATIONS - I

(2008 Pattern) (Semester - II)

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. Answer Q. No. 7 or Q. No. 8, Q. No. 9 or Q. No. 10, Q. No. 11 or Q. No. 12 from Section II.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of pocket calculator, graph paper, log-log graph paper is allowed.*
- 5) *Draw neat sketches wherever necessary.*
- 6) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Compare the contiguous solid melting model (CSM) and dispersed solid melting model (DSM) [6]
- b) Derive an expression for pressure flow in a single screw extruder. [6]
- c) Write a note on grooved barrel systems used. [6]

OR

- Q2)** a) Write a note on vented extruders. [6]
- b) Discuss the advantages and disadvantages of barrier screw over normal screws with respect to melting and conveying characteristics. [6]
- c) Discuss the effect of helix angle and channel width on die and extruder characteristics. [6]

- Q3)** a) Write a note on downstream equipment used for cast film extrusion.[6]
- b) List the various haul off systems used. Explain any one in detail. [6]
- c) Discuss the winding equipment used for blown film. [4]

OR

P.T.O.

- Q4)** a) Write a note on downstream equipment used for extrusion of pipes. [8]
b) Explain the construction of a flat film die with a neat figure. Discuss the complete line for extrusion of flat film. [8]

- Q5)** a) Mention the merits and demerits of pressure based switch over. [5]
b) Explain the effect of variation in mold temperature and injection speed on final product quality of injection molded products. [6]
c) Explain the features of injection molding of polycarbonate switches for electrical applications. [5]

OR

- Q6)** a) Explain special features of injection molding of PVC pipe fitting. [6]
b) Write a short note on close loop and open loop controlled injection molding machines. [6]
c) Discuss parallel and sequential injection molding machines with suitable examples. [4]

SECTION - II

- Q7)** a) Write a short note on low pressure injection molding. [6]
b) Draw a neat sketch and explain construction of any one torpedo used in pattern making injection molding machine. [6]
c) Write a short note on Reaction Injection molding. [6]

OR

- Q8)** a) Explain how injection-compression process results in lower tonnage. [6]
b) Explain what you understand by fingering and gas penetration. [6]
c) Write a short note on injection molding of elastomers. [6]

- Q9)** a) Write a short note on constructional features of co-extrusion die. [6]
b) Write down the process of making extruded magnetized strips. [4]
c) Write a note manufacturing of hollow corrugated sheets. [6]

OR

- Q10)** a) Write a note on downstream equipment used for making of cellular plastic products. [6]
- b) Explain the process of making of extruded nets. [6]
- c) Discuss the effect of orientation on extruded products. [4]
- Q11)** a) Discuss positive, semi-positive and flash type compression molds. Give their merits and demerits. [6]
- b) Explain Integral pot type transfer molding. [4]
- c) Explain the need for preheating thermoset material before processing. Explain different preheating methods. [6]

OR

- Q12)** a) State the various faults and remedies in compression molded products. [6]
- b) Explain compression molding cycle with the help of a neat bar chart. [4]
- c) Derive an equation for compaction force required during compression molding process. [6]

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Total No. of Questions : 12]

SEAT No. :

P832

[Total No. of Pages : 3

[4263] - 351

T.E. (I.T.)

OPERATING SYSTEMS

(2008 Pattern) (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) *Answers to the two sections should be written in separate answer books.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Write functions of operating system. [6]
b) Explain following shell commands [4]
i) Chmod ii) Grep
c) What is distributed OS? Give its advantages over other types of operating systems. [6]

OR

- Q2)** a) Explain monolithic and layered architecture. [8]
b) Write an AWK script to find frequency counts of each word in a text file. Assume each word is stored on a separate line. [4]
c) Write a shell script to search and delete a record from a file. Assume suitable record structure. [4]

- Q3)** a) Draw and explain process state transitions. [6]
b) Draw Gantt chart and calculate turnaround time, waiting time for following processes using FCFS, SJF preemptive, SJF nonpreemptive and Round Robin CPU scheduling algorithms. (Round robin consider time quantum = 2) [12]

Process	Arrival Time	Burst time
P1	0	6
P2	1	4
P3	4	8
P4	3	3

P.T.O.

OR

- Q4)** a) Explain real time scheduling. [6]
b) Explain process scheduling used in UNIX. [8]
c) Explain the use of fork and vfork with example. [4]

- Q5)** a) What is deadlock? State and explain necessary conditions for deadlock. [6]
b) Write and explain semaphore solution to the reader's writer's problem. [10]

OR

- Q6)** a) Explain different strategies for deadlock recovery. [8]
b) What is critical section? Explain necessary conditions for the solution of critical section problem. [8]

SECTION - II

- Q7)** a) Explain Belady's anomaly with suitable example. [8]
b) For the following reference string calculate the number of page fault and page fault frequency using LRU and optimal page replacement policies with number of page frame = 3.
6, 5, 1, 2, 5, 3, 5, 4, 2, 3, 6, 3, 2, 1, 2 [10]

OR

- Q8)** a) Give similarities and differences between paged and segmented memory management schemes. [6]
b) Explain First Fit, Best Fit, Worst Fit, Next Fit memory allocation strategies with example. [12]

- Q9)** a) On a system using contiguous allocation, compute the number of physical block corresponding to the logical block given the file is stored starting at the indicated physical block (assume block number starts with 1).
i) starting physical block : 1000; logical block : 12
ii) starting physical block : 75; logical block : 2000
iii) starting physical block : 150; logical block : 25 [4]
b) Explain file system free space management in detail. [10]
c) State file system object types. [2]

OR

- Q10)** a) Consider a system in which a directory entry can store up to 16 disk block addresses. For files no larger than 16 blocks, the 16 addresses serve as the file's index table. For files larger than 16 blocks, the addresses point to the indirect blocks which in turn point to 256 file block each. A block size is 1024 bytes. How big can a file be. [4]
- b) On a system with 1000 cylinders, numbered 0 to 999, compute the number of tracks the diskarm must move to satisfy all the requests in the disk queue. Assume the last request serviced was at track 345 and the head is moving toward track 0. The queue in FIFO order contains requests for the following tracks : 123, 874, 692, 475, 105, 376. Perform the computation for the algorithms :
- | | | |
|-----------|------------|------|
| i) FCFS | ii) SSTF | |
| iii) SCAN | iv) LOOK | |
| v) C-LOOK | vi) C-SCAN | [12] |

- Q11)** a) Explain why reading an email without looking at attachments cannot cause a computer to become infected with a virus (assuming the email client program is not infected with a virus). [4]
- b) Explain different security mechanisms in UNIX. [6]
- c) Classify each of the following as authentication, prevention, detection, identification, correction, modification. [6]
- | | |
|--|--|
| i) A login program | |
| ii) Scanning for recently modified files in a system directory | |
| iii) Weekly backups | |
| iv) Logging all logins and logouts | |
| v) Promptly deleting unused accounts | |
| vi) Adding to one bank account the entire fractional amount from all the other accounts. | |

OR

- Q12)** a) Explain different threat categories. [8]
- b) Write different program threats. [8]



Total No. of Questions : 12]

SEAT No. :

P833

[Total No. of Pages : 2

[4263] - 353

T.E. (Information Technology)

COMPUTER NETWORK TECHNOLOGY

(2008 Pattern) (Sem. - I)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Explain in detail Link State routing algorithm with example. [8]
b) What is flow control mechanism? What is the role of timer in the flow control. [8]

OR

- Q2)** a) What is routing? State different types of routing? Write properties of routing algorithm. [8]
b) Compare virtual circuit subnet and datagram subnet. [8]

- Q3)** a) Differentiate between BOOTP and DHCP. [8]
b) Explain in detail BGP. [8]

OR

- Q4)** a) Is fragmentation supported by IPv4 and IPv6? Explain. [6]
b) Consider any class - C network with default subnet mask. Design the subnet in such a way that each has 62 nodes. Write the range of IP addresses for all subnets. [10]

- Q5)** a) Explain with example various types of sockets. [8]
b) Explain all the fields of TCP header. [10]

P.T.O.

OR

- Q6)** a) What is a Socket? Explain various socket primitives used in client-server interaction. [10]
b) What do you mean by flow control in transport layer? What are the different methods to achieve it? [8]

SECTION - II

- Q7)** a) List the similarities and differences between POP3 and IMAP. [8]
b) Explain working of DNS in detail. [8]

OR

- Q8)** a) List and describe seven message types in SNMP. [8]
b) Where and when FTP is used? Explain the importance of two parts in FTP? [8]

- Q9)** a) Explain Round Robin and Weighted Fair Queuing algorithm for scheduling. [8]
b) Explain the RTSP protocol. Why this protocol is needed. [8]

OR

- Q10)** a) What do you mean by integrated services? Explain with suitable example. [8]
b) What is meant by interactivity for streaming stored audio/ video? [8]

- Q11)** a) Describe WLAN architecture in detail. [9]
b) Explain Bluetooth architecture with diagram. [9]

OR

- Q12)** Write short note on: [18]
a) Limitations of Bluetooth
b) ATM Switch
c) Hidden Station problem



Total No. of Questions : 12]

SEAT No. :

P836

[Total No. of Pages : 2

[4263] - 356

T.E. (I.T.)

MANAGEMENT INFORMATION SYSTEMS

(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.*

SECTION - I

- Q1)** a) Explain different information systems that support the business operations of an organisation. [9]
- b) What is organizational behavior ? Explain. [9]

OR

- Q2)** a) How MIS creates an impact on the organizational function, performance & productivity? [9]
- b) Discuss essential factors of strategic planning. [9]

- Q3)** a) Explain differences between programmed decision & non-programmed decision. What are the attributes of DSS? [8]
- b) What is data mining? How data mining helps in decision making? [8]

OR

- Q4)** a) Explain the role of analytical modeling in DSS. [8]
- b) Explain Artificial Intelligence system. What is the need of AI system? [8]

- Q5)** a) What is the impact of e-commerce on business? [8]
- b) Describe the relationship between TPS, MIS, DSS & ESS ? [8]

OR

P.T.O.

- Q6)** a) Explain what is CRM? Explain important application components of CRM. [8]
b) State benefits & challenges of supply chain management. [8]

SECTION - II

- Q7)** a) What is Personnel Management ? Explain Transaction documents, applications & reports required for personnel management. [9]
b) Differentiate between service & product. Explain how MIS is applicable in banking services? [9]

OR

- Q8)** a) What is need of production management? Explain different transaction documents & reports generated by production management information systems. [9]
b) Explain cross functional applications for enterprises, in brief. [9]

- Q9)** a) What is Enterprise Management system? Explain with a neat diagram. [8]
b) What is BPO ? Which factors decide the success of BPO industry? [8]

OR

- Q10)** a) Define ITES. What are the objectives of ITES? [8]
b) Explain the process of medical transcription. [8]

- Q11)** a) What is software piracy? What steps will you take to stop this piracy? [8]
b) What are the different health issues in the use of information technology at the work place? [8]

OR

- Q12)** a) How encryption is used as a tool for Security Management ? [8]
b) Explain different global IT strategies. What are global IT applications? [8]



Total No. of Questions : 12]

SEAT No. :

P845

[Total No. of Pages : 3

[4263] - 367

T.E. (Biotechnology)

FERMENTATION TECHNOLOGY - II

(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) a) How Sulphite oxidation method is used for the determination of K_{La} in fermentation broths? Discuss in detail. [9]

b) Deduce Ruth equation describing the rate of filtration for Rotary filters? [9]

OR

Q2) a) Explain in detail the effect of diffusional resistance of oxygen transfer to gas bubbles in fermentation broths? Write equations for the same? [9]

b) What is OTR? Deduce the equation for OTR. How does it influence the fermenter performance? [9]

Q3) a) Explain in detail the construction and working of Spray dryers with the help of a neat sketch? [8]

b) Write short notes on dynamic gassing out technique in order to determine mass transfer coefficients in a fermenter? [8]

OR

Q4) a) Discuss why air lift reactors are a better option than bubble column bioreactors? [8]

b) Write short notes on the construction and working of packed towers? List out its applications? [8]

P.T.O.

- Q5)** a) Write short notes on [8]
i) Langmuir adsorption isotherm
ii) Freundlich adsorption isotherm
b) Discuss in detail the series of steps involved in Ion exchange ? [8]

OR

- Q6)** A volume of 1 m^3 contains a mixture of air and acetone vapor. The temperature is 30°C and the total pressure is 10^5 N/m^2 . If the relative saturation of the air by acetone vapor is 40%, determine the quantity of activated carbon that must be added to the space for reducing the relative saturation to 5% at 30°C . If 1.6kg of carbon is added what will be the percent relative saturation of the equilibrium mixture assuming temperature to be the same? [16]

SECTION - II

- Q7)** Explain graphical representation of the following equilibrium conditions in adsorption. [18]
a) Solids in overflow, variable underflow.
b) No solids in overflow, constant underflow

OR

- Q8)** Roasted copper ore containing copper as CuSO_4 is to be extracted in a multistage countercurrent unit. The Feed to be handled per hour consists of 10,000kg of gangue, 1200 kg of CuSO_4 and 500kg water. The strong solution produced contains 90% water and 10% CuSO_4 by weight. 98% CuSO_4 in ore is recovered using pure water as a solvent. After each stage, 1000 kg of inert gangue retains 2000kg of water plus the copper sulphate dissolved in that water. Equilibrium is attained in each stage. Determine the number of stages required? [18]

- Q9)** a) List out the advantages of membrane separation processes over conventional separation techniques. [8]
b) What is membrane polarization? How does it affect the efficiency of a membrane? What are the methods of preventing membrane polarization? [8]

OR

Q10) a) What are membrane modules? Write short notes on the design criteria for membrane modules? [8]

b) Write short notes on Electro dialysis? What are the membranes used for it ? List out its applications ? [8]

Q11) a) Write short notes on Ternary liquid equilibria? When is it useful and how? [8]

b) Deduce the operating line equation for a single stage extractor and show the graphical representation of the same ? [8]

OR

Q12) Explain with a neat sketch working of perforated plate column extractor. Compare and differentiate the operating process of perforated plate column extractor in the case of heavy liquid and light liquid dispersed conditions. [16]



Total No. of Questions : 12]

SEAT No. :

P846

[Total No. of Pages : 3

[4263] - 368

T.E. (BOTECHNOLOGY)
Immunology and Diagnostics
(2008 Pattern) (Sem. - I)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) *Answer Q. N0. 1 or No. 2, Q. N0. 3 or No. 4, Q. N0. 5 or No. 6 from Section I. Answer Q. N0. 7 or No. 8, Q. N0. 9 or No. 10, Q. N0. 11 or No. 12 from Section II.*
- 2) *Answers to the sections should be written in separate answer book.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of pocket calculator, graph papers, log-log graph paper is allowed.*
- 5) *Draw neat sketches wherever necessary.*
- 6) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Compare the contiguous solid melting model (CSM) and dispersed solid melting model (DSM) [6]
- b) Derive an expression for pressure flow in a single screw extruder. [6]
- c) Write a note on grooved barrel systems used. [6]
- Q2)** a) Write a note on vented extruders. [6]
- b) Discuss the advantages and disadvantages of barrier screw over normal screws with respect to melting and conveying characteristics. [6]
- c) Discuss the effect of helix angle and channel width on die and extruder characteristics. [6]
- Q3)** a) Write a note on downstream equipment used for cast film extrusion.[6]
- b) List the various haul off systems used. Explain any one in detail. [6]
- c) Discuss the winding equipment used for blown film. [4]

P.T.O.

- Q4)** a) Write a note on downstream equipment used for extrusion of pipes. [8]
b) Explain the construction of a flat film die with a neat figure. Discuss the complete line for extrusion of flat film. [8]
- Q5)** a) Mention the merits and demerits of pressure based switch over. [5]
b) Explain the effect of variation in mold temperature and injection speed on final product quality of injection molded products. [6]
c) Explain the features of injection molding of polycarbonate switches for electrical applications. [5]
- Q6)** a) Explain special features of injection molding of PVC pipe fitting. [6]
b) Write a short note on close loop and open loop controlled injection molding machines. [6]
c) Discuss parallel and sequential injection molding machines with suitable examples. [4]

SECTION - II

- Q7)** a) Write a short note on low pressure injection molding. [6]
b) Draw a neat sketch and explain construction of any one torpedo used in pattern making injection molding machine. [6]
c) Write a short note on Reaction Injection molding. [6]
- Q8)** a) Explain how injection-compression process results in lower tonnage. [6]
b) Explain what you understand by fingering and gas penetration. [6]
c) Write a short note on injection molding of elastomers. [6]
- Q9)** a) Write a short note on constructional features of co-extrusion die. [6]
b) Write down the process of making extruded magnetized strips. [4]
c) Write a note manufacturing of hollow corrugated sheets. [6]

- Q10)** a) Write a short note on downstream equipment used for making of cellular plastic products. [6]
- b) Explain the process of making of extruded nets. [6]
- c) Discuss the effect of orientation on extruded products. [4]
- Q11)** a) Discuss positive, semi-positive and flash type compression molds Give their merits and demerits. [6]
- b) Explain Integral pot type transfer molding. [4]
- c) Explain the need for preheating material before processing. Explain different preheating methods. [6]
- Q12)** a) State the various faults and remedies in compression molded products. [6]
- b) Explain compression molding cycle with the help of a neat bar chart. [4]
- c) Derive an equation for compaction force required during compression molding process. [6]



Total No. of Questions : 12]

SEAT No. :

P847

[Total No. of Pages : 3

[4263] - 369

T.E. (Biotechnology)

IMMUNOLOGY AND DIAGNOSTICS

(2008 Pattern) (Semester - II)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) *Answer Q. No. 1 or Q. No. 2. Answer Q. No. 3 or Q. No. 4. Answer Q. No. 5 or Q. No. 6. from Section - I and Answer Q. No. 7 or Q. No. 8. Answer Q. No. 9 or Q. No. 10. Answer Q. No. 11 or Q. No. 12. from Section - II.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat digrams must be drawn wherever necessary.*

SECTION - I

Q1) Explain the broad classes of antibody are present in humans? How are the different classes distinguished from one another? [18]

OR

Q2) Explain the primary lymphoid organs and summarize their functions in the immune response. [18]

Q3) Differentiate between : [16]

- a) Central and peripheral lymphoid organs.
- b) Innate and acquired Immune response.

OR

Q4) Define/Explain in short : [16]

- a) Immunogen
- b) Antigen determinant site
- c) Hapten
- d) Antigen binding site

P.T.O.

Q5) Diagrammatically / schematically represent : **[16]**

- a) Immune cell lineages.
- b) Different types of WBCs.

OR

Q6) Answer the following : **[16]**

- a) What was Edward Jenner's contribution in the field of immunology?
- b) What is the role of phagocytes in immune response, explain the process of phagocytosis?
- c) What physical barriers does the body use to prevent infection?
- d) What is the inflammatory process and What triggers the inflammatory process?

SECTION - II

Q7) Explain the antigen and antibody interaction and the factors responsible for antigen-antibody reactions. **[18]**

OR

Q8) Answer the following : **[18]**

- a) What happens when B cells encounter an antigen? - Explain stepwise.
- b) Explain the difference between antibody affinity and antibody avidity.
- c) Give uses and 2 examples of :
 - i) enzymes in immunoassays
 - ii) fluorescent dyes.

Q9) Define the role of the following : **[16]**

- a) Dendritic cells
- b) Effector cells of the immune system
- c) Helper T cells
- d) Cytokines

OR

Q10) Give the principles underlying the following serological tests. Give applications of each : **[16]**

- a) RIA,
- b) ELISA,
- c) FACS,
- d) Immunoblot test.

Q11) Diagrammatically / Schematically represent : **[16]**

- a) B cell producing antibodies.
- b) Direct Immunofluorescence test.

OR

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

- a) Recombinant Vaccines
- b) HIV infection
- c) Graft rejection
- d) Cancer and immune system



Total No. of Questions : 12]

SEAT No. :

P848

[Total No. of Pages : 2

[4263] - 370

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) *Draw neat diagrams wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Assume suitable data, wherever necessary.*

SECTION - I

Q1) Give an overview of the biological databases, with a detailed description of the network of various databases under Entrez. **[18]**

OR

Q2) What are databases? Describe in detail Object oriented and Relational databases. **[18]**

Q3) Describe briefly : (any 4, 4 marks each) **[16]**

- a) Genbank
- b) EMBL
- c) SGD
- d) Entrez
- e) UniGene
- f) DDBJ
- g) SwissProt

OR

P.T.O.

Q4) Describe the most widely used Sanger's method of sequencing. How is it automated and how has that helped in whole genome sequencing. [16]

Q5) Discuss the different primary protein databases PIR, SWISS-PROT, TrEMBL in detail, and mention the merits and demerits of them all. [16]

OR

Q6) Write short note on the structural database SCOP. Illustrate the organization of the database. [16]

SECTION - II

Q7) What is Sequence Alignment concept, describe in detail with a neat diagram. Write a note on Pairwise Sequence alignment. [18]

OR

Q8) Explain in detail substitution matrices with analysis of PAM and BLOSUM matrices. [18]

Q9) What is Phylogenetic analysis and what is its application? Write a note on distance method for Phylogenetic analysis. [16]

OR

Q10) How is bioinformatics knowledge useful in ligand based and structure based drug designing. [16]

Q11) What is biotechnology management? Which are the different branches which need to be taken into consideration for managing a biotech business? [16]

OR

Q12) Describe in detail the concept of "Technology Transfer" with a case study. [16]

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Total No. of Questions : 12]

SEAT No. :

P791

[Total No. of Pages : 3

[4263] - 283

T.E. (Instrumentation & control)
CONTROL SYSTEM COMPONENTS
(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) *Neat diagrams must be drawn wherever necessary.*
- 3) *Assume suitable data, if necessary.*
- 4) *Answers to the two sections should be written in separate books.*
- 5) *Figures to the right indicate full marks.*
- 6) *Use to logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*

SECTION - I

- Q1)** a) Explain following with respect to Electro Mechanical Relay (EMR)[10]
- i) Construction & Working
 - ii) Applications
 - iii) Selection Criteria
- b) Draw and Explain level switch in detail. Give its application. [8]

OR

- Q2)** a) Explain contactor with following points [10]
- i) Diagram
 - ii) Working principle
 - iii) Construction and
 - iv) Selection criteria
- b) Explain with neat sketch working of following switches. [8]
- i) Limit Switch
 - ii) Temperature switch

P.T.O.

- Q3)** a) What are different methods of braking? Explain forward & Reverse rotation of motor & how it is achieved. [8]
- b) Explain following points with respect to Protection of Motors.
- i) Short circuit Protection
 - ii) Overload Protection
 - iii) Low voltage protection
 - iv) Phase reversal protection [8]

OR

- Q4)** a) Explain with neat sketch working of jogging/inching. [8]
- b) What are interlocks? Explain various interlocks in the lift application with wiring diagram. [8]

- Q5)** a) Explain pneumatics power supply circuit with neat sketch. [8]
- b) Explain with neat diagram construction & Working of 3/2 & 4/3 way Directional control valve. [8]

OR

- Q6)** a) Explain in brief Meter-in & Meter-out Circuit. [8]
- b) Design a circuit for speed Regulation of Single Acting Cylinder by using Pneumatic system. [8]

SECTION - II

- Q7)** a) Design a circuit for reciprocation of double acting cylinder once start signal is applied in hydraulic system. [10]
- b) Explain Hydraulic power supply in detail. [8]

OR

- Q8)** a) List the various properties (Min. 8) of oil used in Hydraulic circuit. [8]
- b) Give the classification of hydraulic pumps. Explain construction & working of any Two pump in detail. [10]

- Q9)** a) Explain along with principle, working & need of circuit breaker. [8]
b) List the different types of Fuses. Explain any one in detail. [8]

OR

- Q10)** a) Explain following with neat diagram. [8]
i) Dampers
ii) Feeders
b) Write a short note on flow totalize. [8]

- Q11)** a) Design & Explain Intrinsic Safety circuit for isolation in Hazardous Area. [8]
b) Compare between pipes, Tubes & Hoses. [8]

OR

- Q12)** a) Explain hazardous area Triangle & its Classification. [8]
b) State Tubes & Tubes fittings along with its application. [8]



Total No. of Questions : 12]

SEAT No. :

P793

[Total No. of Pages : 2

[4263] - 289

T.E. (Instru. & Control)

INSTRUMENTATION SYSTEM DESIGN

(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 books.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Figures to the right indicate full marks.
- 5) Your answers will be valued as a whole.
- 6) Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
- 7) Assume suitable data ,if necessary.

SECTION - I

- Q1)** a) What are the different approaches adapted for product design. [8]
b) If first digit is 6 and second digit is 7 in IP specifications of an equipment, then explain ingress protection standard of the same. [8]

OR

- Q2)** a) Explain general configuration of an instrumentation system. [8]
b) Comment on the phases of product life cycle. [8]

- Q3)** a) What is “Arcing” observed in electro static discharge and what are the ways to avoid it? [8]
b) Explain popcorn noise and shot noise. What are the cares taken to minimize it? [8]

OR

- Q4)** a) Explain principle of working of hybrid ground system? [8]
b) What is “Watch dog timer”? How does it help to detect infinite loop condition? [8]

P.T.O.

- Q5)** a) How does “cold junction compensation” work in AD 595? And also explain AD 595 as a Celsius thermometer. [10]
b) What are the advantages of HCNR 200 over MCT2E? Elaborate an application of HCNR 200. [8]

OR

- Q6)** a) Comment on internal blocks of XTR 110. Can it be used for temperature transmitter? [10]
b) How does AD620 is useful for monitoring ECG (Electro Cardio Gram) of a patient? [8]

SECTION - II

- Q7)** a) How does ULN 2803 used for driving a stepper motor? [10]
b) Explain display driver section of ICM7217A with the help of block diagram. [8]

OR

- Q8)** a) Explain the scheme for frequency multiplication using IC-CD4046 phase lock loop. [10]
b) Explain open collector configuration of ULN 2803 with an appropriate application. [8]

- Q9)** a) What are the advantages and limitations of mass soldering? Explain any one method for mass soldering. [8]
b) Explain necessity of flexible printed circuit boards with an example. [8]

OR

- Q10)** What are the design rules followed for making printed circuit boards for analog and digital circuits. [16]

- Q11)** a) What are the different terms used in reliability testing of an equipment. [8]
b) What are the basic elements of a calibration program? [8]

OR

- Q12)** a) What are the features of virtual instrumentation? Explain with an example. [8]
b) Explain different sections of bath tub curve with an example. [8]



Total No. of Questions : 12]

SEAT No. :

P794

[Total No. of Pages : 3

[4263] - 290

T.E. (Instrumentation & Control)
CONTROL SYSTEM DESIGN
(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) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 6) *Assume suitable data ,if necessary.*
- 7) *Your answer will be valued as a whole.*

SECTION - I

- Q1)** a) For a system having open loop transfer function $G(s) = \frac{4}{s(s+2)}$ and the feedback is unity. **[12]**
- i) Draw the block diagram.
 - ii) Design a suitable compensator for having $\zeta = 0.5$ and undamped natural frequency $\omega = 4$ rad/sec.
- b) What is necessity of compensator in control system? What is selection criterion of compensators? **[6]**

OR

- Q2)** a) Discuss characteristics of Lead and Lag compensators. **[8]**
- b) Give procedure to design procedure for Lead and Lag compensator using root locus approach. **[10]**

- Q3)** Design a Lead-Lag compensator for open loop transfer function $G(S) = \frac{K}{s(s+1)(s+2)}$ The static velocity error constant be 10 sec^{-1} , P. M/. = 50° , G.M.= 10db. **[16]**

OR

P.T.O.

- Q4)** a) A unity feedback control system has an open loop transfer function of $G(S) = \frac{1}{s^2}$. Design a suitable compensating network such that a phase margin of 45° is achieved without sacrificing system velocity error constant. Sketch the bode plot of the uncompensated and compensated system. [8]
- b) Discuss different source of error in strain gauge and how they can be eliminated. [8]

- Q5)** The transfer function of unity feedback system is given below : $G(S) = \frac{K}{s(s+1)(s+3)}$. Find the parameters for P, PI and PID using Ziegler-Nicholas method. [16]

OR

- Q6)** a) The following transfer function is obtained from step response of the system $G(S) = \frac{3e^{5s}}{(20s+1)}$. Find the parameters for P, PI and PID using Cohen-Coon method. [10]
- b) Explain the tuning of PID controller by using Ziegler-Nichols methods. [6]

SECTION - II

- Q7)** a) Design a PD Controller so that a unity feedback system with open loop transfer function $G(S) = \frac{20}{s(s+2)(s+4)}$ Will have damping ratio of 0.8 and natural frequency of oscillation is 2 rad/sec. [8]
- b) Design a PI Controller so that a unity feedback system with open loop transfer function $G(S) = \frac{5}{(s+2)(s+1)}$ Will have damping ratio of 0.5 and natural frequency of oscillation is 2 rad/sec. [8]

OR

- Q8)** a) Design a PID Controller so that a unity feedback system with open loop transfer function $G(S) = \frac{25}{(s+3)(s+2)(s+1)}$ Will have P. M. 50° at 2 rad/sec and steady state error for unit ramp should be 10%. [10]

- b) Design a PI Controller so that a system transfer function $G(S) = \frac{1}{(s-1)}$ will have closed loop poles at $s = -0.5$ and $S = -1$. [6]

Q9) a) The state space representation of a system is given by

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

Compute the state transition matrix and obtain state response. [10]

- b) Determine whether following system is controllable and observable or

$$\text{not } \begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -4 & -6 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 2 \end{bmatrix} u; y = \begin{bmatrix} 1 & 4 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} \quad [8]$$

OR

Q10) a) Give derivation for the necessary and sufficiency condition for complete state observability. [10]

- b) Explain the Lyapunov Stability criteria in detail. [8]

Q11) Design full order state observer that the system.

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -6 & -11 & -6 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u \quad y = \begin{bmatrix} 1 & 0 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$$

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. :

P798

[Total No. of Pages : 3

[4263] - 303

T.E. (Chemical)

INDUSTRIAL ORGANISATION AND MANAGEMENT
(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 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

Unit - I

- Q1)** a) Explain in detail Functional Approach Management. [8]
b) Define Management. State and explain various functions of management. [8]

OR

- Q2)** a) Give detailed classification of forms of organisations. Explain in detail Joint Stock Company (JSC). [8]
b) Explain in detail various functions of managers in an organisation. [8]

Unit - II

- Q3)** a) Define Manpower Planning. Enlist various objectives and requirements of Manpower Planning. [8]
b) Explain in detail classification of Job Evaluation. [8]

OR

- Q4)** a) What is Merit Rating? Explain in detail various methods of merit rating. [8]
b) Write note on : [8]
i) Industrial Fatigue.
ii) Trade Unions.

P.T.O.

Unit - III

- Q5)** a) A fertilizer company needs 700 units of consumables as annual requirement ordering one month usage time. Each consumable costs Rs. 170/-, the ordering cost per order is Rs. 40/-. Inventory carrying cost per year is 17% per year. Suggest economical purchasing policy for the company. What advice one should offer and how much would be annual saving. [12]
- b) State various functions of purchase department. [6]

OR

- Q6)** a) Explain Economic Ordering Quantity (EOQ). Derive

$$Q = \sqrt{\frac{2PD}{HC}}$$

Where, Q = Economic Ordering Quantity, C = unit cost of production,
D = Annual production, P = Set up cost for quantity Q,
H = Inventory carrying cost /handling cost. [12]

- b) State the various functions of Stores department. [6]

SECTION - II

Unit - IV

- Q7)** a) What are the various methodologies used for effective marketing strategies in the competitive market. [8]
- b) What is sales promotion? Explain sales promotion technique. [8]

OR

- Q8)** a) Explain the role of advertising in Marketing. Give various advantages of advertising. [8]
- b) What is sales forecasting? Explain the two types of sales forecasting in detail. [8]

Unit - V

- Q9)** a) Write an explanatory note on Total Quality Management (TQM). [8]
- b) Explain in detail various steps in exporting equipment to a foreign based customer. [8]

OR

- Q10)** a) Explain any two duties related to Import and Export of goods. [8]
b) Explain in detail various steps in exporting equipment to a foreign based customer. [8]

Unit - VI

- Q11)** 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 FERA and FEMA. [6]

OR

- Q12)** Write notes on : [18]
a) Contract Act.
b) MRTP.
c) Therbligs.



Total No. of Questions : 12]

SEAT No. :

P799

[Total No. of Pages : 2

[4263] - 304

T.E. (Chemical)

CHEMICAL PROCESS TECHNOLOGY

(2008 Pattern) (Semester - I)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

Q1) a) Describe various types of flow diagram with example for each. [6]

b) Discuss unit operations and unit processes with example. Give any five types of unit operations with schematic representation. [10]

OR

Q2) a) How soda ash is produced from brine solution? Explain with detailed process flow diagram and reactions. [10]

b) Describe the recovery of Mg salts from sea water. [6]

Q3) a) Explain the various engineering problems related to production of Nitric acid with detailed Process flow diagram. [8]

b) Discuss production of phosphoric acid by weak acid process. [8]

OR

Q4) a) Explain the Process used to produce ammonium phosphate. [8]

b) Describe Finnish Process for elemental sulphur Production. [8]

Q5) a) Explain how starch derivatives are produced with a detailed process flow diagram. [8]

b) Describe production of absolute alcohol. [10]

OR

P.T.O.

- Q6)** a) Discuss the paper making process. [8]
b) Describe production of sugar from sugarcane with major engineering problems. [10]

SECTION - II

- Q7)** a) Explain destructive distillation of coal in detail. [8]
b) Discuss the basic chemistry and cleaning action of soap and explain the procedure used to produce soap. [10]

OR

- Q8)** a) Write in detail about interesterification of fats. [8]
b) Explain the process of solvent extraction for oil recovery with engineering problems. [10]

- Q9)** a) Describe production of natural gas in detail. [8]
b) Discuss the cracking operation and compare thermal and catalytic cracking. [8]

OR

- Q10)** a) Explain polymerization and catalytic reforming operations. [10]
b) Write a short note on refinery operations. [6]

- Q11)** a) Explain production of acetone. [8]
b) Describe production of phenol. by cumeneoxidation. [8]

OR

- Q12)** a) Draw a neat PFD and explain the production of ethylene. [10]
b) Describe production of formaldehyde. [6]



Total No. of Questions : 12]

SEAT No. :

P809

[Total No. of Pages : 2

[4263] - 324

T.E. (Petrochemical)

PETROCHEMICAL PROCESSES - I

(2008 Pattern) (Sem. - I)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Describe the process of continuous nitration of benzene with HNO₃ fortified spent acid. [8]
- b) Write a note on the Schmid nitrator. [5]
- c) Write a note on working up procedures for sulfonation. [5]

OR

- Q2)** a) Describe with flowsheet the process for conversion of 1, 2 dichloroethane to vinyl chloride monomer by alkali route. [8]
- b) Describe the process of photochlorination of cyclohexane. [5]
- c) Write a short note on DVS. [5]

- Q3)** a) Describe with flowsheet the process of conversion of acetaldehyde to acetic acid. [8]
- b) Write short notes on : [8]
- i) Hydrogenation catalysts
 - ii) Oxidising agents

OR

- Q4)** a) Describe the continuous process for manufacture of aniline from chlorobenzene. [8]
- b) Mention with examples the types of oxidation processes. [4]
- c) Write a note on Bechamp reduction. [4]

P.T.O.

- Q5)** a) Describe with flowsheet the process for conversion of benzene to dodecyl benzene. [10]
b) Write a note on the various alkylation agents. [6]

OR

- Q6)** a) Describe with flowsheet the process for conversion of benzene to ethyl benzene. [10]
b) Write a note on hydrolyzing agents. [6]

SECTION - II

- Q7)** a) Describe the process of ethanol production by fermentation. [8]
b) Differentiate between chemical process and biochemical process. [8]

OR

- Q8)** a) Explain in detail engineering challenges in bioprocesses and bioseparations. [8]
b) Describe in detail various photochemical processes. [8]

- Q9)** a) Explain in detail emulsion polymerization. [10]
b) Write a short note on crystallinity and orientation of polymers. [8]

OR

- Q10)** a) Describe with flow sheet the high pressure process for conversion of ethylene to polyethylene. [10]
b) Write a short on : [8]
i) Acrylate polymers
ii) Vinyl polymers

- Q11)** a) Describe in detail LASER ablation techniques for production of carbon nanotubes. [8]
b) Write a short note on multiwall nanotubes. [8]

OR

- Q12)** a) Describe in detail the electric arc techniques for production of carbon nanotubes. [8]
b) Explain in detail growth mechanisms of carbon nanotubes. [8]



Total No. of Questions : 12]

SEAT No. :

P835

[Total No. of Pages : 4

[4263] - 355

T.E. (Information Technology)
SYSTEM SOFTWARE PROGRAMMING
(2008 Pattern) (Semester - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6 from Section - I and Q. 7 or Q. 8, Q. 9 or Q. 10, Q. 11 or Q. 12 from Section - II.*
- 2) *Answers to the two sections should be written in separate 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 what is meant by pass of an assembler. [2]
b) What activities are conducted during analysis and synthesis phase of a two pass assembler. [6]
c) Explain the terms forward reference and backpatching with reference to the single pass assembler. [8]

OR

- Q2)** a) What are the assembler directives? Explain how assembler directives LTORG, ORIGIN and EQU are processed in first pass. [8]
b) What types of errors are handled by the assembler? Explicitly mention error reporting in Pass I and Pass II of two pass assembler. [8]
- Q3)** a) Define the term macro. Explain the terms lexical expansion and semantic expansion with respect to macro. [8]
b) State True or False and justify your answer : [10]
i) A unit of specification for a program generation through expansion is called as Compiler.
ii) An AGO <Sequencing Symbol> statement unconditionally transfers control.

P.T.O.

- iii) APTAB and EVTAB data structures are constructed during pass II of Macro preprocessor.
- iv) A language processor which bridges an execution gap but is not a language translator is called as detranslator.
- v) The process of replacement of a character string by another character string during program generation is called as semantic expansion.

OR

Q4) a) [12]

```

MACRO
ABC  &X, &N, &REG = AREG
LCL  &M
&M SET  0
      MOVER  &REG, = '0'
.MORE MOVEM  &REG, &X + &M
&M    SET    &M + 1
      AIF    (&M NE N) .MORE
MEND
START  500
MOVER  CREG, B
ABC   AREA, 10
      ADD CREG, = '1'
      END

```

- i) Show the contents of different tables and output after processing of macro definition.
 - ii) Show the expanded assembly language program.
- b) Explain C - Preprocessor. [6]

- Q5) a) Explain the role of finite automata in lexical analysis phase of compiler. [6]**
- b) Compare top down parsing and bottom up parsing. [4]
 - c) Explain error recovery in top down parsers. [6]

OR

Q6) a) Consider following program. **[10]**

```
void main ()  
{  
    int p, q, r;  
    P = 10;  
    printf("10");  
}
```

Write down the output of lexical analyzer and also show the contents of different tables.

b) Explain different strategies to recover from a syntactic error. **[6]**

SECTION - II

Q7) a) What is the purpose behind code optimization? What is the criteria for code Optimization? **[8]**

b) Explain Loop optimization techniques with example. **[8]**

OR

Q8) a) Show the triple and quadruple representation of following three address statements. **[8]**

$t_1 := -c$

$t_2 := b * t_1$

$t_3 := -c$

$t_4 := b * t_3$

$t_5 := t_2 + t_4$

$a := t_5$

b) Explain any two issues in code generation. **[8]**

Q9) a) Compare linking loader and linkage editor. **[6]**

b) Explain ESD and RLD cards. **[6]**

c) Explain the functions of loader. **[6]**

OR

- Q10)** a) Explain following : **[10]**
i) Dynamic linking
ii) Overlays
b) Explain BSS loading scheme with the help of an example. Explain how four basic functions of loader are performed in BSS loading scheme. **[8]**

- Q11)** a) Explain debug monitor in detail. **[6]**
b) What are various types of Editors? With the help of block diagram explain typical Editor structure. **[10]**

OR

- Q12)** a) Explain YACC file structure. **[4]**
b) Write short notes on : **[12]**
i) Programming Environment
ii) User Interfaces
iii) LEX



Total No. of Questions : 12]

SEAT No. :

P837

[Total No. of Pages : 3

[4263] - 357

T.E. (Information Technology)
PROGRAMMING PARADIGMS
(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 books.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Your answers will be valued as a whole.*
- 5) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*

SECTION - I

- Q1)** a) Explain key features of various programming paradigms. [8]
b) Explain properties of following data types. [8]
i) Structured
ii) Derived
iii) Scalar
iv) Composite

OR

- Q2)** a) What are the attributes of good programming language? What are the major applications area and corresponding programming language ? [8]
b) Explain type conversion and Coercion. [8]
- Q3)** a) Explain following parameter passing methods : [8]
i) Call by value and
ii) Call by reference
b) What do you mean by exception ? Explain with eg. With respect to C++ and JAVA. [8]

OR

P.T.O.

- Q4)** a) Define following terms wrt to variables. [8]
i) Lifetime
ii) Scope
iii) Static scope
iv) Dynamic Scope
b) What are the elements of procedure declaration? [4]
c) Explain the importance of local and non-local variables. [4]

- Q5)** a) Explain the concept of Multithreading? Explain the same with respect to JAVA with suitable example. [10]
b) Explain the Applet Life cycle with eg. [8]

OR

- Q6)** Write short notes on following : [18]
a) Inheritance in C++
b) Layout Manager in JAVA
c) Significance of access specifiers in JAVA

SECTION - II

- Q7)** a) Explain rules, facts and queries in Prolog with example. [8]
b) Explain the approaches for garbage collection in LISP. [8]

OR

- Q8)** a) Explain distributed operating system organization. [8]
b) Explain parallel programming languages. [8]

- Q9)** a) What are the primitives required for data flow notation? [4]
b) Explain the methods for node firing. [4]
c) What are advantages and disadvantages of relational database model. [4]
d) Write short note on Windows programming. [4]

OR

- Q10)** a) Enlist and explain the 8 socket primitives required for network connection. [8]
b) Write down the steps for creating socket based application in Java. [8]

- Q11)** a) Explain design principles of network system. [8]
b) Explain design principles Data flow programming. [8]
c) Explain the concept of links in HTML document [2]

OR

- Q12)** Write short notes on : [18]
a) Parallel operating systems
b) Design principles of Database Programming
c) Flynn's Classification.



Total No. of Questions : 12]

SEAT No. :

P838

[Total No. of Pages : 2

[4263] - 359

T.E. (Information Technology)

HUMAN COMPUTER INTERACTION AND USABILITY

(2008 Pattern) (Semester - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer Question 1 or 2, 3 or 4, 5 or 6 from Section - I and Question 7 or 8, 9 or 10, 11 or 12 from Section - II.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Explain the goals of interaction design in detail. [8]
b) Differentiate between inductive and abductive reasoning in detail with suitable example. [8]

OR

- Q2)** a) Classify the different models of interaction. Explain any one in detail. [8]
b) What is ergonomics? Explain its significance in user interface design. [8]

- Q3)** a) What are the different styles of interaction? Explain form filling and menu selection style of interaction in detail with suitable example giving their advantages and disadvantages. [10]
b) Explain the process of interaction design. [8]

OR

- Q4)** a) What is WIMP interface? Explain its elements in detail with advantages and disadvantages of each. [10]
b) Explain any one lifecycle model of HCI in detail. [8]

P.T.O.

- Q5)** a) Explain learnability principles to support usability. [8]
b) Explain guidelines for data display and data entry. [8]

OR

- Q6)** a) Explain Shneiderman's Eight Golden Rules of Design. [8]
b) Explain how HCI pattern can prove to be useful in any interaction design. [8]

SECTION - II

- Q7)** a) What is DECIDE? Explain DECIDE framework in detail. [10]
b) Explain different evaluation techniques for evaluating interfaces. [8]

OR

- Q8)** a) Explain web usability standards and guidelines in detail. Explain how they can be applied for designing an online shopping store. [10]
b) Explain in brief Hutch World evaluation framework. [8]

- Q9)** a) What is linguistic model? Explain BNF and TAG linguistic notations. [8]
b) Explain the use of task analysis and task decomposition in HCI. [8]

OR

- Q10)** a) Explain different dialog design notations. [8]
b) Write a short note on status-event analysis for modeling rich interaction [8]

- Q11)** a) What is Groupware? Explain synchronous and asynchronous groupware in brief. [8]
b) Write short note on Information Visualization. [8]

OR

- Q12)** Write short note on : [16]
a) Virtual and Augmented Reality
b) Computer Supported Cooperative Work (CSCW)



Total No. of Questions : 12]

SEAT No. :

P839

[Total No. of Pages : 2

[4263] - 361

T.E. (Biotechnology)
GENETICS ENGINEERING
(2008 Pattern) (Semester - I)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer Q. No. 1 or Q. No. 2, Answer Q. No. 3 or Q. No. 4, Answer Q. No. 5 or Q. No. 6, Answer Q. No. 7 or Q. No. 8, Answer Q. No. 9 or Q. No. 10, Answer Q. No. 11 or Q. No. 12.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Draw neat diagrams wherever necessary.*
- 4) *Figures to the right indicate full marks.*

SECTION - I

Q1) Describe and discuss in detail Restriction Enzymes, the different types and their modes of action. Describe the experiment which led to the identification of Restriction enzymes, enlist five examples and the organism from which they are isolated. **[18]**

OR

Q2) Write a detailed note on PCR with a neat diagram. Describe the significance of each step, reactant and temperature. **[18]**

Q3) What are plasmids, explain their significance in genetic engineering? Describe in detail a typical cloning vector, with all the different parts and their importance. **[16]**

OR

Q4) Write short note on bacterial and yeast artificial chromosomes. What are cosmids? **[16]**

Q5) Explain the concept of gene libraries, how are they constructed? What are cDNA libraries? **[16]**

OR

P.T.O.

Q6) Discuss in detail the steps and their significance involved for cloning a protein in an expression system after it has been isolated and characterized. Also draw a neat flow chart. **[16]**

SECTION - II

Q7) Answer the following : (9 marks each) **[18]**

- a) How are recombinants identified by colony hybridization, give details? Explain the blue white selection.
- b) What are the different types of modifications of Restriction Fragments used in cloning?

OR

Q8) Explain the Sanger's method of sequencing, with a neat diagram. How was its automation possible? **[18]**

Q9) Answer in brief : (8 marks each) **[16]**

- a) Bacterial Conjugation
- b) Vaccines

OR

Q10) What are transgenic animals and plants? What is their significance in biotechnology? **[16]**

Q11) Answer the following : (8 marks each) **[16]**

- a) Write a note on Bt Cotton, explain the advantages and disadvantages.
- b) What is Golden Rice? How is it synthesized? What was the necessity and what are the problems with its production?

OR

Q12) Explain in brief : (4 marks each) **[16]**

- a) Hep B
- b) Humulin
- c) Factor VIII
- d) Gene Therapy



Total No. of Questions : 8]

SEAT No. :

P1226

[Total No. of Pages : 3

[4263] - 203

T.E. (Civil)

STRUCTURAL DESIGN - I
(2008 Pattern) (Semester - I)

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 answer books.*
- 3) *Neat diagram should be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Take f_c 410 grade of steel.*
- 6) *Take ultimate stress in bolt, $f_{ub} = 400 \text{ N/mm}^2$.*
- 7) *Use of electronic pocket calculator IS : 800 - 2007 and steel table is allowed.*
- 8) *Use of cell phone is prohibited in the examination hall.*

SECTION - I

- Q1)** a) Explain in detail gauge line, gauge distance, pitch, edge distance and end distance with sketch. **[10]**
- b) Design the tie of a roof truss subjected to factor design tension, $T = 230 \text{ kN}$ using unequal angle section. Centre to centre length of intersection is 2.8 m. Also design the welded connection and draw the design details. **[15]**

OR

- Q2)** a) Explain the limit state of serviceability in brief. **[6]**
- b) Explain the classification of cross section and hence find class of ISHB 225 @ 43.1 kg/m. **[6]**
- c) A tension member consist of two ISA 90 x 90 x 8 mm @ 10.8 kg/m back to back on either side of 10 mm thick gusset plate. Determine the design strength using bolted connection. **[13]**

P.T.O

- Q3)** a) Design a column to support a factored load of 1100 kN. The column has an effective length of 7.0m with respect to z-axis and 5 m with respect to y-axis. [8]
- b) Design the section of steel column and suitable base for an axial compressive factor load of 3000 kN. The effective length of the column is 6 m. The grade of concrete used for pedestal is M_{30} . [17]

OR

- Q4)** a) Design a double angle discontinuous strut to carry a factored load of 135 kN. The centre to centre length of strut is 3 m. The angles are placed back to back on opposite side of gusset plate. Also design the welded connection and draw the design details. [10]
- b) Design column of 8 m length using two channels placed back to back subjected to factored compressive force of 1800 kN. It is effectively held in position at both ends and restrained against rotation at one end. Design batten system and draw the design details. [15]

SECTION - II

- Q5)** a) Determine the safe uniformly distributed load that the beam ISLB 600 @ 99.5 kg/m has been used as a simply supported over 7.2 m span. The compression flange of a beam is not restrained against lateral buckling. At the ends beam is fully restrained in torsion but both the flanges are free to warp at the ends. [15]
- b) A Simply supported beam of span 5 m carries uniformly distributed load $w = 40$ kN/m and a central point load $W = 50$ kN. The beam is laterally supported throughout the span. Design economical cross section and check for deflection. [10]

OR

- Q6)** a) A conference hall 8 m x 18 m is provided with a 120 mm R C C slab over rolled steel beams spaced 3 m c/c. A wearing coat of 100 mm thickness is provided over the roof. Design the beam section if, the compression flange of the beam is laterally supported throughout the span. [15]
- b) An ISLB 325 @ 43.1 kg/m transmit a factored end reaction of 75 kN and a factor end moment of 100 kNm to the flange of a column ISHB 250 @ 54.7 kg/m. Design the bolted connection. [10]

Q7) Design Suitable cross section for welded plate girder for an effective span of 30 m and carrying uniformly distributed load $w = 30 \text{ kN/m}$. It is also loaded with two concentrated load of 150 kN acting at 10 m from either supports. The compression flange of the girder is laterally supported throughout the span. Also design load bearing stiffener, connection between flange and web plate and draw the design sketches. [25]

OR

Q8) Design L_0U_1 , L_0L_1 and U_1L_1 of a pratt truss as shown in **Fig.8**. The design wind pressure is 1200 N/m^2 , the truss are covered with A C sheet and the centre to centre spacing of truss is 6 m. [25]

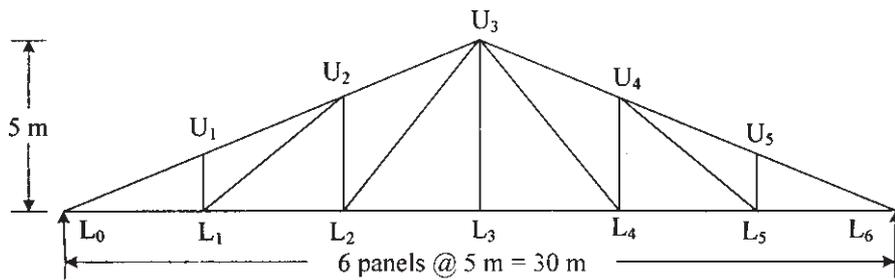


Fig. 8



Total No. of Questions : 6]

SEAT No. :

P1228

[Total No. of Pages : 3

[4263] - 241

T.E. (Production S/W)

MANUFACTURING TECHNOLOGY

(Self Study) (2008 Pattern) (Sem. - I)

Time :3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) *Answers to the two sections should be written in separate answer books.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Use of logarithmic tables, slide rules, Mollier charts, electronic pocket calculator & steam tables is allowed.*
- 4) *Assume suitable data, if necessary.*

SECTION - I

Q1) Draw schematic diagram, explain in brief working principle, state advantages & limitations & applications, mention process parameters for any two of the following non-traditional machining processes. **[16]**

- a) Abrasive Jet machining.
- b) Electro chemical machining.
- c) Electron beam machining.

OR

Describe the basic mechanism of material removal in (any two) : **[16]**

- a) Ultrasonic machining.
- b) Electro-discharge machining.
- c) Wire cut EDM.
- d) Electrochemical machining.

Also identify process parameters.

Q2) Explain following for plastic processing : **[16]**

- a) Elastomers
- b) Calendaring
- c) Thermoforming
- d) Molding processes for plastic.

OR

P.T.O.

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 modelling & simulation important for system design, particularly for MEMS design? What are the specifications of requirement as far as modelling is concerned?

Give an example of how a parallel plate actuator system can be modelled
Represent the above system in pictorial Form & describe each element.[18]

OR

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

- a) Lithography.
- b) Diffusion & implantation.
- c) Printed circuit boards.
- d) Bonding.
- e) Crystal Growing & Water preparation.

SECTION - II

Q4) a) What is Comparator? Classify the different types of comparators. [4]
b) What are salient features of a comparator & how are they achieved in 'Sigma Comparator'? Explain your answers with sketches. [12]

OR

For measurement by light wave interference explain following (any two) :[16]

- a) Fringe patterns & their interference.
- b) Michelson interferometer.
- c) NPL flatness interferometer.

Q5) Explain following (any two) : [16]

- a) Sine Bar.
- b) Auto collimator.
- c) Angle Dekkor.
- d) Surface finish measurement.

OR

Explain principle & applications of measuring instruments of optical & bevel protractor. [16]

Q6) Explain objectives & functions of cost estimating & principle factors in estimating, along with estimating procedure. **[18]**

OR

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

- a) Estimation of volume & weight of material.
- b) Methods of depreciation.
- c) Replacement techniques.
- d) Methods of depreciations.
- e) Provision for scrap & its necessity in estimating.



Total No. of Questions : 12]

SEAT No. :

P1229

[Total No. of Pages : 3

[4263] - 255

T.E. (Electrical Engineering)

ELECTRICAL INSTALLATION, MAINTENANCE & TESTING

(2008 Pattern) (Semester - I)

Time :3 Hours]

[Max. Marks :100

Instructions to the candidates:-

- 1) *Answer any three questions from each Section.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of electronic pocket calculator is allowed.*
- 6) *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) A 300 m long distributor is fed at point 'A' and is loaded as 60A at 0.85 lag p.f. and 85 A at 0.9 lag p.f. at point 'B' and Point 'C' respectively. Point 'B' is midpoint of feeder. Power factors at both load points are referred to the voltage at point 'C'. The impedance of each section is $0.2 + j0.3$. Calculate the sending end voltage, current and power factor if the voltage at point 'C' is maintained at 230 V. [8]

OR

- Q2)** a) Cost of a 3.phase overhead transmission line is Rs. $(35000a + 3500)$ per km, where 'a' is the area of cross section of each conductor in cm^2 . The line is supplying a load of 6 MW at 33 KV and 0.8 p.f. lagging. The average working hours are 20 per day in a year. Energy cost is Rs. 2 per kWh and interest and depreciation of 10% per annum. Use Kelvin's law to find the most economical size of conductor. Specific resistance of conductor material is 10^{-6} ohm.cm. [8]
- b) What are different types of feeders and distributors? Bring out their relative advantages and disadvantages. [8]

P.T.O

- Q3)** a) Explain in detail functions of the equipments used in substation. [8]
b) State the objectives of substation grounding. State and explain the factors which affect the soil resistivity. [8]

OR

- Q4)** a) Explain in detail design of earthing grid of substation. [8]
b) Explain in detail classification of substation. [8]

- Q5)** a) Explain planned and preventive maintenance of transformer. [8]
b) Explain the breakdown maintenance and preventive maintenance strategies. [5]
c) Explain the effect of magnitude of test voltage in the measurement of insulation resistance. [5]

OR

- Q6)** a) Explain in detail the process of deterioration of insulation. [10]
b) In connection with insulation resistance measurement, explain the term polarization index and its use to judge the quality of insulation. [8]

SECTION - II

- Q7)** a) Explain in detail different failure modes of transformer. [8]
b) How degree of polymerization and partial discharge measurement is used for condition monitoring of transformer? [8]

OR

- Q8)** a) How transformer oil gets contaminated? With suitable 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 is it useful in condition monitoring of electrical equipment? [8]
b) Explain various methods used for location of fault in power cables. [8]

OR

- Q10)** a) Enlist different faults occurring in the induction motor and their causes. [8]
- b) Write detail note on thermography. [8]

Q11) Write short notes (Covering Construction, Working principle and Troubleshooting - Electrical faults only).

- a) Washing Machine.
- b) Fan. [18]

OR

Q12) Write short notes (Covering Construction, Working principle and Troubleshooting - Electrical faults only)

- a) Water Pump.
- b) Refrigerator. [18]



[4263] - 352

T.E. (IT)

THEORY OF COMPUTATION

(2008 Pattern) (Sem. - I)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:-

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

SECTION - I

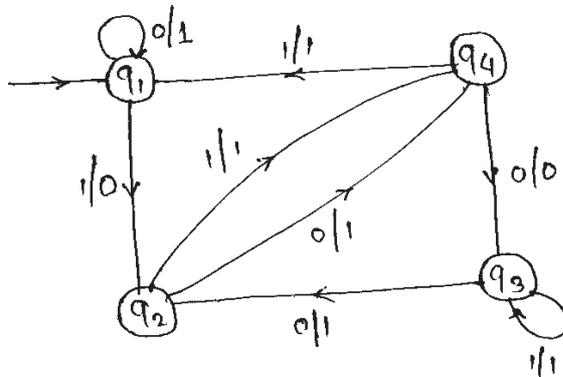
- Q1)** a) Design an NFA equivalent to following RE- [6]
 $(0 + 1)^*(00 + 11)(0 + 1)^*$
- b) Give RE for the following languages over $\Sigma = \{0,1\}$. [6]
- i) Strings containing even number of 1's followed by odd number of 0's.
 - ii) Strings that do not contain three consecutive 0's.
 - iii) Strings that contain at most three 0's.
- c) Give the difference between NFA and DFA. [4]

OR

- Q2)** a) Find all strings of length 5 or less in the regular set represented by the following - [6]
- i) $(ab + a)^*(aa + b)$
 - ii) $(a^*b + b^*a)^*a$
 - iii) $a^* + (ab + a)^*$
- b) Show that - [6]
- i) $R^*R = R^+$
 - ii) $(P + Q)^* = (P^*Q^*)^*$
 - iii) $(R^*)^* = R^*$
- c) Give the difference between Mealy machine and Moore machine. [4]

- Q3)** a) Design a DFA for a language of strings of 0's and 1's such that - [10]
 i) Substring is 10.
 ii) Strings ending with 101.

- b) Convert the following Mealy machine to its equivalent Moore machine - [6]



- c) Explain term 'Word'. [2]

OR

- Q4)** a) Design an NFA to accept set of all strings which end with 00. Where $I = \{0, 1\}$. Convert this NFA into its equivalent DFA. [8]

- b) Obtain a DFA to accept strings of a 's and b 's such that -
 $L = \{W/W \in (a + b)^* \text{ such that } N_a(W) \bmod 3 = 0 \text{ and } N_b(W) \bmod 2 = 0\}$ [10]

\Rightarrow

- Q5)** a) Construct a CFG to generate following language [6]

$$L = \{0^m 1^m 2^n \mid m \geq 1 \text{ and } n \geq 0\}$$

- b) Show that the grammar [6]

$$S \rightarrow aB \mid ab$$

$$A \rightarrow aAB \mid a$$

$$B \rightarrow ABb \mid b$$

is ambiguous for the string $aaabbb$.

- c) Explain Chomsky Hierarchy with example. [4]

OR

- Q6)** a) Consider the following productions [8]

$$S \rightarrow aB \mid bA$$

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

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

For the string *aaabbabbba*, find -

- i) The leftmost derivation.
 - ii) The rightmost derivation.
 - iii) Parse tree.
- b) Convert the following grammar in CNF [8]
- A $\rightarrow 01XY$
X $\rightarrow 1XY \mid$
Y $\rightarrow YXa \mid X$

SECTION - II

- Q7)** a) Construct left linear and right linear grammar for the RE $(0 + 1)^* 00(0 + 1)^*$ [8]
- b) Prove that -
 $L = \{a^i b^i c^i \mid i \geq 1\}$ is not a CFL. [8]

OR

- Q8)** a) Construct a DFA to accept the language generated by the left linear grammar given below -
- S $\rightarrow B1 \mid A0 \mid C0$ \Rightarrow
B $\rightarrow B1 \mid 1$
A $\rightarrow A1 \mid B1 \mid C0 \mid 0$
C $\rightarrow A0$ [6]
- b) Prove that CFLs are closed under union, concatenation and closure. [10]

- Q9)** a) i) Explain the concept of Post machine. [4]
ii) Give the difference between PDA & FSM. [4]
- b) Construct a PDA that accepts the language generated by following grammar [8]
- i) S $\rightarrow aA$
A $\rightarrow aABc \mid bB \mid a$
B $\rightarrow b$
C $\rightarrow c$
 - ii) S $\rightarrow AA \mid a$
A $\rightarrow SA \mid b$

OR

- Q10)** a) i) What are the applications of PDA? [4]
ii) Define PDA. [4]
b) Construct a PDA that accepts by empty stack all strings over $\{0, 1\}$ with equal number of zeroes and ones. [8]

- Q11)** a) Write short note on unsolvability of Turing machine. [6]
b) Construct a Turing machine to compute - [12]
 $f(x, y) = x + y$; if $x \geq y$
 $= 0$; if $x < y$

OR

- Q12)** Write short notes on - [18]
a) Composite TM.
b) Halting problem of TM.
c) Church Turing hypothesis.



\geq

Total No. of Questions : 12]

SEAT No. :

P1305

[Total No. of Pages : 7

[4263] - 212

T.E. (Mechanical / Automobile & Mech. S/w)

HEAT TRANSFER

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

SECTION - I

UNIT - I

- Q1)** a) Write a note on electrical analogy of heat transfer. **[4]**
- b) Explain : Isotropic and Anisotropic materials. **[4]**
- c) A 10 cm diameter copper ball is to be heated from 100°C to an average temperature of 150°C in 30 minutes. Taking average density and specific heat of copper in this temperature range as 8950 kg/m³ and 0.395 kJ/kg°C respectively, determine -
- i) The total amount of heat transfer to the ball and
 - ii) The average rate of heat transfer to the ball and average heat flux. **[4]**
- d) The roof of an electrically heated room is 6m long, 8m wide and 0.25m thick, and is made of a flat layer of concrete whose thermal. Conductivity is 0.8 W/m°C. The temperatures of inner and outer surfaces of room one night are measured to be 15°C and 4°C respectively, for a period of 10 hours. Determine - **[4]**

P.T.O

- i) Rate of heat loss through roof that night and
- ii) Cost of heat loss if cost of electricity is Rs. 4 / kWh.

OR

- Q2)** a) Derive three dimensional heat conduction equation in cartesian coordinates and reduce it to Poisson equation. [8]
- b) Write three dimensional conduction equations in cylindrical and spherical coordinates. [4]
- c) A 2m long 0.3 cm diameter electrical wire extends across a room. Heat is generated in the wire as a result of resistance heating and the surface temperature of wire is measured to be 152°C in steady operation. Also, the voltage drop and electric current through the wire are measured to be 60V and 1.5A respectively. Disregarding any heat loss by radiation, determine the heat transfer coefficient for heat transfer between the outer surface of wire and air in the room if air temperature is 15°C. [4]

UNIT - II

- Q3)** a) Derive an expression for critical thickness of insulation on a spherical body. [6]
- b) Write a note on 'Thermal contact Resistance'. [4]
- c) Solid cylindrical rod 8 cm in diameter ($K = 50 \text{ W/mK}$) generates heat at the rate of $2 \times 10^5 \text{ W/m}^3$. If centre line temperature is 150°C, Calculate [6]
- i) Surface temperature
 - ii) Rate of heat conducted at outer surface per metre of rod. Consider only radial conduction.

OR

- Q4)** a) Derive an expression for steady state temperature distribution in an infinite slab of width $2b$ with uniform heat generation rate of \bar{q} units per unit volume. Hence evaluate maximum temperature and its location in a 30 mm thick plate if it has uniform heat generation of $2.7 \times 10^3 \text{ W/m}^3$. Temperature of one surface is 110°C and the other is 100°C. Take $K = 15 \text{ W/mK}$. [10]

- b) Two aluminium plates ($K = 240 \text{ W/mK}$) of 2 cm thickness with 10 microns surface roughness are placed in contact under 10^5 N/m^2 pressure in air. The temperatures at outer surfaces are 406°C and 390°C . Calculate
- Heat flux,
 - Temperature drop due to thermal contact resistance and
 - Contact temperatures. Thermal contact resistance with air as intermediate fluid for 10 micron roughness is $2.75 \times 10^{-4} \text{ m}^2\text{K/W}$.
- [6]**

UNIT - III

- Q5)** a) Write a note on time constant and response of thermocouple. **[4]**
- b) Define : Biot number and Fourier number. **[4]**
- c) Derive an expression for temperature distribution as a function of time in an arbitrary body of volume V and surface area A . The body is initially at temperature t_0 and immersed in surroundings at temperature T_f . Take heat transfer coefficient at surface as h . **[4]**
- d) A cylindrical fin is 3 mm in diameter and 3 cm long. Calculate the value of the temperature at fin tip if the fin is made of **[6]**
- Copper ($k = 350 \text{ W/mK}$) and
 - Teflon ($K = 0.35 \text{ W/mK}$).
- Assume that heat loss from fin tip is negligible.
- Take $h = 10 \text{ W/m}^2\text{K}$, $T_f = 20^\circ\text{C}$ $T_{\text{base}} = 120^\circ\text{C}$.

OR

- Q6)** a) Define : Fin efficiency, Fin effectiveness. **[4]**
- b) Derive an expression for steady state temperature distribution along the length of a pin fin and heat transfer rate from its surface. Assume the fin to be infinitely long. **[8]**
- c) A thermocouple junction which may be approximated as a sphere, is to be used for temperature measurement of a gas. The convection coefficient between the junction surface and gas is known to be $400 \text{ W/m}^2\text{K}$ and the

junction thermophysical properties are $K = 20 \text{ W/mK}$, $C_p = 400 \text{ J/kgK}$ and $\rho = 8500 \text{ kg/m}^3$. Determine the junction diameter needed for the thermocouple to have time constant of 1 sec. If the junction is at 25°C and is placed in a gas stream that is at 200°C , how long will it take for the junction to reach 199°C ? [6]

SECTION - II

UNIT - IV

Q7) a) State and derive the relation of [8]

- i) Wien's Displacement law,
- ii) Stefan Boltzman law.

b) The effective temperature of a body having an area of 0.15m^2 is 530°C . Calculate : the total rate of energy emission, the intensity of normal radiation and the wavelength of maximum monochromatic emissive power. [6]

c) Define intensity of radiation and Lambert's law of radiation. [4]

OR

Q8) a) Explain "Surface resistance" and "Space resistance". Construct radiation network for two gray surfaces exchanging radiant energy. Give the formula for the radiant heat exchange between them. [6]

$$F_{1-2} = \frac{1}{2B^2} \left[X - \sqrt{X^2 - 4B^2C^2} \right]$$

b) A short cylinder enclosure is formed with three surfaces, a circular plane surface 1 of radius 20 cm maintained at 2000K and having emmissvity of 0.8, another circular plane surface 2 of same size as surface 1 having emmissivity of 0.5 and maintained at 500K. The surface 1 and 2 are parallel to each other and the distance between them is 5 cm. The third surface is reradiating, which forms an enclosure. Draw an equivalent circuit and compute all resistances. Also find

- i) Temperature attained by reradiating surface and
- ii) Net heat transfer rate between surface 1 and 2 due to radiation.

Use the following expression for finding the shape factor between two circular discs, coaxial and parallel areas :

Where, $B = r_1/H$, $C = r_2/H$ and $X = (1 + B^2C^2)$

Where, r_1 and r_2 are the radii of the circular planes and H is the distance between them. [12]

UNIT - V

Q9) a) Show that for velocity distribution $\frac{u}{U} = 2\left(\frac{y}{\delta}\right) - \left(\frac{y}{\delta}\right)^2$ the ratio of $\delta/\delta^* = 3$. [8]

b) A long 10 cm diameter steam pipe is exposed to atmospheric air at 4°C. The outer surface of the pipe is at 110°C and air is flowing across the pipe at the velocity of 8 m/s. Determine the rate of heat loss from the pipe per unit of its length. [8]

OR

Q10) a) A vertical 0.8m high, 2m wide, double pane window consists of two sheets of glass separated by 2 cm air gap at atmospheric pressure. If the glass surface temperatures across the air gap are measured to be 12°C and 2°C, determine the rate of heat transfer through the window. [8]

b) Show that the coefficient of volumetric expansion for an ideal gas is $\beta = 1/T$, where T is absolute temperature of gas. [4]

c) Define [4]

i) Grashoff Number

ii) Rayleigh Number.

UNIT - VI

Q11) a) Differentiate between [6]

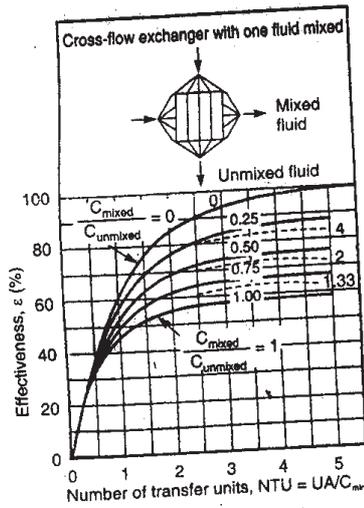
i) Pool boiling and forced convection boiling,

ii) Nucleate and film boiling.

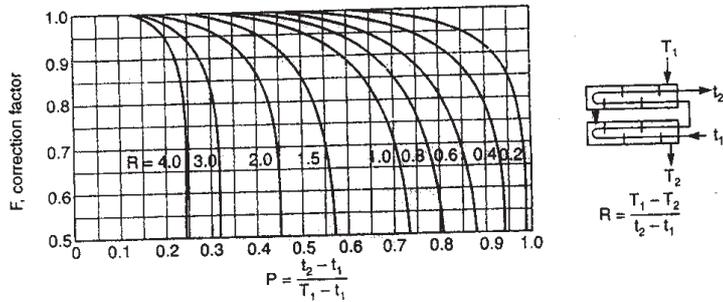
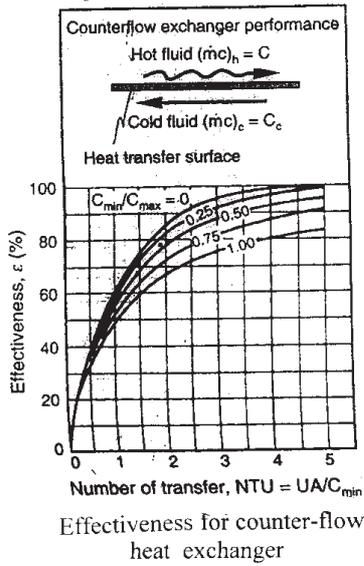
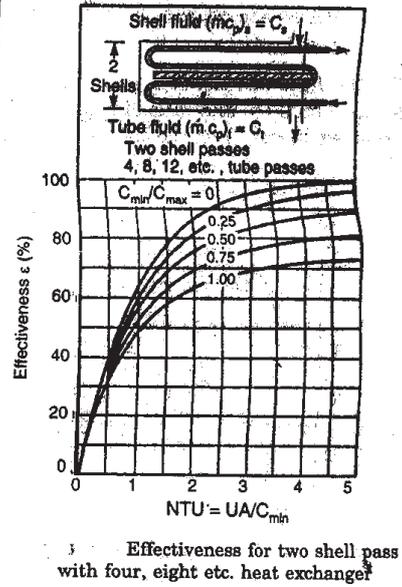
b) What are the modes of boiling? Explain any one boiling mode with neat sketch. [10]

OR

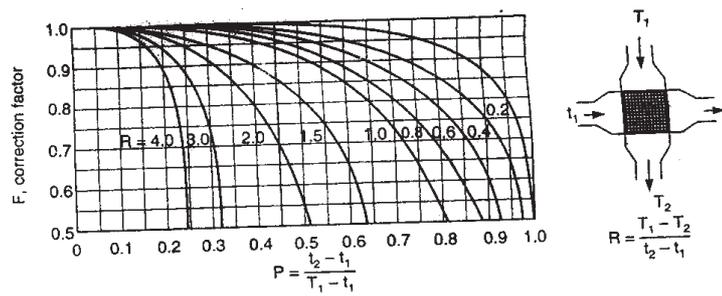
- Q12)** a) In the heat exchanger, hot fluid enters at 200°C and leaves at 125°C . The cold water enters at 103°C and leaves at 127°C . Find the LMTD, NTU and effectiveness in the following cases of heat exchanger. **[10]**
- i) Counterflow heat exchanger.
 - ii) Two shell passes and multiple tube passes.
 - iii) Cross flow both fluids unmixed.
- b) What do you mean by 'fouling' in heat exchangers? State the causes of fouling. Give the relation of overall heat transfer coefficient by considering the fouling factors at the inside and outside surface. **[6]**



Effectiveness for cross-flow heat exchanger, both fluid unmixed



(b) Two shell pass and four tubes pass or multiple of four tube pass



(c) Cross flow, both fluid unmixed

Q12 (a)



- Q5)** a) Describe seam welding process with its controlling parameters? Briefly explain types of seam welds. [8]
b) Explain the principle of resistance welding, mentioning its advantages, disadvantages and application. [8]

OR

- Q6)** a) Distinguish between flash welding and upset butt welding. [8]
b) Write a note on percussion welding and briefly discuss parameters controlling the process. [8]

SECTION - II

- Q7)** a) Sketch and describe the Thermit welding process. Also list its application. [8]
b) Describe the EBW with neat sketch listing its advantages and application? [6]
c) Write down the steps followed during friction welding to get sound weld quality? [4]

OR

- Q8)** Write short note on : [18]
a) Explosive welding,
b) Diffusion welding,
c) LBM.

- Q9)** a) Explain the principle of braze weld and in detail discuss the diffusion and furnace brazing methods. [8]
b) Write a note on solder and fluxes used in soldering with their applications. [8]

OR

- Q10)** a) Write a note on Soldering methods. [8]
b) Write a note on testing of adhesive bonded joint. [8]

- Q11)** a) List any four weld defects with its causes and remedies. [8]
b) Write a note on Quality assurance v/s Quality control. [8]

OR

- Q12)** a) Elaborately discuss the factors to be considered while calculating welding cost? [10]
b) Explain the following terms : deposition rate, deposition efficiency, operating factor. [6]



Total No. of Questions : 12]

SEAT No. :

P1308

[Total No. of Pages : 2

[4263] - 285

T.E. (Instrumentation & Control)

INDUSTRIAL MANAGEMENT

(2008 Pattern) (Sem. - I)

Time :3 Hours]

[Max. Marks :100

Instructions to the candidates:-

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

SECTION - I

Q1) a) State and explain Porter's five forces. How they will be helpful in competitive business? [12]

b) State and explain the concept of Mind - Mapping. [6]

OR

Q2) a) Define strategic planning. Explain Mergers and Take-overs as a strategic alternative with its importance to current business scenario. [12]

b) Explain Business process Re-engineering. Explain its importance to business. [6]

OR

Q3) a) Explain the following quality standards : [8]

i) ISO - 9000

ii) ISO - 14000

b) Write a note on quality circle. [8]

OR

Q4) a) Explain the following concepts : [8]

i) Patent management.

ii) Business expansion and diversion strategy.

b) Explain expansion and diversification as business strategies. [8]

P.T.O

- Q5)** a) Explain the term 'Purchasing' in relation to a manufacturing industry. Give the general purchase procedure. [10]
b) Write a short note on store keeping. [6]

OR

- Q6)** a) State and explain the objectives, importance of production planning. Do you consider outsourcing is a part of production planning? Explain.[10]
b) Write a note on supply chain management. [6]

SECTION - II

- Q7)** a) Giving importance, explain appraisal management. [8]
b) Define Man Power Planning. Explain the functions and process of man power planning. [10]

OR

- Q8)** a) Explain need, objective and types of Training. [10]
b) What is the role of Job Description in man power planning? Explain.[8]

- Q9)** a) What is capital? What are the two types of capital? Give the different sources of finance. [8]
b) Explain project costing. What are the various project costs and also explain how the project report is prepared? [8]

OR

- Q10)** a) State and explain how Balance Sheet, Profit and Loss Account evaluate the performance of a company. [10]
b) What is CVP graph? Explain its assumptions and importance. [6]

- Q11)** a) What is disaster management? Explain its causes, effects and mitigation Mechanisms. [8]
b) Explain the following : [8]
i) Value Added Tax.
ii) Service Tax.

OR

- Q12)** a) Global warming - causes and effects. [8]
b) Safety and Environmental norms. [8]



Total No. of Questions : 8]

SEAT No. :

P720

[Total No. of Pages : 4

[4263] - 1

T.E. (Civil)

STRUCTURAL DESIGN - I

(2003 Pattern) (Semester - I)

Time :4 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) *Answer Q1 or Q2, Q3 or Q4, from Section I and Q5 or Q6, Q7 or Q8 from Section II.*
- 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 electronic pocket calculator, IS-800 and steel table is allowed.*
- 6) *Assume suitable data, if necessary and clearly state them.*
- 7) *Use of cell phone is prohibited in the examination hall.*

SECTION - I

- Q1)** a) State the advantage and disadvantage of bolted connection. [5]
- b) A double angle discontinuous strut ISA 150 mm x 75 mm x 10 mm back to back and longer legs connected to one side of gusset plate. The length of strut between center to center of intersection is 3.5 m. Determine the safe load carrying capacity. [10]
- c) An ISLB 350 @ 0.495 kN/m transmits an end reaction of 290 kN to the web of ISMB 500 @ 0.869 kN/m. Design bolted connection using 22 mm diameter of bolt and draw the design sketch. [10]

OR

- Q2)** a) State and explain the structural properties of steel in construction. [5]
- b) Design a tension member using two equal angle sections to carry an axial force of 360 kN when both angles are connected to both side of gusset plate. Also design the welded connection and draw the design sketch. [10]

P.T.O.

- c) A bracket plate 10 mm thick is used to transmit a reaction of 150 kN at an eccentricity of 150 mm from the column flange as shown in Fig. 2 (c). Design the weld. [10]

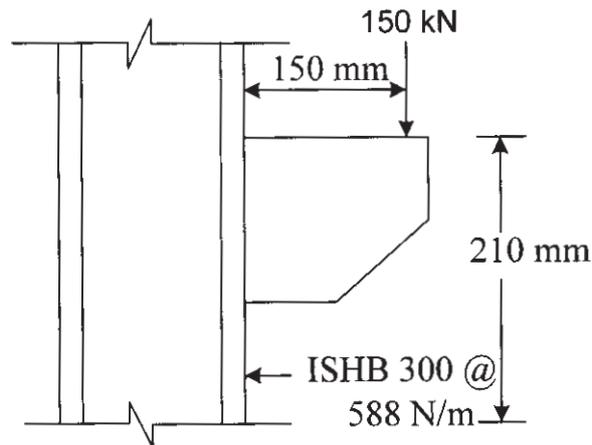


Fig. 2 (c)

- Q3)** a) A laterally restrained beam ISLB 350 @ 0.495 kN/m has been placed on the support. Determine the safe uniformly distributed load per meter length which can be placed over the beam for an effective span of 6.3 m. [10]
- b) Design a cross-section of plate girder to carry a uniformly distributed load of 1000 kN over a span of 10m. A full lateral support is provided to the compression flange. Show the curtailment and design the flange to web connection. Draw the design sketches. [15]

OR

- Q4)** a) A simply supported beam of span 9 m carries a uniformly distributed load of 12 kN/m. Design the cross-section of beam, if depth of beam is limited to 450 mm from clear head requirements. [12]
- b) Determine maximum bending moment & shear force for gantry girder due to vertical load (in the plane of web) to be used in an industrial building, carrying an electric overhead traveling crane with following data. [13]

Crane Capacity	: 200 kN
Self weight of crane girder	: 200 kN
Self weight of Accessories	: 40 kN
Min. approach of the crane hook to the gantry girder	: 1.2 m
Wheel base	: 3.2 m
Span of crane girder	: 16 m
Span of gantry girder	: 08 m

SECTION - II

Q5) Design the members L_0U_1 , U_1L_1 and L_0L_1 of the fink truss shown in Fig. 5 with following data. Design the angle purlin and draw the design sketches.

[25]

Spacing of trusses	: 8 m c/c
Asbestos roofing sheet of self weight	: 170 N/m^2
Self weight of purlin	: 315 N/m
Self weight of bracing	: 15 N/m^2
Coefficient of external wind pressure, C_{Pe}	: -0.6
Coefficient of internal wind pressure, C_{Pi}	: ± 0.2
Basic wind speed	: 39 m/s

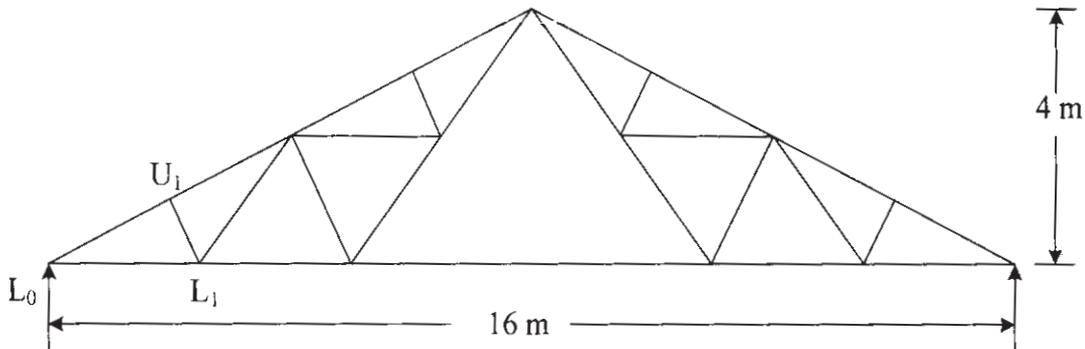


Fig. 5

OR

Q6) Design foot over bridge with following details.

[25]

Type of girder	: N type truss
Span of girder	: 20 m c/c
Spacing of cross girder	: 2.5 m
Clear walking width between main girder	: 3 m
Live load	: 4 kN/m^2
Height of truss	: 2 m

Design the timber plank flooring, cross girder, rakers, central top chord and bottom chord members and draw the design sketches.

Q7) Design a built up column using two channels placed face to face to carry an axial load of 1500 kN. The effective length of column is 5 m. Also design single lacing system & gusseted base for built up column. Draw the design sketches. **[25]**

OR

Q8) a) Design a column base for an axial load of 700 kN & a bending moment of 100 kN-m. The column section provided is ISHB 400 @ 822 N/m. Design the anchor bolt also, if required. The bearing pressure from concrete may be assumed to be 4200 kN/m². **[15]**

b) Explain design procedure of compression member using cold formed light gauge sections. **[10]**



Total No. of Questions : 12]

SEAT No. :

P722

[Total No. of Pages : 4

[4263] - 3

T.E. (Civil)

CONSTRUCTION TECHNIQUES & MACHINERY

(2003 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, Q7 or Q8, Q9 or Q10, Q11 or Q12 from Section II.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*

SECTION - I

- Q1)** a) 'Construction activity plays an important role in national & global development' justify the sentence. [4]
- b) Enlist various equipments used for material handling and with a neat labelled sketch explain tower crane. [6]
- c) What are the merits & demerits of precast concrete? [4]
- d) What are the safety parameters considered in using the construction equipments? [4]

OR

- Q2)** a) Explain the manufacturing process of siporex blocks with a neat flow diagram. [6]
- b) Write short note on 'demolition techniques'. [4]
- c) What are the various conveying equipments? Briefly explain any one conveyor equipment. [4]
- d) Explain the importance of mechanisation in construction equipment. [4]

P.T.O.

- Q3)** a) What are the various methods of under water concreting? Explain any one of them in detail. [8]
- b) Write short notes on: [8]
- i) Slip form techniques
 - ii) Tunnel form work

OR

- Q4)** a) Describe the production process of RMC at plant with the help of neat sketch & flow diagram. [8]
- b) Write short notes on: [8]
- i) Power shovels
 - ii) Pumped concrete.

- Q5)** a) Describe crushing plant giving the flow chart of aggregate processing plant. [8]
- b) With the help of a neat labelled sketch explain how will you construct the flooring structure for high duty industry. [8]

OR

- Q6)** a) Enlist the various pneumatic equipments that are commonly used & also state the various factors that are considered while selection of pneumatic equipments. [8]
- b) Write short notes on: [8]
- i) Shotcreting
 - ii) Tunnel boring machine

SECTION - II

- Q7)** a) What are the factors considered in the selection of an earth moving equipments? Explain them. [8]
- b) Explain the following terms- [8]
- i) Cycle time
 - ii) Operating factor
 - iii) Bucket fill factor
 - iv) Bank volume

OR

- Q8)** a) What do you mean by equipment sizing or matching? Discuss the concept for earth moving machinaries. [8]
- b) Explain the following with neat sketches- [8]
- i) Trenching machine
 - ii) Back hoe

- Q9)** a) Explain the important properties of aggregate required in asphalt mix production. [6]
- b) What do you mean by the term P.Q.C.? Also, explain the same giving a neat sketch. [6]
- c) Write short note on 'dry lean concrete'. [4]

OR

- Q10)** a) Give any two applications where slip form technique has been actually used. What are precautions to be taken while performing the slip form operations? [8]
- b) Briefly describe the hot mix & cold mix plant of bituminous concrete mix. [8]

Q11) a) What do you mean by cost of owning & operating of an equipment?
What are the factors considered for purchasing or hiring of an equipment. **[8]**

b) Write short notes on: **[10]**

- i) Preventive maintenance of equipments
- ii) Overheads
- iii) Useful life of an equipment
- iv) Salvage value
- v) Sum of digit method of depreciation

OR

Q12) a) What do you mean by economic life of an equipment? What are the aspects considered in the economic life of equipment. **[8]**

b) Write short notes on: **[10]**

- i) equipment working rate
- ii) record keeping
- iii) straight line method of depreciation
- iv) fuel & lubrication cost
- v) equipment costs



Total No. of Questions : 12]

SEAT No. :

P743

[Total No. of Pages : 4

[4263] - 204

T.E. (Civil)

FLUID MECHANICS - II

(2008 Pattern) (Sem. - I)

Time :3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) *Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 in Section-I.*
- 2) *Answer Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12 in Section-II.*
- 3) *Answers to the two sections should be written in separate answer books.*
- 4) *Neat diagrams must be drawn wherever necessary.*
- 5) *Figures to the right indicate full marks.*
- 6) *Your answers will be valued as a whole.*
- 7) *Use of electronic pocket calculator is allowed.*
- 8) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) An air plane weighing 35000 N is flying at a velocity of 360 kmph. The plane has a wing surface area of 25 m². If the coefficient of drag is 0.03 find i) the coefficient of lift ii) the drag force and iii) the power required to drive the plane. The density of air is 1.2 kg/m³. **[8]**
- b) Derive an expression for rise of water pressure due to gradual valve closer. **[6]**
- c) Derive equation for speed of sound for adiabatic process. **[4]**

OR

- Q2)** a) Describe polar diagram of an air foil. **[6]**
- b) Define the terms 'drag coefficient' and 'lift coefficient'. **[4]**
- c) Water is flowing through a pipe of diameter 40 cm and length 2400m with a velocity of 2.5 m/s. A valve is provided at the end of the pipe. If the valve is closed in 30 seconds find the rise in pressure. Take the velocity of pressure wave as 1500 m/s. **[4]**

P.T.O.

- d) Find the speed of sound in dry air at sea level where the pressure and temperature are 101 kN/m² and 25°C respectively. The characteristics gas constant and the ration of specific heats for air are 287 J/kg-K and 1.4 respectively. [4]

- Q3)** a) Prove that for a single curved moving vane the maximum efficiency is

$$\eta_{\max} = \frac{16}{27} \cos^2 \frac{\theta}{2} \quad [8]$$

- b) A centrifugal pump running at 1200 r.p.m. delivers water. The diameter of the impeller at the inlet is 100 mm and at the outlet is 300 mm. The width of the impeller is 50 mm at inlet and 20 mm at the outlet. The blade angle at the outlet is 30°. If the velocity of flow at the inlet is 2.2 m/s find the velocity of flow at the outlet. Also find the head developed if the manometric efficiency is 75%. [8]

OR

- Q4)** a) Jet of water of 60 mm strikes a symmetrical stationary curved vane at its centre and is deflected through an angle of 135°. Because of the friction over the surface the water leaving the vane has only 90% of its original velocity. If the force exerted by the jet on the plate is 1800 N find the volume flow rate of water. [8]

- b) Derive expression for specific speed of a centrifugal pump. [8]

- Q5)** a) Design a Pelton wheel with the following data: Head = 450m, Power = 16650 kW, No. of jets = 3, speed = 400 r.p.m., $C_v = 0.96$, $\eta_h = 0.95$, $\eta_m = 0.96$, speed ratio = 0.48. [8]

- b) Define a hydraulic turbine and give its classification based on various criteria. [4]

- c) Explain following terms: [4]

- i) Hydraulic efficiency.
- ii) Volumetric efficiency.
- iii) Mechanical efficiency.
- iv) Overall efficiency.

OR

- Q10) a)** For a hydraulic jump in rectangular channel, the loss of energy in the jump is 3.75 m and pre jump Froude number is 7.5. Determine **[10]**
- i) the rate of flow
 - ii) the conjugate depth
 - iii) relative loss and
 - iv) the length of the jump
- b) Explain in short specific energy diagram and specific force diagram. **[6]**

- Q11) a)** What are the assumptions involved in the analysis of GVF? Derive the differential equation of GVF in open channel. **[10]**
- b) Explain the graphical integration method of computation of gradually varied flow. **[8]**

OR

- Q12) a)** A rectangular channel 20 m wide flow with normal depth of 2 m with a slope of bed 1 in 6400. At a certain section, the flow depth is 3 m. How far upstream or downstream of this section will the depth be 2.6 m. Use step method and take only two steps. Take Manning's coefficient = 0.015. Sketch & mention the profile. **[10]**
- b) Explain M_2 , S_1 and H_3 profile with a neat sketch. **[8]**



Total No. of Questions : 12]

SEAT No. :

P746

[Total No. of Pages : 4

[4263] - 207

T.E. (Civil)

PROJECT MANAGEMENT AND ENGINEERING ECONOMICS

(2008 Pattern) (Semester - II)

Time :3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *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 any two types of organisation with example. [6]
b) Explain any three functions of Management. [6]
c) Explain salient features of CPM and PERT and the circumstances in which each is used. [6]

OR

- Q2)** A small construction work comprises the following activities. The duration and restraints are given below.

Activity	Duration (Weeks)	Restraints
A	4	Starting Activity
B	5	Starting Activity
C	6	C follows A
D	2	D follows B
E	2	E follows C & D
F	4	F follows C & D
G	1	G follows E
H	2	H follows F
I	4	I follows G & F
J	2	J follows H & I

P.T.O.

OR

- Q6)** a) Following table shows the annual consumption of the items used in a project and their unit cost. Classify them in A, B, C classes and plot ABC curve. [12]

Sl.No.	Item	Annual consumption	Unit cost in Rs
1	Water	80 litres	20/litre
2	Cement	2000 bags	300/bag
3	Fly ash	50 kg	150/kg
4	Tor steel	4000 kg	50/kg
5	Mild steel	2000 kg	38/kg
6	Nails	100 kg	15/kg
7	12 mm Aggregate	3000 m ³	20/m ³
8	20 mm Aggregate	3000 m ³	19/m ³
9	Oil	10 litres	100/litre
10	Sand	3000 m ³	20/m ³

- b) Explain the principles of Break - Even Analysis. [4]

SECTION - II

- Q7)** a) Draw a site Layout for construction of a multistoreyed building. [8]
b) What are the various causes of accidents on any multistoreyed building site? [5]
c) What are the responsibilities of a safety manager on construction sites? [5]

OR

- Q8)** a) What are the factors to be considered while preparing a site layout? [6]
b) Explain the significance of "Safety Programme" and "Safety Training". [6]
c) Write a detailed note on "Personal Protective Equipment". [6]

- Q9)** a) What is the importance of Economics in civil engineering construction field? [6]
b) Explain 'Cost, Price & Value' with an example. [6]
c) Define Demand. Explain "Law of Demand" With an example. [4]

OR

- Q10)** a) Explain the following with example. [6]
 i) Law of substitution
 ii) Elasticity of Demand
 b) What are Demand and Supply Curves? Explain how the Price Equilibrium takes place. [6]
 c) Explain with example “The law of Diminishing Marginal Utility”. [4]

- Q11)** a) Define capital. Explain Fixed and working capital. [6]
 b) Differentiate between N.P.V and I.R.R. [6]
 c) Explain “Time Value of Money” with an example. [4]

OR

- Q12)** a) Define Annuity. What are the different types of annuities. [6]
 b) The following are the details of a project A and B. [10]
 Suggest which one is to be accepted by using
 i) NPV
 ii) BCR [$i = 8\%$]

Years	Project A	Project B
0	4,00,000	4,50,000
1	1,20,000	1,40,000
2	1,25,000	1,45,000
3	78,000	76,000
4	80,000	65,000
5	75,000	60,000
6	—	90,000



Total No. of Questions : 8]

SEAT No. :

P747

[Total No. of Pages : 8

[4263] - 208

T.E. (Civil)

STRUCTURAL DESIGN - II

(2008 Pattern) (Semester - II)

Time : 4 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer Q.1 or Q.2, and Q.3 or Q.4 in section-I.*
- 2) *Answer 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) Answer the following **[9]**
- i) Explain the stress strain relationship for concrete according to the assumptions in limit state of collapse in flexure.
 - ii) Explain the term 'Moment of Resistance' and its significance in the design of flexural members.
 - iii) Compare LSM with WSM from consideration of material behaviour.
- b) A rectangular, singly reinforced beam, 300mm wide and 565mm effective depth is used as a simply supported beam over an effective span of 6m. The reinforcement consists of 4 bars of 20mm diameter at tension face. If the beam carries a load of 15kN/m, inclusive of its self weight, determine the stresses developed in concrete and steel using WSM. Use M20 concrete and Fe415 steel. **[8]**
- c) Calculate the moment of resistance by LSM for flanged beam section detailed as below **[8]**
- i) Width of rib = 230mm
 - ii) Effective flange width = 1250mm
 - iii) Thickness of flange = 120mm

P.T.O.

- iv) Total depth = 600mm with clear cover 25mm
- v) Tension steel = 6 No. of 20mm diameter bars.
- vi) Use M25 grade of concrete and Fe415 grade of steel.

OR

- Q2)** a) A rectangular beam section, 300mm wide and 600mm deep is reinforced with 4 bars of 25mm diameter in the tensile zone and 2 bars of 16mm in the compression zone. The clear cover is 25mm for both the reinforcement. Determine moment of resistance of the section using WSM. Use M20 grade of concrete and Fe415 grade of steel. **[8]**
- b) A reinforced concrete rectangular beam has width 300mm and total depth 750mm with clear cover of 25mm. Design the beam by LSM, if it is subjected to total bending moment of 160kNm. Use M20 grade of concrete and Fe415 grade of steel. Compare the design with that obtained by WSM. **[12]**
- c) Draw strain and stress distribution diagrams with all parameters for the design of RCC section of flexural member using LSM. **[5]**

- Q3)** Design the slab S9 and S10 only for flexure by LSM. Refer the centerline plan given in fig. 1. **[25]**

Consider live load = 3kN/m^2 ,

Floor finish = 1.5 kN/m^2

Use M25 grade of concrete and Fe415 grade of steel.

Draw neat sketches showing details of reinforcement.

OR

- Q4)** Design dog legged staircase from plinth level to the first floor level for the following data: **[25]**

Floor to floor height = 3450mm

Rise = 150mm; Tread = 300mm

No of risers in first flight = 11

No of risers in second flight = 12

Width of stair = 1 m

Clear Landing width at midlanding and first floor level = 1 m

At plinth level, plinth beam is provided below first step, whereas at midlanding level and first floor level beam is provided at the outer face of landing. Show detailed load calculations and reinforcement details in sectional elevation.

SECTION - II

Q5) A continuous R.C.C. floor beam is simply supported at A and C and continuous over support B, span AB = 7m and BC = 5 m. The beam carries a dead load of 20kN/m (inclusive of self weight) and live load of 12 kN/m. The beam supports one way slabs of span 3m on either side of it. Calculate the support moment at B and maximum span moments of span AB and BC, using 25% redistribution of moments. Draw bending moment diagram and design the beam only for flexure. Draw longitudinal section showing all details.

Material- Concrete of grade M25, Fe500 reinforcement. [25]

OR

Q6) a) A reinforced concrete beam has the following data:

Clear Span of beam = 5 m, Width of supporting columns = 300mm,
Beam section = 230 x 450mm,

Ultimate UDL on beam = 50kN/m, inclusive of self weight.

Reinforcement at top – 2 Nos of 12mm diameter bars

Reinforcement at bottom – 2 Nos of 16mm diameter bars through
+ 2nos of 12 mm diameter bars curtail.

Design the shear reinforcement using vertical stirrups. Draw neat diagram showing zoning.

Material- Concrete of grade M20, Longitudinal reinforcement- Fe415 HYSD,

Shear reinforcement- Fe250. [20]

b) What do you understand by “redistribution of moments” as applied to R.C. structures. ? What are its advantages? [5]

Q7) Design column C10 as axially loaded short column for G+2 building with isolated trapezoidal footing for the following data. Refer fig. 1

Floor to floor height = 3.2m

Height of plinth above ground level = 1.2m

Depth of foundation below ground level = 1.5m

Live load on all slabs = 3kN/m²

Floor finish load on all slabs = 1.5kN/m²

Thickness of slab = 140mm

Thickness of wall on all beams = 230mm

Height of parapet wall = 1 m

Size of all beams = 230 x 450mm

S.B.C. of soil = 180 kN/m²

Material- Concrete of grade M25, Fe500 HYSD reinforcement. Detailed load and design calculations are expected. Draw neat sketches giving reinforcement details of column and footing. **[25]**

OR

Q8) Design a rectangular column subjected to a working load of 800 kN and working moment of 62kNm about major axis and 16kNm about minor axis. The unsupported length of column is 4.5m. Assume both ends of column fixed. Also design its footing considering axial load and moment about major axis only. Take S.B.C. of soil = 200 kN/m². Use M20 concrete and Fe415 steel. Detailed calculations and sketches are expected. (Use given charts) **[25]**

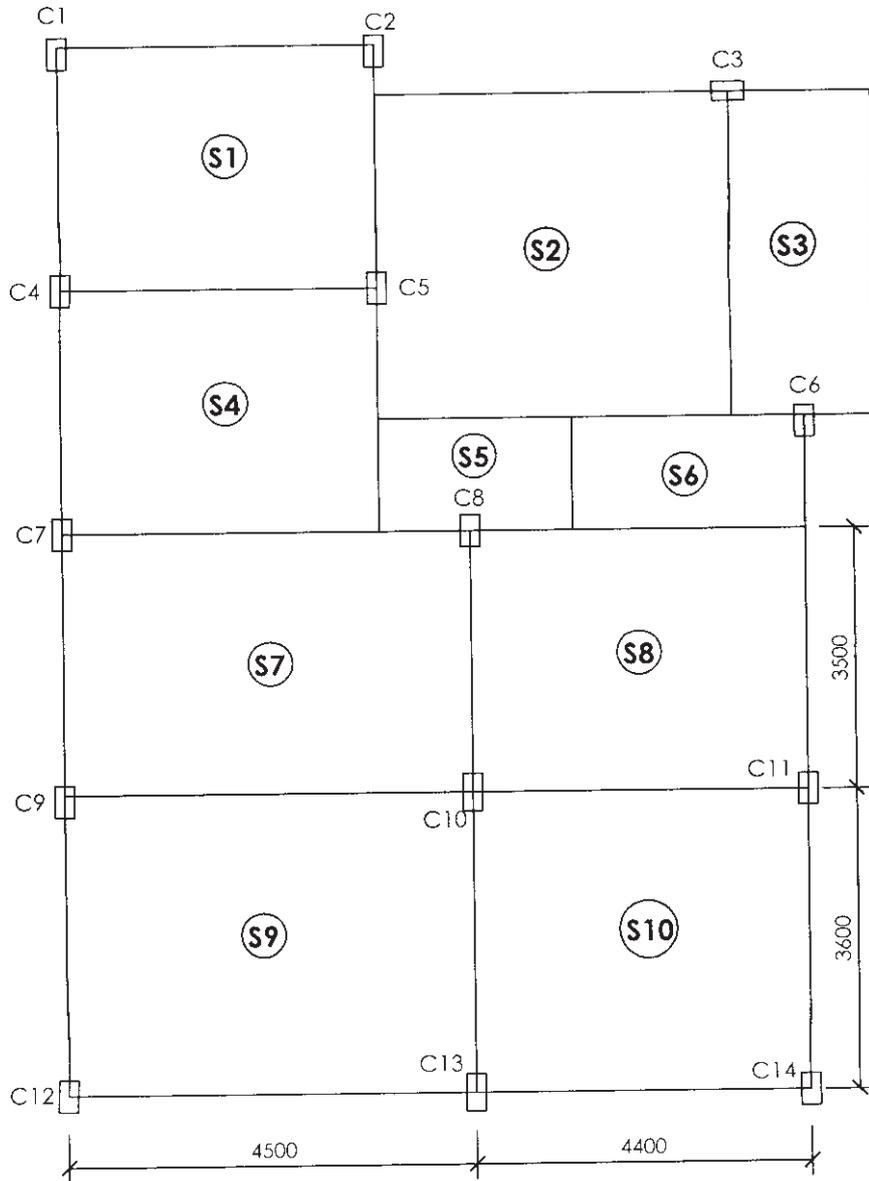
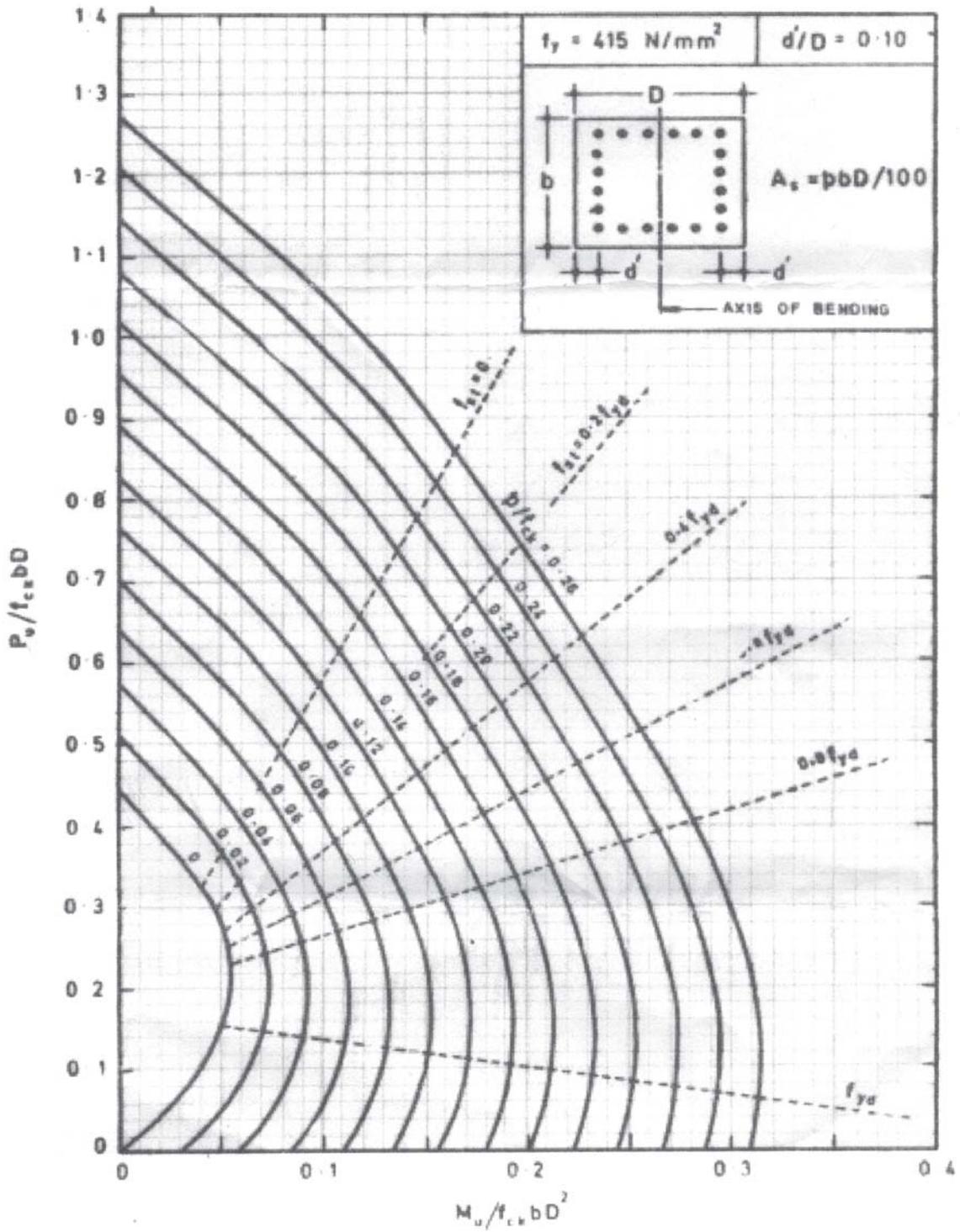


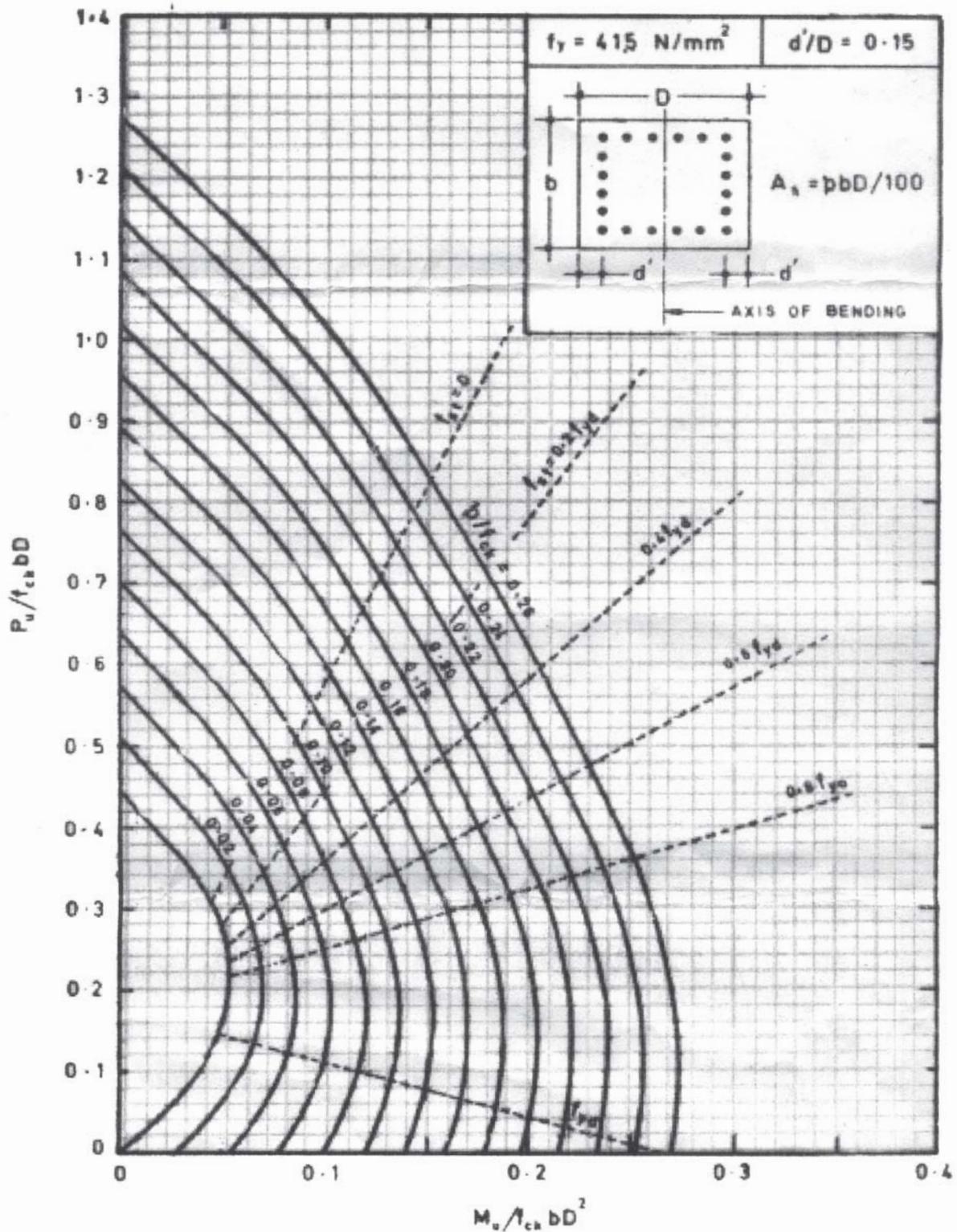
FIG.1 (Q.3 & Q 7)

Chart 44 COMPRESSION WITH BENDING – Rectangular Section – Reinforcement Distributed Equally on Four Sides



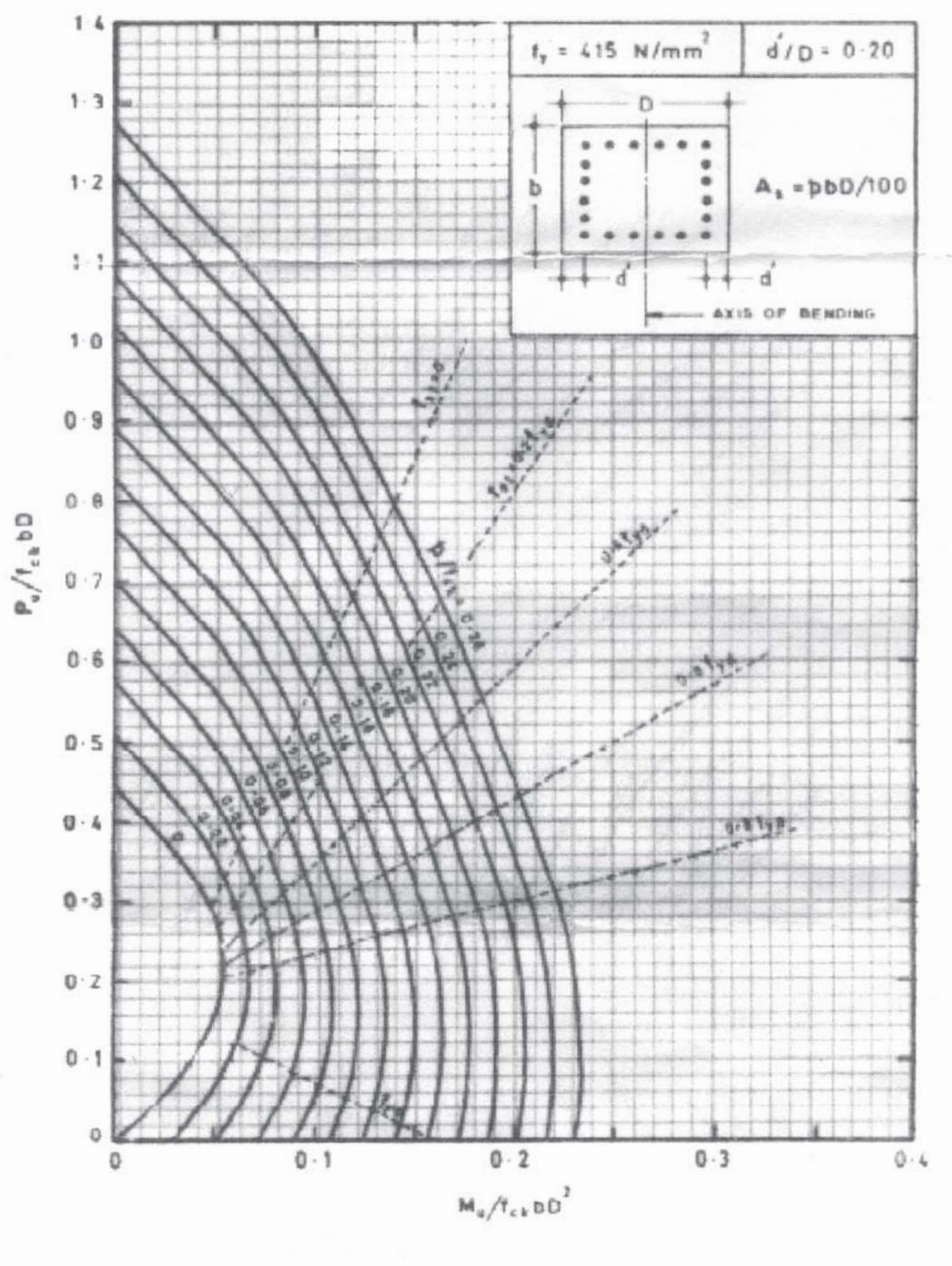
COMPRESSION MEMBERS

Chart 45 COMPRESSION WITH BENDING – Rectangular Section – Reinforcement Distributed Equally on Four Sides



DESIGN AIDS FOR REINFORCED CONCRETE

Chart 46 COMPRESSION WITH BENDING – Rectangular Section – Reinforcement Distributed Equally on Four Sides



COMPRESSION MEMBERS



Total No. of Questions : 12]

SEAT No. :

P756

[Total No. of Pages : 7

[4263] - 220

T.E. (Mechanical)

REFRIGERATION AND AIR CONDITIONING

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

SECTION - I

Unit - I

- Q1)** a) Sketch the reversed Carnot cycle on P-h, T-s diagram within the temperature limits 27°C and 77°C with vapor as a working medium. Is it practical cycle? Why? What is the coefficient of performance (COP) of heat pump working within same temperature limits? [6]
- b) Show that coefficient of performance of reversed Brayton cycle is a function of pressure ratio. Show the effect of discharge pressure on COP of reversed Brayton cycle on T-s diagram. [6]
- c) What are the advantages and disadvantages of vapor compression cycle over reversed Carnot cycle. [6]

OR

P.T.O.

- Q2)** a) Explain with sketch working, advantages and limitations of thermo-electric refrigeration system. [6]
- b) Air conditioner of 1.5 ton refrigeration (TR) capacity working on reversed Carnot cycle has cooling coil temperature of 8°C and condenser temperature 57°C. Cooling air enters the condenser at 44°C and leaves at 54°C. Overall heat transfer coefficient (U) between condenser coil and air is 250 W/m²K. Determine the mass flow rate of the air, area of condenser, COP, power consumption of air conditioner. [8]
- c) Room can be heated using either electrical heater or a heat pump. Which one better choice? Sketch and justify your answer. [4]

Unit - II

- Q3)** a) Sketch actual vapor compression cycle on P-h and T-s diagram and explain all processes briefly. [8]
- b) Simple saturated VCC using ammonia has capacity of 25TR. Evaporator and condenser temperatures are -5°C and 40°C respectively. Calculate mass flow rate of refrigerant, COP of system, heat rejected in condenser. What will be dimensions bore and stroke of the single acting four cylinder compressor running at 350 rpm, L/D = 1.1, volumetric efficiency = 0.7. Use following properties. Specific heat of ammonia vapor is 2.1897 kJ/kgK. Show the cycle on P-h and T-s diagram with important parameters. [8]

t°C	P bar	v _g m ³ /kg	h _f kJ/kg	h _g kJ/kg	s _f kJ/kgK	s _g kJ/kgK
-5	3.5571	0.346	176.9	1456.1	0.9154	5.6856
40	15.57	--	390.6	1490.4	1.6437	5.1558

OR

- Q4)** a) In a vapor compression cycle using R22 condenser and evaporator temperatures are 40°C and 0°C respectively. Instead of throttling device, if we use isentropic expander, will it save work input? What will be percentage of savings of work? Determine percentage rise in refrigerating effect per kg of refrigerant and COP. Compression begins with dry saturated vapor condition. Show cycle on P-h and T-s diagram. Use following properties. Specific heat of R22 vapor is 0.651 kJ/kgK. [10]

t°C	P bar	v _g m ³ /kg	h _f kJ/kg	h _g kJ/kg	s _f kJ/kgK	s _g kJ/kgK
0	4.976	0.0471	200.0	405.36	1.000	1.7518
40	15.335	0.151	249.08	415.95	1.1666	1.6995

- b) Describe with sketch working of lithium-bromide vapor absorption system. [6]

Unit - III

- Q5)** a) Explain the following terms- Ozone depletion potential, Global warming potential, Total equivalent warming impact. [6]
- b) Two stage R-22 plant with flash inter cooler has two 45 mm bore and 40 mm stroke compressors as follows - LP compressor: number of cylinders = 6, Speed 1000rpm, volumetric efficiency = 75 %. HP compressor: number of cylinders = 4, Speed 800rpm, volumetric efficiency = 69 %. Find the capacity of the plant for the condenser and evaporator temperatures 40°C and -40°C respectively. What should be inter-stage pressure? Use Chart. [10]

OR

- Q6)** a) What are desirable properties of refrigerants? [6]
- b) R-22 plant of capacity 150 kW is working between the condenser and evaporator temperatures 40°C and -30°C respectively. There is no sub-cooling of the refrigerant and vapor enters the compressor in dry saturated state. Find power consumption, COP, and mass flow rate i) when one stage is used and ii) when two stage compression with flash inter cooling is used. Use Chart. [10]

SECTION - II

Unit - IV

- Q7)** a) Define and discuss the significance of following terms: [8]
- i) Dew point temperature
 - ii) Specific humidity
 - iii) Degree of saturation
 - iv) Relative humidity

- b) For a hall to be air conditioned, [6]
 Outdoor conditions DBT = 40°C, WBT = 20°C
 Required conditions DBT = 20°C, RH = 60%
 Seating capacity of hall = 1500
 Amount of outdoor air supplied = 0.3 m³/min/person. If required conditions are achieved first by adiabatic humidification and then by cooling, estimate:
- i) Capacity of cooling coil in TR
 - ii) Capacity of humidifier in kg/hr.
- c) What is effective temperature? Explain factors affecting the effective temperature. [4]

OR

- Q8)** a) Define : ADP, RSHP, GSHP, ESHP. [8]
- b) Two kg of air at 40°C DBT and 50% RH is mixed with 3 kg of air at 20°C DBT and 100% RH. Without using psychrometric chart, calculate specific humidity and final temperature of the air after mixing. [6]
- c) What do you understand by Indoor Air Quality (IAQ)? [4]

Unit - V

- Q9)** a) Write short notes on: [8]
- i) Scroll compressor
 - ii) Automatic expansion valve
- b) Explain split air conditioning system [4]
- c) What is a fan coil system? What are its advantages and disadvantages. [4]

OR

- Q10)** a) Explain how temperature and humidity is controlled in air conditioning system. Describe any one thermostat and one humidistat. [8]
- b) Write a note on all water air conditioning system. [4]
- c) What are the grill outlets and registers? How they are used in air conditioning system. [4]

Unit - VI

Q11) a) A circular duct of 40 cm diameter is used to carry air in an air conditioning system at a velocity of 440 m/min. If this duct is to be replaced by a rectangular duct of aspect ratio of 1.5, find out the size of rectangular duct for equal friction method when **[6]**

- i) Velocity of air in two ducts is same.
- ii) The discharge rate of air in two ducts is same.

If $f = 0.015$, find out the pressure loss per 100m length of the duct. Take density of air = 1.15 kg/m^3 .

- b) Write a note on classification of ducts. **[4]**
- c) Explain methods of food preservation. **[6]**

OR

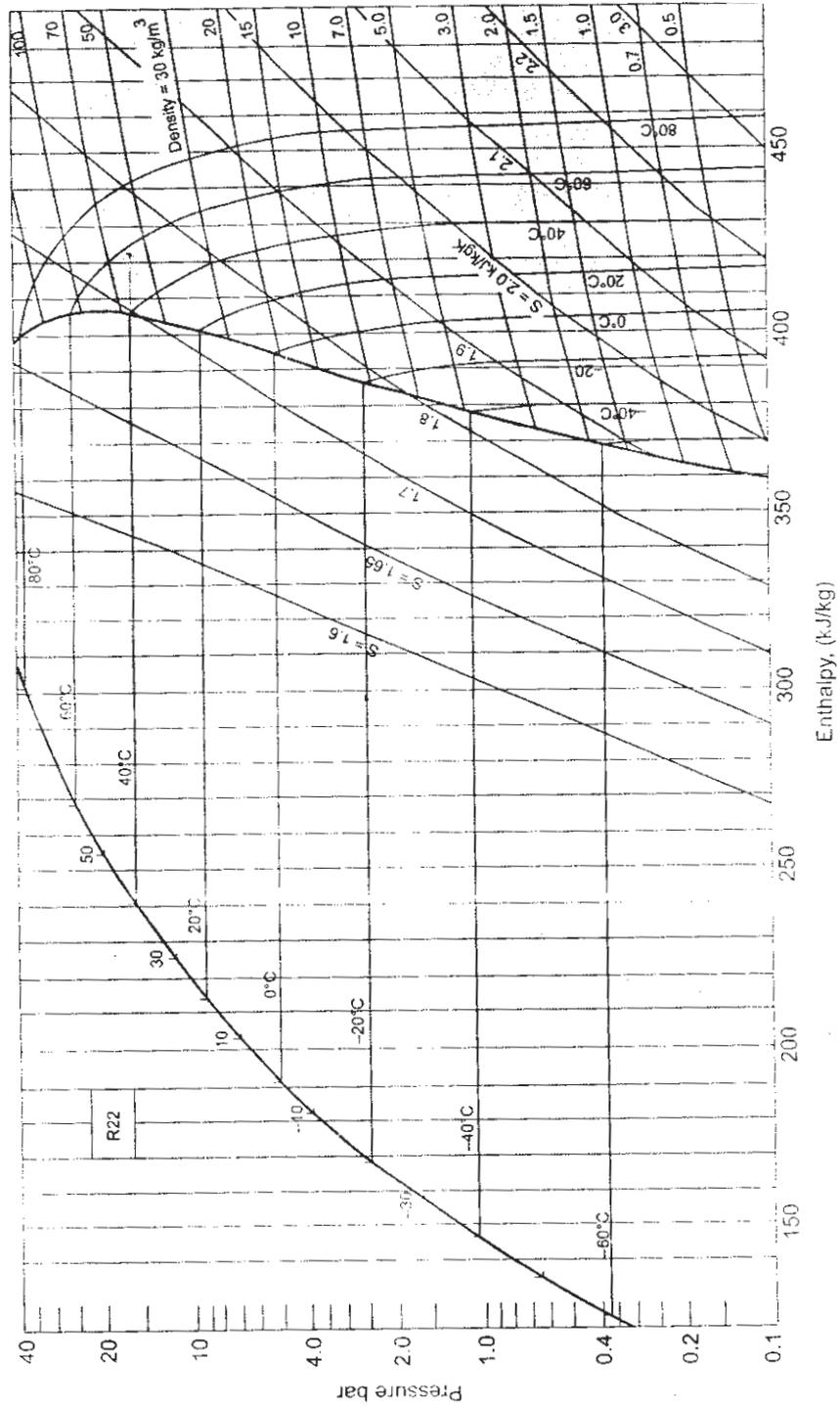
Q12) a) What are the objectives of duct designing? Explain equal friction loss (or pressure drop) method of duct design giving its advantages and disadvantages. **[8]**

- b) Write short notes on: any two: **[8]**
 - i) Basic selection method for a fan in air conditioning system.
 - ii) Individual Quick Freezing (IQF).
 - iii) Blast freezers.

Q5 and Q6

CHART 2

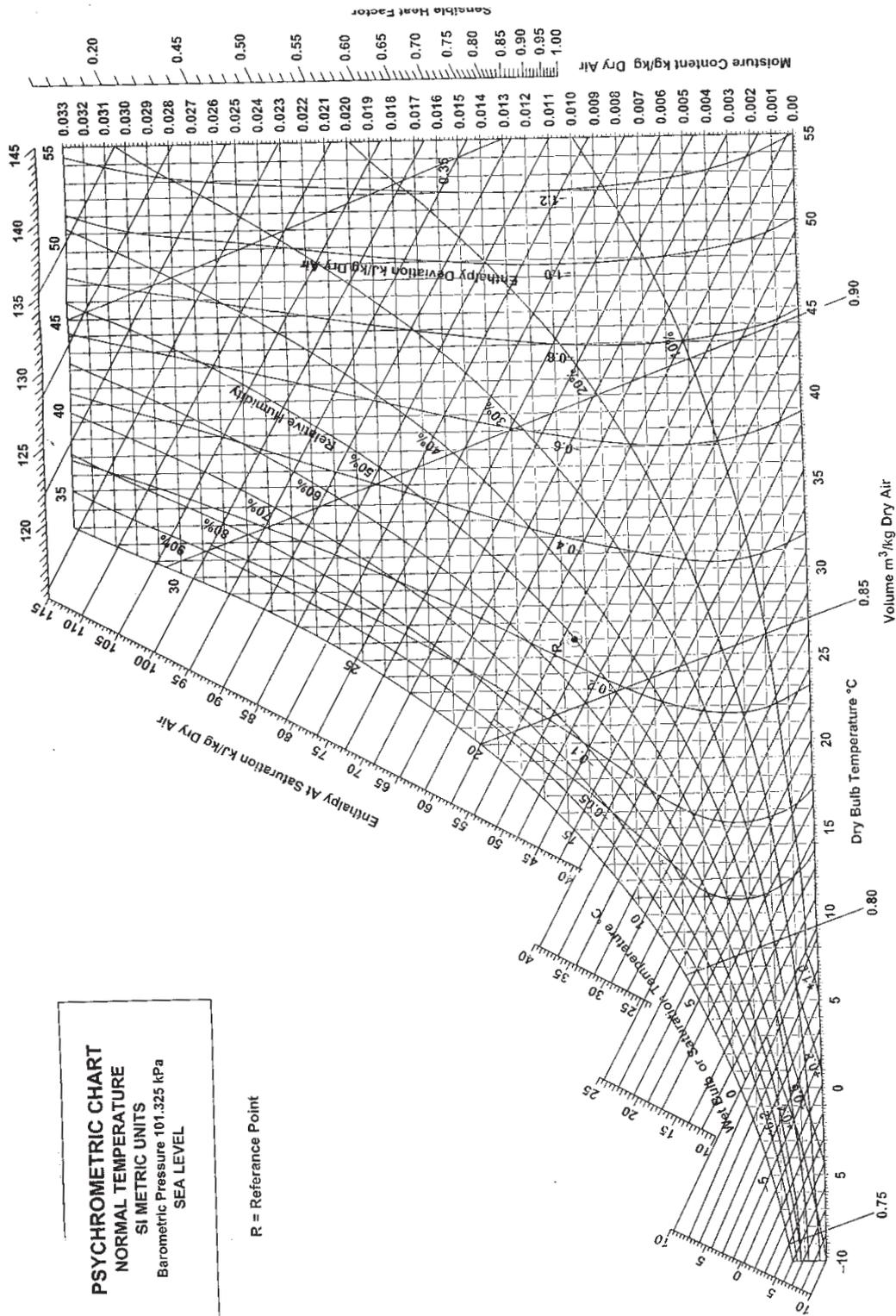
P-h CHART FOR R22, MONOCHLORODIFLUOROMETHANE





PSYCHROMETRIC CHART
 NORMAL TEMPERATURE
 SI METRIC UNITS
 Barometric Pressure 101.325 kPa
 SEA LEVEL

R = Reference Point



... and Enthalpy Deviation Lines Are For Ice

Total No. of Questions : 12]

SEAT No. :

P768

[Total No. of Pages : 7

[4263] - 242

T.E. (Production S/W)

KINEMATICS DESIGN OF MACHINES

(2008 Pattern) (Semester - II)

Time :3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) *Solve Que. No.1 or Que. No.2, Que. No.3 or Que. No.4, Que. No.5 or Que No.6 from Section - I and Que. No. 7 or Que. No.8, Que. No. 9 or Que. No. 10, Que No. 11 or Que. No. 12. From Section - II.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Assume suitable data, if necessary.*
- 6) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*

SECTION - I

Unit - I

- Q1)** a) Explain various Kinematics principles used in the operation of gear hobbing machine used to generate helical gear. **[10]**
- b) Explain the following terms related to Kinematic Synthesis. **[6]**
- i) Function Generation
 - ii) Dimensional Synthesis
 - iii) Path Generation.

OR

- Q2)** a) Explain the following Kinematic chain representation with figure: **[8]**
- i) E-21
 - ii) C-13
 - iii) K-25
 - iv) K-23

P.T.O.

- b) 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 12 rad/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.

Unit - II

- Q3)** a) Define following terms: [4]
- i) Notch sensitivity
 - ii) Fatigue
- b) At a section of steel shaft where the diameter changes from 430mm to 300mm , the fillet radius provided is 7.5mm . The shaft is finished by fine turning. The section is subjected to a constant bending moment of 470kNm . Endurance strength of 10mm diameter specimen with 50% reliability in reverse bending is 210MPa . [12]

Use following data:

Yield strength of shaft material	=	350MPa .
Notch sensitivity of material	=	0.8
Surface finish factor	=	0.8
Size factor	=	0.75
Ultimate tensile strength	=	500MPa

The theoretical stress concentration factor K_t may be interpolated from the following table, where r_f = fillet radius and d = shaft diameter.

r_f/d	0.025	0.05	0.1
K_t	2.6	2.05	1.66

Determine the life expected in revolution of the shaft.

OR

- Q4)** a) Explain the various factors influencing the fatigue strength of components. **[4]**
- b) A transmission shaft made of cold drawn steel 45C8 ($S_{ut} = 630\text{N/mm}^2$ and $S_{yt} = 360\text{N/mm}^2$) is subjected to a fluctuating torque which varies between 600Nm clockwise and 400Nm clockwise, determine the diameter of the shaft. Use maximum shear stress theory of failure. **[12]**

Use following data;

Surface finish factor = 0.8

Size factor = 0.85

Reliability factor = 0.897

Factor of safety = 2

Unit - III

- Q5)** a) What is the significance of formative number of teeth in the design of helical gear? **[4]**
- b) The following data is given for a spur gear pair made of steel and manufactured by shaping. **[14]**

Module = 6mm

Centre distance = 240mm

Permissible bending stress

For pinion & gear = 60N/mm^2

Pinion speed = 1500 rpm

Gear speed = 500 rpm

Face width = 10 module

Tooth system = 20° full depth involute

Application factor = 1.5

Factor of safety = 2.0

Velocity factor $K_v = \frac{6}{6 + v}$

Assuming the velocity factor accounts for the dynamic load; calculate the rated power that the gear pair can transmit. Suggest the surface hardness.

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 grade7. 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. [12]

Use following data:

$$\text{Dynamic Factor } K_v = \frac{5.6}{5.6 + \sqrt{V}}$$

$$\text{For Grade 7, } e = 11.0 + 0.9 (m_n + 0.25 \sqrt{d})$$

$$\text{Lewis Factor, } Y' = 0.484 - \frac{2.87}{Z'}$$

$$F_d = \frac{e \cdot n_p \cdot Z_p \cdot b \cdot r_p \cdot r_g}{2527 \sqrt{r_p^2 + r_g^2}} \times \cos \phi_n \cos \phi$$

Notations have usual meaning.

- b) What are the different types of gear tooth failures explain? [6]

SECTION - II

Unit - IV

- Q7)** a) A single row deep groove ball bearing is subjected to the following work cycle: **[12]**

Element No.	Element Time %	Radial Load 'Fr' KN	Thrust Load 'Fa' KN	Radial Factor 'X'	Thrust Factor 'Y'	Race Rotating	Service Factor	Speed in rpm
1	20	5.0	1.5	0.56	2.0	inner	1.5	720
2	50	7.0	1.0	1.0	0	outer	1.25	1440
3	10	7.5	2.5	0.56	1.8	inner	1.5	720
4	20	No load	No load	-	-	inner	-	360

If the dynamic capacity of the bearing is 108 KN, Calculate:

- i) Rating life of the bearing in hours
 - ii) Average speed of operation, &
 - iii) Life of the bearing in hours, if the required reliability is 95%
- b) What are the desirable properties of the sliding contact bearing materials? **[6]**

OR

- Q8)** 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]**

Unit - V

- Q9)** a) 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 be exceeds 1 % and the maximum centrifugal stress in the flywheel is to be 5.5MPa, estimate the mean diameter and the cross sectional area of the rim. The material of the rim has a density of 7200kg/m³ [12]
- b) Explain the working of flywheel in four stroke internal combustion engine. [4]

OR

- Q10)** The areas of the turning moment diagram for one revolution of a multi cylinder engine with reference to the mean turning moment below and above the line are -32, +408, -267, +333, -310, +226, -374, +260 & -244 mm² The mean speed is 300 rpm with a percentage speed fluctuation of $\pm 1.5\%$ Determine suitable diameter and cross section for the flywheel, assuming that the width is equal to four times the thickness. Neglect the effect of the boss and arms.

[16]

Use following data;

Scale for abscissa 1 mm = 2.4°

Scale for abscissa 1 mm = 650Nm

Hoop stress in the material = 5.6MPa

Density of the material = 7200Kg/mm³

Unit - VI

- Q11) a)** The recommended class of fit for the journal & bearing of a hydrodynamic bearing is $20H_7-e_8$. The diameter of the journal and bearing are normally distributed. From the consideration of hydrodynamic action and bearing stability, the maximum and minimum clearances are limited to 0.075 & 0.05 mm respectively. Determine the percentage of rejected assemblies. The tolerances in microns are as follows: **[12]**

Diameter in mm	H_7		e_8	
	e_s	e_i	e_s	e_i
20	+21	0	-40	-73

Area under the normal distribution curve are given below:

Z	1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.4
Area	0.3413	0.3849	0.4192	0.4452	0.4641	0.4772	0.4861	0.4918

Z	2.6	2.8	3.0
Area	0.4953	0.4974	0.4987

Assume linear interpolation for intermediate values.

- b) What is adequate design and optimum design? Explain with suitable examples. **[4]**

OR

- Q12) a)** Draw neat sketch of normal curve and write its equation in terms of standard variables. **[8]**
- b) Explain with suitable example the method of optimum design for normal specifications. **[8]**



[4263] - 254
T.E. (Electrical)
POWER ELECTRONICS
(2008 Pattern) (Sem. - I)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

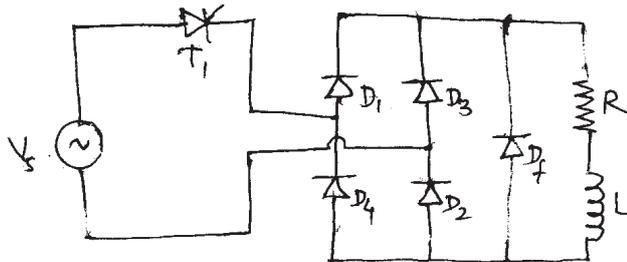
- 1) Answer any three questions from each section.
- 2) Answers to the two sections should be written in separate answer books.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Figures to the right indicate full marks.
- 5) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket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

SECTION - I

- Q1)** a) Draw gate drive circuit of GTO. Explain switching characteristics of GTO & compare with SCR. [9]
- b) Explain various techniques adopted for protection of SCR. [9]

OR

- Q2)** a) Draw & explain gate characteristics of SCR. How the gate voltage & gate current can be determined. [9]
- b) Draw & explain switching characteristics of SCR. [9]
- Q3)** a) Draw the output voltage waveforms for following circuit. State whether it is full wave or half wave & controlled or uncontrolled. Show the devices conducting on w/f. [8]



Que. 3a

- b) Why generally transistor family devices are not used in converter. Explain three phase fully controlled converter with necessary circuit & w/fs. [2 + 6 = 8]

OR

- Q4)** a) Explain single phase fully controlled converter. [8]
b) Explain single phase dual converter with circulating current mode. State the disadvantages of circulating current & their compensation. Draw w/fs for $\alpha_1 = 60^\circ$. [8]

- Q5)** a) Explain single phase single step ac voltage regulator feeding RL load with necessary circuit & w/fs. [8]
b) Explain four modes of operation of TR/AC. [8]

OR

- Q6)** a) Explain with necessary circuit & w/fs single phase three stage ac voltage regulator. [8]
b) Explain three phase two stage ac voltage regulator. [8]

SECTION - II

- Q7)** a) Explain construction details of IGBT & explain switching characteristics. [8]
b) Explain following with respect to MOSFET [8]
i) Pinch off voltage.
ii) Transconductance.
iii) Threshold voltage.
iv) Turn on & turn off chara.

OR

- Q8)** a) What is SOA? Compare MOSFET & BJT SOA. What is secondary breakdown in transistors? [8]
b) What are gate circuit requirements of MOSFET & IGBT? Compare. [8]

- Q9)** a) Explain working of type C chopper with neat diagram & output voltage & current waveforms for motor load. [8]
- b) A step down chopper is feeding RL load with $R = 2\Omega$ & $L = 5\text{mH}$ from supply of 220V with switching freq. of 500 Hz at 30% duty. Calculate minimum and maximum load current and % ripple current. [8]

OR

- Q10)** a) Explain type A chopper circuit. Explain if it can be suitable for operating a separately excited dc motor below rated speed? [8]
- b) What are control strategies used in chopper circuits? Compare. [8]
- Q11)** a) Draw neat circuit dia. & explain working of 1 phase full bridge inverter for generating quasi square wave output. Show output voltage and current waveforms for inductive load. [10]
- b) Explain why : [8]
- Transistorised inverters are preferred over thyristorised inverters.
 - Antiparallel diodes are used across switching devices in inverter circuits feeding inductive loads.

OR

- Q12)**a) How output voltage magnitude and frequency can be controlled in a sinusoidal PWM inverter? How harmonics in output are controlled? [9]
- b) What are controlling modes in case of 3 phase stepped voltage inverters? Explain any one in detail. Draw phase & line voltage waveforms. [9]



[4263] - 260
T.E. (Electrical)
CONTROL SYSTEM - I
(2008 Pattern) (Semester - II)

Time : 4 Hours]

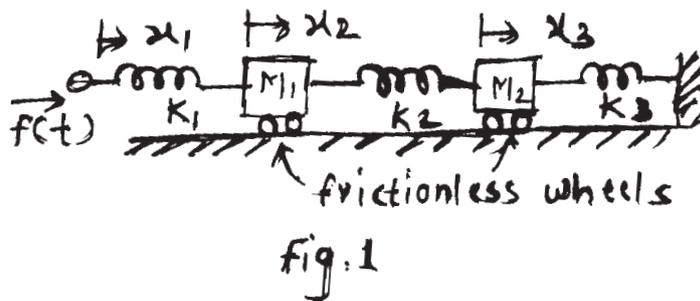
[Max. Marks : 100

Instructions to the candidates:

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

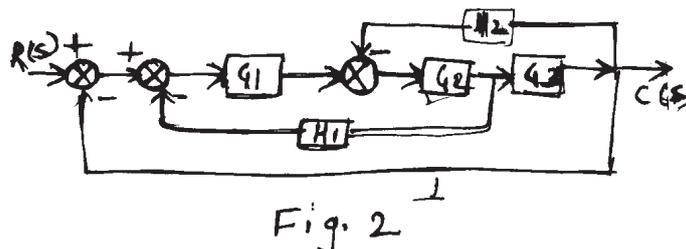
SECTION - I

- Q1)** a) Distinguish between open loop and closed loop system. **[8]**
 b) Draw the mechanical equivalent network of the given system and also draw the electrical analogous circuit using F-V analogy. **[8]**



OR

- Q2)** a) Determine the ratio $C(s) / R(s)$ for the system shown in fig. 2. **[8]**



- b) Find the transfer function of the system whose signal flow graph is shown in fig. 3. [8]

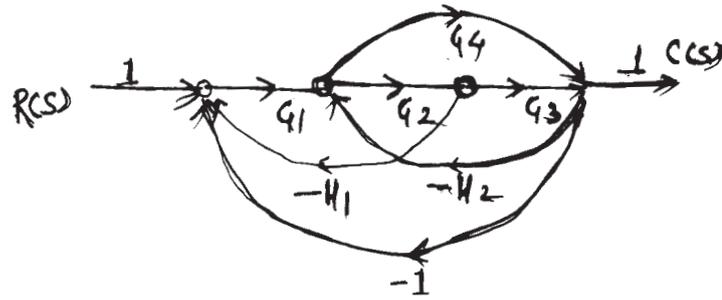


Fig 3

- Q3)** a) Define and explain time domain specifications. [8]
 b) A feedback system is described by the following TF

$$G(s) = \frac{12}{s^2 + 4s + 16}, H(s) = ks$$

Determine the overshoot and K if the damping factor is 0.8. [8]

OR

- Q4)** a) The OLTF of unity feedback system is $G(s) = \frac{50}{(1 + 0.1s)(S + 10)}$.

Determine type of the system and static error coefficients. [8]

- b) What are standard test signals used in time domain analysis. Derive steady state error and static error coefficients. [8]

- Q5)** a) Explain Routh Hurwitz criterion for determining stability. [8]

- b) Obtain stability of system using Routh Hurwitz criteria. The characteristic equation of the system is

$$s^6 + 3s^5 + 5s^4 + 9s^3 + 8s^2 + 6s + 4 = 0. \quad [10]$$

OR

- Q6)** a) Explain how magnitude and angle theories are useful in root locus method used for stability. [8]

- b) Sketch the root locus for the system having [10]

$$G(s)H(s) = \frac{K}{S(s+1)(s^2 + 4s + 5)}. \text{ Also determine marginal value of K.}$$

SECTION - II

Q7) a) Draw a neat block diagram of second order system. Explain the terms gain margin phase margin, gain cross over frequency, phase cross over frequency. [4]

b) Sketch Bode plot for the T.F. Determine P.M and. GM from the plot.

$$G(s) = \frac{10(s+10)}{s(s+2)(s+5)}. \quad [8]$$

c) Make sketches of polar plot for [6]

i) Type '0' and order '1' system

ii) Type '0' and order '2' system

iii) Type '1' and order '3' system

OR

Q8) a) State and explain Nyquist stability criteria. [6]

b) A control system with closed loop has transfer function

$$G(s)H(s) = \frac{K(s-1)}{s(s+1)}$$

Plot Nyquist plot and comment on stability. [12]

Q9) a) Define - state, state vector, state space and state equation. [4]

b) Derive Transfer function from state model. [4]

c) The system model is given below. Find the transfer function

$$\dot{X} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & -4 & 3 \\ -1 & -1 & -2 \end{bmatrix} x + \begin{bmatrix} 0 & 0 \\ 1 & 0 \\ 0 & 1 \end{bmatrix} u$$
$$Y = \begin{bmatrix} -1 & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix} x \quad [8]$$

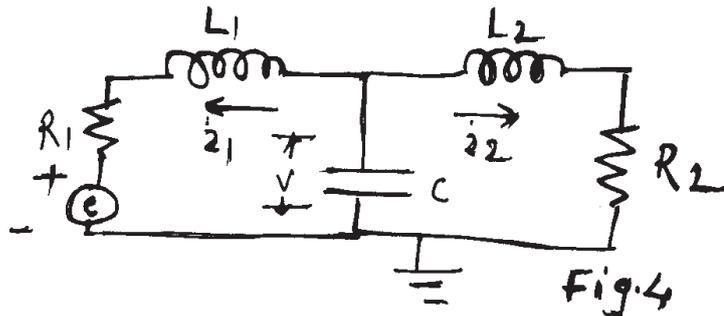
OR

Q10) a) Draw a block diagram representation of state model of n^{th} order SISO system. [4]

b) Find transfer function decomposition by direct method. Draw state diagram or signal flow graph. [4]

$$G(s) = \frac{a_0s^2 + a_1s + a_2}{b_0s^2 + b_1s + b_2}$$

c) Formulate state model for a simple RLC Electrical network shown below. [8]



Q11) a) Draw block diagram of PID controller. Discuss transfer function and effect of increasing K_p , K_i , K_d on Risetime overshoot, stability. [8]

b) Write short note on [8]
 i) AC tachometer
 ii) Synchros

OR

Q12) a) Write a short note on [8]

i) Potentiometer
 ii) AC servo motors
 b) Explain transfer function of [8]
 i) Lag compensator.
 ii) Lead compensator.
 iii) Lead - Lag compensator.



[4263] - 263

T.E. (Electronics)

NETWORK SYNTHESIS AND FILTER DESIGN

(2008 Pattern) (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) Answers to the two sections should be written in separate books.
- 3) Figures to the right indicate full marks.
- 4) Use of electronic pocket calculator is allowed.
- 5) Assume suitable data, if necessary.

SECTION - I

- Q1) a) Calculate the network functions voltage transfer ratio $G_{12}(S) = \frac{V_2}{V_1}$, the input impedance $Z_{11}(S) = \frac{V_1}{I_1}$ and transfer impedance $Z_{21}(S) = \frac{V_2}{I_1}$ for the ladder network shown in figure 1. [8]

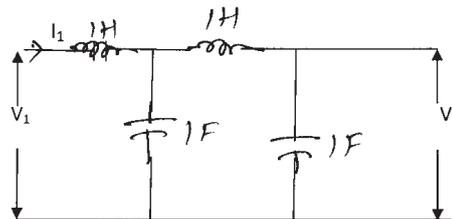


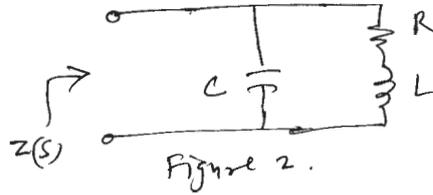
Figure 1

- b) Explain procedure for testing of positive real function (PRF). [6]
- c) Test whether $F(S) = \frac{s+3}{s^2+5s+4}$ is positive real. [4]

OR

P.T.O.

- Q2)** a) A network shown in fig. 2. The poles and zeros of the driving point function $z(s)$ of the network are at the following places. Poles at $-\frac{1}{2} \pm \frac{j\sqrt{3}}{2}$ and zero at -1 and if $z(0) = 1\Omega$ determine the values of R, L, C . [6]



- b) Compare network analysis and network synthesis also state the properties of Hurwitz Polynomial. [6]
- c) Test whether following polynomials are Hurwitz [6]
- $s^5 + 8s^4 + 24s^3 + 28s^2 + 23s + 6$
 - $s^5 + 6.5s^4 + 16s^3 + 18.5s^2 + 10s + 2$
- Q3)** a) Realize the given RLC admittance function using partial fraction expansion. [6]

$$Y(s) = \frac{(s+2)(s+3)}{(s+1)(s+4)}$$

- b) Indicate which of the following functions are R-C, R-L or LC. [4]
- $Z(s) = \frac{s(s+4)(s+8)}{(s+1)(s+6)}$
 - $Y(s) = \frac{s^4 + 4s^2 + 3}{s^3 + 2s}$
- c) State the properties of RL driving point impedance function and hence explain the nature of reactance curve for RL network along with suitable diagram. [6]

OR

- Q4)** a) An impedance function has simple poles at $s = 0$ and $s = -2$. It has simple zeros at $s = -1$ and $s = -3$. Also $Z(-4) = \frac{3}{8}$. Realize the function in Cauer I and Cauer II forms. [10]
- b) Obtain Foster I and II forms for the given network function. [6]

$$Z(s) = \frac{4s^4 + 40s^2 + 36}{s^3 + 4s}$$

- Q5)** a) Realize the voltage ratio transfer function. [6]

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

- b) For a constant resistance bridge T network, terminated by 1Ω , synthesize

$$Z_a \text{ and } Z_b \text{ if } G_{12} = \frac{V_2}{V_1} = \frac{s^2 + 3s + 2}{s^3 + 4s^2 + 5s + 2}. \quad [4]$$

- c) Explain the concept of zeros of transmission. What is minimum phase and non-minimum phase functions? How the driving point impedance of series or shunt arm elements helps to identify ZOT of ladder network? Explain with proper example. [6]

OR

- Q6)** a) The transfer function of 1Ω terminated constant resistance lattice network

$$\text{is given as } Z_{12}(s) = \frac{(s^2 - 2s + 5)(s^2 - 8s + 20)}{(s^2 + 2s + 5)(s^2 + 8s + 20)} \text{ Find the lattice}$$

network. [6]

- b) Synthesize following functions as an open circuited LC ladder two-port

$$\text{network. } Z_{12}(s) = \frac{s^3}{(s^4 + 4s^2 + 3)} \quad [5]$$

- c) Prove that $Z_a Z_b = R^2$ For constant resistance bridged T networks. [5]

SECTION - II

- Q7)** a) Realize a third order low pass Butterworth filter and using frequency and impedance scaling technique, design it for cut-off frequency $\omega_c = 10^4$ rad/sec and load resistance of 500Ω . [8]

- b) Write a short note on frequency transformation. [6]

- c) The specifications of Butterworth low pass filter are [4]

- 1) Pass band 0.2 Mrad/sec
- 2) Pass band loss ≤ 2 db
- 3) Stop band loss ≤ 60 db at 6 Mrad/sec.

Find the minimum order of the filter.

OR

- Q8)** Synthesize a Chebyshev LPF with following specification. [18]

- a) Load resistance 600Ω
- b) 1 dB ripple with pass band
- c) Cut off frequency 3×10^5 rad/sec
- d) at 9×10^5 rad/sec down is 15 dB

- Q9)** a) Synthesize a second order Sallen and Key BP filter with a center frequency of 2000 rad/sec and band width 400Hz. [7]
 b) Differentiate between Active and Passive filters. [3]
 c) Explain with suitable example the coefficient matching techniques for obtaining element values. [6]

OR

- Q10)** a) Design a second order low pass Sallen Key filter with Butterworth approximation having upper cut-off frequency of 1.8 kHz. [8]
 b) Explain the positive biquad topology used in active filter design and obtain the equation for transfer function. [8]

- Q11)** a) For the network shown in figure 3, find transfer function $\frac{V_o}{V_{in}}$ and find the sensitivities of K , ω_p , ω_z , Q_z and Q_p with respect to the passive elements R, L and C. [10]

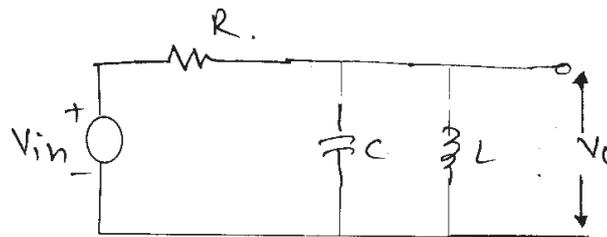


Figure 3

- b) Explain the effect of op-amp frequency characteristics on filter performance. [6]

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 op-amp used in the inverter circuit has $R_1 = 10K\Omega$ and $R_f = 100 K\Omega$. It has input bias current 500nA and an input offset current that can range $\pm 100nA$. Find resulting output offset voltage. [6]



Total No. of Questions : 12]

SEAT No. :

P780

[Total No. of Pages : 3

[4263] - 264

T.E. (Electronics)
MICROCONTROLLERS
(2008 Pattern) (Sem. - I)

Time :3 Hours]

[Max. Marks :100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Interface an 8-bit microcontroller with one 8K×8 EPROM and one 8K×8 RAM using suitable 3 : 8 decoder. EPROM address starts from 0000H & RAM address will follow end address of EPROM. Show all interface signals. **[8]**
- b) Compare Von Neuman and Harvard Architecture. **[4]**
- c) Give performance measurement like clock frequency, instruction execution time, word length and Address & data bus width of microcontroller 8051. **[4]**

OR

- Q2)** a) Draw and explain internal architecture of 8051. microcontroller. **[8]**
- b) Explain the internal structure of Port 0 of 8051. Explain why external pull up resistors required for port 0 of 8051. **[8]**

P.T.O.

- Q3)** a) Explain the following instructions with suitable example. [10]
- i) RLC A
 - ii) XCHD A, @Ri
 - iii) ANL A, #Data
 - iv) Cjne
 - v) MOVC A, @A + DPTR.
- b) Write an ALP to find number of positive numbers and negative numbers which are stored at code memory starting address 6000H. [6]

OR

- Q4)** a) Write the instructions to copy byte in TCON to register R2 using at least three methods & explain it. [6]
- b) Write an ALP to find number of zeros & number of ones in a register. [6]
- c) Draw format of PSW register & explain it. [4]

- Q5)** a) Draw an interfacing diagram for LCD with 8051 & write an ALP to display "UNIVERSITY" on 16×2 LCD starting with 84 H location. [9]
- b) Write the interrupt programming for 8051 microcontroller to toggle pin P1.2 for every second. Explain delay calculation in this program. Assume Crystal frequency = 22 MHz. [9]

OR

- Q6)** a) Write a program to interface 4 × 4 matrix keyboard to 8051 using port 1 & port 2 to read a key. Use port 1 for rows & port 2 for columns. Draw the flowchart for the same. [9]
- b) Explain interrupt Vs polling with suitable example. What are the steps in executing an interrupt? Explain all interrupts for 8051. [9]

SECTION - II

- Q7)** a) Explain need of MAX 232 in serial communication. Explain MAX 232 IC & its connection to 8051 with suitable diagram. [9]
- b) Explain how to double the baud rate. Write a program to transfer ASCII letter 'B' continuously with baud rate 19200. Assume crystal frequency = 11.0592 MHz & use SMOD = 1. [9]

Total No. of Questions : 12]

SEAT No. :

P802

[Total No. of Pages : 2

[4263] - 310
T.E. (Chemical)
PROCESS INSTRUMENTATION & CONTROL
(2008 Pattern) (Semester - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Describe the static and dynamic characteristics of measuring instruments. **[12]**
- b) Discuss PC based instrumentation systems. **[6]**
- OR
- Q2)** a) Explain the basic and auxillary functional elements of an instrument with neat diagram. **[12]**
- b) Discuss the various process variables and give their classification in detail. **[6]**
- Q3)** a) Describe bimetallic thermometers in detail. **[8]**
- b) What are the factors affecting dynamic response of U-tube manometers. **[8]**
- OR
- Q4)** a) Explain various sources of static error in pressure spring thermometers. **[8]**
- b) Describe diaphragm pressure gauge. **[8]**
- Q5)** a) Describe various point contact methods of level measurement. **[8]**
- b) Describe turbine type flow meters. **[8]**

OR

P.T.O.

- Q6)** a) Explain the functions of flow integrators. [8]
b) Describe various float level gauges. [8]

SECTION - II

- Q7)** a) Describe X ray absorption spectroscopy method. [8]
b) Describe various fluid density measurement methods. [8]

OR

- Q8)** Describe any two techniques of composition analysis [16]
a) UV absorption spectroscopy.
b) Gas chromatography.
c) Refractive Index Method.

- Q9)** a) Give classification of process variables with respect to process control. [8]
b) Explain dynamic behaviour of 1st order process for step change in input. [10]

OR

- Q10)** a) Derive pure capacitive process dynamic behaviour for step change in input. [10]
b) Explain classification of IInd order systems based on values of damping ratio. [8]

- Q11)** a) Explain features of controller action. [10]
i) Auto/Manual switch.
ii) Direct / reverse action.
b) Define : [6]
i) bias
ii) reset rate.
iii) integral time.

OR

- Q12)** a) Explain control actions (any 2): [12]
i) P
ii) PI
iii) PID
b) What are servo and regulator operations? [4]



Total No. of Questions : 12]

SEAT No. :

P813

[Total No. of Pages : 2

[4263] - 329

T.E. (Petrochemical)

PETROCHEMICAL PROCESSES - II

(2008 Pattern) (Semester - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Write a note on kerogen. [8]
b) Discuss any three fuel specifications (smoke point, cloud point, etc) that are important to characterize diesel fuel. [8]

OR

- Q2)** a) Write a note on TBP and ASTM distillation. [8]
b) Explain in detail any one of the non-conventional sources of energy. [8]

- Q3)** a) Compare the single stage and dual stage desalting process for crude oil. [8]
b) Write a note on the atmospheric topping unit (ATU) in a refinery. [8]

OR

- Q4)** a) With the help of a neat flow diagram explain the sulphuric acid alkylation process. [8]
b) How is dewaxing of lube done with ketone? [8]

- Q5)** a) Draw a neat labeled diagram of the FCC unit and discuss the role of regenerator. [10]
b) Explain the process of air blowing of bitumen. [8]

P.T.O.

OR

- Q6)** a) Write a note on petroleum coke. Also discuss the uses of petroleum coke. [10]
b) Discuss the once through Claus process for sulphur recovery from refinery gases. [8]

SECTION - II

- Q7)** a) How is steam reforming for hydrogen production accomplished? [8]
b) Write a note on disproportionation of toluene. [8]

OR

- Q8)** a) Describe the manufacturing process for p-xylene by catalytic reforming. [8]
b) Explain the semi regenerative process for catalytic reforming. [8]
- Q9)** a) What are polymers? Classify them. [8]
b) Give the various process technologies for the manufacture of polyethylene [8]

OR

- Q10)** a) Write a note on thermosetting and thermoplastic polymers. [8]
b) Describe in brief the manufacture of polyvinyl chloride by emulsion polymerisation and suspension polymerization. [8]
- Q11)** a) Give the various routes for the manufacture of caprolactam. [9]
b) Describe the AMCO process for the manufacture of terephthalic acid (TPA) [9]

OR

- Q12)** a) Give the process steps involved in the manufacture of nylon-6 with a flow diagram. [9]
b) Describe the process of manufacture of polyester from DMT. [9]



Total No. of Questions : 12]

SEAT No. :

P815

[Total No. of Pages : 4

[4263] - 332

T.E. (Polymer)

POLYMER MATERIALS

(2008 Pattern) (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) *Answers to the two 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) Classify the following polymers as commodity, engineering and high performance polymers. **[3]**
- | | |
|----------------------|---------------|
| i) Polyether ketones | ii) PVC |
| iii) Polycarbonate | iv) Nylon 6,6 |
| v) PTFE | vi) LDPE |
- b) Polyvinylalcohol is crystalline where as polyvinylacetate is amorphous in nature. Explain. **[3]**
- c) What are the effects of cross - linking on the properties of polyethylene? Discuss the various methods used for cross-linking PE. Give examples where XL PE is used. **[4]**
- d) List the various additives used in compounding polyethylene. **[3]**
- e) Differentiate between HDPE and LDPE on the basis of their structure, properties and applications. **[5]**

OR

P.T.O.

- Q2)** a) Polyethylene has a low value of T_g yet it does not exhibit rubbery characteristics. Explain why. [3]
- b) How is PP film manufactured? Why? [4]
- c) Give one application of each of the following polymers. [4]
- i) Polyvinylalcohol ii) Polyvinylacetate
- iii) LLDPE iv) Polypropylene
- d) Polyvinyl acetate shows excessive “cold flow”. Discuss. [3]
- e) List the additives used with isotactic PP. [4]
- Q3)** a) Discuss the various stages involved in the melt processing of plasticised PVC. [5]
- b) Explain the process for manufacture of “Thermocol”. [4]
- c) What is k-value w.r.t to PVC? How is it calculated? [3]
- d) Why does polystyrene require modification? State the modified forms of polystyrene. Give one application of each form. [4]

OR

- Q4)** a) Discuss the need for addition, mechanism of functioning, level of addition and two examples of the following additives w.r.t. PVC. [8]
- i) Heat stabilisers ii) Fillers
- b) Differentiate between the basic paste types w.r.t. PVC. [4]
- c) Write a short note on polyvinylidene dichloride. [4]
- Q5)** a) Discuss the batch process for manufacture of PMMA sheets. [6]
- b) State the method used: [6]
- i) To weld two PVC sheets together.
- ii) To join 2 sheets of PMMA.
- iii) To seal a polyethylene bag.
- c) List the derivatives of cellulose. Give 2 properties and two applications of each. [4]

OR

- Q6)** a) How is cellulose Acetate Prepared? What is the effect of increase in degree of acetylation on the properties of cellulose acetate? [6]
- b) Discuss the points to be borne in mind while processing polycarbonate. [4]
- c) List the various transparent polymers. [2]
- d) Give two outstanding properties of PMMA and state two applications of PMMA. [4]

SECTION - II

- Q7)** a) Define the term adhesion and discuss the thermodynamics of adhesion. [4]
- b) Discuss the types of adhesives giving suitable examples of each type. [6]
- c) Differentiate between the terms paint, varnish, stain and lacquer. [4]
- d) What is the purpose of applying a paint or coating on to a sub strate. [2]

OR

- Q8)** a) What are the main ingredients which go into making of a paint? Give the role of each of the ingredients. [6]
- b) Define the term “tack”. How do tackifiers improve adhesion w.r.t adhesives. Give examples of different types of adhesives. [4]
- c) What is the difference between convertible and non-convertible coatings. Give examples of each. [4]
- d) What are primers? Give examples. [2]

- Q9)** a) What are the molecular requirements for a material to be a rubber? [4]
- b) Give a brief outline of latex technology. [6]
- c) List the various additives used in a rubber compound. State the role and one example of each of the additive. [6]

OR

- Q10)** a) What is mastication? How is it done and why? [4]
- b) Give a brief outline of the raw rubber technology. [6]
- c) What is the need for vulcanisation? State the various types of vulcanising agents. [6]

- Q11)** a) Explain the process for manufacture of ribbed smoked sheets and pale crepe w.r.t. Natural rubber. [8]
- b) Addition of carbon black reinforcement is a must with natural rubber but not with SBR. Discuss. [4]
- c) Give the structure and composition of Nitrile rubber. List the properties of NBR vulcanisates. [6]

OR

- Q12)** a) What are 'Thermoplastic elastomers?' What are its advantages over conventional elastomers? Name a few commercial Thermoplastic elastomers. [6]
- b) State the outstanding property of each of the following elastomers giving one application of each. Also give its structure. [6]
- i) NBR
- ii) Butyl rubber
- iii) Neoprene
- c) Differentiate between Hot SBR, Cold SBR and Oil extended SBR. [6]



Total No. of Questions : 12]

SEAT No. :

P816

[Total No. of Pages : 4

[4263] - 333

T.E. (Polymer)

POLYMER STRUCTURE PROPERTY RELATIONSHIP

(2008 Pattern) (Sem. - I)

Time :3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) *Answer three questions from section I and three questions from section II.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *You 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) Give the effect of bonds formed by carbon atom on structure and various properties. [10]
- b) Give the types of bonds formed by oxygen as well as halogens. [8]

OR

- Q2)** a) List different types of additives added during compounding and their effect on properties. [10]
- b) What are the precautions to be taken while choosing an additive during compounding. [4]
- c) With any 2 egs. explain role of blends in enhancement of certain property. What type of morphology is generally seen in blends. Also explain the role of compatibiliser. [4]

P.T.O.

- Q3)** a) Explain number average molecular weight as well as weight average M.W. What properties are governed by both. Also explain NMWD and BMWD. [6]
- b) Explain conversion of polymers to high molecular weight during processing with help of any 2 egs. [6]
- c) Give effect of M.W. on any 2 properties of polymer. [4]

OR

- Q4)** a) Give the effect of molecular size and shape on processability and properties like mechanical, thermal electrical and optical. [8]
- b) Explain why PP has low density and high melting point as compared to LDPE; of similar M.W. [3]
- c) Explain what range of M.W.'s are recommended for different processing techniques. Also explain how processing conditions influence the end properties. [5]

- Q5)** a) Explain the significance of molecular flexibility and freedom of rotation of bonds and how polymer structure plays its role towards it. Explain with egs. [8]
- b) Explain factors that resist internal rotation found in main chain as well as side chain. [8]

OR

- Q6)** a) Explain whose T_g is high: PMMA or PMA and Justify. [3]
- b) Why T_g of 2,6 dimethyl PS is more than PS. [3]
- c) Explain the effect of polar groups on flexibility and with egs. Explain the effect of symmetry of substitution on flexibility. [5]
- d) Explain how tacticity helps in allowing flexibility in the polymer structure. [3]
- e) Why PP undergoes degradation in presence of heat & UV light. [2]

SECTION - II

- Q7)** a) What is meant by intermolecular order. Explain what is amorphous and crystalline state using fringed micelli model. [5]
- b) State the factors leading to crystallinity and give the effect of crystallisation on various polymer properties. [8]
- c) What is a sphenulite. What are the factors affecting its growth and which properties do they affect. [5]

OR

- Q8)** a) What is meant by orientation. Give the difference and similarity between orientation and crystallinity. Give the effect of orientation of polymer structure and properties. [10]
- b) Explain freedom of rotation with any 2 egs. [4]
- c) Give the effect of n-alkyl groups on polymer structure and thus properties. [4]

- Q9)** a) Write a short note on “Primary covalent bonds” and “Secondary covalent bonds”. [6]
- b) What is London Dispersion Force (LDF) and explain all the factors that influence LDF's. [10]

OR

- Q10)** a) What are the factors that decide polarity of a bond. Give egs. [4]
- b) Write a short note on solubility parameter, cohesive energy density, and what is their significance. [8]
- c) Write a short note on Ionic bonds. [4]

- Q11)** a) Write short note on Emulsions. [5]
b) List application where polymer is required in powder form. [6]
c) Write short note on 'Foams'. [5]

OR

- Q12)** a) Write short notes on Composites. [5]
b) Write short notes on Laminates. [5]
c) Explain role of any one speciality polymer in regards its structure to property. [6]



Total No. of Questions : 12]

SEAT No. :

P817

[Total No. of Pages : 7

[4263] - 334

T.E. (Polymer Engg.)

DESIGN EQUIPMENT AND MACHINERY ELEMENT

(2008 Pattern) (Sem. - I)

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. Answer Q. No. 7 or 8, Q. No. 9 or 10, Q. No. 11 or 12 from Section-II.*
- 2) *Answers to the two sections must be written in two separate answer books.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of scientific calculator and graph paper is allowed.*
- 5) *Assume suitable data, if required.*

SECTION - I

- Q1)** a) A cold drawn steel rod of circular cross section is subjected to bending moment of 500 N-m and torsional moment of 1500 N-m. Determine the diameter of the shaft using at least two theories of failure. Consider the yield strength of steel as 700 MPa. Take factor of safety as 2. Take Young's modulus $E = 210 \text{ GPa}$ and Poisson's ratio = 0.25. [7]
- b) It is required to design a square key for fixing a gear on a shaft of 25 mm diameter. The shaft is transmitting 20 kW power at 800 rpm of the gear. The key is made of the steel 55C4 material with yield strength in tension of 460 N / mm^2 . Take factor of safety of 3. Assume yield strength in compression as equal to tension. Determine dimensions of the key. [4]
- c) Draw a neat sketch of compression coupling and explain the design procedure for muff, key and clamp bolts. [5]

P.T.O.

- Q2)** a) Two planes AB and BC which are right angles to each other carry shear stress of intensity of 20N/mm^2 . These opposite planes also carry stresses of intensity 40 N/mm^2 and 80 N/mm^2 both being compressive. Determine principle stresses and maximum shear stress using Mohr's Circle. **[4]**
- b) Prove that compressive stress induced in a square key due to transmitted torque is twice that of shear stress. **[3]**
- c) Write short notes on (any three): **[9]**
- i) Copper and its alloys
 - ii) 18-4-1 high speed steel
 - iii) Nickel based alloys
 - iv) 18/8 Austenitic stainless steel
 - v) Any one failure theory for biaxial stress system
- Q3)** a) A transmission shaft is mounted on two bearings A and B is 500 mm apart. Pulley C is mounted to left of bearing A at a distance of 200 mm while pulley D is mounted to right of bearing B at a distance of 250 mm. The shaft transmits 7.5 kW power at 400 rpm from pulley C to pulley D. The diameters of pulley C and D are 250 mm and 500 mm and their weights being 100 N and 300 N respectively. The belt tensions act vertically downwards for both pulleys and ratio of belt tension on tight side to slack side being 2.5. The shaft is made of plain carbon steel 40C8 with yield strength in tension as 380N/mm^2 . Take factor of safety as 3. Estimate suitable diameter for shaft. **[10]**
- b) Derive an expression for diameter of solid shaft subjected to combined bending moment and twisting moment using maximum shear stress theory. **[8]**
- Q4)** a) In case of a flat belt drive, derive the condition for the transmission of maximum power. **[6]**

- b) A flat leather open belt drive is used for transmitting 20 kW power. The center distance between the pulleys is twice the diameter of larger pulley. Smaller and bigger pulleys are rotating at 1400 and 500 rpm respectively. The belt should operate at 22 m/s approximately and the stresses in belt should not exceed 2.25 N/mm². The density of belt is 0.95 gm/cc and coefficient of friction is 0.4. The thickness of belt is 5 mm. Calculate.

[6]

- i) Diameters of pulleys
- ii) Length and width of belt
- iii) The belt tensions

- c) Determine the diameter of the hollow shaft with inner to outer diameter ratio as 0.6 capable of transmitting 250 kW at 250 rpm and subjected to maximum bending moment of 5000 N-m. Take allowable shear stress as 55 MPa and take shock factor for bending and torsion as 1.5 and 1.8 respectively.

[6]

- Q5)** a) Thrust of a propeller shaft in marine engine is taken up by number of collars integral to shaft. Rubbing surfaces of these collars have outer diameter of 300 mm and inner diameter of 200 mm. The thrust load on the shaft is 250 kN and speed is 100 rpm. Taking coefficient of friction as 0.05 and uniform bearing pressure of 0.5 N / mm², calculate

[6]

- i) Number of collars required
- ii) Power lost in friction
- iii) Heat generated at bearing in kJ/min.

- b) A journal bearing of diameter 75 mm and 130 mm long is to be designed for supporting a load of 25 kN. The shaft runs at 960 rpm. The bearing surface temperature is not to exceed 75°C in a room temperature of 35°C. The oil used has an absolute viscosity of 0.01 kg/m-sec at the operating temperature. Determine the amount of artificial cooling required in watts. Assume the diametral clearance ratio (d/c) as 1000. Take heat dissipation constant, $C = 280 \text{ W/m}^2 \text{ } ^\circ\text{C}$.

[6]

- c) Explain the concept of interference in gears.

[4]

- Q6)** Write short notes on (Any four): **[16]**
- a) Types of sliding contact bearings.
 - b) Various terms used in hydrodynamic Journal bearings.
 - c) Clutched system for obtaining multiple spindle speeds.
 - d) Types of gear and their applications.
 - e) Rating life of a ball or roller bearing.
 - f) Lewis Equation for beam strength of gear tooth.

SECTION - II

- Q7)**
- a) Explain the traverse and feed circuit with circuit diagram and explain applications where it can be used. **[4]**
 - b) Explain the “Regeneration Circuit” with circuit diagram and explain applications where it can be used. **[4]**
 - c) Explain the brake circuit for following situations- **[6]**
 - i) Normal running
 - ii) Acceleration and deceleration
 - iii) Overrunning load
 - iv) Braking
 - d) Explain any one design of a check valve. **[4]**
- Q8)**
- a) Draw a neat sketch of cushioning type cylinder and explain application where such cylinders can be used. **[5]**
 - b) Explain anyone of the following type of valves with a neat sketch- **[7]**
 - i) Back pressure valve
 - ii) Pilot operated pressure reducing valve
 - c) Explain with neat sketch external gear pump operation. **[6]**

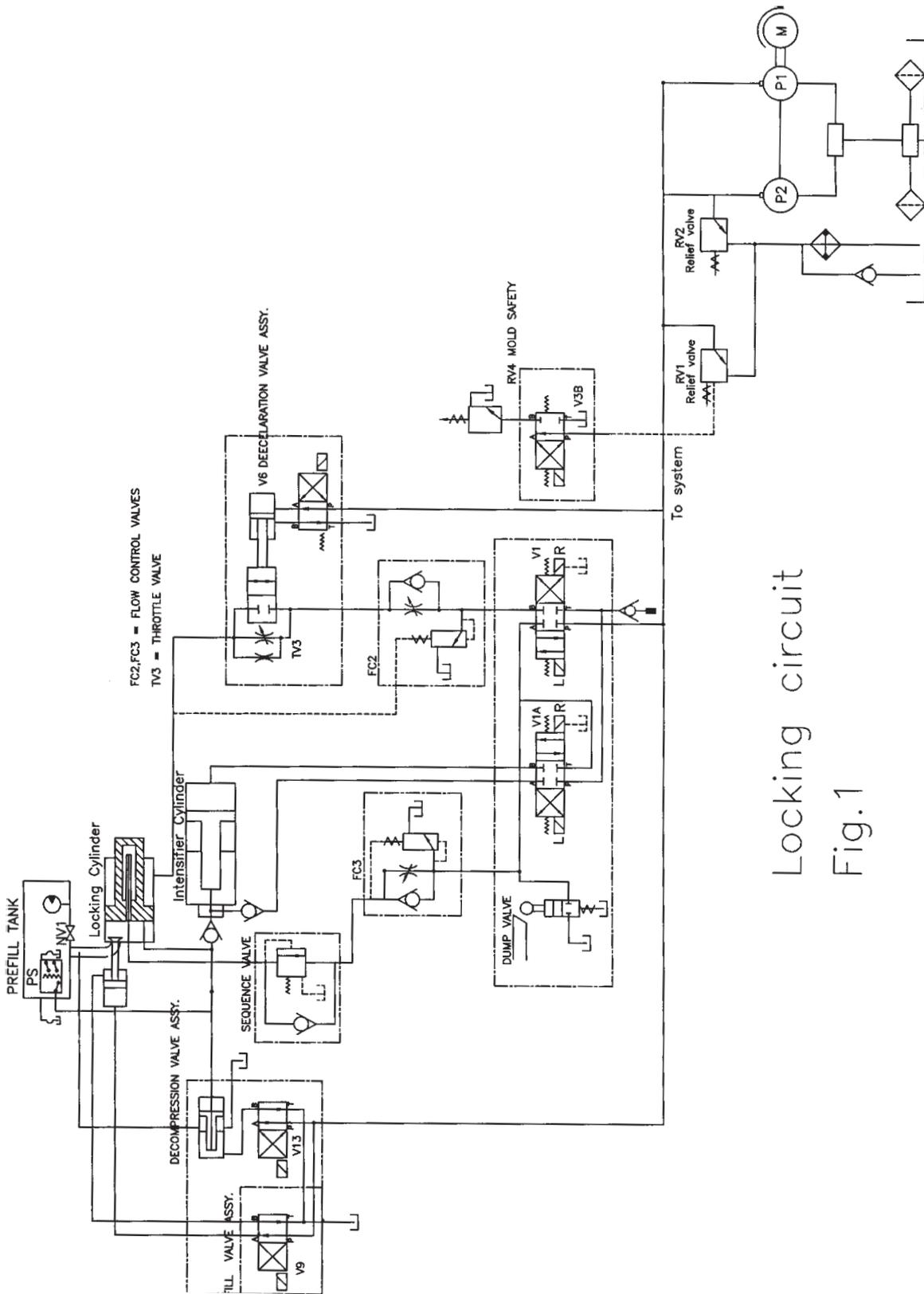
- Q9)** a) A direct locking hydraulic machine has single locking cylinder 500 cm² area and tonnage of 200ton is to be taken. If stroke of the locking cylinder is 200 cm, find the tonnage time assuming that locking cylinder is full of hydraulic oil prior to tonnage due to pre-fill tank and the pump capacity is 100 lpm . Assume hydraulic oil requires 0.5 % volumetric compression for generation of 70 bar pressure. [4]
- b) An injection moulding machine has four tie bars of 200 mm diameter, each having length of 250cm . The locking tonnage is 500ton . Taking young's modulus as 200 GPa, find extension of tie bars when the tonnage is taken. Suggest the material of construction of tie bars and justify the same. [4]
- c) Explain various reasons for which smaller tonnage machines can be advantageously built with toggle system. Explain also with sketch of three point toggle system the mechanical advantage obtainable in generation of clamp force. [4]
- d) Explain anyone "Lock and block" type locking system used and mention the advantages it has over direct locking hydraulic machines. [4]

Q10) Referring to the figure no 1, explain the locking circuit functioning of a direct locking hydraulic machine. Explain also the requirements of following operations. [16]

- Mould close (fast, slow and mould safety phase)
- Mould open (fast and slow)
- Tonnage development
- Decompression

- Q11)** a) Write a note on formed and dished heads. [5]
- b) Give design formulae for design of spherical shell pressure vessel. [5]
- c) Write a note on design procedure for reaction vessels with half coil jacket. [6]

- Q12)** a) Give a stepwise design procedure for a cylindrical pressure vessel subjected to internal pressure, taking into consideration wind and piping load, self weight of the vessels and weight of the contents in the vessel. Assume a joint efficiency J . If the contents in the pressure vessel are corrosive, how is it taken into account while designing? **[10]**
- b) Calculate the thickness of a shallow dished head for a pressure vessel with internal pressure 0.3 N/mm^2 , crown radius 1200 mm , knuckle radius 72 mm , permissible stress in the material 130 N/mm^2 . Assume joint efficiency to be 80% . **[6]**



FC2, FC3 = FLOW CONTROL VALVES
TV3 = THROTTLE VALVE

Locking circuit
Fig.1



Total No. of Questions : 12]

SEAT No. :

P818

[Total No. of Pages : 4

[4263] - 335

T.E. (Polymer Engineering)

MASS TRANSFER & REACTION ENGINEERING

(2008 Pattern) (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) *Answers to the two sections should be written in separate books.*
- 3) *Draw neat diagrams wherever necessary.*
- 4) *Numbers to the right indicate full marks.*
- 5) *Assume suitable data, if necessary.*
- 6) *Use of logarithmic table, electronic pocket calculator is allowed.*

SECTION - I

Q1) a) Ethanol (A) – Water (B) solution in the form of a stagnant film of 4 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 19.8 wt% and 7.8 wt% of ethanol respectively. Find the steady state flux of Ethanol. [9]

Diffusivity of Ethanol is $0.74 \times 10^{-9} \text{ m}^2/\text{sec}$.

Density of 19.8 wt% acetic Acid = 972 kg/m^3 .

Density of 7.8 wt% acetic Acid = 988 kg/m^3 .

b) Find $D_{\text{N}_2 - \text{Gas mix}}$ if the gas mixture composition by volume % is as follows:
 $\text{N}_2 = 69\%$, $\text{CO}_2 = 16\%$, $\text{CO} = 9\%$, $\text{O}_2 = 6\%$ at 373 °K, 1.5 atm pressures.
Data: [9]

$D_{\text{N}_2 - \text{O}_2} = 18.15 \times 10^{-6} \text{ m}^2/\text{sec}$ at 273 °K, 1 atm pressure.

$D_{\text{N}_2 - \text{CO}} = 19.15 \times 10^{-6} \text{ m}^2/\text{sec}$ at 288 °K, 1 atm pressure.

$D_{\text{N}_2 - \text{CO}_2} = 15.15 \times 10^{-6} \text{ m}^2/\text{sec}$ at 298 °K, 1 atm pressure.

OR

P.T.O.

Q2) a) By what percentage would the rate of absorption be increased or decreased by increasing the total pressure from 150 to 250 kN/m² in the following case. Ammonia from ammonia and air mixture containing 15% ammonia by volume is absorbed by using pure water as solvent; assume all the resistance to mass transfer lies within the gaseous phase. Assume the diffusivity is inversely proportional to the pressure. [9]

b) Find the concentration of Naphthalene in the exit air. A tube is coated with Naphthalene with ID of 25 mm and length 1.15 m. Air at 318 °K, 101.3 kPa flows through this pipe at a velocity of 1.2 m/sec. [9]

$$D_{AB} = 6.92 \times 10^{-6} \text{ m}^2/\text{sec}, \text{ Vapor Pressure } P_{Ai} = 74 \text{ Pa.}$$

For air Dynamic viscosity $\mu = 1.95 \times 10^{-5} \text{ Pa}\cdot\text{sec}$, $\rho = 1.114 \text{ kg/m}^3$.

$$N_{Re} * N_{Sc} * D/L * \Pi/4 = C_{Ae} / C_{Ai}$$

Q3) a) Derive Rayleigh Equation for Simple Distillation. [8]

b) Discuss the term Relative Volatility of vapor liquid systems and Calculate the variation in relative volatility for benzene - toluene system at 85 °C and 105 °C.

Vapor Pressure of Benzene = 116 kPa and Vapor Pressure of Toluene = 46 kPa at 85°C and at 105°C Vapor Pressure of Benzene = 204 kPa and Vapor Pressure of Toluene = 86 kPa. [8]

OR

Q4) a) Write a note on minimum liquid to gas ratio for gas absorber. [8]

b) Gas at 0.0108 kgmole/sec with 3% by volume of Benzene is in contact with Wash oil which enters from top at 26 °C in counter current manner. Wash oil contains 0.003 mole fraction of Benzene and at a rate of 1.5 times minimum is to be used. Find (L_s/G_s) actual and operating line composition. [8]

Equilibrium Mole ratio Data:

X	0	0.04	0.08	0.12	0.16	0.20
Y	0	0.005	0.009	0.014	0.018	0.022

Q5) a) Write a note on Tray Dryer, Drum Dryer, and Spray Dryer. [8]

b) Discuss the term Total Drying time. [8]

OR

- Q6) a)** Discuss in detail with neat diagram Drying of emulsion PVC Polymer. [8]
- b) Batch of wet solid is to be dried from free moisture content $X_1 = 0.48$ kg H_2O /kg Dry solid to $X_2 = 0.25$ kg H_2O /kg Dry solid. Weight of dry solid = 399 kg and area = 18.58 m^2 . Assume X_1 and X_2 are larger than critical moisture content $R_c = 1.55$ kg H_2O /hr. m^2 . Find the total drying time. [8]

SECTION - II

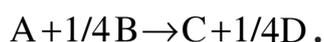
- Q7) a)** Explain Arrhenius equation and calculate activation energy from the following data: [8]

Rate constant $K \text{ sec}^{-1}$	0.00043	0.00103	0.00180	0.00355	0.00717
Temperature $T \text{ }^\circ\text{K}$	313	319	323	328	333

- b) Explain the following terms: [10]
Conversion, Molecularity of reaction, Order of Reaction, Reaction rate Constant, first order and second order reaction.

OR

- Q8) a)** Discuss different parameters affecting Rate of reaction. [6]
- b) Find the Stoichiometry Table expressing the concentration of each species in terms of conversion X and number of initial moles NA_0 and initial concentration CA_0 for following reaction: [6]



- c) For a gas reaction at 400°K, the rate is reported as $-dP_A/dt = 3.66P_A^2$ atm/hr, what are the units of rate constant and if the rate is expressed by $-r_A = KC_A^2$ mole/lit.hr. [6]

- Q9) a)** Plot the Rate Vs Concentration of A, find the rate constant and order of reaction. The following table shows how the concentration of reactant A varied with time in a particular experiment: [8]

Time (min)	0	18	31	55	79	157	Infinite
Concentration $\times 10^4$ Mole/lit	2.7	2.3	2.1	1.6	1.3	0.6	0

- b) Discuss the Integral Method of analysis of kinetics of constant volume batch reactor for the irreversible first order, second order, nth order and zero order reaction. [8]

OR

- Q10)** a) Find order of reaction by using half life period data of thermal decomposition of reactant in gas phase reaction at 1000°K which is studied in constant volume reactor at various pressures The half life time data is as under: [8]

Initial Pressure P_0 atm	0.07	0.18	0.38	0.47
half life time sec	850	465	255	212

- b) What will the volume of reactor for 45% decomposition. Under appropriate conditions, 0.12 kg/sec of reactant is to be decomposed at 520°C and 1atm in a plug flow reactor. Assume reaction is second order and value of rate constant $K = 0.44 \text{ m}^3/\text{kgmole}\cdot\text{sec}$. [8]

- Q11)** a) The laboratory measurements of rate v/s conversion for reactant A are as below. Compare the volumes of a mixed flow reactor and a plug flow reactor required to achieve 60% conversion. The feed conditions are the same in both cases and molar flow rate of reactant A entering a reactor is 10 mole/sec. [10]

Conversion X_A	0	0.20	0.40	0.60	0.80
Rate $-r_A$	0.182	0.143	0.10	0.0667	0.0357

- b) Derive the necessary expression for ratio of volumes of mixed flow reactor and plug flow reactor as a function of conversion X_A . [6]

OR

- Q12)** a) Explain the size comparison of Single Batch Reactor. [10]
Explain the size comparison of Mixed Flow Reactor and Plug Flow Reactor for first and second order reactions.
- b) Derive the necessary performance equation for the Equal size Two CSTR in series. [6]



Total No. of Questions : 12]

SEAT No. :

P820

[Total No. of Pages : 3

[4263] - 338

T.E. (Polymer Engineering)

INSTRUMENTATION AND PROCESS CONTROL

(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 books.*
- 3) *Draw neat diagrams wherever necessary.*
- 4) *Numbers to the right indicate full marks.*
- 5) *Assume suitable data, if necessary.*
- 6) *Use of logarithmic table, electronic pocket calculator is allowed.*

SECTION - I

- Q1)** a) Discuss the followings with one example: **[6]**
Transducer, Signal Conditioner and Display element.
- b) A pressure gauge instrument is specified as having range of 120-520 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]**
- c) Explain the role of Calibration in Instrumentation. What do you understand by the term Calibration? **[6]**

OR

- Q2)** a) Define the following terms and give suitable examples. **[8]**
- i) Indirect measurement.
 - ii) Primary Element.
 - iii) Functioning Element.
- b) Explain the various Static and Dynamic Characteristics of measuring instruments. **[10]**

P.T.O.

- Q3)** a) Draw the diagram and explain the principle of Photoelectric pyrometers. [10]
b) Explain different principles, effects and laws on which thermoelectric temperature measurements depend. [6]

OR

- Q4)** a) What are elastic element transducers to measure pressure and explain any one in detail. Define Gauge Factor and what is the change in resistance of strain gauge with resistance of 120Ω & gauge factors of 2.2, if the gauge is subjected to strain of 0.013. [10]
b) List various temperature measuring instruments & describe any one in detail. [6]

- Q5)** Explain the construction and working of float type level indicator. Explain in detail Capacitance liquid level indicator system. [16]

OR

- Q6)** a) A sharp edge orifice meter connected to manometer is installed in pipe of ID 25cm through which liquid with density 1500 kg/m^3 is flowing and if volumetric flow rate = $200 \text{ m}^3/\text{hr}$ and manometer reads 450 mm find size of orifice meter $C_d = 0.61$. [8]
b) Explain the importance of viscosity measurement in polymer industry and suggest suitable instruments for doing so. [8]

SECTION - II

- Q7)** a) Define the term transfer Function and derive applicable Transfer Equation for U tube Manometer. [10]
b) Explain the term Process control and discuss any three benefits that can be achieved via process control system. [8]

OR

- Q8)** a) Write a note on the response of Non-interacting system. [8]
b) Find out the response of same at time = 10,15,20,25,30 min. 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 $10^\circ\text{C}/\text{min}$. [10]

- 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) Explain with neat diagram the negative feedback control system with one example and compare with the positive feedback system. [8]
- b) Write a note on Servo and Regulator problem control system. [8]

- Q11)** Explain the followings: [16]
- a) Cascade Control of Liquid Level in a Tank.
 - b) Digital Control System.
 - c) Control Tuning.

OR

- Q12)** Write a note on: [16]
- a) Control of Polymer Processing.
 - b) Programmable Logic Control.



Total No. of Questions : 12]

SEAT No. :

P824

[Total No. of Pages : 3

[4263] - 343

T.E. (Computer Engg.)

MICROPROCESSOR AND MICROCONTROLLER

(2008 Pattern) (Semester - I)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Explain the dynamic branch prediction used in Pentium Processor. [10]
b) Describe with diagram structure of 8kb two way-set associative cache organization in Pentium processor. [8]

OR

- Q2)** a) What does locality of reference mean? How does it apply to an execution of program? [10]
b) How many stages floating point unit pipeline have? Explain function of each stage. [8]

- Q3)** a) Explain with timing diagram bus burst read cycle. [8]
b) Describe meaning of the following signal in Pentium processor. [8]
i) $\overline{\text{KEN}}$ ii) APICEN
iii) $\overline{\text{BRDY}}$ iv) $\overline{\text{IGNNE}}$

OR

P.T.O.

Q10) a) What are different addressing modes of 8051 microcontroller. Give examples. [8]

b) Explain the following pins in microcontroller. [8]

- | | |
|-----------------------------|--------------------------------|
| i) $\overline{\text{PSEN}}$ | ii) XTAL |
| iii) TO | iv) $\overline{\text{INT1}}$. |

Q11) a) Give the features of 8096. Draw and explain architecture of 8096. [8]

b) Explain mode2 and mode3 of Timer of 8051 microcontroller. [8]

OR

Q12) a) Give the difference between serial and parallel data transfer. Draw the format of SCON register Explain in detail each bit. [8]

b) Draw the memory map of 8096 microcontroller. Show the structure of internal RAM of 8096. Explain the SFR used in it. [8]



Total No. of Questions : 12]

SEAT No. :

P825

[Total No. of Pages : 3

[4263] - 344

T.E. (Computer Engineering)
DIGITAL SIGNAL PROCESSING
(2008 Pattern) (Sem. - I)

Time :3 Hours]

[Max. Marks :100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Define linear convolution. Explain different steps to calculate linear convolution with example. [6]
- b) Define the impulse response of the DT system. Show that $h(n) = 0$ for $n < 0$, for a causal system. [6]
- c) Explain quantization process in ADC. [4]

OR

- Q2)** a) Test the system $y(n) = x(n) + n x(n + 1)$ for causality, linearity and time invariance. [6]
- b) State and explain the sampling theorem. [6]
- c) Define the terms: natural & forced response for a causal system. [4]

- Q3)** a) Explain how N-point DFT and IDFT can be obtained by means of linear transformation matrix. [8]
- b) State and prove differentiation property of F.T. [6]
- c) Find $x((n + 2))_5$ and $x((-n))_5$ for the sequence $x(n) = \{1, 2, 3, 4\}$ [4]

OR

P.T.O.

- Q4)** a) Find the fourier transform of $x(n) = -a^n u(-n - 1)$, where a is real. [6]
 b) What is the significance of N in DFT? Why it is necessary to have $N \geq L$ where L is length of DT signal. [6]
 c) Determine 2-point and 4-point DFT of a sequence $x(n) = u(n) - u(n - 2)$. Compare the result. [6]

- Q5)** a) Draw a signal flow diagram for 8-point DFT using Decimation in Frequency (DIF) FFT algorithm. Obtain its computational complexity. [8]
 b) Why z-transform need to be specified only with ROC? What are the all possible ROCs for finite and infinite duration sequences? [8]

OR

- Q6)** a) Using residue method, obtain inverse Z transform from

$$X(z) = \frac{1}{(z-1)(z-3)} \quad [6]$$

- b) State and prove time reversal property of Z-transform. [6]
 c) Write a short note on bit reversal in FFT [4]

SECTION - II

- Q7)** a) With example, explain the method of simple geometric construction to obtain the phase and frequency of DT system. [10]
 b) An LTI system is represented by difference equation $y(n) = 0.7 y(n - 1) - 0.1 y(n - 2) + 2x(n) - x(n - 2)$. [6]
 i) Find System function
 ii) Draw pole zero plot and check stability

OR

- Q8)** a) Find the frequency response of a system described by difference equation $y(n) - \frac{1}{2} y(n - 1) = x(n) - \frac{1}{4} x(n - 1)$. Plot magnitude of a frequency response. [10]
 b) Define a unilateral z-transform. What are the different characteristics of it? State time delay and time advanced property of unilateral z transform. [6]

Q9) a) Explain the design steps of IIR filter by using impulse invariance method and then find out $H(z)$ from $H(s) = \frac{2}{(s+1)(s+2)}$ with $F_s = 5$ Hz. [10]

b) State the characteristics of ideal filter. What are the advantages and disadvantages of digital filter over analog filter? [8]

OR

Q10) a) What are the two different methods to design FIR filter? Explain the design steps of each method. [8]

b) Compare: FIR and IIR filter. [6]

c) Write a short note on: Effect of finite word length. [4]

Q11) a) Draw and explain functional Block diagram of barrel shifter. [8]

b) Obtain parallel form realization for IIR filter having:

$$H(z) = \frac{3(2z^2 + 5z + 8)}{(2z + 1)(z + 2)} \quad [8]$$

OR

Q12) a) Explain the application of DSP in speech processing. [8]

b) Draw and explain in brief the cascade form of FIR filter structure. [8]



[4263] - 345
T.E. (Computer Engineering)
THEORY OF COMPUTATION
(2008 Pattern) (Semester - I)

Time : 3 Hours]

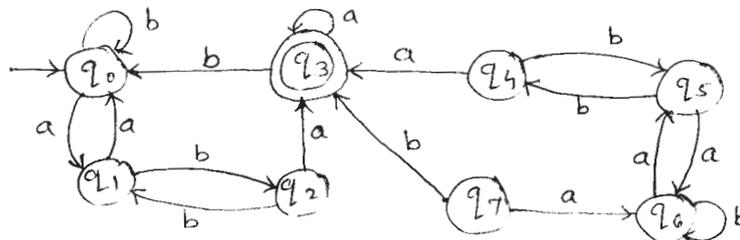
[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

Q1) a) Construct the minimum state automaton equivalent to the transition diagram given: **[8]**



b) Construct a Moore machine equivalent to the Mealy machine M given as: **[6]**

Present state	Next state			
	a = 0		a = 1	
	state	output	state	output
→ q ₁	q ₁	1	q ₂	0
q ₂	q ₄	1	q ₄	1
q ₃	q ₂	1	q ₃	1
q ₄	q ₃	0	q ₁	1

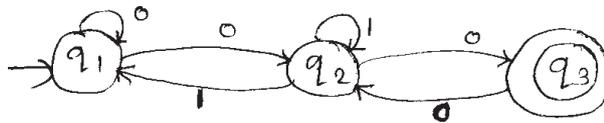
c) Define Deterministic Finite Automata with example. **[2]**

OR

Q2) a) Construct Mealy machine equivalent to Moore machine given as: [6]

Present state	Next state		output
	a = 0	a = 1	
→ q ₀	q ₁	q ₂	1
q ₁	q ₃	q ₂	0
q ₂	q ₂	q ₁	1
q ₃	q ₀	q ₃	1

b) Consider the transition system given below: [8]



Prove that the strings recognized are :

$$(0 + 0 (1 + 00)^* 1)^* 0 (1 + 00)^* 0$$

c) Define Non-deterministic finite automaton with example. [2]

Q3) a) Construct NFA and then DFA with reduced states, equivalent to [6]

$$(0 + 1)^* (00 + 11) (0 + 1)^*$$

b) Show that the set $L = \{a^{i^2} \mid i \geq 1\}$ is not regular. [6]

c) Define regular set and explain with example. [4]

OR

Q4) a) Find regular expressions representing the following sets: [6]

- The set of all strings over $\{a, b\}$ having atmost one pair of a's or atmost one pair of b's.
- The set of all strings over $\{a, b\}$ in which the number of occurrences of a is divisible by 3.
- The set of all strings over $\{a, b\}$ in which there are at least two occurrences of b between any two occurrences of a.

b) Show that $L = \{ww \mid w \in \{a, b\}^*\}$ is not regular. [6]

c) Prove the following; [4]

$$(b + a a^* b) + (b + a a^* b) (a + b a^* b)^* (a + b a^* b) = a^* b (a + b a^* b)^*$$

- Q5)** a) Construct reduced grammar equivalent to the grammar [6]
 $S \rightarrow a A a$
 $A \rightarrow sb \mid b cc \mid D a A$
 $C \rightarrow abb \mid D D$
 $D \rightarrow a D A$
 $E \rightarrow a C$
- b) Find a grammar in Greibach Normal form equivalent to the grammar [6]
 $S \rightarrow A A \mid a$
 $A \rightarrow S S \mid b$
- c) Write short note : Application of CFG for parsing. [6]

OR

- Q6)** a) Show that following grammar is ambiguous : [4]
 $S \rightarrow a \mid absb \mid a A b$
 $A \rightarrow bs \mid a A A b$
- b) Reduce the following grammar to CNF [6]
 $S \rightarrow 1 A \mid 0B$
 $A \rightarrow 1A A \mid 0 s \mid 0$
 $B \rightarrow 0 B B \mid 1 s \mid 1$
- c) Explain in detail chomsky classification of Languages with suitable examples. Clearly state the machines that accept each type of grammar. [8]

SECTION - II

- Q7)** a) Design a PDA accepting the language of even and odd length palindromes of the subsets of $\{a, b\}^*$ [8]
- b) Justify the PDA in Q.7 (a) for strings with even and odd length palindromes. [4]
- c) Construct a PDA for following CFG. [6]
 $S \rightarrow a \mid a S \mid b S S \mid S S b \mid S b S$

OR

Q8) a) Construct a CFG for the PDA given below: [10]

$A = (\{q_0, q_1\}, \{a, b\}, \{z_0, z\}, \delta, q_0, z_0, \phi)$ δ is given by ,

$$\delta (q_0, b, z_0) = \{(q_0, zz_0)\}$$

$$\delta (q_0, \epsilon, z_0) = \{(q_0, \epsilon)\}$$

$$\delta (q_0, b, z) = \{(q_0, zz)\}$$

$$\delta (q_0, a, z) = \{(q_1, z)\}$$

$$\delta (q_1, b, z) = \{(q_1, \epsilon)\}$$

$$\delta (q_1, a, z_0) = \{(q_0, z_0)\}$$

b) Design a PDA accepting balanced strings of brackets involving two types of brackets: [8]

{ } and []

Q9) a) Design a turing machine over {1, b} which can compute concatenation function over $\Sigma = \{1\}$. If a pair of words (w_1, w_2) is the input, the output has to be $w_1 \cdot w_2$ [8]

b) Justify the above TM for the following : [4]

$$w_1 = 11 \text{ and } w_2 = 111$$

c) Define Halting problem of TM with example. [4]

OR

Q10) a) Design a TM to recognize the language $\{a^n b^n c^m \mid n, m \geq 1\}$ [8]

b) Define the following: [8]

i) Universal TM

ii) Post Machine

iii) Instantaneous description w.r.t. TM

iv) Turing Machine

Q11) a) If L is recursively enumerable language, whose complement is recursively enumerable, then L is recursive. Prove this. [8]

b) Prove that every recursive language is recursively enumerable. [8]

OR

Q12) a) Write a note on post correspondance problem. [8]

b) Prove that the set of real numbers is not countable. [4]

c) Show that any subset of a countable set is countable. [4]



Total No. of Questions : 12]

SEAT No. :

P843

[Total No. of Pages : 4

[4263] - 365

T.E. (Biotechnology)

MASS TRANSFER

(2008 Pattern) (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) *Draw a neat sketch wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of programmable calculator is not allowed.*
- 5) *Make necessary assumptions wherever required.*
- 6) *Use graph sheets wherever required.*

SECTION - I

- Q1)** a) Hydrogen diffuses through a non porous polyvinyltrimethylsilane membrane at 25°C. The pressure on both the sides of the membrane is 3.5 M pa and 200 K pa respectively. Diffusivity and solubility data are given as $D = 160 \cdot 10^{-11} \text{ m}^2/\text{sec}$, $H = S = 0.54 \cdot 10^{-4} \text{ mol/m}^3\text{pa}$. If the hydrogen flux is to be $0.64 \text{ Kmol/m}^2 \text{ hr}$, how thick in micrometers should the membrane be? [8]
- b) Explain in detail mass transfer from a fluid - fluid interface into a bulk liquid stream by surface renewal theory. Give necessary equations? [8]

OR

- Q2)** a) Write short notes on Chilton Colburn analogy? [8]
- b) Explain in brief how various design factors affect the efficiency of mass transfer equipment? [8]
- Q3)** a) Write short notes on the factors which influence the design of a binary distillation column. [8]
- b) Explain in detail how sub cooled reflux affects the number of equilibrium stages in a distillation column? [8]

P.T.O.

OR

Q4) Write short notes on the following: [16]

- a) Positive deviations from ideality
- b) Limitations of Mc Cabe Thiele method
- c) Partial condenser
- d) Define Q. How q varies for various thermal conditions of feed.

Q5) Feed containing 40 mole% of more volatile component and 60 mole% of less volatile component is subjected to distillation at atm pressure to recover 95% of the original more volatile component. Relative volatility is 2.5. Calculate the mole% of the distillate and composition of the distillate if distillation is carried out [18]

- a) Simple equilibrium distillation
- b) Differential distillation taking all distillate together.

OR

Q6) a) A mixture of benzene and toluene is subjected to distillation. Feed rate is 180 K mol/hr and 60% of the feed has been vaporized. Distillate flow rate is 100 K mol/hr with 0.98 mole fraction of more volatile component. Reboiler steam demand is 4200Kg/hr. Latent heat of steam used in reboiler is 2200 J/g. Latent heat of column liquid is 3×10^4 J/mol. Calculate the operating reflux ratio and the composition of vapor entering that plate from which the liquid overflow contains 0.7 mole fraction of more volatile component. [9]

b) Methanol and water containing 80 mole% methanol and 20 mole% water is subjected to distillation. The overhead product is to contain 99 mole% methanol and bottom product contains 0.5 mole% methanol. The feed is cold and for each mole of feed, 0.2 moles of vapor is condensed on feed plate. The reflux ratio is 1.35 and reflux is at its bubble point. Calculate [9]

- i) Minimum reflux ratio
- ii) Number of theoretical plates using total condenser

x	0	0.10	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
y	0	0.42	0.58	0.67	0.73	0.78	0.83	0.87	0.92	0.96	1

SECTION - II

- Q7)** a) Derive the operating line equation for single component absorbed in a countercurrent operation using graphical methods starting with a component balance. [8]
- b) A packed tower is designed to recover 98% CO₂ from a gas mixture containing 10% CO₂ and 90% air using water. Equilibrium relationship is given as $Y = 8.69X$. Water to gas rate is kept 30% more than the minimum value. Calculate the height of the tower if $(HTU)_{OG}$ is 1 meter. [8]

OR

- Q8)** a) A gas absorber has to be designed to handle 900 m³/hr of coal gas containing 2% by volume benzene. Coal gas enters at a temperature of 300°K. and 805mm Hg. 95% of benzene should be recovered by solvent. The solvent enters at 300°K containing 0.005 mole fraction of benzene and has an average molecular weight of 260. Calculate the circulation rate of solvent per second, if the column is to be operated at 1.5 times the minimum Ls. Equilibrium data is given as $Y/1 + Y = 0.125 X/1 + X$. [8]
- b) Write short notes on minimum absorbent flow rate? [8]

Q9) At a certain location in a dryer where benzene is being evaporated from a solid, nitrogen gas at 50°F and 1.2 atm has a relative humidity for benzene of 35%. Determine [16]

- a) Partial pressure of benzene if the vapor pressure of benzene at 50°F is 45.6 torr.
- b) Humidity of nitrogen benzene mixture.
- c) Saturation humidity of mixture.
- d) Percentage humidity of mixture.

OR

Q10) Describe the four different periods in direct heat drying operation? [16]

Q11) Write short notes on the construction and working of any two crystallizers with the help of a neat sketch where crystallization takes place by super saturation on cooling alone [18]

OR

Q12) a) A hot solution containing 2000 Kg of MgSO_4 and water at 57°C and with a concentration of 30 weight% MgSO_4 is cooled to 30°C . $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ crystals are removed. The solubility at 30°C is 35.5 Kg MgSO_4 per 100 Kg water. Calculate the yield of the crystals. Assume that no water is vaporized. [10]

b) Write short notes on Mier's supersaturating theory? [8]



Total No. of Questions : 12]

SEAT No. :

P886

[Total No. of Pages : 7

[4263] - 228

T.E. (Automobile)

AUTOMOTIVE ENGINE DESIGN

(2008 Pattern) (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) *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 four-cylinder, four-stroke, spark ignition engine has a displacement volume of 300 cc per cylinder. The compression ration of the engine is 10 and operates at a speed of 3000 rpm. The engine is required to develop an output of 40 kW at this speed. Calculate the cycle efficiency, the necessary rate of heat addition the mean effective pressure and the maximum temperature of the cycle. Assume that the engine operates on the Otto cycle and that the pressure and temperature at the inlet conditions are 1 bar and 27°C respectively.

If the above engine is a compression ignition engine operating on the Diesel cycle and receiving heat at the same rate. Calculate efficiency, the maximum temperature of the cycle, the cycle efficiency the power out put and mep. Take $C_v = 0.717\text{kJ/kg K}$ and $\gamma = 1.4$ **[16]**

OR

P.T.O.

Q2) 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. But the compression and expansion processes follow the law $PV^{1.3} = C$. The pressure and temperature at the beginning of compression are 1 bar 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. **[16]**

Q3) a) Explain in detail how to balance multi cylinder engine and What is role of firing order in balancing. **[8]**

b) Following illustration is for 5 kW at STP. The fuel used is high speed diesel with a calorific value of 42 MJ/kg and overall efficiency of 35%, brake mean effective pressure = 550 kPa, rotational speed =1500 rpm, four stroke cycle engine. Take (L/D) ratio = 1.2. **[8]**

Determine:

Bore diameter

No of cylinders

Fuel rate required

Rate of air required

Assume suitable data if necessary

OR

Q4) a) Discuss the general principles of S. I. Engines combustion chamber design. [8]

b) The cylinder of a four stroke diesel engine has the following specifications [8]

Brake power = 3.5 k W

Speed = 1000 RPM

Indicated mean effective pressure = 0.35 MPa

Mechanical Efficiency = 80%

Determine the bore and length of cylinder liner

Q5) a) Describe selection criteria for type of cooling system. [6]

b) A test on a single cylinder, four-stroke oil engine having a bore of 18 cm and stroke 36 cm, gave the following results: [12]

Speed = 290 rpm,

Brake torque = 392 Nm,

Indicated mean effective pressure = 7.2 bar,

Fuel consumption = 3.5 kg/h,

Cooling water flow = 270 kg/h,

Cooling water temperature rise = 36°C,

Air-fuel ratio = 25,

Exhaust gas temperature = 415°C,

Barometer pressure = 1.013 bar,

Room temperature = 21°C,

The fuel has a calorific value 45.2 MJ/kg and contains 15 % by weight of hydrogen.

Determine:

- i) Indicated thermal efficiency
- ii) The volumetric efficiency based on atmospheric conditions

Draw up a heat balance in terms of kJ/min.

Take $R = 0.287$ kJ/kg K, C_p for dry exhaust gas = 1.0035 kJ/kg K and

Super heater steam $C_p = 2.093$ kJ/kg K

OR

Q6) a) Discuss the important properties of lubricating oil which affects engine performance. [6]

b) A test on two-stroke engine gave the following results at full load: [12]

Speed = 350 rpm,

Net brake load = 590 N,

MEP = 2.8 bar,

Fuel consumption = 4.3 kg/h,

Jacket cooling water flow rate = 500 kg/h,

Jacket water temperature at inlet = 25°C,

Jacket water temperature at outlet = 50°C ,

Test room temperature = 25°C ,

Temperature of exhaust gas = 400°C ,

Air used per kg of fuel = 33kg,

Cylinder diameter = 22 cm,

Stroke = 28 mm,

Effective brake diameter = 1 m,

Calorific value of fuel 43.9 MJ/kg,

Proportion of Hydrogen in fuel = 15%,

Mean specific heat of dry exhaust gas = 1 kJ/kg K,

Mean specific heat of steam = 2.09 kJ/kg K,

Sensible heat of water at room temperature = 417 kJ/kg,

Latent heat of steam = 2257 kJ/kg.

Find IP, BP and draw up a heat balance sheet for the test in kJ/min and in percentage.

SECTION - II

Q7) Design a cast iron piston for a single acting four-stroke diesel engine with following data: **[16]**

Cylinder bore 300mm

Length of stroke 450mm

Speed 300rpm

Indicated mean effective pressure = 0.85MPa

Maximum gas pressure = 5MPa

Fuel consumption = 0.30 kg/BP h

Higher calorific value of fuel = 44 MJ/kg

Assume suitable data if required and state the assumptions you make

OR

Q8) Design a connecting rod for an I C Engine running at 1800 rpm and developing a maximum pressure of 3.15 N/mm^2 . The diameter of piston is 100mm; mass of reciprocating parts per cylinder 2.25 kg; length of connecting rod 380mm; stroke of piston 190mm and compression ratio 6: 1. Take the factor of safety of 6 for the design. Take length to diameter ratio for big end bearing as 1.3 and small end bearing as 2 and the corresponding bearing pressure as 10 N/mm^2 and 15 N/mm^2 . The density of material of the rod may be taken as 8000 kg/m^3 and the allowable stress in bolts as 60 N/mm^2 and in cap as 80 N/mm^2 . The rod is to be of I section for which you can choose your own proportions.

Draw a neat dimensioned sketch showing provision for lubrication. Use Rankine formula for which the numerator constant may be taken as 320 N/mm^2 and the denominator constant $1/7500$. **[16]**

- Q9)** a) Explain cylinder compression test in detail. [8]
b) Explain: [8]
i) Ignition timing
ii) Distributor dwell-angle

OR

- Q10)** a) What is mean by cylinder power balance and how it is carried out. [8]
b) Explain exhaust gas CO and HC analyzer. [8]
- Q11)** a) Explain stratified charged engine. [6]
b) Explain A TFT Technology in detail. [6]
c) Explain Dual-fuel engine and state its advantages. [6]

OR

- Q12)** a) Explain variable compression ratio engine with suitable diagram. [6]
b) Explain four valve engine and give one example of it. [6]
c) Explain variable valve timing and state its advantages. [6]



Total No. of Questions : 12]

SEAT No. :

P890

[Total No. of Pages : 4

[4263] - 256

T.E. (Electrical)

POWER SYSTEMS - II

(2008 Pattern) (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) *Use of scientific calculator is allowed.*

SECTION - I

- Q1)** a) Show how receiving end power circle diagram of a transmission line based on generalized constants (A, B, C, D) can be drawn. Also show how power at the receiving end can be calculated for any torque angle from such a diagram. **[8]**
- b) A 3-ph, 132 kV line delivers 45 MW at 0.8pf lagging using power circle diagram find, **[10]**
- i) Sending End Voltage.
 - ii) Capacity of synchronous condenser required if sending voltage is increased to 180kV
 - iii) Capacity of synchronous condenser needed at no-load if both sending and receiving end voltages are 132 kV.

The line constants are $A = 0.9 \angle 2.5^\circ$, $B = 100 \angle 70^\circ$

OR

P.T.O.

- Q2)** a) What is line compensation? Why it is necessary? Compare static capacitors and synchronous compensators. [8]
- b) A 275 kV transmission line has the following line constants, $A = 0.85 \angle 5^\circ$
 $B = 200 \angle 75^\circ$. [10]
- i) Determine the power at unity p.f. that can be received if the voltage profile at each end is to be maintained at 275kV.
- ii) What type and rating of compensation equipment would be required if the load is 150 MW at unity p.f. with same voltage profile i.e. 275kV.

- Q3)** a) Discuss the factors and conditions affecting corona loss. [8]
- b) A 3ph overhead line consists of 3 conductors in equilateral formation with 2.44m spacing. The conductor diameter is 1.04 cm and surface factor (m) is 0.85. The air temperature and pressure are 21.1°C and 74 cm of mercury. Find the visual corona voltage. [8]

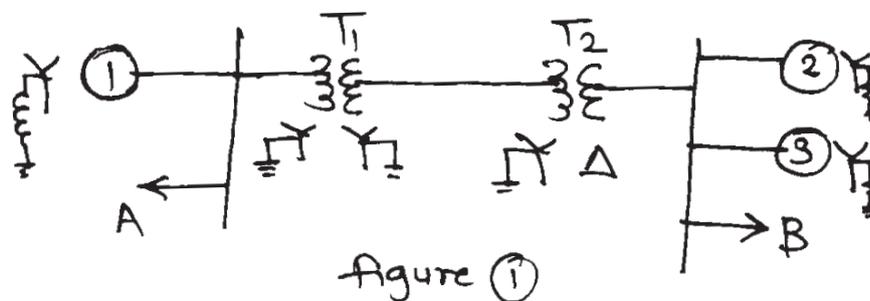
OR

- Q4)** a) What is meant by corona? Why does it occur? What is the difference between visual critical voltage and disruptive critical voltage. [8]
- b) A 3ph, 220 kV 50Hz, 250 km long line consisting of 22.26 mm diameter conductors spaced in a 6 m delta configuration. [8]

The temperature is 25°C , pressure 73 cm of mercury, surface factor 0.84, irregular factor for local corona 0.72, irregular factor for general corona 0.82.

Find the total loss in fair weather condition using peek's formula.

- Q5)** a) Obtain the per unit impedance (reactance) diagram of the power system of figure 1. [8]



- b) Explain advantages and application of per unit system. [8]

OR

Q6) a) Explain sudden 3-phase short-circuit analysis of an unloaded alternator. [8]

b) A 25 MVA, 11 kV generator with $X_d'' = 20\%$ is connected through a transformer, line and a transformer to a bus that supplies three identical motors as shown in figure 2. Each motor has $X_d'' = 25\%$ and $X_d' = 30\%$ on a base of 5 MVA, 6.6 kV. The three phase rating of T_1 is 25 MVA, 11/66 kV with a leakage reactance of 10% and T_2 is 25 MVA, 66/6.6 kV with leakage reactance of 10%. The bus voltage at the motors is 6.6 kV when a three phase fault occurs at point F, for the specified fault, calculate [8]

- The subtransient current in the fault.
- The subtransient current in the breaker B.

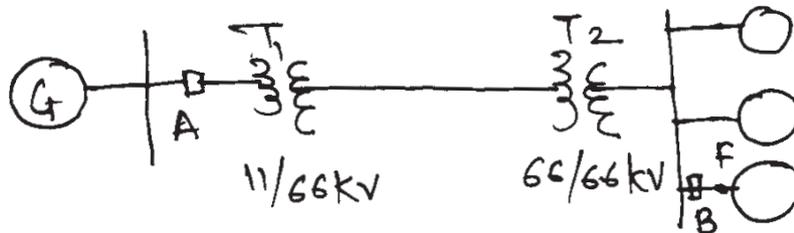


fig. (2)

SECTION - II

Q7) a) A delta connected balanced resistive load is connected across an unbalanced three phase supply. The line currents are $I_R = 10 \angle 30^\circ$, $I_Y = 15 \angle -60^\circ$ and $I_B = 18 \angle 154^\circ$. Find the symmetrical components of line currents and phase currents. The value of resistance is 3R ohm per phase. [10]

b) Show that fault current $I_f = \frac{3E}{Z_1 + Z_2 + Z_0}$ when L-G fault occurs at the terminals of solidly grounded star connected alternator. [8]

OR

Q8) a) Derive the expression for fault current of an alternator, with sequence diagram in following types of faults. [12]

- Line to line fault
- Double line to ground fault

b) Draw the equivalent circuit for zero sequence reactance of three phase transformer, for different combinations of connections. [6]

Q9) a) Explain the step by step method of formation of Y_{bus} matrix. [8]

b) Explain Newton Raphson method of load flow analysis along with flowchart. [8]

OR

Q10) a) Give classification of various types of buses in power system for load flow studies. What is the significance of reference bus? [6]

b) Derive static load flow equation for 'n' bus system [10]

Q11) a) Explain constant ignition control method for HVDC transmission system. [8]

b) With the help of suitable diagram, explain different component of HVDC transmission system along with their function. [8]

OR

Q12) a) Discuss the technical and economic advantage of HVDC transmission system over HVAC transmission system. [8]

b) What are the recent developments in HVDC transmission system? Discuss future scope of HVDC transmission system in India. [8]



Total No. of Questions : 6]

SEAT No. :

P892

[Total No. of Pages : 2

[4263] - 297

T.E. (Printing)

STATISTICAL PROCESS CONTROL

(2008 Pattern) (Semester - II)

Time :3 Hours]

[Max. Marks :100

Instructions to the candidates:

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

SECTION - I

Q1) Explain the role of Histogram tool used in SPC with reference to the printing industry. **[16]**

OR

Explain the application of process mapping / flowcharting in solving the process problems with the help of suitable examples. **[16]**

Q2) Explain the various run chart patterns and its correlation with the process problems with suitable examples. **[16]**

OR

Differentiate between Primary and Secondary type of Data. Give suitable examples of both, and also explain the importance of Primary and Secondary data in solving process problems. **[16]**

P.T.O.

Q3) Explain the term sampling plan. And explain in detail the single and double sampling plan used in quality control. **[18]**

OR

Explain the Measures of Distribution and its application in Statistical Process Control with suitable examples. **[18]**

SECTION - II

Q4) Differentiate between \bar{X} R and \bar{X} S chart in detail with suitable examples. **[16]**

OR

Differentiate between 'P' and 'np' chart in detail with suitable examples. **[16]**

Q5) Explain various techniques of process improvements with suitable examples. **[16]**

OR

Explain the method of implementing the SPC in an existing printing press with suitable examples. **[16]**

Q6) Explain Six Sigma concept with diagram in detail. **[18]**

OR

Explain the term DOE with suitable example and its application in process improvement. **[18]**



Total No. of Questions : 12]

SEAT No. :

P893

[Total No. of Pages : 2

[4263] - 13

T.E. (Printing)

PRINTING TELELECTRONICS AND OPTO ELECTRONICS

(2003 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) *Neat diagrams must be drawn wherever necessary.*
- 4) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Explain different data transfer techniques. [8]
b) Explain basic problems of long distance transmission. [8]

OR

- Q2)** a) Explain various data networks. [8]
b) Explain data transfer using satellite network. [8]

- Q3)** a) What is modulation? Explain pulse position modulation with suitable diagram. [8]
b) What is multiplexing? Explain time division multiplexing with block diagram. [8]

OR

- Q4)** a) Explain uniform & non uniform quantization. [8]
b) Explain companding with 'A' Law and 'μ' Law with suitable diagram. [8]

P.T.O.

- Q5)** a) What are various types transmission channels? What is channel capacity? [8]
b) Explain different types of noise. [10]

OR

- Q6)** Write short notes on (Any three) [18]
a) Data Transfer using E-mail.
b) Image grabbing and transfer.
c) Tele text
d) Videotext
e) Noise interference and remedies.

SECTION - II

- Q7)** a) What are different types of light sources? Explain LED. [8]
b) Explain Laser printer application. [8]

OR

- Q8)** a) Explain sheet thickness measurement with magnetic and optical sensors. [8]
b) What are different photo detectors? Explain characteristic of photo-diode. [8]

- Q9)** a) Explain the construction and working of fiber optic cable. [8]
b) Derive the expression for numerical aperture of optical fiber. [8]

OR

- Q10)** a) Explain with block diagram basic fiber optic communication system. [8]
b) Explain the different losses in fiber. [8]

- Q11)** a) Explain WI-Fi technology. [10]
b) What RFID? Explain with one application. [8]

OR

- Q12)** a) Explain plate making application using Laser. [10]
b) Explain smart ticket application of RFID. [8]



Total No. of Questions : 12]

SEAT No. :

P894

[Total No. of Pages : 3

[4263] - 307
T.E. (Chemical)
TRANSPORT PHENOMENA
(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 books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 6) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Derive the velocity profile and momentum profile for a Newtonian fluid through a circular pipe inclined at an angle β . Find the ratio of maximum velocity to the average velocity. **[12]**
- b) An horizontal annulus is 27 ft long. The outside radius of inner cylinder is 0.495 inch. The inside radius of outside cylinder is 1.1 inch. The fluid density is 80.3 lb/ft³ and viscosity is 136.8 lb.m/ft.s. What is the volume rate of flow, the impressed pressure drop is 5.39 psi. **[6]**

OR

- Q2)** a) What is Lennard Jones potential and what does it represents. **[6]**
- b) Explain time independent fluids and time dependent fluids. **[6]**
- c) How the equation of continuity simplified for steady state flow. **[6]**

- Q3)** a) A small capillary tube with an inside diameter of 2.2×10^{-3} m and length of 0.317m is being continuously used to measure the flow rate of liquid having density of 990 kg/m³ and $\mu = 1.13 \times 10^{-3}$ Pa.sec. The velocity of liquid is 0.275 m/sec. Calculate pressure drop. **[6]**
- b) Derive Continuity equation. **[10]**

P.T.O.

OR

- Q4)** a) Explain friction factor for packed column. [6]
b) Derive macroscopic energy balance equation. [10]
- Q5)** a) Deduce the relation for temperature distribution and efficiency of straight rectangular fin of uniform cross section. [10]
b) A copper wire has a radius of 2 mm and a length of 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. [6]

OR

- Q6)** a) Derive expression for heat flux and temperature distribution for nuclear heat source. [10]
b) A 60 W bulb is buried in soil ($K = 0.84 \text{ W/m.k}$) and burnt until a steady state is reached. Find the temperature 0.3 m away from it. [6]

SECTION - II

- Q7)** a) Derive expression for heat flow rate for composite slab. [10]
b) Explain heat transfer coefficients for forced convection around submerged object. [8]

OR

- Q8)** a) What are semiempirical expressions for turbulent energy flux and what are their applications. [10]
b) Heat is flowing through an annular wall of inside radius r_i and outside radius r_o . The thermal conductivity varies linearly with temperature from K_0 at T_0 to K_1 at T_1 . Develop an expression for the heat flow through the wall at $r = r_a$. [8]

- Q9)** a) Discuss the theory of ordinary diffusion in gases at low density. [8]
b) Estimate diffusivity of acetic acid in dilute aqueous solution at 12.5°C. The density of acetic acid at its normal boiling point is 0.937 g/cm^3 , $\psi_B = 2.6$, $M_B = 18.02$, $\mu = 1.22 \text{ CP}$. [8]

OR

- Q10)** a) Explain concentration fluctuations and time smoothed concentration. [8]
- b) A large tank filled with a mixture of CH_4 and air is connected with second tank filled with different composition of CH_4 and air. Both tanks are at 100 kN/m^2 and 0°C . The connection between the tanks is a tube of I.D. 2mm and length of 1500 mm. Calculate the steady state rate of transport of CH_4 through the tube when the concentration of CH_4 is 90% (mole) in one tank and 50% (mole) in another tank. Assume that the transport is by molecular diffusion. [8]

- Q11)** a) Write analogies among mass, heat and momentum transfer. [8]
- b) Explain diffusion in laminar falling film. [8]

OR

Q12) Write note on:

- a) Explain correlations of binary mass transfer coefficients in one phase at low mass transfer rates. [8]
- b) Discuss transfer coefficients at high mass transfer rates for penetration theory. [8]



Total No. of Questions : 9]

SEAT No. :

P895

[Total No. of Pages : 3

[4263] - 316

T.E. (Petroleum Engineering)

PETROLEUM GEOLOGY - II

(2003 and 2008 Pattern) (Semester - II)

Time :3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Draw neat diagrams wherever necessary.*

SECTION - I

Q1) What are hydrocarbons? Give important chemical and physical properties of crude oil and natural gas. **[15]**

OR

Q2) With the help of neat figures give important surface and subsurface occurrences of hydrocarbons. **[15]**

Q3) Give a generalized outline of transformation of organic matter into hydrocarbons with the help of a neat diagram. Explain the role of important factors influencing this change. **[15]**

OR

Q4) Explain the processes of primary and secondary migration of hydrocarbons from source rocks to reservoirs. **[15]**

P.T.O.

- Q5)** Write notes on any four of the following: **[20]**
- a) Types of structural traps,
 - b) Trapping mechanisms in sand-shale sequences,
 - c) Unconventional hydrocarbon resources,
 - d) Source rock evaluation,
 - e) Composition of subsurface waters,
 - f) Geochemical fossils,
 - g) Concept of a Petroleum System.

SECTION - II

- Q6)** a) Explain various carbonate rock depositional systems in marine environment. **[10]**
- b) Write a note on development of a 'Fan System'. **[5]**

OR

- Q7)** a) Describe a generalized model of a typical depositional basin. **[5]**
- b) Give characteristic features of fluvial depositional systems in brief. **[10]**

- Q8)** Write notes on any three of the following: **[15]**
- a) Geological Examination of well cuttings,
 - b) Geological factors giving rise to abnormal pressures,
 - c) Significance of structure contour maps,
 - d) Diagenesis of sediments,
 - e) Vertical and lateral variations in a sedimentary sequence,
 - f) Carbon Preference Index,
 - g) Natural gas potential of India.

Q9) Solve any two of the following:

[20]

- a) Give any one classification of sedimentary basins.
- b) Describe generalized geology and petroleum system of any one producing basin in India.
- c) Why are petroleum reserves found more prominently only in certain geologic periods? Give a generalized distribution of petroleum deposits in different geographic regions of the world.



Total No. of Questions : 12]

SEAT No. :

P899

[Total No. of Pages : 7

[4263] - 336

T.E. (Polymer Engineering)

MATHEMATICAL METHODS FOR POLYMER ENGG.

(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) *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) Prove that $\delta = \Delta E^{-1/2}$, and hence prove that $E = \left(\frac{\Delta}{\delta}\right)^2$. **[4]**

b) A slider in a machine moves along a fixed straight rod. Its distance x in meters along the rod are given in the following table for various values of the time 't' seconds. **[7]**

t(sec)	1	2	3	4	5	6
x(m)	0.0201	0.0844	0.3444	1.010	2.366	4.7719

Find the velocity and acceleration of the slider at time $t = 6$ secs.

c) Evaluate $\int_2^6 \log_{10} x \, dx$ by using Simpson's $\frac{1}{3}$ rule taking $n = 6$. **[6]**

OR

P.T.O.

- Q2)** a) Using Lagrange's interpolation formula, find the value of y at $x = 10$ from the following data. [6]

x	5	6	9	11
y	380	-2	196	508

- b) Find $f(0.5)$ using Newton's forward difference formula from the following table. [6]

x	0	1	2	3	4
$f(x)$	1	7	23	55	109

- c) Evaluate $\int_0^1 e^{-x^2} dx$ by dividing the range into 4 equal parts using Trapezoidal Rule. [5]

- Q3)** a) Find a real root of $x^3 - 2x - 3 = 0$, correct to three decimal places using the Successive Approximation Method. [6]

- b) Solve the following equations by Gauss - Seidal Method. [5]

$$4x - y + z = 12$$

$$-x + 4y - 2z = 1$$

$$x - 2y + 4z = 5$$

- c) Find least square polynomial approximation of degree two to the data: [6]

x	0	1	2	3	4
y	-4	-1	4	11	20

OR

Q4) a) Solve $x^3 + x^2 + x + 7 = 0$ by Newton Raphson's Method. [6]

b) Solve the following equation using Jacobi's Iteration Method. [6]

$$3x + 4y + 15z = 54.8$$

$$x + 12y + 3z = 39.66$$

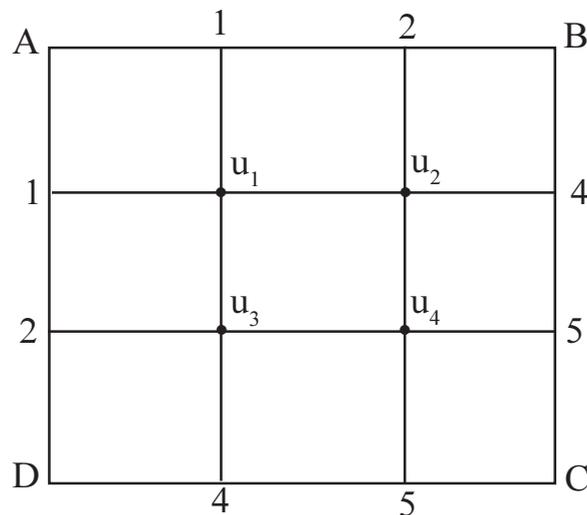
$$10x + y - 2z = 7.74$$

c) Find the best values of a and b so that $y = a + bx$ fits the data given below. [5]

x	0	1	2	3	4
y	1.0	2.9	4.8	6.7	8.6

Q5) a) Solve $\frac{dy}{dx} = \sqrt{x^2 + y}$ using Runge - kutta fourth order method to find y at $x = 0.4$ given $y(0) = 1$, take $h = 0.2$. [8]

b) Solve the elliptic equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ for the following square mesh with boundary values as shown in the figure below. $h = k = 1$. [8]



OR

Q6) a) Solve $\frac{dy}{dx} = y - \frac{2x}{y}$, $y(0) = 1$ in the range $0 \leq x \leq 0.2$ using modified Euler's method and $h = 0.1$ [8]

b) Solve the following Poisson equation over the square region bounded by the lines $x = 0, y = 0, x = 3, y = 3$, given that $u = 0$ throughout the boundaries taking $h = 1$ and $k = 1$ and the equation as

$$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = -(x + y)^2 \quad [8]$$

SECTION - II

Q7) a) Solve the following Linear programming problem by using simplex method. [10]

$$\text{Maximize } Z = 3x_1 + 5x_2 + 4x_3$$

$$\text{Subject to the constraints } \quad 2x_1 + 3x_2 \leq 8$$

$$2x_2 + 5x_3 \leq 10$$

$$3x_1 + 2x_2 + 4x_3 \leq 15$$

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

b) Write the dual of the following LP problem [6]

$$\text{Minimize } Z = 3x_1 - 2x_2 + 4x_3$$

$$\text{with constraints } \quad 3x_1 + 5x_2 + 4x_3 \geq 7$$

$$6x_1 + x_2 + 3x_3 \geq 4$$

$$7x_1 - 2x_2 - x_3 \leq 10$$

$$x_1 - 2x_2 + 5x_3 \geq 3$$

$$4x_1 + 7x_2 - 2x_3 \geq 2$$

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

OR

Q8) a) Solve the following LP problem by using simplex method. **[9]**

$$\begin{aligned} \text{Maximize} \quad & Z = 3x_1 + 2x_2 \\ \text{Subject to} \quad & x_1 + x_2 \leq 4 \\ & x_1 - x_2 \leq 2 \\ & \text{and } x_1, x_2 \geq 0 \end{aligned}$$

b) Write the dual of the following LP problem **[7]**

$$\begin{aligned} \text{Maximize} \quad & Z = 2x_1 + 3x_2 \\ \text{subject to} \quad & x_1 - 4x_2 \leq 3 \\ & 4x_1 - x_2 \leq 10 \\ & x_1 + 3x_2 \leq 19 \\ & 3x_1 - 5x_2 \leq 4 \\ & \text{with } x_1, x_2 \geq 0 \end{aligned}$$

Q9) a) Marks obtained by 1st and 2nd toppers at their S.E. examination are tabulated as **[6]**

Shilpa	80	85	66	71	97	90	79	65	75	82
Vikrant	78	82	72	73	85	86	77	67	71	75

Decide, who is better and who is more consistent

b) Compute the first four central moments for the following distribution. **[6]**

No.of jobs completed	0 -10	10 - 20	20 - 30	30 - 40	40 - 50
No. of workers	6	26	47	15	6

c) An unbiased coin is thrown 9 times. Find the probability of getting 6 Heads and at least 3 Heads. **[5]**

OR

Total No. of Questions : 6]

SEAT No. :

P923

[Total No. of Pages : 3

[4263] - 296

T.E. (Printing)

OFFSET MACHINES - II

(2008 Pattern) (Semester - II)

Time :3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Figures to the right indicate full marks.*

SECTION - I

Q1) Explain the following: **[16]**

- a) How is web threaded in web machine? What is the difference between vertical press and horizontal press
- b) State different types of pasters used for web offset. Explain splice cycle of any one type.

OR

Explain the following: **[16]**

- a) Vertical festoon
- b) Factors to be considered for splice pattern selection
- c) Protective covering on rolls
- d) Dancer roller

Q2) a) Write a short note on ink water emulsification. **[8]**

- b) Write short note on oscillators, riders and distributors in inking system. **[8]**

OR

P.T.O.

Explain: [16]

- a) Setting of doctor to fountain roller and doctor to transfer roller
- b) Durometer and roller settings
- c) Dead weight bench micrometer
- d) Cylinder Packing and its importance

Q3) How does ink dry on heatset press. Explain. [18]

OR

- a) Explain ribbon folder and double former folder. [9]
- b) Explain maintenance of former folding mechanisms. [9]

SECTION - II

Q4) Explain the following terms w.r.t. web tension: [18]

- a) Variable speed devices to control the flow rate
- b) Constant torque devices to apply force

OR

Explain: [18]

- a) Cutoff
- b) Backup and color register
- c) Grey balance chart
- d) Star target

Q5) Explain: [16]

- a) Automatic ink level controller
- b) Ink pumping
- c) Ink agitators

OR

What is total preventive maintenance? How is it useful for news paper industry? [16]

- Q6)** Explain following press troubles: **[16]**
- a) Inadequate chilling of chill roll section
 - b) Ink flying in press room
 - c) Doubling
 - d) TVI on press

OR

- Explain following paper problems: **[16]**
- a) Edge cracks
 - b) Crushed core
 - c) Mill splice defects
 - d) Slitter defects



Q3) a) Design 8086 processor based system in MINIMUM mode with following specifications. [10]

i) 16K RAM using 4 chips of 4K each.

ii) 8K EPROM using 2 chips of 4K each

Draw the complete interfacing diagram and memory map.

b) Write an assembly language program for 8086, to arrange the 10 data bytes in the descending order. Assume data bytes are available at location starting from BFFF0H onwards. [8]

OR

Q4) a) Write an assembly language program for 8086, to find out the largest number from a given unordered array of 8-bit numbers, stored in the location starting from a known address. [10]

b) Draw the interrupt vector table. Explain the conditions which causes the 8086 to perform following interrupts: [8]

i) Type 0

ii) Type 1

iii) Type 2

iv) Type 3

Q5) a) Draw and explain the structure of descriptors supported by 80386. [8]

b) What do you mean by paging? What are advantages and disadvantages? [8]

OR

Q6) a) Draw and explain the architecture of 80386 processor. [8]

b) Explain the multitasking concept in 80386 processor with the help of TSS and TR. [8]

SECTION - II

Q7) a) Explain the architecture of CRT controller 6845 with the help of block diagram. [6]

b) List the specifications of following: [6]

i) EISA Bus

ii) PCI Bus

c) Explain with respect to USB: [6]

i) Endpoint

ii) Enumeration

OR

- Q8)** a) Draw the keyboard interfacing diagram using parallel port and explain the functions of each pin. [6]
b) State and explain different data transfer types supported by USB interface. [6]
c) With suitable block diagram explain the PCI Bus interface to the PC. [6]
- Q9)** a) Explain the following software interrupt exceptions for ARM processor. [8]
i) Interrupt request ii) Fast interrupt request
iii) Data abort iv) Prefetch abort.
b) Explain following ARM instructions with suitable example. [8]
i) LDRBT ii) MLA
iii) RSB iv) TST

OR

- Q10)** a) Compare RISC and SISC processors. [8]
b) Write an assembly language program for ARM7 to transfer 10 bytes of data from location 300000000 to location 400000000 and arrange in the reverse order. [8]
- Q11)** Design 8086/ARM7 based system to display number of persons available in the auditorium on LED/LCD display and turns off the auditorium lights when no one is present in the auditorium. [16]
i) Draw the complete interfacing diagram
ii) Draw the flowchart
iii) Explain important design steps.

OR

- Q12)** Design 8086/ARM7 based system to sense temperature from PT-100 (Temperature sensor) and display it on LCD. [16]
i) Design signal conditioning circuit.
ii) Draw the complete interfacing diagram.
iii) Draw the flowchart.



Total No. of Questions : 12]

SEAT No. :

P931

[Total No. of Pages : 3

[4263] - 277

T.E. (E & TC)

SYSTEM PROGRAMMING AND OPERATION SYSTEMS

(2008 Pattern) (Semester - II)

Time :3 Hours]

[Max. Marks :100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) What are different language processing activities involved in language processor. [8]
- b) Explain different data structures used to design pass - I and pass - II assembler. [10]

OR

- Q2)** a) Explain different development tools used for to develop language processor. [8]
- b) Explain design of pass - I assembler with example. [10]

- Q3)** a) Explain macro with example & describe nested macro calls with example. [8]
- b) What are different phases of compiler & explain in detail. [8]

OR

P.T.O.

- Q4)** a) What are advantages & disadvantages of combining macro processor with pass - I of an assembler. [8]
- b) Explain: [8]
- i) Code of optimization
 - ii) Interpreter
 - iii) Compiler

- Q5)** a) Describe the different loader function & feature in operating system. [8]
- b) What is program relocation & how to achieve relocation in operating system. [8]

OR

- Q6)** a) Explain : [8]
- i) Subroutine linker
 - ii) Dynamic linking loader
- b) Explain different software tools used for program development. [8]

SECTION - II

- Q7)** a) Define process. Draw & explain process state transition diagram. [8]
- b) Explain various types of operating system. [10]

OR

- Q8)** a) Explain pre-emptive and non-pre-emptive scheduling. [10]
- b) Explain with diagram how do dead lock occur & how to avoid it. [8]

- Q9)** a) Describe page replacement algorithm for the memory management. [8]
- b) What is virtual memory? Mention different techniques used for virtual memory. Explain any one in detail. [8]

OR

- Q10)** a) Explain: [8]
i) Swapping ii) Paging
b) Explain different design issues in the paging system. [8]

- Q11)** a) Explain different requests and responses of input and output devices interfacing. [8]
b) Explain power management in computer. [8]

OR

- Q12)** a) Explain principles of I/O hardware and I/O software. [8]
b) Write note on; [8]
i) Graphical user interface.
ii) Network terminal.



Total No. of Questions : 6]

SEAT No. :

P932

[Total No. of Pages : 2

[4263] - 298

T.E. (Printing)

DIGITAL WORKFLOW AND IMAGE SETTING

(2008 Pattern) (Semester - II)

Time :3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Figures to the right indicate full marks.*

SECTION - I

Q1) What is workflow? Compare between conventional and digital workflow.

OR

Differentiate between jobflow and workflow in details. **[16]**

Q2) What is job ticket? How is it useful for the smooth workflow of the job?

OR

What is the significance of pre-flight checking? How would it save the job from possible rejection? **[16]**

Q3) What are the different modules of the PDF workflow? Explain each in details.

OR

Explain in details JDF workflow with its features. **[18]**

P.T.O.

SECTION - II

Q4) What is file format? Which are the most common file formats used while a job is designed and being processed?

OR

Write down in details the objective of RIP. **[16]**

Q5) Which are the steps followed while the image gets processed digitally? Explain each in details.

OR

Why is image compression necessary? Which are the typical image compression techniques? **[16]**

Q6) Draw neat diagram of thermographic printer and explain its technology.

OR

What is the significance of proofing? Which are the most common technologies used in industry today for proofing? Why these technologies are preferred over others? **[18]**



Total No. of Questions : 6]

SEAT No. :

P936

[Total No. of Pages : 3

[4263] - 243

T.E. (Production S/W)

MATERIAL FORMING & MOULD DESIGN

(2008 Pattern) (Semester - II)

Time :3 Hours]

[Max. Marks :100

Instructions to the candidates:

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

SECTION - I

- Q1)**
- a) Define true stress & true strain. **[2]**
 - b) Calculate the ratio of true strain to engineering strain for the values of engineering strains of 0.001, 0.01, 0.02, 0.05, 0.1, 0.2 & 0.5. Also show for what values of engineering strain, true strains & engineering strains are equal. **[10]**
 - c) Show that true strains are additive in nature. **[4]**

OR

- a) Explain :Von-Mises & Tresca Yield Criterion. Enlist the difference between them. **[8]**
- b) Explain the concept of formability formability limit & formability diagram. **[8]**

P.T.O.

Write short notes on following:

- a) Roll flattening. [6]
- b) Roll camber [6]
- c) Automatic Gauge control [4]

Q5) For Gating system explain - Design of Gating system, Solidification time Riser design Principles of gating & risering. [16]

OR

Explain following for die casting design (any eight) [16]

- i) Minimum wall thickness
- ii) Undercuts & Ribs
- iii) Corner radii & fillets
- iv) Draft
- v) Cored holes
- vi) Combination die
- vii) Figure showing a typical Die-casting die
- viii) Pre heating of dies
- ix) Die-lubrication & coatings
- x) Design of cooling system

Q6) a) Explain open die forging & closed die forging with explanatory sketch? [6]

- b) For design of simple die for forging (any four) [12]
 - i) Types of allowances & their consideration
 - ii) Heat transfer considerations
 - iii) Inter cooling system
 - iv) Cam operated ejectors
 - v) Determination of cavity shapes

OR

Write short notes on following for casting design, design of [18]

- a) Cooling system
- b) Free flow system



Total No. of Questions : 6]

SEAT No. :

P937

[Total No. of Pages : 2

[4263] - 299

T.E. (Printing)

TECHNOLOGY OF FLEXOGRAPHY

(2008 Pattern) (Semester - II)

Time :3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Figures to the right indicate full marks.*
- 4) *Draw neat diagram wherever necessary.*

SECTION - I

Q1) Compare between flexo photopolymer and rubber plates. **[18]**

OR

Explain in detail factors to be considered for printing a job on flexo press. **[18]**

Q2) Explain the video mounting technique for flexo plates. **[16]**

OR

a) Calculate % shortening and new negative length for 2.84 mm plate thickness having printed length of 50 cm. **[10]**

b) Mention the specifications of a negative for flexo plate reproduction. **[6]**

Q3) a) Explain in detail the process of making a 2.84 mm PP plate. **[10]**

b) Mention the correlation between Back-exposure and Wash-out. **[6]**

OR

Explain in detail the standardization of a conventional PP plate. **[16]**

P.T.O.

SECTION - II

- Q4)** a) Explain in detail the making of a 1.7 mm flexo photopolymer plate. [10]
b) Mention the features of digital flexo PP plate. [6]

OR

Explain the safety precautions and optimization of wash out solvents. [16]

- Q5)** Explain CI flexo press with applications. [18]

OR

Describe unwinder, infeed, outfeed and rewinder sections of a flexo press. [18]

- Q6)** Explain in detail the doctor blade inking system of a flexo press. [16]

OR

Write notes on: [16]

- a) Ink Transfer in Flexography
b) Flexo Process Variables



Total No. of Questions : 12]

SEAT No. :

P1230

[Total No. of Pages : 3

[4263] - 281

T.E. (Instrumentation and Control)

INSTRUMENTATION FOR CHEMICAL ANALYSIS

(2008 Pattern) (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) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Explain the following terms and give two examples each for the following types of analysis :
- i) Qualitative Analysis [4]
 - ii) Quantitative Analysis [4]
- b) Explain principle and instrumentation used for Potentiometry. [8]

OR

- Q2)** a) Draw Electromagnetic Spectrum. Also list one instrumentation method, one source and one detector for each region. [8]
- b) Enlist various Electro analytical methods. Explain any one in detail. [8]
- Q3)** a) Explain the working of Double Beam Spectrophotometer with neat diagram. [8]
- b) Explain the following terms : [8]
- i) Beer's Law
 - ii) Lambert's Law
 - iii) Causes of deviation from Beer's law
 - iv) Typical graph of UV-VIS Spectrophotometer.

OR

P.T.O.

Q4) a) Explain with a neat diagram principle and working of Atomic Absorption Spectrometer. [8]

b) List the various types of Nebulizers and explain Ultrasonic Nebulizer with neat diagram. [8]

Q5) a) Explain construction and operation of Pyroelectric Detectors with neat diagram. [9]

b) What is Plasma? Explain ICP with the help of neat diagram. [9]

OR

Q6) a) Explain the principle of Atomic Emission Spectroscopy with a neat diagram. Explain working of Flame Photometer. [9]

b) State principle of Bolometer. Draw the block diagram of measurement system for bolometer and explain its working. [9]

SECTION - II

Q7) a) What is Raman Scattering? Explain Raman Spectrometer with neat diagram. [8]

b) Explain working of NMR Spectrometer. How Sensitivity can be increased in NMR Spectrometer. [8]

OR

Q8) a) What is Phosphorescence. Explain with a neat diagram principle and working of Spectrophosphorometer. [8]

b) Explain the working of N₂ Analyzer. Also explain importance of Gas Analyzers. [8]

Q9) a) Enlist various types of Mass Analyzers and explain any one mass Analyzer in details. [8]

b) Explain working of Gas Chromatography and give ideal characteristics of the carrier gas. [10]

OR

Q10) a) With the help of neat diagram, explain the working of HPLC and also explain one HPLC Detector. **[10]**

b) Enlist various types of Mass Analyzers and explain any one Mass Analyzer in detail. **[8]**

Q11) a) Enlist various radiation Detectors. Explain any one in detail. **[8]**

b) Explain Bragg's Law and also explain working of X- ray Diffractometer. **[8]**

OR

Q12) Write short note on :

a) Instrumentation for ESCA. **[8]**

b) Geiger - Muller Tube. **[8]**



Total No. of Questions : 6]

SEAT No. :

P1232

[Total No. of Pages : 3

[4263] - 291

T.E. (Printing)

OFFSET MACHINES - I

(2008 Pattern) (Semester - I)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Explain the following w.r.t. printing cylinder : **[8]**
- i) Effective diameter of cylinder
 - ii) Backlash
 - iii) Pitch diameter
 - iv) Undercut
- b) Explain with help of neat diagram perfecting type of transfer drum. **[8]**

OR

Explain the following : **[16]**

- a) How is packing calculated for plate and blanket cylinder? Explain calculations.
 - b) State difference between bearer contact and non-bearer contact press.
- Q2)** a) Explain procedure of preparing thermal CTP plate. **[8]**
- b) Explain in detail the effects of exposure and development on image reproduction on P.S. platemaking **[8]**
- OR
- a) Explain procedure of preparing thermal CTP plate. **[8]**
 - b) Compare digital and conventional plate making. **[8]**

P.T.O.

- Q3)** a) Explain the following for sheet fed offset inking unit. [9]
- i) Oscillating drum and its construction
 - ii) Friction driven rollers
 - iii) Fountain keys in modern machines
- b) Rollers in inking unit have varying diameters. Explain. [5]
- c) Explain roller pressure setting by stripe method. [4]

OR

- a) Explain multiroll type inking system with diagram. [9]
- b) Explain the following problems of inking unit : [9]
- i) Roller streaking
 - ii) Glazed rollers
 - iii) Roller stripping

SECTION - II

- Q4)** Explain : [18]
- a) Reduction of the surface tension of water in fountain solution
 - b) Conductivity of dampening solution
 - c) Chrome plated roller in dampening system

OR

- a) i) Explain combination continuous flow dampening system. [5]
- ii) On which factors does the chemical nature of fountain solution depend upon? [4]
- b) Compare roller materials used in conventional and modern dampening systems. [9]

- Q5)** a) Explain IR drying systems with their principle of working and various parts. [8]
- b) What is the utility of UV inks and UV curing system in offset. Explain. [8]

OR

- a) What is the purpose of infeed section in offset press. Explain any 2 types. [8]
- b) Explain the following : [8]
- i) Sheet decurler
 - ii) Joggers
 - iii) Positioning of Skeleton wheels
 - iv) Delivery chain grippers

- Q6)** a) State the make-ready arrangement for a 4 colour job on a single colour machine. [8]
- b) Considering the constituents of sheetfed offset inks, what disposable methods should be followed in printing industry for environment protection. [8]

OR

Write short notes on : [16]

- a) SWOP
- b) GraCol
- c) ISO 12647-2
- d) FOGRA



Total No. of Questions : 12]

SEAT No. :

P1235

[Total No. of Pages : 3

[4263] - 301

T.E. (Chemical)

CHEMICAL ENGINEERING MATHEMATICS

(2008 Pattern) (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) 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) Calculate the density of chlorine gas at 230°C and 150 atm pressure assuming that gas follows vander walls equation of state

$$\left(P + \frac{a}{V^2} \right) (V - b) = RT \text{ using Newton Raphson method.}$$

Data :- Critical temperature and pressure for Cl₂ gas are 417°K and 76.1 atm.

$$a = \frac{27R^2T_c}{64P_c}, \quad b = \frac{RT_c}{8P_c} \quad [10]$$

b) Explain graphical interpretation of secant method. [8]

OR

Q2) a) What are different types of errors associated with numerical methods.[8]

b) Find the root of the equation $x^3 - x - 1 = 0$. Using Mullers method.[10]

P.T.O.

- Q3) a)** Find the values of x , y and z using Gauss Seidal method for the following system. [8]

$$\begin{aligned} 4x + y + 2z &= 5 \\ x + 6y + 2z &= 19 \\ -x - 2y - 5z &= 10 \end{aligned}$$

- b) Explain Thomas Algorithm for tridiagonal matrix. [8]

OR

- Q4) a)** Solve the system of equations [8]

$$\begin{aligned} 6x_1 - 3x_2 + x_3 &= 11 \\ 2x_1 + x_2 - 8x_3 &= -15 \\ x_1 - 7x_2 + x_3 &= 10 \end{aligned}$$

by relaxation method, starting with the vector $(0,0,0)$.

- b) Discuss in short the drawbacks of elimination method. [8]

- Q5) a)** A missile is launched from a ground station. The acceleration during its first 80 seconds of flight, as recorded is given in the following table. [8]

t (s)	0	10	20	30	40	50	60	70	80
a (m/s ²)	30	31.63	33.34	35.47	37.75	40.33	43.25	46.69	50.67

Compute the velocity of the missile when $t = 80$ S, using Simpson's $\frac{1}{3}$ rule.

- b) Explain the principle of least square method to show the sum of the squares of the residuals is minimum. [8]

OR

- Q6) a)** The values of Nussult numbers (Nu) and Reynolds number (Re) found experimentally are given below. If the relation between Nu and Re is of the type $Nu = a \cdot Re^b$, find the values of a and b for the given values of Nu and Re [10]

Re	3000	4000	5000	6000	7000
Nu	14.3575	16.6517	16.7353	17.6762	18.5128

- b) The temperature - Viscosity relationship is given as follows [6]

t°C	40	41	42	43	44	45
Z (C _p)	52.5	50	47.5	45	43	41

Calculate the temperature of lubricant for a viscosity of 43.2 using back ward difference method.

SECTION - II

Q7) Solve the boundary value problem $\frac{d^2y}{dx^2} - 64y + 10 = 0$ with $y(0) = y(1) = 0$ using finite difference method calculate $y(0.5)$, taking step size $h = 0.25$. [16]

OR

Q8) a) Explain space - Time index notation for finite difference method. [6]

b) Using Runge Kutta 4th order method, solve $\frac{dy}{dx} - y = 0$, Given $y(0) = 2$, $h = 0.1$ find y at $x = 0.2$. [10]

Q9) Solve the unsteady heat equation $T_i = T_{xx}$, $0 \leq x \leq 4$ subject to the initial conditions $T(x, 0) = 1000$, and the boundary conditions

$\frac{\partial T}{\partial x}(0, t) = 0.15(T - 70)$, $\frac{\partial T}{\partial x}(4, t) = 0.25(T - 70)$ Using Crank - Nicolson finite difference method by taking, $\alpha = 0.132$, $\Delta x = 1.0$, $\Delta t = 1.893$. Give solution after one time step. [16]

OR

Q10) Solve $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$, for the following condition using explicit method at $x = 0$ and $x = 0.5$, $u = 1$ for all values of t at $t = 0$, $u = 2x + 1$ for $0 < x < 0.5$ Take increment in x as 0.1 and increment in t as 0.01. Find all values of u for $t = 0$ to $t = 0.03$. [16]

Q11) a) Explain scanning and bracketing procedures for optimization of unconditional function of one dimensional search. [9]

b) What are the six steps of optimization. [9]

OR

Q12) A chemical is produced by a batch process. Chemicals X and Y are used to make Z with the following relationship for kg of Z produced and kgs of X and Y used.

$$Z = 1.5 (1.1 \times X + 1.3 YZ - XY)^{0.5}$$

X costs Rs. 0.18/kg, Y Rs. 0.08/kg and Z sells for Rs. 1.60/kg. One half of the selling price for Z is due to costs other than raw material. Only Z is recovered from the process. Find the maximum profit obtainable per kg of Z. [18]



Total No. of Questions : 12]

SEAT No. :

P1237

[Total No. of Pages : 7

[4263] - 311

T.E. (Petroleum Engg.)

NUMERICAL METHODS AND GEO-STATISTICS

(2008 Pattern) (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, 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 books.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Figures to the right indicate full marks.
- 5) Use of electronic pocket calculator is allowed.
- 6) Assume suitable data, if necessary.

SECTION - I

Q1) a) If $f(z) = u + iv$ is an analytic function find $f(z)$ if $u + v = e^{-x}$
($\cos y - \sin y$). **[5]**

b) Show that the transformation $w = \frac{5-4z}{4z-2}$ transforms the circle $|z| = 1$
into a circle of radius unity in the w plane and find its radius. **[6]**

c) Evaluate $\int_C \frac{e^{2z}}{(z+1)^4} dz$ where C is the circle $|z| = 2$. **[6]**

OR

Q2) a) Find the analytic function $f(z) = u(r, \theta) + i v(r, \theta)$ such that $v(r, \theta)$
 $= r^2 \cos 2\theta - r \cos \theta + 2$. **[6]**

P.T.O.

b) Find the bilinear transformation which maps the points $z = 0, -1, i$ onto $w = i, 0, \infty$. [5]

c) Evaluate $\int_C \frac{\cos \pi z^2 dz}{(z-1)(z-2)}$ where C is the circle $|z| = 3$. [6]

Q3) a) The first four moments of a distribution about the value 4 of the variables are $-1.5, 17, -30$ and 108 . Find the moments about mean and β_1 and β_2 . [8]

b) Find the coefficient of correlation and obtain the equation to the lines of regression of the data. [8]

x	6	2	10	4	8
y	9	11	5	8	7

OR

Q4) a) Calculate the coefficient of correlation between the marks obtained by 8 students in Mathematics and statistics. [8]

Mathematics	25	30	32	35	37	40	42	45
Statistics	08	10	15	17	20	23	24	25

b) Two lines of regression are given by $5y - 8x + 17 = 0$ and $2y - 5x + 14 = 0$. If $\sigma_y^2 = 16$, Find (i) mean value of x and y , (ii) variance of x and (iii) correlation coefficient between x and y . [8]

Q5) a) A and B take turns in throwing two dice, the first to throw 10 being awarded the prize. Find the probability of A winning, if A has the first throw. [5]

b) Determine the probability that the amount of cosmic radiation X , a pilot of jet plane will be exposed is more than '5.20 m rem' if X is normally distributed with mean 4.35 m rem and S.D. 0.59 m rem Area = 0.4251 when $z = 1.44$. [6]

- c) On an average, 1.3 gamma particles/mill second come out of a radio active substance. Determine the probability of more than one gamma particles emanate from the substance. (Use Poisson). [6]

OR

- Q6)** a) Assume that 50% of all engineering students are good in Mathematics. Determine the probabilities that among 18 engineering students (i) exactly 10 students are good in Maths (ii) at most 8 are good in Maths. [6]

- b) In a certain town 40% have brown hair, 25% have brown eyes and 15% have both brown hair and brown eyes. If a person selected at random has brown hair, then what is the probability that he has brown eyes also. [5]

- c) If X is a normal variable with mean 30 and S.D. 5, find the probabilities $26 \leq X \leq 40$ and $X \geq 35$. [6]

(i) Area when $z = 0.8$ is 0.2881

Area when $z = 2$ is 0.4772

Area when $z = 1$ is 0.3413

SECTION - II

- Q7)** a) Establish the following results : [9]

i) $(E + 1) \delta = 2 (E - 1) \mu$

ii) $\left(E^{1/2} + E^{-1/2} \right) (1 + \Delta)^{1/2} = 2 + \Delta$

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

- b) A function $f(t)$ is described by the following experimental data at equally spaced intervals. [8]

t	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
$f(t)$	93	87	68	55	42	37	35	39	48	53	51

Evaluate the integral $I = \int_0^1 f(t) dt$, using Simpson's rule. Write the algorithm for the method used.

OR

- Q8) a) For the following data : [9]

x	2	6	10	14	18
$f(x)$	21.857	21.025	20.132	19.145	18.057

Use Stirling's formula to compute $f(11)$ and $f'(6)$

- b) A curve is drawn to pass through the points given by the following table : [8]

x	1	1.5	2	2.5	3	3.5	4
y	2	2.6	2.9	3.2	3.7	2.8	2.2

Estimate the area bounded by the curve, the x-axis and ordinates $x = 1$, $x = 4$

If the area is revolved completely around x-axis, find the volume of the solid generated.

- Q9) a) Solve $3x - 1 - \cos x = 0$ by using the method of successive approximations write the algorithm for the method used. [8]

- b) Solve the system of equations by using Gauss-Seidel method. [8]

$$20x + 2y + 3z = 33$$

$$x + 25y - 2z = 45$$

$$2x - 3y + 30z = 86$$

OR

- Q10) a)** The values of Nusselt number y and Reynold number x found experimentally are given below. Determine the relation of the type $y = ax^b$ by using method of least squares. [8]

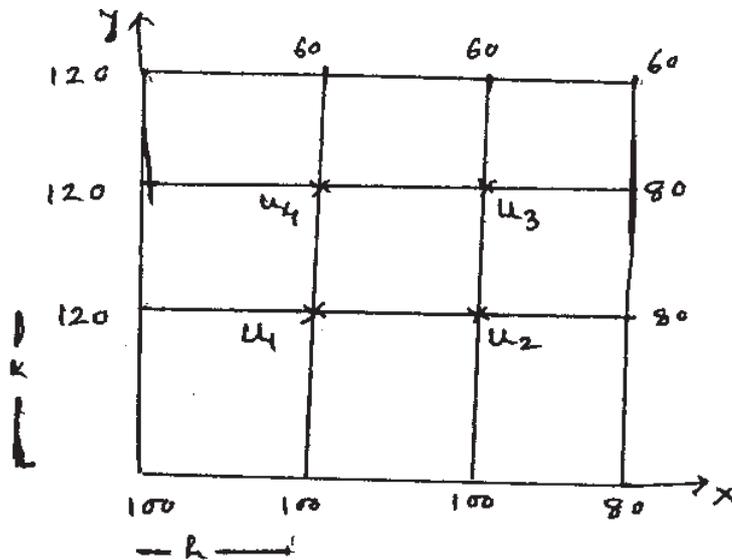
Reynold No. (x)	3000	4000	5000	6000	7000
Nusselt No. (y)	14.3575	15.6517	16.7353	17.6762	18.5128

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

$$\frac{dI}{dt} + \frac{R}{L}I = \frac{E}{L}$$

where $R = 100$ ohms, $L = 0.5$ henry and $E = 20$ volts, to calculate I at $t = 0.001$ and $t = 0.01$ taking step sizes of 0.001 and 0.01 respectively. Given that $I = 0$ at $t = 0$. [8]

- Q11) a)** Solve the equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$, to find the unknown pivotal values corresponding to the grid shown below $h = k = 1$. [9]



- b) Solve the following Linear Programming Problem by using simplex technique

$$\text{Maximize } z = 50x_1 + 60x_2$$

$$\text{with constraints } 2x_1 + x_2 \leq 300$$

$$3x_1 + 4x_2 \leq 509$$

$$4x_1 + 7x_2 \leq 812$$

$$x_1, x_2 \geq 0$$

[8]

OR

- Q12)** a) Solve the equation $\frac{\partial u}{\partial t} + \frac{\partial^2 u}{\partial x^2}$, using explicit finite difference scheme, subject to the conditions

$$u(0, t) = 0, u(1, t) = 0 \text{ for all } t$$

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

$$= 2(1-x), \frac{1}{2} \leq x \leq 1$$

take $\delta x = 0.1$, $\delta t = 0.001$ and find $u(x, t)$ at all nodal points at $t = 0.001, 0.002, 0.003$. [9]

b) Solve the following LPP by using simplex method

$$\text{Maximize} \quad Z = 20x_1 + 10x_2$$

$$\text{subject to the constraints} \quad x_1 + 6x_2 \leq 300$$

$$2x_1 + 2x_2 \leq 150$$

$$4x_1 + x_2 \leq 240$$

$$x_1, x_2 \geq 0$$

[8]



Total No. of Questions : 12]

SEAT No. :

P1240

[Total No. of Pages : 7

[4263] - 321

T.E. (Petrochemical Engineering)
NUMERICAL AND STATISTICAL METHODS
(2008 Pattern) (Semester - I)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) *Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, from Section I and Q.7 or Q.8, Q.9 or Q.10, and Q.11 or Q.12, from Section II.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of electronic pocket calculator is allowed.*
- 6) *Assume suitable data, if necessary.*

SECTION - I

- Q1) a)** Explain the term : Basic Feasible solution. Find all basic feasible solutions to the system of equations : **[6]**

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

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

- b)** Use simplex method to solve following Linear Programming Problem:**[10]**

$$\text{Maximize } Z = 5x_1 + 3x_2$$

Subject to the constraints

$$x_1 + x_2 \leq 2$$

$$5x_1 + 2x_2 \leq 10$$

$$3x_1 + 8x_2 \leq 12$$

$$x_1, x_2 \geq 0$$

OR

P.T.O.

Q2) a) Apply the principle of duality to solve the following L.P.P. **[10]**

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

Subject to the constraints

$$x_1 + x_2 \leq 5$$

$$x_1 \leq 4$$

$$1 \leq x_2 \leq 6$$

$$x_1, x_2 \geq 0$$

b) Write the dual of the following L.P.P. **[6]**

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

$$\text{Subject to } -2x_1 + x_2 + 3x_3 = 2$$

$$2x_1 + 3x_2 + 4x_3 = 1$$

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

Q3) a) A company has received a contract to supply gravel for three new projects located in towns A, B, C. The company has 3 gravel pits located in towns W, X, Y. The availability of gravel at three pits W, X, Y and requirement at projects in towns A, B, C are shown below. The delivery cost from each pit to each project location are also shown in the following matrix. **[10]**

		<u>Project location</u>			Availability
		A	B	C	
<u>Pits</u>	W	4	8	8	76
	X	16	24	16	82
	Y	8	16	24	77
Requirement		72	102	41	

Schedule the shipment from pit to project location in such a manner so as to minimize the total transportation cost.

- b) PQR company is engaged in manufacturing 5 brands B_1, B_2, B_3, B_4 and B_5 of packed snacks. It is having 5 manufacturing setups S_1, S_2, S_3, S_4 and S_5 , each capable of making any of the brand. The cost to make a brand on these setups is given in the following table. Find the optimum assignment of products on these setups resulting in the minimum cost. [6]

	S_1	S_2	S_3	S_4	S_5
B_1	4	6	7	5	11
B_2	7	3	6	9	5
B_3	8	5	4	6	9
B_4	9	12	7	11	10
B_5	7	5	9	8	11

OR

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

		To			
		W	X	Y	availability
From	A	8	6	5	150
	B	6	6	6	150
	C	10	8	4	150
	D	8	6	4	150
Demand		200	200	200	

- b) A department has four employees and four jobs are to be performed. The time taken by each employee to perform each job is given in the following table : [6]

		Jobs			
		1	2	3	4
Employee	A	10	12	19	11
	B	5	10	7	8
	C	12	14	13	11
	D	8	15	11	9

How the jobs should be assigned to the employees so that the total time is minimum.

- 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 the given data.

- b) Mean and variance of a binomial distribution are 4 and 2 respectively. Find the probability of i) atleast two successes ii) less than 2 successes. [6]
- c) The accidents per shift in a factory are given by the following table : [5]

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.

OR

- Q6) a)** The regression equations are $8x - 10y + 66 = 0$ and $40x - 18y = 214$. The value of variance of x is 9. Find i) The mean value of x and y ii) The correlation coefficient between x and y iii) The standard deviation of y . [6]

- b) In a certain examination test, 2000 students appeared in a subject of statistics. Average marks obtained were 50% with standard deviation 5%. How many students are expected to obtain more than 60% of marks, supposing that marks are distributed normally. [6]

Given $Z = 2$

area = 0.4772

- c) In an experiment on pea breeding, the following frequencies of seeds were obtained : [6]

Round and Green	Wrinkled and Green	Round and Yellow	Wrinkled and Yellow	Total
222	120	32	150	524

Theory predicts that the frequencies should be in proportion 8 : 2 : 2 : 1. Examine the correspondence between theory and experiment.

Given $\chi_{3;0.05}^2 = 7.815$.

SECTION - II

Q7) a) With usual notations prove the following :

i) $\Delta + \nabla = \frac{\Delta}{\nabla} - \frac{\nabla}{\Delta}$

ii) $\nabla\Delta = \Delta - \nabla = \delta^2$

iii) $E = e^{hD}$ [9]

b) Calculate $\int_{0.5}^{0.7} e^{-x} x^{1/2} dx$ taking 5 ordinates by Simpson's $\frac{1}{3}$ rule and compare it with using Trapezoidal Rule Result. [8]

OR

Q8) a) From the following table of half-yearly premium for policies maturing at different ages, estimate the premium for policy maturing at the age of 63. [8]

Age :	45	50	55	60	65
Premium (In Rupees)	114.84	96.16	83.32	74.48	68.48

b) Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at $x = 1.2$ from the following data. [9]

x	1.0	1.2	1.4	1.6	1.8	2.0	2.2
y	2.72	3.32	4.06	4.96	6.05	7.39	9.02

Q9) a) Solve the following system of linear equations using Gauss-Seidel Method upto 5 iterations. [8]

$$23x_1 + 13x_2 + 3x_3 = 29$$

$$5x_1 + 23x_2 + 7x_3 = 37$$

$$11x_1 + x_2 + 23x_3 = 43$$

b) By using Newton-Raphson's Method, find the root $x^4 - x - 10 = 0$ which is near to $x = 2$ correct to three places of decimal. [8]

OR

- Q10)** a) Apply iterative scheme method to find the real root of $xe^x = 1$ correct to three decimal places assuming the initial approximation as $x_0 = 0.5$. [8]
- b) Fit a straight line to the following data. [8]

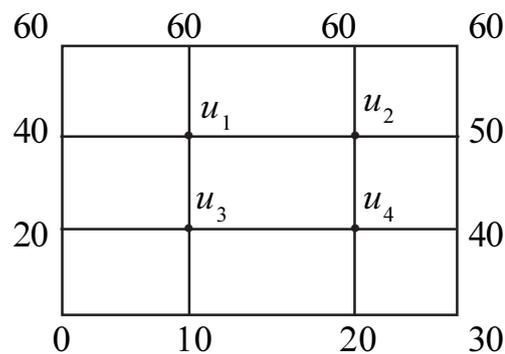
x	71	68	73	69	67	65	66	67
y	69	72	70	70	68	67	68	64

- Q11)** a) Compute $y(0.1)$ and $y(0.2)$ by Runge-Kutta method of 4th order for the differential equation

$$\frac{dy}{dx} = xy + y^2 \quad y(0) = 1$$

$$h = 0.1 \quad [9]$$

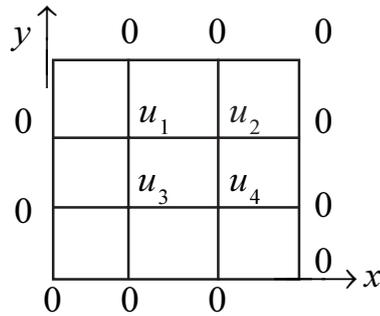
- b) Solve $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ within the square given below $h = k = 1$. [8]



OR

Q12) a) Using Euler's modified method solve the equation $\frac{dy}{dx} = 2 + \sqrt{xy}$ with $y(1) = 1$ for $x = 1 (0.2) 1.4$ $\{(h = 0.2)$ find $y(1.2)$ and $y(1.4)\}$. **[9]**

b) Solve $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = -10(x^2 + y^2 + 10)$ over the square with $x = 0, y = 0, x = 3, y = 3$, with $u = 0$ on the boundary and mesh length $h = 1, k = 1$. **[8]**



STRUCTURAL ANALYSIS - II
(2008 Pattern) (Semester - I)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4 & Q.5 or Q.6 in Section - I.
- 2) Answer Q.7 or Q.8, Q.9 or Q.10 & Q.11 or Q.12 in Section - II.
- 3) Answers to the two sections should be written in separate answer books.
- 4) Neat sketches must be drawn wherever necessary.
- 5) Figures to the right indicate full marks.
- 6) Assume suitable data, if necessary.

SECTION - I

- Q1)** Analyse the continuous beam ABCD loaded as shown in Figure 1 by Slope Deflection Method if the support 'B' sinks by 5 mm. Take $E = 2 \times 10^5$ N/mm² and $I = 1600$ cm⁴. Draw B.M.D. showing all salient points. [16]

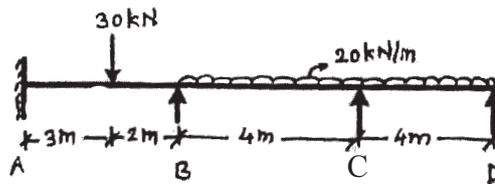


Fig. 1

OR

- Q2)** Analyse the rigid frame shown in Figure 2 using Slope - Deflection method. Draw B.M.D. showing all salient points. [16]

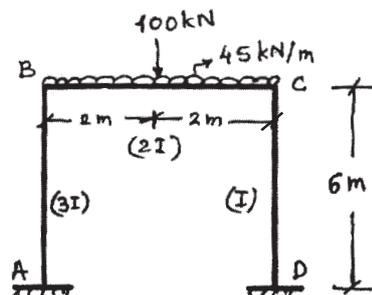


Fig. 2

- Q3)** a) Define [4]
- i) Distribution Factor
 - ii) Carry over Moment
 - iii) Stiffness of Member
 - iv) Relative Stiffness of Member

- b) Analyse the continuous beam ABC using the moment distribution method. Also plot S.F. and B.M.D. showing important points. Refer Figure 3. [14]

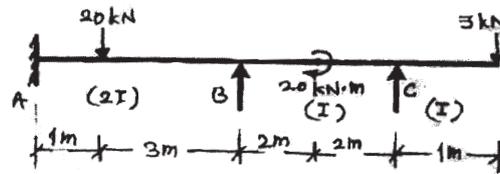


Fig. 3

OR

- Q4) A propped cantilever beam AB of varying cross section and loaded as shown in Figure 4. Plot B.M.D. and S.F.D. for the beam using Moment Distribution Method. [18]

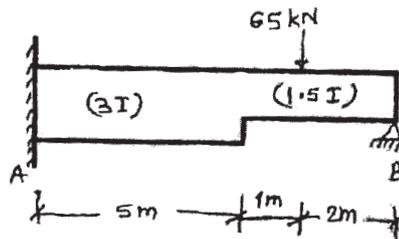


Fig. 4

- Q5) a) A two hinged parabolic arch of span 'L' and rise 'h' carries a point load 'W' at the crown. Determine the expression for horizontal thrust developed at the springing. [8]
- b) Determine the vertical reactions and horizontal thrust for the three hinged arch ABC shown in Figure 5. [8]

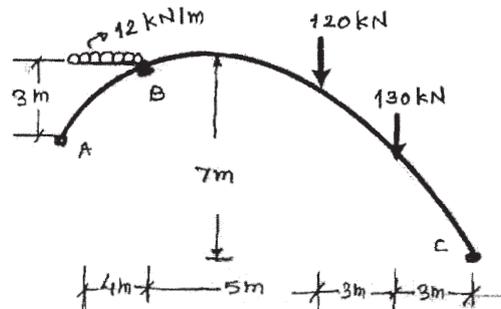


Fig. 5

OR

- Q6) a) Show that bending moment at any section of a three hinged arch is zero and find horizontal thrust if it carries u.d.l. throughout the length 'l' and rise 'h'. [8]
- b) A three hinged semi - circular arch has span 45 m and 7 m central rise. It carries a point load of 370kN at 7 m from left hand support. Determine a) horizontal thrust b) vertical reactions c) bending moment under the load. [8]

SECTION - II

- Q7)** a) Define flexibility & stiffness stating the properties of stiffness matrix. [4]
 b) Analyse the continuous beam shown in figure 7 by Flexibility Matrix Method and draw BMD, SFD and elastic curve. [12]

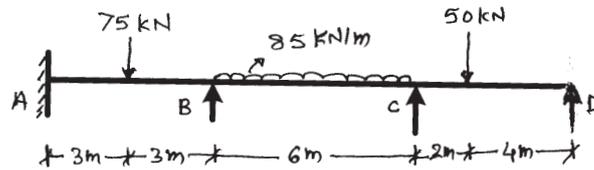


Figure 7

OR

- Q8)** Analyse the frame shown in Figure 8 by Flexibility Matrix Method and draw BMD and SFD. Assume flexural rigidity EI constant for all members. [16]

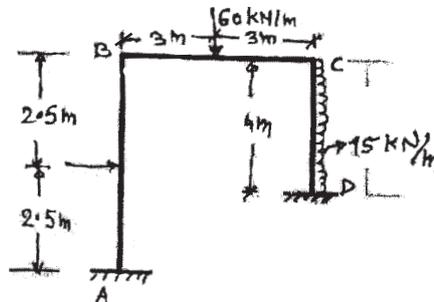


Fig. 8

- Q9)** Analyse the continuous beam shown in figure 9 by Stiffness Matrix Method and draw BMD, SFD and elastic curve. The support 'B' sinks by 15 mm. Take $E = 200\text{GPa}$ and $I = 1600\text{ cm}^4$. [16]

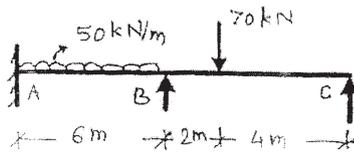


Fig. 9

OR

- Q10)** Analyse the frame shown in Figure 10 by Stiffness Matrix Method and draw BMD and SFD. Assume flexural rigidity EI constant for all members. The support 'C' is hinged. [16]

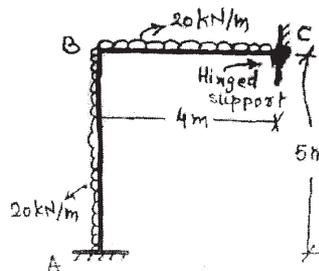


Fig. 10

- Q11)** a) A cantilever beam of length 'L' is loaded with u.d.l. of 'w' kN/m. Determine the deflection of free end by using Finite Difference Method. [6]
- b) Determine the approximate values of moments, shear and axial force in each member of frame shown in Figure 11. Use Portal Frame Method. Assume columns of same cross section. [12]

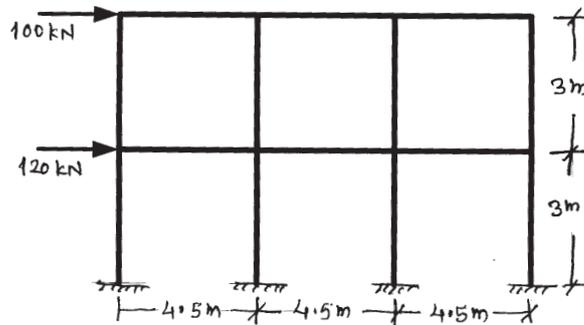


Figure 11

OR

- Q12)** a) A simply supported beam of span 12 m is loaded with point loads 150 kN each at quarter points. Using Finite Difference Method, find deflection at centre of the beam. $EI = 4 \times 10^5 \text{ kN.m}^2$. [6]
- b) Determine the approximate values of moments, shear and axial force in each member of frame shown in Figure 12. Use Cantilever Method. Assume columns of same cross section. [12]

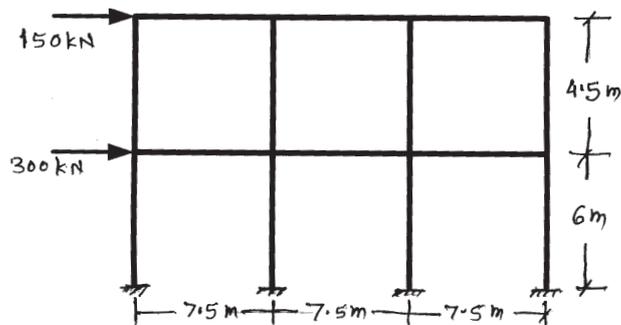


Figure 12



Total No. of Questions : 12]

SEAT No. :

P742

[4263]-202

[Total No. of Pages : 3

T.E. (Civil)

**INFRASTRUCTURAL ENGINEERING AND CONSTRUCTION
TECHNIQUES**

(2008 Pattern) (Sem. - I)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Solve Q.1 or 2, Q.3 or Q.4, Q.5 or Q.6 from Section I & Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12 from Section - II.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 6) *Assume suitable data if necessary.*

SECTION - I

- Q1)** a) Explain in brief the organizational setup of the Indian Railways. [6]
b) Draw a neat sketch of the permanent way and state the functions of components of permanent way. [6]
c) Write a short note on Tilting of rails and coning of wheels. [4]

OR

- Q2)** a) What are the functions of rails? Name the various types of rail in use. Which one is widely use now and why? [6]
b) Define Gauge. State the various gauges adopted by Indian Railways along with their gauge distance. Also state the advantage of having uniform gauge throughout the country. [6]
c) State the comparison between steel sleepers and prestressed concrete sleepers. [4]

- Q3)** a) Define cant. State various functions of cant. Also state the formula for calculation of equilibrium cant. [6]
b) Explain the following terms in brief: [6]
i) Pusher Gradient.
ii) Grade Compensation.
iii) Negative Superelevation.
c) What do you understand by plate laying. State various methods of plate laying. Explain any one in brief. [4]

P.T.O.

OR

- Q4)** a) Define points and crossings. Draw a neat labelled diagram of right hand turnout. [4]
- b) Explain in brief the need of sky bus and metro railway in growing cities of India. [4]
- c) Calculate the superelevation and maximum permissible speed for 2° BG transitioned curve on a high speed route with a maximum sanctioned speed of 110 kmph. The speed for calculating the equilibrium superelevation as decided by the chief engineer is 80 kmph and the booked speed of goods train is 50 kmph. [8]
- Q5)** a) State the detail classification of Tunnels. [6]
- b) Briefly describe how you would transfer the centre line of a proposed tunnel from the ground surface to the tunnel interior. [6]
- c) Define port. State the various requirements of good port. [6]

OR

- Q6)** a) Explain in brief the following : [6]
- i) Twin Tunnels.
- ii) Pilot Tunnel.
- iii) Faces of Attack.
- iv) Hard Ground & Soft Ground.
- b) Define Harbour. State the classification of Harbours with example. [6]
- c) Define Mucking. State various method of Mucking. Explain any one in brief. [6]

SECTION - II

- Q7)** a) Discuss the different construction techniques for high rise structures with their difficulties during the execution phase. [6]
- b) Explain the production techniques and quality control in construction for prefabricated elements. [6]
- c) Enlist the various equipments used for material conveying and explain the difficulties in material handling. [5]

OR

- Q8)** a) 'Construction activity plays an important role in the national & global development'. Justify the sentence by giving examples of various construction sectors. [6]

- b) Enlist the different types of crane and state the various factors considered for selection of crane in construction work. [6]
- c) Write short note on autoclave curing. [5]

- Q9)**
- a) Enlist the various earth moving equipments with their suitability as per type of work. [6]
 - b) Explain the importance of preventative maintenance in mechanization of construction sector. [6]
 - c) What is work cycle for operation of equipment and what are the factor affecting the cycle time. [5]

OR

- Q10)**
- a) Explain equipment working rate, discusses the factor affecting working rates. [6]
 - b) What are the types of scraper? Explain the working operation of scraper. [6]
 - c) Write short note on hydraulically operated rock breakers. [5]

- Q11)**
- a) Enlist the various pneumatic equipments that are commonly used and also state various factors that are to be necessarily considered while making suitable selection of pneumatic equipment. [5]
 - b) Write short notes on : [6]
 - i) Slip form technique.
 - ii) Jump form technique.
 - c) What is dredging? What are the different dredging techniques? [5]

OR

- Q12)**
- a) Explain the multistage well point system of dewatering. [5]
 - b) Write short notes on : [6]
 - i) Products of crushed sand and crushed aggregates.
 - ii) Use of RMC plant.
 - c) What makes concrete pumpable? Give the factors that influencing the performance and concrete pumps. [5]



Total No. of Questions : 12]

P744

SEAT No. :

[Total No. of Pages : 4

[4263] - 205
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) Neat diagrams must be drawn wherever necessary.*
- 4) Figures to the right indicate full marks.*
- 5) Use of logarithmic table electronic pocket calculator and steam table is allowed.*
- 6) Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) State the objects of Geodetic Surveying and explain Secondary Triangulation? [8]
- b) State and explain various components of GPS [6]
- c) What are the various points to be considered for selecting a triangulation station? [4]

OR

- Q2)** a) What are various potential error sources that affect GPS signal or result? [5]
- b) Differentiate between absolute positioning and Relative positioning.[5]
- c) 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]

P.T.O

Q3) a) The angles of triangle ABC were recorded as follows: [8]

Angle	Weight
-------	--------

A = 77° 14' 20''	4
------------------	---

B = 49° 40' 35''	3
------------------	---

C = 53° 04' 52''	2
------------------	---

Give the corrected values of the angles

b) Explain stepwise procedure of computations of sides of a Spherical Triangle by Spherical Trigonometry. [4]

c) Define the following terms [4]

i) Conditioned equation

ii) Weight of an observation

iii) Most probable value

iv) Mistake

OR

Q4) a) Explain step by step procedure for figure adjustment for a geodetic quadrilateral with central station [6]

b) What is spherical excess? [2]

c) Find the most probable values of the angles A, B and C of a triangle ABC from the following observations (Use method of differences).[8]

Angle	Weight
-------	--------

Angle A = 65° 15' 30''	3
------------------------	---

Angle B = 51° 11' 25''	2
------------------------	---

Angle C = 63° 32' 34''	4
------------------------	---

Q5) a) 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. [8]

b) Describe the methods of setting out of tunnel, explain with a neat sketch. [8]

OR

- Q6)** a) Describe the procedure for setting out of a pipeline and sewers [8]
b) Write a note on correction for curvature and refraction in geodetic surveying [8]

SECTION - II

- Q7)** a) Derive an expression for displacement due to ground relief. [8]
b) A tower, lying on a flat area having an average elevation of 800 m above msl, was photographed with a camera having a focal length of 24 cm. The distance between the images of top and bottom of the tower measures 0.34 cm on the photograph. A line AB, 200 m long on the ground, measures 12.2 cm on the same photograph. Determine the height of the tower if the distance of the image of the top of the tower is 8.92 cm, from the principal point. [10]

OR

- Q8)** a) Write short notes on: [10]
i) Crab and Drift
ii) Flight planning
and define principal point and photo nadir
b) Write a note on Radial line method of plotting. [8]

- Q9)** a) What is raster and vector data. How do you analyse the satellite image for civil engineering projects, draw sketches to support your answer. [8]
b) State and explain various components of GPS. Differentiate between absolute positioning and relative positioning. [8]

OR

- Q10)** a) What is GIS. State various GIS software's and explain how remote sensing and GIS are linked. [8]
b) What is the working principle of Total station? How will you use Total station to determine the remote distance (RDM) [8]

Q11) a) Define hydrographical surveying? How hydrographical survey shall be beneficial? [8]

b) What is sounding? State use of lead line for measuring sounding and explain with a neat sketch. [8]

OR

Q12) a) State various methods of locating the position of boat in hydrographical surveying and explain briefly [8]

i) One angle from the shore and other from the boat

ii) Intersecting ranges

b) What is fathometer? Explain its use in assessing the amount of silt deposition in the water body. [8]

❖❖❖❖

Total No. of Questions : 12]

P745

SEAT No. :

[Total No. of Pages : 4

[4263] - 206

T.E. (Civil Engineering)

HYDROLOGY AND WATER RESOURCES ENGINEERING

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

SECTION - I

- Q1)** a) What is meant by Probable Maximum Precipitation? Describe the methods of estimating PMP. What are its design applications? [10]
- b) Describe the principle of working of a tipping bucket type recording rain gauge with neat sketch. Mention its advantages and disadvantages. [8]

OR

- Q2)** a) What is evaporation? How will you measure it? Draw neat labelled sketch of field method to measure evaporation. State methods to control evaporation loss from reservoir. Explain any one method in detail.[10]
- b) What is stream gauging? Explain dilution technique method with sketch and explain its application in water resources engineering [8]

P.T.O

- Q3)** a) Explain extreme value (Gumbel's) distribution [8]
b) State various formulae to estimate flood and explain any two methods [8]

OR

- Q4)** a) What do you understand by return period? Give few formulae to determine return period. [8]
b) Given below are the ordinates of a 4 h UH of a basin in m^3/s at 1 hour interval. 4, 25, 44, 60, 70, 61, 52, 45, 38, 32, 27, 22, 18, 14, 11, 08, 06, 4, 2 and 1. What is the area of basin? [8]

- Q5)** a) Explain types of reservoirs and explain the points considered for selecting the site for a reservoir and state the investigation required for construction of a reservoir, [8]
b) What is design life period of storage reservoir? How do you account for sediment deposition in the reservoir while fixing its storage capacity? [8]

OR

- Q6)** a) Define trap efficiency of reservoir. Describe how the time required to for the reservoir to fill up with the sediments is calculated. [8]
b) Write a note on Benefit-Cost studies for reservoir. Explain any two methods. [8]

SECTION - II

- Q7)** a) Explain any two methods of assessing canal revenue [8]
b) Explain sprinkler irrigation with a neat layout sketch and state the advantages of sprinkler irrigation over other methods of irrigation. [8]

OR

Q8) a) Explain the relation between duty, delta and base period. Derive the relation between them and states the methods to improve duty of water. [8]

b) Define

- i) Kor watering,
- ii) Kor depth,
- iii) Paleo irrigation,
- iv) Crop period,
- v) Base period,
- vi) Intensity of irrigation,
- vii) Gross command area,
- viii) Culturable command area.

[8]

Q9) a) Explain Dupits and Thiems theory and state the assumptions made [8]

b) Enlist different types of tube wells and dug wells and explain strainer type with a neat sketch [8]

OR

Q10) a) Explain pumping and recuperation test. What should be the diameter of an open well to give safe yield of 5 lit/sec? Assume the working head at 3.75 m and the subsoil consists of fine sand. (For fine sand specific yield = 0.5/hour). [8]

b) In an artesian aquifer of 10 m thick, a 10 cm diameter well is pumped at a constant rate of 100 lit/minute. The steady state drawdown observed in two wells located at 10 m and 50 m distances from the centre of the well are 3 m and 0.05 m respectively, compute the transmissivity and the hydraulic conductivity of the aquifer. [8]

Q11) 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. [12]

b) Write a note on ancient system of water distribution [6]

OR

Q12) a) What are co-operative water distribution society's. State the rules and regulation laid down by these societies for equitable distribution of water to farmers. [10]

b) What is water logging? What are the ill effects of water logging? Explain any one method to improve the sub-surface drainage [8]

❖❖❖❖

Total No. of Questions : 12]

SEAT No. :

P748

[Total No. of Pages : 4

[4263] - 209

T.E. (Civil)

ENVIRONMENTAL ENGINEERING-I

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

SECTION - I

- Q1)* a) Discuss the various demands of water. Mention these demands per capita basis. [5]
- b) A river water supply is treated by the sequence of unit operations and chemical additions in the following list. [2 × 5 = 10]
State the purpose or purposes for each unit process and chemical addition.
- i) Presedimentation with polymer addition
 - ii) Mixing and Flocculation with addition of alum and polymer.
 - iii) Addition of Activated Carbon.
 - iv) Granular Media Filtration
 - v) Post Chlorination
- c) What do you mean by design period. Explain the factors affecting the design period. [3]

OR

P.T.O

Q2) a) Forecast the future population of a town for the year 2021 by the incremental increase method with the help of following census data:[9]

Year	1931	41	51	61	71	81	91
Population	30000	34500	40800	77900	52700	57500	62500

b) Give the standards as per IS 10500 for the following for drinking water. Also state the ill effects if they are in excess. [9]

- i) pH
- ii) Chlorides
- iii) Iron
- iv) Fluorides
- v) MPN
- vi) Turbidity

Q3) a) What is intake structures? Discuss the general design consideration of intake. Describe the river intake with structures neat sketch. [10]

b) Discuss the various methods of aeration with neat sketch and state its limitations. [6]

OR

Q4) a) Explain the principle of plane sedimentation tank. [4]

b) A water treatment plant treats 200 m³/hr of water. Workout the following with respect to flocculator. [12]

- i) Dimensions of flocculator unit.
- ii) Power input by paddles to water.
- iii) Size and Number of paddles.

Assume water temp. = 25° C and absolute viscosity = 0.89×10^{-3} N-S/mt².

Detention time = 30 minutes.

Given that velocity of water in inlet pipe = 1.2 mt/sec. Drag coefficient $C_D = 1.8$, $G = 40 \text{ sec}^{-1}$.

Velocity at tip of paddle = 0.5 mt/sec.

- Q5)** a) Explain different mechanisms of filtration. [4]
- b) The population of a city is 50,000 and per capita water consumption is 135lit/day. Calculate the following with respect to rapid sand filter for the above data. [12]
- i) Total area of filters
- ii) Number and dimensions of each filter.
- iii) Depth of sand bed.
- Assume break through index as 4×10^{-4}

OR

- Q6)** a) Explain Chlorine-Ammonia treatment of what are its advantages? [4]
- b) Discuss the effect of [4]
- i) pH of water and
- ii) Organic matter of water on efficiency of disinfection by chlorine.
- c) Chlorine usage in the treatment of 20,000 m³/day is 8 kg/day. The residual Chlorine after 10 min. contact is 0.2 mg/lit. Calculate the dosage in milligram per litre and chlorine demand of water. [6]
- d) Explain the importance of disinfection in Public Water Supplies. [2]

SECTION - II

- Q7)** a) Write note on the wastage of water in public water supplies. State various methods of detection and prevention of wastage. Enumerate the causes of such wastage. [8]
- b) What do you know about Rain Water harvesting? Draw a sketch of Roof-Top Rain Water harvesting system for a bungalow [10]

OR

- Q8)** a) The designed demand is 4 MLD water is pumped into a elevated service reservoir from 5 am to 1 pm. The supply to the community is from 5 a.m. to 10 a.m. and 5 p.m. to 10 p.m. at a uniform rate. Design the balancing capacity of the reservoir [9]

- b) Write a short note on following[All] [9]
- i) Pressures in the distribution system
 - ii) Noise induced permanent threshold shift.
 - iii) Noise controlled techniques

- Q9)** a) Discuss the benefits of rain water harvesting system. [2]
- b) Describe the various methods of distributing water and discuss the advantages and disadvantages of each. [6]
- c) What is a service reservoir? Give the importance of distribution system. Draw the neat sketch of an elevated tank and show on it all of its component parts and appurtenances. [8]

OR

- Q10)** a) Discuss the factors affecting the efficiency of disinfection, Enlist at least four disinfectants used in water treatment plant and discuss the theory of chlorination in details. [12]
- b) Discuss the various method of removal of Iron and Manganese from water why their removal is necessary. [4]

- Q11)** a) What is inversion condition? Explain the types of inversion. How inversion does affect the dispersion of air pollutants in the atmosphere. [6]
- b) Draw a neat sketch of electrostatic precipitator and explain its working principle. Write the advantage and disadvantages of it. [10]

OR

- Q12)** a) What do you understand by desalination? Why it is necessary? Explain the electro dialysis method of desalination. [8]
- b) What are the causes of tastes and odours in water available from various sources? Enumerate the methods of their removal [6]
- c) Discuss the various natural and man made air pollutants and their major sources. [2]

❖❖❖❖

Total No. of Questions : 12]

P749

SEAT No. :

[Total No. of Pages : 4

[4263] - 210
T.E. (Civil)
FOUNDATION ENGINEERING
(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) 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) How will you plan soil exploration for an important building project. [6]
- b) Explain the terms : Inside clearance, out side clearance, Area ratio [6]
- c) Explain standard penetration test? What are various corrections? [6]

OR

- Q2)* a) Explain with sketches the layout and plot of seismic refraction method. [6]
- b) Write a short note on pressuremeter test. [6]
- c) In a geophysical exploration, the time distance plot gave $V_1 = 300\text{m/s}$ and $V_2 = 900\text{m/s}$ and the break in the plot was located at 35m. Determine the depth of over burden. [6]

P.T.O

- Q3)** a) Differentiate between Local and General shear failure. [5]
b) State and explain Terzaghis equation of bearing capacity. [5]
c) Write a short note on plate load test. [6]

OR

- Q4)** a) Explain the concept of floating foundation applied to raft. [5]
b) Explain the effect of water-table on value of bearing capacity. [5]
c) Compute safe bearing capacity of a continuous footing 1.8m wide and located at a depth of 1.2m below ground level in a soil having unit weight $\gamma = 20 \text{ kN/m}^3$, $C = 20 \text{ kN/m}^2$ and $\phi = 20^\circ$. Assume factor of safety 2.5. Terzaghis bearing capacity factors for $\phi = 20^\circ$ are, $N_c=17.7$, $N_q=7.4$ and $N_r = 5.0$. [6]

- Q5)** a) What is elastic settlement? Explain, how, it is evaluated. [5]
b) What is the difference between immediate settlement, primary consolidation settlement. [5]
c) In a consolidation test void ratio decreased from 0.70 to 0.65, when the load was changed from 50 kN/m² to 100 kN/m². Compute compression index and coefficient of volume change. [6]

OR

- Q6)** a) Enlist the causes of differential settlement and explain how to minimize it. [5]
b) Define the terms: [6]
i) Compression Intex
ii) Coefficient of volume compressibility
iii) Coefficient of consolidation
c) Explain the method of determining preconsolidation pressure. [5]

SECTION - II

- Q7)** a) State and explain static formula for load bearing capacity of piles in general and explain how would you decide values of various terms involved in the same. [6]
- b) What are the advantages and disadvantages of pneumatic caissons over open caissons? [6]
- c) A square group of 9 piles was driven into soft clay extending to a large depth. The diameter and length of the piles were 30cm and 9m respectively. If the unconfined compression strength of the clay is 90 kN/m², and the pile spacing is 90 cm centre to centre, What is the capacity of the group? Assume a factor of safety of 2.5 and adhesion factor of 0.75. [6]

OR

- Q8)** a) Explain with a sketch the concept of negative skin friction and state how would you determine the same in cohesive and non-cohesive soil. [6]
- b) A pile is driven in a uniform clay of large depth. The clay has an unconfined compression strength of 90 kN/m². The pile is 30 cm diameter and 6 m long. Determine the safe frictional resistance of the pile, assuming a factor of safety of 3. Assume the adhesion factor, $\alpha = 0.7$. [6]
- c) Sketch and describe the various components of well foundation, indicating functions of each component. [6]
- Q9)** a) Draw a neat sketch of double under reamed pile giving details of dimension and state how would you work out its load bearing capacity. [6]
- b) Draw a cross-section of braced excavation indicating component parts. State forces and design principles involved. [6]
- c) With examples, explain the application of sheet pile walls. [4]

OR

- Q10)** a) For anchored sheet pile compare in tabular form [6]
- i) deflection
 - ii) pressure distribution
 - iii) bending moment, patterns for free and fixed earth support condition.
- b) What is a sheet pile wall? Explain cantilever sheet pile wall and anchored sheet pile wall with sketches. [6]
- c) Enlist typical characteristics of Black Cotton soils and give their approximate values. [4]

- Q11)** a) Explain with sketches any three important functions of geosynthetics. [6]
- b) Discuss in detail the types of seismic waves with sketches. [6]
- c) Explain four effects of liquefaction on built environment. [4]

OR

- Q12)** Write detailed notes on any four of following with sketches. [16]
- a) Liquefaction hazard mitigation.
 - b) Factors affecting ground motion.
 - c) Magnitude and intensity of earthquake.
 - d) Geotextile as filter.
 - e) Soil nailing.



Total No. of Questions : 12]

SEAT No. :

P751

[Total No. of Pages : 7

[4263] - 213

T.E. (Mechanical) (Common to Automobile)

THEORY OF MACHINES - II

(2008 Pattern) (Sem - I)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) Answer 3 questions from Section - I and 3 questions from Section - II*
- 2) Answers to the two sections should be written in separate answer books.*
- 3) Neat and labelled diagram 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 table, electronic pocket calculator is allowed.*
- 7) Assume suitable data, if necessary.*

SECTION - I

Unit-I

- Q1)** a) Explain the terms friction circle, friction couple & friction axis. [6]
- b) An automobile single-plate clutch consists of a pair of contacting surfaces. The inner and outer radii of friction plate are 120mm and 250mm respectively. The coefficient of friction is 0.25 and the total axial force is 15kN. Calculate the power transmitting capacity of the clutch at 500 r.p.m. by using [6]
- i) Uniform Wear Theory (UWT) and
 - ii) Uniform Pressure Theory (UPT).
- c) Justify the statement, "Though cone clutches provide high frictional torque, yet they have become obsolete." [4]

P.T.O.

OR

- Q2)** a) Explain with a neat sketch Torsion Dynamometer used for measuring large powers. [6]
- b) A bicycle and a rider of mass 90kg are travelling at the rate of 15km/hr on the level road. A brake is applied to the rear wheel which 0.70m in diameter and this is only resistance acting. How far will the bicycle travel and how many turns will its wheel make before it comes to rest? The pressure applied on the brake is 100N. Take $\mu = 0.06$ [6]
- c) Explain “self - energizing,” and “self - locking,” effect related to block or shoe brakes. [4]

Unit-II

- Q3)** a) What is Cam - Jump phenomenon? What are possible ways to avoid Camp - Jump. [6]
- b) What is polynomial curve CAM? Derive the expression for displacement, velocity and acceleration for 2-3 polynomial D-R-D cam. [8]
- c) Why a Roller follower is preferred to that of a knife-edged follower? Explain in brief. [2]

OR

- Q4)** a) Prepare a layout of cam profile and draw cam-profile for cam with roller reciprocating follower passes through the axis of the cam. Details of the cam and follower motion are given below.

Roller diameter = 5mm, Minimum radius of cam = 20mm,
Total lift = 25mm.

The cam has to lift the follower with simple harmonic motion during 180° of cam rotation. Further cam allowed to the follower to drop suddenly half way and return the follower with uniform velocity during the remaining 180° of cam rotation. Determine the maximum velocity and maximum acceleration on the outstroke, if cam rotates at a uniform speed of 100 rpm. [16]

Unit-III

Q5) a) Draw controlling force diagram for spring-controlled governors and explain [6]

- i) Stable governor,
- ii) Unstable governor,
- iii) Isochronous governor.

b) A ship is propelled by a turbine having a mass of 6000kg and a speed of 2400 r.p.m. The direction of rotation of rotor is anticlockwise when viewed from the bow end. The radius of gyration of rotor is 450mm. Determine gyroscopic effect when : [12]

- i) Ship is steering to the left in a curve of 60m radius at a speed of 18knots(Take 1knot = 1860 m/hr).
- ii) Ship is pitching in SHM with bow descending (falling) with maximum velocity. The time period of pitching is 18 seconds and the ship pitches 7.5° above and 7.5° below the normal position.
- iii) Ship is rolling and at the instant, its angular velocity is 0.035rad/sec counterclockwise when viewed from stem.
- iv) Also find the maximum angular acceleration during pitching.

OR

- Q6)** a) Explain with a neat and labelled diagram the concept of Yawing, Pitching and Rolling related to Naval ships. [6]
- b) A hartnell governor has equal balls of mass 3kg, set initially at a radius of 20cm. The arms of the bell crank lever are 12cm vertically and 15cm horizontally. Determine, [12]
- i) The initial spring force, if the speed for an initial ball radius of 20cm is 240rpm. Assume mass of sleeve as 6kg.
- ii) The stiffness of spring required to permit sleeve movement of 0.4cm on a fluctuation of 7% in the engine speed.

SECTION - II

Unit-IV

- Q7)** a) Draw well labeled diagram of Gear Tooth Terminology. [4]
- b) The two involute spur gears in mesh have a module of 8mm. The gear ratio is 2.5 and pinion has 22 teeth. If pressure angle is 20° . Find:[12]
- i) The number of pairs of teeth in contact.
- ii) Angle of action of pinion and gear wheel.
- iii) The ratio of the sliding velocity to rolling velocity at the beginning of contact, at pitch point and end of contact.

OR

Q8) a) Prove that the change in center distance within limits of involutes gears will not affect the velocity ratio. [4]

b) A pair of involute spur gear has 20° pressure angle and pitch of module 6mm. The gear ratio is 1.8 and number of teeth on gear is 36. The rotational speed is 280 rpm. Find the following in order that the interference is just avoided. [12]

i) The addenda on pinion and gear wheel

ii) The length of path of contact

iii) The maximum velocity of sliding of the teeth on either side of the pitch point.

Unit-V

Q9) a) Find relations to calculate the pitch angles of bevel gears. [4]

b) A spiral gear drive transmits power with speed ratio 2.5. The approximate center distance is 34cm and shaft angle is 60° . The gears have normal pitch of 2cm. If the spiral angles for the wheels are equal, Find: [12]

i) Number of teeth on each gear

ii) The exact center distance

iii) Efficiency of the drive if friction angle is 6°

What change will you suggest to obtain maximum efficiency from this drive? What will be the maximum efficiency?

OR

- Q10) a)** Explain Helical Gear force analysis with neat sketch. [4]
- b) A three start worm has a pitch diameter of 78mm and a pitch of 18mm. It rotates at 800 rpm and 35 teeth worm gear. If coefficient of friction is 0.05. Find the following: [12]
- i) The helix angle of worm
 - ii) The speed of the gear
 - iii) The center distance
 - iv) The efficiency
 - v) The lead angle for maximum efficiency
 - vi) The maximum efficiency

Unit-VI

- Q11) a)** Explain with neat sketch: [4]
- i) Reverted Gear Train
 - ii) Simple Gear Train
- b) An internal wheel B with 90 teeth is keyed to a shaft F. The fixed internal wheel C with 94 teeth is concentric with B . A compound wheel D-E gears with two internal wheels: D has 32 teeth and gears with C, while E gears with B. The compound wheel revolves freely on a pin which project from a disc keyed to shaft A, co-axial with shaft F. All the wheels have same module. What will be the speed of shaft F if the shaft a rotates at 900 rpm? If the power supplied at A is 6kW, what is the holding torque on the internal gear C? [14]

OR

Q12) a) Explain the Inertia of geared system. [6]

b) A gear wheel A having 44 teeth is rigidly mounted on the driving shaft. It gears with 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 driving shaft. The internal wheel B is fixed and module of all the gears is same. The driving & driven shafts and the internal wheel are co-axial. Driving shaft rotates at 300 rpm and transmits 2.5kW power. [12]

i) Sketch the arrangement

ii) Find the speed of driven shaft

iii) Find the torque transmitted by the driven shaft

iv) Fixing torque.



Total No. of Questions : 12]

SEAT No. :

P752

[Total No. of Pages : 3

[4263] - 214

**T.E. (Mechanical) (Common to Automobile)
INDUSTRIAL ENGINEERING & TECHNOLOGY MANAGEMENT
(2008 Pattern) (Semester-I)**

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

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

SECTION - I

Q1) 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]

OR

Q2) a) Explain in brief various functions of management. [8]

b) List material handling equipments & Describe any three types of material handling equipment with suitable illustration. [8]

Q3) a) Define Productivity. How it improves standard of living. [6]

b) State methods of Merit rating & explain any one in detail [6]

c) Write note on PMTS. [4]

OR

P.T.O

- Q4)** a) Describe the following with suitable examples. [10]
i) Two handed process chart.
ii) Multiple Activity Chart
b) Describe in brief the different types of allowances used while determining standard time. [6]

- Q5)** a) A particular item has a demand of 9500 units/year. The cost of one procurement is Rs.125 & holding cost per unit is Rs.2.50 per year. The replacement is instantaneous & no shortages are allowed. Determine. [6]
i) Economic lot size
ii) Time between orders
iii) Total cost per year including demand.
b) Compare techniques CPM and PERT. [6]
c) Explain the any three types of Forecast. [6]

OR

- Q6)** Write notes on (Any Three) [18]
a) Zero based Budgeting.
b) Break even Analysis
c) Aggregate Planning.
d) ABC Analysis.

SECTION - II

- Q7)** a) Explain the importance of Technology management in present scenario. [8]
b) Explain in brief concept of management of Technology & give classification of Technology. [8]

OR

- Q8)** a) Discuss the growth of technology in concern with Indian industries.[8]
b) Explain the following:
i) Role of government in Technology Management
ii) Impact of Technology on society [8]

- Q9)** a) Why technology forecasting is necessary? Discuss any two forecasting methods. [6]
- b) Discuss various techniques used in Technology Forecasting. [4]
- c) What is technology strategy? How it is different from other business strategies. [6]

OR

- Q10)** a) Explain the various techniques used in Technological Forecasting [6]
- b) Explain the following in brief [10]
- i) Technological Leadership
- ii) Technology Monitoring

- Q11)** a) Explain the various key principles for developing technology strategy. [6]
- b) What are various channels of technology transfer Explain. [6]
- c) Explain the term 'Technology Absorption'. [6]

OR

- Q12)** Write notes on following:- (Any Three) [18]
- a) Technology Diffusion.
- b) Invention, Innovation and Creativity
- c) Intellectual Property Rights
- d) S-Shaped curve of Technology Adoption



Total No. of Questions : 12]

P754

SEAT No. :

[Total No. of Pages : 8

[4263] - 216
T.E. (Mechanical)
MACHINE DESIGN - II
(2008 Pattern) (Semester - II)

Time : 4 Hours]

[Max. Marks :100

Instructions to the candidates:

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

SECTION - I

Unit-I

- Q1)** a) What is the objective of preloading? Explain mounting and preloading of a taper roller bearing with appropriate sketch. **[6]**
- b) A ball bearing carries a radial load of 400N at 1760 rpm for 40% time, 600N at 880rpm for 30% time, 200N at 1000rpm for 10% time and no load at 1500rpm for remaining period of the cycle. If the expected life of the bearing is 10,000 hours with 95% reliability, calculate **[10]**
- i) Basic dynamic load capacity of the bearing.
 - ii) Average speed of bearing operation.

Use following relation for reliability analysis

$$\frac{L}{L_{10}} = \left[9.4911 \ln \left(\frac{1}{R} \right) \right]^{\frac{1}{1.17}}$$

OR

P.T.O

- Q2) a)** A transmission shaft is supported by two deep groove ball bearings at two ends. The center distance between the two bearings is 160mm. A load of 300N acts vertically downward at 60mm distance from the left hand bearing whereas a load of 550N acts horizontally at 50mm distance from the right hand bearing. Shaft speed is 3000 rpm and expected life of the bearings is 7000 hours 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. Use above relation for reliability analysis. [12]
- b) Discuss equivalent dynamic load and load life relationship for rolling contact bearings. [4]

Unit-II

- Q3) a)** Explain the mechanism of pressure development in oil film and draw radial & axial pressure distribution for hydrodynamic journal bearing.[4]
- b) The following data refers to a 360° hydrodynamic journal bearing[12]
- Radial load = 10kN
 - Journal speed = 1450 rpm
 - l/d ratio = 1
 - Eccentricity = 15 microns
 - Radial clearance = 20 microns
 - Bearing length = 50mm
 - Specific gravity of lubricant = 0.86
 - Specific heat of lubricant = 2.09 kJ/ kg °C Calculate :
- 1) the minimum oil film thickness
 - 2) the coefficient of friction
 - 3) the power loss in friction
 - 4) the viscosity of lubricant in CP
 - 5) the total flow rate of lubricant in lit/min
 - 6) the side leakage
 - 7) the average temperature, if make up oil is supplied at 30°C
- (Refer Table 3)

- Q4) a)** Derive from First principal Reynold's equation with usual notation. [6]
- $$\frac{\partial}{\partial x}(h^3 \frac{\partial p}{\partial x}) + \frac{\partial}{\partial y}(h^3 \frac{\partial p}{\partial y}) = 6\mu u \frac{\partial h}{\partial x}$$
- b) A 50mm diameter hardened and ground steel journal rotates at 1440 rpm in a lathe turned bronze bushing which is 50mm long. For hydrodynamic lubrication, the minimum oil film thickness should be five times the sum of surface roughness (clearance values) of journal and bearing. The data about machining methods is as follows (Table 1). [10]

Table 1

Elements	Machining methods	Clearance values
Shaft	Grinding	1.6microns
Bearing	Turning/Boaring	0.8microns

The class of fit is H8d8 and the viscosity of the lubricant is 18 cP. Determine the maximum radial load that the journal can carry and still operate under hydrodynamic conditions. Also, calculate quantity of lubricating oil required.

(Refer Table 3)

Unit-III

- Q5) a)** Draw the following diagrams and write their equations [6]
- i) Goodman diagram
 - ii) Soderberg diagram
- b) A spherical pressure vessel, with 500mm inner diameter is welded from steel plates. The welded joints are sufficiently strong and do not weaken the vessel. The plates are made from cold drawn steel 20C8 ($S_{ut} = 440\text{MPa}$ and $S_{yt} = 242\text{MPa}$). The vessel is subjected to internal pressure, which varies from 0 to 6 N/mm². The expected reliability is 50 % and the factor of safety is 3.5. The size factor and surface finish factor is 0.85 and 0.82 respectively. The vessel is expected to withstand infinite number of stress cycles. Calculate the thickness of the plates. [12]

OR

- Q6)** a) What is endurance strength of material? [4]
- b) A transmission shaft having an ultimate tensile strength of 600MPa and yield strength of 380MPa is subjected to a fluctuating torque of 200 Nm anticlockwise and 800Nm clockwise. The factor of safety is 2 and the expected reliability is 50%. The surface factor is 0.8 and the size factor is 0.85. Assuming that there is no stress concentration, determine the diameter of the shaft for infinite life. Assume the distortion energy theory of failure. Also determine the diameter of the shaft, if only the fluctuating torque is change to 10Nm anticlockwise to 800Nm clockwise. [14]

SECTION - II

Unit-IV

- Q7)** a) What is self energizing and self locking block brake? [4]
- b) Figure 1 shows the arrangement and dimensions of a pivoted block brake with a face width of 50 mm. The coefficient of friction and the permissible intensity of pressure between the friction lining and the brake drum are 0.25 and 0.55 N/mm² respectively. If the pivot of the shoe is located such that the moment of frictional force on shoe about the pivot is zero. Calculate [12]
- 1) The braking torque capacity
 - 2) The actuating torque
 - 3) The heat generated, if the speed of the brake drum is 100 rpm and the brake is applied for 5 sec to bring the drum to the rest.

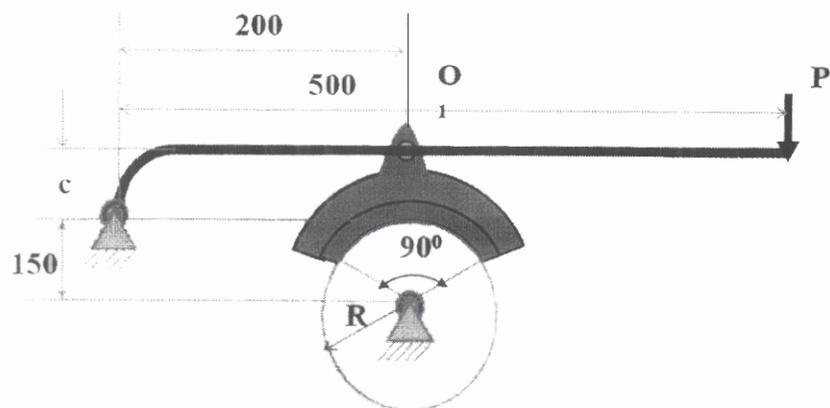


Figure 1

Q8) a) An automotive type clutch of heavy vehicle has inside and outside diameters of 150 and 225mm respectively. Clamping force is provided by nine springs, each compressed 6.5 mm to give a force of 625 N when the clutch is new. The moulded friction material provides a conservatively estimated coefficient of friction of 0.35. The maximum engine torque is 280 N-m. [12]

- i) What is the safety factor with respect to slippage of a brand new clutch?
- ii) What is the safety factor after initial wear has occurred?
- iii) How much wear of the friction material can take place before the clutch will slip?

b) Why heat dissipation is necessary in clutches? [4]

Unit-V

Q9) a) An electric hoist is being designed for lifting capacity of 30kN at 80m/min. The rope drum diameter will be approximately 640mm and it will be driven by an electric motor running at 1440 rpm through a pairs of spur gears only. The pinion and gear are made of plain carbon steel 55 C8 ($S_{ut} = 720 \text{ N/mm}^2$). The tooth system is 20° full depth involute and number of teeth on pinion as minimum as possible. The service factor and factor of safety are taken as 1.25 and 1.5 respectively. The face width 12 times module. Suggest suitable number of stages for the reduction drive. The velocity ratio in each stage should not exceed 6:1. Design the first stage gear pair by using velocity factor. Also, suggest suitable capacity of electric motor. Use following data:[12]

- Velocity factor $C_v = \frac{3}{3+V}$
- Lewis form factor $Y = 0.484 - \frac{2.87}{Z}$

- Load stress factor $K = 0.16 \left[\frac{BHN}{100} \right]^2 \frac{N}{mm^2}$
- Stage efficiency = 95%

Standard module in mm 1,1.25,2,3,4,5,6,8,10,12,16

Standard kW Rating of electric motors 5,10,15, 20,25,30, 35, 40, 45, 50,60

b) Define beam and wear strength of spur gear. [4]

OR

Q10) A belt conveyor system is to be driven by a 30kW, 720rpm electric motor through a helical gear pair running at 225 rpm. A pinion having 14 teeth made of alloy steel ($S_{ut} = 800 \text{ N/mm}^2$) is meshed with gear made of plain carbon steel ($S_{ut} = 720 \text{ N/mm}^2$). The application and load concentration factor is 1.3 and 1.1 respectively, while the factor of safety is 2. The face width is 10 times normal module and tooth system is 20° full depths involute. The helix angle is 25° . The gears are to be machined to meet the specification of grade 7. The deformation factor for gear pair is 11000 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 Standard module in mm=1,1.25,2,3,4,5,6,8,10,12,14

[16]

$$\text{Velocity factor} = C_v = \frac{5.6}{5.6 + \sqrt{V}}$$

$$\text{Dynamic load } P_d = \frac{21V(bC \cos^2 \psi + P_{t_{\max}}) \cos \psi}{21V + \sqrt{bC \cos^2 \psi + P_{t_{\max}}}} N$$

$$\text{Lewis form factor } Y' = 0.484 - \frac{2.87}{Z'}$$

$$\text{Load stress factor } K = 0.16 \left[\frac{BHN}{100} \right]^2 \frac{N}{mm^2}$$

$$\text{for grade 7 } e = 11.0 + 0.9(m + 0.25\sqrt{d}) \mu m$$

Unit-VI

Q11) A centrifugal pump submerged in a well is driven at 600 rpm by a 25kW motor running at 1500rpm through a pair of straight bevel gears. The bevel pinion and gear are made of alloy steel with ultimate tensile strength 720 N/mm². The axis of pinion and gear intersect at right angle. The starting torque is 125% to the rated torque. The factor of safety required is 1.75. The tooth system is 20° full depth involute. The gears are to be cut to meet the specification of grade 6. The pinion and gear are case hardened to 420 BHN and 400 BHN respectively. The deformation factor is 11488e N/mm. Design the gear pair. **[18]**

Use following data: Standard module in mm – 1, 1.25, 1.5, 2.0,3,4,5, 6,8,10 and 12.

$$\text{Lewis form factor } Y' = 0.484 - \frac{2.87}{Z'}$$

$$\text{Load stress factor } K = 0.16 \left[\frac{BHN}{100} \right]^2 \frac{N}{mm^2}$$

$$\text{For grade 7 } e = 8.0 + 0.63(m + 0.25\sqrt{r_m}) \mu m$$

$$\text{Velocity factor } C_v = \frac{6}{6 + V}$$

$$\text{Dynamic load } P_d = \frac{21V(bC + P_{t \max})}{21V + \sqrt{bC + P_{t \max}}} N$$

OR

Q12) A pair of worm and worm gear is used to drive an elevator cage for the following specifications shown in table 2. **[18]**

S.N.	Particulars	Worm	Worm gear	Remark
1	Pressure angle	20°	20°	Normal plane
2	Axial pitch	18.85mm	—	—
3	Pitch circle diameter	48mm	192mm	—
4	Lead	18.85mm	—	—
5	Effective width	—	36mm	—
6	Speed	3500 rpm	—	—
7	Permissible bending stress	—	90N/mm ²	—
8	Wear factor	—	0.83N/mm ²	—

- Overall heat transfer coefficient without fan = $16 \text{ W/m}^2\text{°C}$.
- Overall heat transfer coefficient with fan = $15.2 + 8.25 \times 10^{-3} \times n_w \text{ W/m}^2\text{°C}$
Where n_w is speed of worm in rpm
- Effective area of housing = $9 \times 10^{-5} \times (a)^{1.88} \text{ m}^2$
(where a = centre distance in mm)
- Frictional losses in bearing = 4.5% of total input power

Take coefficient of friction between worm and worm gear teeth = 0.025

Determine

- 1) Dimensions of worm gear pair
- 2) Input power rating on strength basis
- 3) Temperature rise of lubricating oil with or without fan. Is fan necessary?
Give comment.

Use following equations

$$\text{Lewis form factor } Y' = 0.484 - \frac{2.87}{Z'}$$

$$\text{Velocity factor } C_v = \frac{6}{6 + V_g}$$

$$\text{Efficiency } \eta = \frac{\tan \lambda}{\tan(\phi_v + \lambda)}$$

Where λ = Lead angle of worm

Table 3

l/d	h_o/c	E	S	(r/c)f	$Q/rcn_s \ell$	Q_s/Q	P_{\max}/P
1	0.0	1.0	0	0	----	1	----
	0.03	0.97	0.00474	0.514	4.82	0.973	6.579
	0.1	0.9	0.0188	1.05	4.74	0.919	4.048
	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
	0.9	0.1	1.33	26.4	3.37	0.150	1.852
	1.0	0.0	∞	∞	3.142	0	----



Total No. of Questions : 12]

SEAT No. :

P755

[Total No. of Pages : 4

[4263] - 217

T.E. (Mechanical and Automobile)

METROLOGY AND QUALITY CONTROL

(2008 Pattern) (Semester - II)

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

SECTION - I

- Q1)* a) Explain different types of errors in measurement. [5]
- b) Describe in details with sketch Angle Dekkor in angular measurement. [5]
- c) Explain with figure working, advantages & limitations of Johanson's mickrokator. [6]

OR

- Q2)* a) Explain alignment tests for lathe machine. [8]
- b) Explain sine bar & sine centre [4]
- c) What is comparator? How does it differ from a measuring instruments. [4]

P.T.O

- Q3)** a) Describe procedures for straightness, flatness & circularity measurement. [5]
- b) What are optical flat? How are Patterns of fringes interpreted? [5]
- c) Design a plug gauge for checking hole. 70H8 [8]

$$\text{Use } i = 0.45 \sqrt[3]{D} + 0.001D \text{ IT8} = 25i$$

Diameter steps are 50-80mm.

OR

- Q4)** a) Describe with sketch NPL flatness interferometer. [5]
- b) Describe with sketch Tomlinson surface recorder [5]
- c) Design & make a drawing of general purpose GO & NO GO ring gauge for Inspection of 30f 8 shaft use following data. [8]

- i) Fundamental deviation for shaft

$$f = -5.5D^{0.41}$$

- ii) IT 8 = 25i

- iii) Dia. step is 18 and 30

- Q5)** a) Describe the three wire method of checking the effective diameter of screw threads. Derive the relationship for this measurement. [6]
- b) Sketch & Describe Parkinson gear Tester. [4]
- c) Write short notes on use of Laser in Metrology. [6]

OR

- Q6)** a) Explain with figure use of tool maker's microscope for measurement of threads. [6]
- b) Calculate the constant chord length & its distance below the tooth tip for gear of module 5mm & pressure angle 20° [4]
- c) Explain universal measuring machine [6]

SECTION - II

- Q7)** a) Explain cost of quality and value of quality [6]
- b) Explain what do you understand by concurrent engineering. [5]
- c) Write a note on Malcom Balbridge National Quality Award. [5]

OR

- Q8)** a) Explain pareto Analysis and fish bone diagram. [6]
- b) Explain concept of quality circle [5]
- c) Write a note on PDCA & PDSA [5]

- Q9)** a) What is TPM? Explain eight pillars of TPM [8]
- b) Explain ISO 14000 and TS 16949. [8]

OR

- Q10)** a) Explain kanban in details [6]
- b) What do you understand by FMECA. [5]
- c) Write a note on 5'S' [5]

Q11) Write short notes on following

- a) Process capability. [6]
- b) Statistical process control (SPC) [6]
- c) OC curve and its characteristics [6]

OR

Q12) a) For the following data, calculate the sample size AOQ for a single sampling plan. [6]

- i) Probability of acceptance for 0.4% defectives in a lot is 0.558
- ii) Lot size $N = 10000$ units
- iii) $np^1 = 1.5$
- iv) Defective found in the sample are not to be replaced.

b) Explain following SQC tools [12]

- i) \bar{X} and R chart
- ii) P chart
- iii) C chart

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Total No. of Questions : 12]

P757

SEAT No. :

[Total No. of Pages : 2

[4263] - 221
T.E. (Mech S/W)
PRODUCTION MANAGEMENT
(2008 Pattern) (Elective-I) (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) Assume suitable data, if necessary.*

SECTION - I

Q1) a) What are important characteristics of management? Brief them. [8]

b) What are logical steps involved in process of organization? [8]

OR

Q2) a) What is group dynamics? What are its functions and objectives? [8]

b) What are different forms of business ownership? Brief any two types.[8]

Q3) a) What is production management? Explain elements of production function and productivity. [8]

b) Define industrial engineering. What are duties of industrial engineer?[8]

OR

Q4) a) What is production planning and control? What are its functions? [8]

b) Explain principles of material handling. [8]

Q5) Write short notes on

a) Simo chart and Chronocyclograph. [10]

b) Method study and its techniques. [8]

OR

Q6) a) Define and explain with example standard time and performance rating. [10]

b) What is MOST? Explain in brief [8]

P.T.O

SECTION - II

- Q7)** a) What operating characteristic curve? Explain in detail. [8]
b) What is control chart for variable and for attributes? State its importance. [8]

OR

- Q8)** a) Define work sampling. Explain procedure for conducting work sampling. [8]
b) Explain quality of design, quality of conformance and quality of performance. [8]
- Q9)** a) What are 7QC tools? What is significance? [5]
b) What is 5S and kanban techniques? [6]
c) Explain Quality function deployment. [5]

OR

- Q10)** a) What is Concurrent Engineering? What is its application area? [8]
b) Define six sigma. Explain steps to apply six sigma. [8]
- Q11)** a) What is ISO, QS and CMM standards? State its application area. [10]
b) Explain concept of design of experiment with example. [8]

OR

- Q12)** a) What is concept of hypothesis testing? How it is applied? [8]
b) Explain taguchi method? Explain with example. [10]



Total No. of Questions : 12]

P758

SEAT No. :

[Total No. of Pages : 7

[4263] - 224

T.E. (Mechanical Sandwich)
THEORY OF MACHINE AND MACHINE DESIGN-II
(2008 Pattern) (Semester - II)

Time : 4 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) *Answer 3 questions from Section I and 3 questions from Section II.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of electronic pocket calculator is allowed.*
- 6) *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) The following data is related to a cam profile, in which the follower moves with simple harmonic motion during the lift and returning it with uniform acceleration and retardation, acceleration being half the retardation. **[12]**

Minimum radius of cam = 30 mm

Roller radius = 10 mm

Lift of follower = 45 mm

Offset towards right from cam center = 12 mm

Angle of ascent = 70°

Angle of descent = 120°

Angle of dwell between ascent and decent = 45°

Speed of cam = 300 r.p.m.

Draw the cam profile and determine maximum velocity of follower during lift.

P.T.O

OR

- Q2)** a) Derive relation for displacement, velocity and acceleration of follower which has simple harmonic motion during rise. [6]
- b) Synthesize a four bar mechanism by the method of inversion. Assume the following data. [10]
- i) Length between fix points 100 mm
 - ii) Two positions of the input link from the initial position 30° and 60°
 - iii) Two positions of the output link from the initial position 20° and 40°

- Q3)** a) Explain methods to avoid interference in involute gears. [6]
- b) Two helical gears transmit 30 kW with velocity ratio 4, the normal pressure angle of 20° and helix angle 30° , normal module is 12 mm and standard addendum is equal to one module. The pinion has 20 teeth and rotates at 400 r.p.m. Determine the centre distance and evaluate the forces acting on the tooth with the help of neat sketch. [10]

OR

- Q4)** a) Two 20° involute spur gears have module of 8 mm. Gear ratio 2.5, speed of gear wheel 120 r.p.m., 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 the wheel. Also determine the length of arc of contact. Does the interference occur? [8]
- b) The arm of an epicyclic gear train rotates at 100 r.p.m. in anticlockwise direction. The arm carries two wheels A and B having 36 and 45 teeth respectively. The wheel A is fixed and the arm rotates about the centre of wheel A. Find the speed of wheel B. What will be the speed of B, if the wheel A instead of being fixed, makes 200 r.p.m. clockwise? Use tabular method. [8]

- Q5) a)** Define the terms **[4]**
- i) Gyroscopic couple axis
 - ii) Precession axis
- b) Explain with neat diagram the belt transmission dynamometer **[5]**
- c) A simple band brake is applied to a shaft carrying a flywheel of mass 250 kg and radius of gyration 300 mm. The shaft speed is 200 r.p.m. The drum diameter is 200 mm and coefficient of friction is 0.25. The free end of band is attached at 100 mm from fulcrum and effort of 120 N is applied on lever at 280 mm from fulcrum. The angle embraced by belt is 225° . Determine for counter clockwise rotation of drum.**[9]**
- i) Braking torque
 - ii) The number of turns of flywheel before it come to rest
 - iii) The time taken by flywheel to come to rest.

OR

- Q6) a)** Derive an expression for tension ratio in case of band and block brake in terms of coefficient of friction, block angle of contact and number of blocks in the shoe. **[8]**
- b) Each wheel of a motorcycle is of 600 mm diameter and has a moment of inertia of 1.2 kg.m^2 . The total mass of the motorcycle and the rider is 180 kg and the combined centre of mass is 580 mm above the ground level when the motor cycle is upright. The moment of inertia of the rotating parts of the engine is 0.2 kg.m^2 . The engine speed is 5 times the speed of the wheels and is in the same sense. Determine the angle of heel necessary when the motorcycle takes a turn of 35 m radius at a speed of 54 km/hour **[10]**

SECTION - II

Q7) a) With neat sketches, describe the different constructions of worm gears. **[6]**

b) A pair of parallel helical gears consists of 20 teeth pinion meshing with 100 teeth gear. The pinion rotates at 720 r.p.m. The normal pressure angle is 20° , while the helix angle is 25° , the face width is 40 mm and normal module is 4mm. The pinion is made of plain carbon steel 55C8($S_{ut}=720 \text{ N/mm}^2$) while the gear is made of plain carbon steel 40C8 ($S_{ut}=580 \text{ N/mm}^2$). 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 respectively. Assuming the velocity factor accounts for dynamic load, calculate the power transmitting capacity of helical gear pair. **[10]**

Use following data:

$$\text{Velocity factor, } K_v = \frac{5.6}{5.6 + \sqrt{V}}$$

OR

Q8) a) Derive an expression for beam strength of spur gear troth. **[6]**

b) A straight bevel pinion with 24 teeth is to mesh with straight bevel gear with 32 teeth. The axis of pinion and gear intersect at right angle. The pinion is to be made of plain carbon steel having ultimate tensile strength of 580 N/mm^2 and gear is to be made of gray cast iron having ultimate tensile strength of 350 N/mm^2 . The gear pair is manufactured by generation. The pinion is connected to 10 kW, 1000 r.p.m. electric motor. The starting torque of motor is 1.75 times are rated torque. If the surface hardness of gear pair is 300 BHN, design the gear pair for factor of safety of 1.5. Assum velocity factor accounts for dynamic load. **[10]**

Q9) a) Write a note on ‘Failure in rolling contact bearings’. [6]

b) A cone clutch with asbestos friction lining is used to transmit 15 kW power at 1440 r.p.m. The coefficient of friction between the contacting surfaces is 0.3, while the permissible intensity of pressure is 0.23 N/mm². The semi cone angle is 12.5°. The mean radius of the friction surface is twice the face width. Assuming the uniform pressure condition, determine [10]

i) The dimensions of the friction surface.

ii) The axial force required to engage the clutch.

iii) The axial force required to disengage the clutch.

OR

Q10) a) Write a note on ‘Thermal considerations in design of clutches’. [6]

b) 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 76000 hours, select the bearing from manufacturers catalogue. [10]

Use the following data

Bearing No.	NU 2205	NU 2305
Basic Dynamic	15.99	31.39
Capacity ‘C’ kN		

Q11) a) Explain modified Goodman diagram for fluctuating torsional shear stresses. [8]

b) A work cycle of a mechanical element is subjected to complete reversed bending stresses as follows. [10]

i) ± 300 MPa for 30% of time.

ii) ± 275 MPa for 25% of time.

iii) ± 400 MPa for 10% of time.

iv) ± 325 MPa for 25% of time.

v) No load for remaining time.

The material has an ultimate tensile strength of 1200 MPa. Take surface finish as 0.8, size factor as 0.85, reliability factor as 0.897 for 90% reliability. The operating temperature is 400°C and the temperature factor may be taken 0.5. Assume the fatigue stress factor at the most stressed section as 0.7. Determine the life of the component.

OR

Q12) a) What is stress concentration? What are the causes of stress concentration? Explain with diagrams, methods of reducing stress concentration. [8]

b) A cantilever beam of circular cross section, made of alloy steel 30Ni 4 Cr 1 [$S_{ut}=1500$ N/mm²], is fixed at one end and subjected to completely reversed force of 1000 N at the free end. The force is perpendicular to the axis of the beam. The distance between the fixed and free end of

the cantilever beam is 500 mm. The theoretical stress concentration factor and notch sensitivity are 1.33 and 0.85 respectively. The surface finish factor and size factor are 0.79 and 0.85 respectively. The temperature factor and reliability factor are 0.795 and 0.868 respectively. The desired life of the beam is 55000 cycles. If the required factor of safety is 1.5, determine the diameter of the beam.[10]



Total No. of Questions : 12]

P759

SEAT No. :

[Total No. of Pages : 4

[4263] - 225
T.E. (Mechanical S/W)
TRIBOLOGY
(2008 Pattern) (Semester - II)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) Answer 3 questions from each section.*
- 2) Answer to the two sections should be written in separate books.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Figures to the right indicate full marks.*
- 5) Use of programmable calculator is not permitted.*
- 6) Assume suitable data if necessary.*

SECTION - I

- Q1)** a) What do you mean by tribology? Explain the importance of tribology in industry. **[6]**
- b) Explain the following properties of lubricant in brief. **[6]**
- i) Viscosity
 - ii) Flash point & fire point
 - iii) Viscosity Index
- c) Write a short note on the solid lubricants. **[4]**

OR

- Q2)** a) Compare sliding and rolling contact bearing on the basis of **[8]**
- i) Load carrying capacity
 - ii) Space requirements
 - iii) Suitability for shock load
 - iv) Accessory required
 - v) Frictional power loss
 - vi) Quietness of operation
 - vii) Maintenance cost
 - viii) Overall cost

P.T.O

- b) Explain the importance of recycling of used oils. [4]
- c) Write a short note on extreme pressure additives. [4]

Q3) a) Explain following theories of friction: [8]

- i) Bowden & tabor's theory
- ii) Modified adhesion theory

b) Write short note on: [8]

- i) Two body & three body abrasive wear
- ii) Erosion wear

OR

Q4) a) Explain following theories of wear: [8]

- i) Theory of abrasive wear.
- ii) Delamination theory of wear

b) Explain types of friction based on type of relative motion. [4]

c) Explain the laws of friction. [4]

Q5) a) Discuss different regimes of lubrication with the help of stribeck curve. [6]

b) With usual notations, derive an expression for oil-film thickness in the form. $h = c.(1 + \epsilon.\cos \theta)$ [6]

c) Explain following terms with reference to hydrodynamic journal bearings. [6]

- i) Design variables
- ii) Performance variables
- iii) Sommerfield number

OR

Q6) a) Explain the mechanism of pressure development in hydrodynamic lubrication. [6]

- b) Starting from two dimensional Raynold's equation, derive following expression for infinitely short journal bearing using usual notations.[12]
- i) Pressure distribution
 - ii) Volume flow rate of fluid in axial direction

SECTION - II

- Q7)** a) Derive an equation for volume flow rate of fluid through a rectangular slot for applying it to hydrostatic step bearings. [10]
- b) Draw a typical arrangement of a hydrostatic lubrication system and give advantages and limitations of hydrostatic bearings. [6]

OR

- Q8)** a) With the help of equation of load carrying capacity, obtain an equation for optimum stiffness of a hydrostatic step bearing. [6]
- b) The following data is related with the hydrostatic step bearing: [10]
- i) Shaft Speed = 720 RPM
 - ii) Oil Film thickness = 0.16mm
 - iii) Shaft diameter = 500mm
 - iv) Recess diameter = 250mm
 - v) Viscosity of the lubricant = 170 SUS
 - vi) Specific gravity of lubricant = 0.86
 - vii) Specific heat of lubricant = 1.76kj/kg°C
 - viii) Thrust load = 450 kN

Calculate:

- 1) Supply pressure
- 2) Frictional power loss
- 3) The flow rate in liters/min.
- 4) The pumping power loss
- 5) The temperature rise, assuming the total power loss in bearing is converted into the frictional heat.

- Q9)** a) Explain the phenomenon of squeeze film, Give examples of practical situations where hydrostatic squeeze film could be observed. [8]
- b) A rectangular plate having length to width ratio of 0.25 is approaching towards a fixed plane with an oil film thickness between the plate and plane 0.05mm. Load supported by the is 12kN for 4 seconds. The viscosity of oil is 35CP. Calculate bearing length and width for final oil film thickness as 0.01mm. Also find maximum pressure value.[10]

OR

- Q10)** a) Derive an equation for load carrying capacity for given instantaneous velocity of approach and film thickness when a circular plate is approaching a plane. Also obtain the equation for time required to squeeze the film from h_1 to h_2 . [10]
- b) Discuss the contamination and degradation of lubricating oil and the measures taken against it. [8]

- Q11)** a) Derive an equation for pressure distribution and load carrying capacity for Rayleigh step bearing. [10]
- b) Sketch different types of hydrodynamic thrust bearings and state their specific features. [6]

OR

- Q12)** Write short notes on any four below [16]
- Types of Oil seals and applications
 - Principal of elastohydrodynamic Lubrication
 - Bearing Materials
 - Lubrication in metal working
 - Economic aspects of tribology

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Total No. of Questions : 12]

SEAT No. :

P766

[Total No. of Pages : 4

[4263] - 237
T.E. (Production)
TOOL DESIGN
(2008 Pattern) (Semester - II)

Time : 4 Hours]

[Max. Marks :100

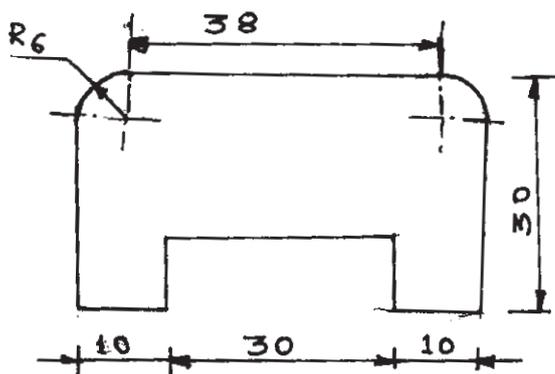
Instructions to the candidates:

- 1) *Solve three questions from each section.*
- 2) *Use separate answer sheets for each section.*
- 3) *Assume suitable data, if required.*

SECTION - I

Q1) Design and draw blanking die for a given component. **[18]**

- a) Calculate percentage utilization.
- b) Calculate press capacity required.
- c) Work out dimensions for die & punch.
- d) Workout centre of pressure.
- e) Draw assembly drawing of die set with punch and die



Thickness = 2.5 mm
Shear strength = 300 MPa

OR

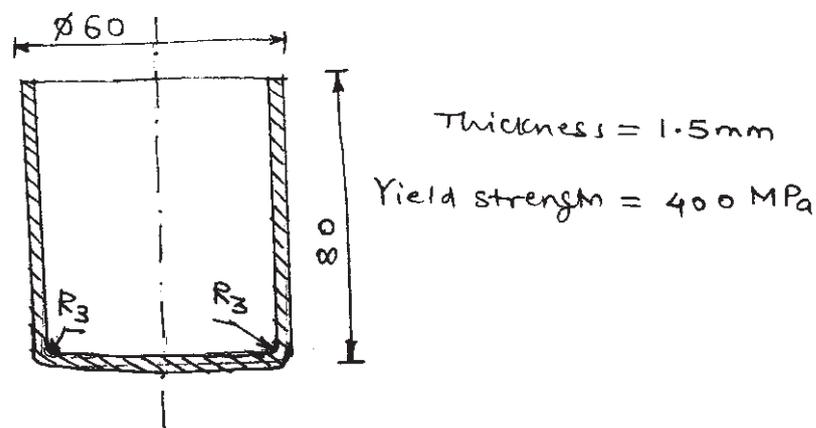
- Q2)** a) Explain types of punches with suitable sketches. **[9]**
- b) Explain various mechanisms used in presses with suitable sketches. **[9]**

P.T.O

Q3) Design deep drawings die for a given component.

[16]

- a) Calculate blank size.
- b) Percentage reduction and no. of draws
- c) Die and punch corner radius for each draw
- d) Cup size after each draw
- e) Workout centre of pressure
- f) Calculate press capacity for each draw
- g) Draw assembly drawing of die set for last draw.



OR

Q4) a) Explain bend terminology with suitable sketch. [4]

b) Explain press brake operation suitable sketches. [6]

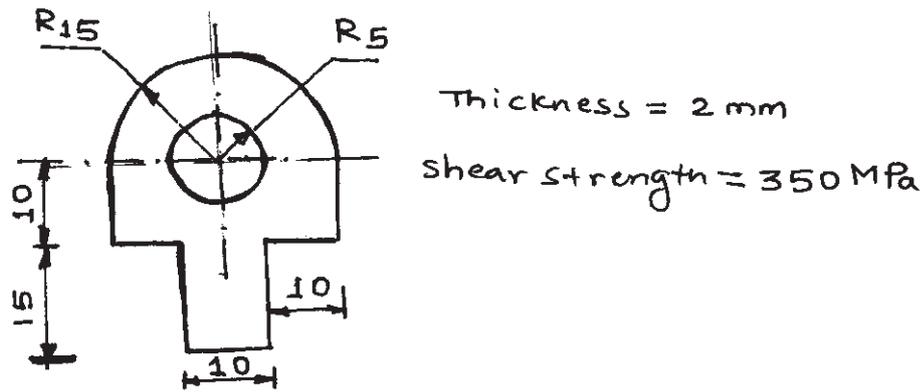
c) Calculate bending force required for a 2mm steel sheet of width 1m to be bent in wiping die. The die radius used is 4mm. UTS = 500 MPa [6]

Q5) Design progressive die for a given component

[16]

- a) Calculate percentage utilization
- b) Calculate press capacity required
- c) Work out dimensions for die & punch.
- d) Workout centre of pressure.

e) Draw assembly drawing of die set with no. of stations

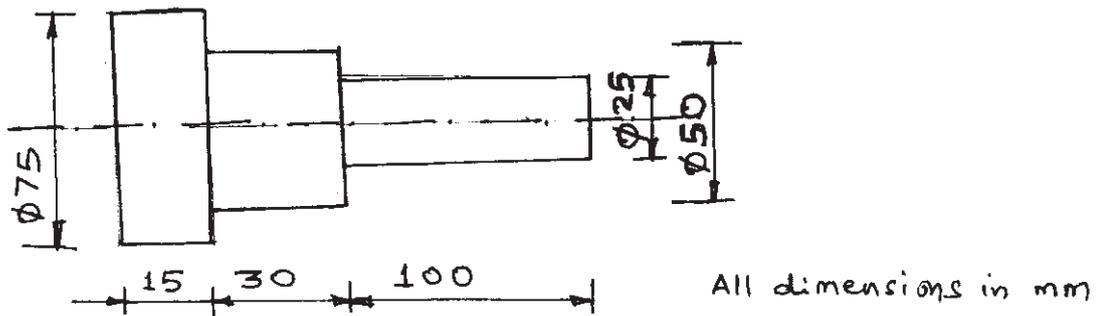


OR

- Q6) a) Explain hot chamber die casting with suitable sketches [8]
b) Explain types of cores used in die casting. [8]

SECTION - II

- Q7) a) Discuss various guidelines to be used in selection of parting line in forging die design with suitable sketches [8]
b) Design upset forging die for a given component. [10]



OR

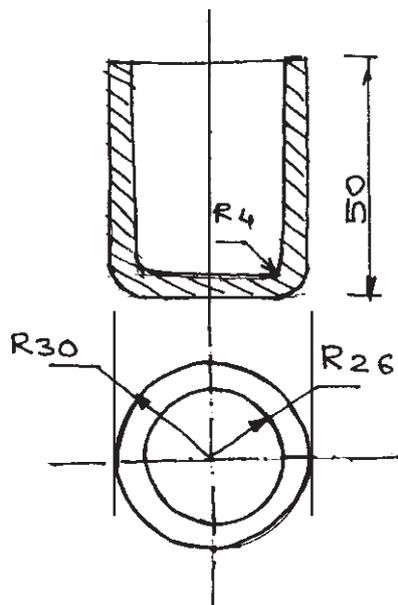
- Q8) a) Explain how to calculate stock size in forging die design [10]
b) Explain types of inserts used in forging die with suitable sketches [8]

- Q9)** a) Explain Blow Moulding with suitable sketches [8]
b) Explain Compression Moulding suitable sketches [8]

OR

- Q10)** a) Explain pressure time diagram in Injection Moulding with suitable sketches [8]
b) Explain multi-day light moulding with suitable sketches. [8]

Q11) Design an Injection Mould for given a component shown in figure [16]



OR

- Q12)** a) Discuss any four types of gates used in Injection Moulding with suitable sketches. [8]
b) Explain various types of Nozzles with suitable sketches [8]

❖❖❖❖

Total No. of Questions : 12]

P777

SEAT No. :

[Total No. of Pages : 4

[4263] - 261
T.E. (Electronics)
FEEDBACK CONTROL SYSTEMS
(2008 Pattern) (Semester - I)

Time : 3 Hours]

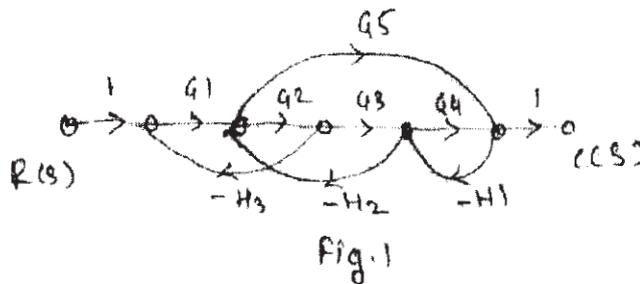
[Max. Marks :100

Instructions to the candidates:

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

SECTION - I

- Q1) a) Distinguish between: [8]**
- i) Block diagram method with signal flow method.
 - ii) Open loop and closed loop system:
- b) Find transfer function for S.F.G shown below. [8]**

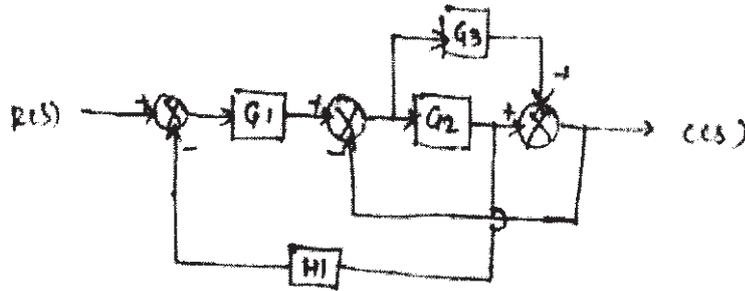


OR

- Q2) a) Derive transfer function of DC motor position control system. [8]**

P.T.O.

- b) Determine transfer function $C(s)/R(s)$ from given diagram. [8]



- Q3) a) The open loop transfer function of system is [10]

$$G(s).H(s) = K (S + 4)/(S + 2)(S + 3).$$

Determine complete root locus and comment on stability of control system.

- b) What are static error coefficients? Derive formula for each. [6]

OR

- Q4) a) A unity feedback system has [8]

$$G(S) = K / S (S + 10) (S^2 + 4S + 5).$$

Determine range of K for closed loop system to be stable.

- b) Use Routh-Hurwitz criterion and determine: [8]

- i) Number of roots in left of s-plane
- ii) Number of roots in right of s-plane
- iii) Number of roots on imaginary axis. $S^4 + 2S^2 + 1 = 0$

- Q5) a) A unity feedback system has open loop transfer function as [12]

$$G(s) = 100 / S (1 + 0.1S) (1 + 0.2S)$$

Sketch bode plot and determine:

- i) Gain Crossover Frequency (ω_{gc})
 - ii) Phase Crossover Frequency (ω_{pc})
 - iii) Gain Margin (GM)
 - iv) Phase Margin (PM)
- b) Write short note on Frequency Domain Specifications. [6]

OR

- Q6)** a) A unit step input is applied to unity feedback control system having open loop transfer function $G(s) = K/S(1 + ST)$.
Determine value of K and T to have $M_p = 20\%$ and resonant frequency $\omega_r = 6$ rad/sec. Calculate Resonant peak M_r . [10]
- b) Explain Nyquist stability criterion based on mapping theorem. [8]

SECTION - II

- Q7)** a) Obtain state model using signal flow approach of a system whose transfer function is
 $Y(S)/U(S) = (3S + 4)/(S^2 + 5S + 6)$. [8]
- b) What is state diagram? Explain state diagram of standard state model. [8]

OR

- Q8)** a) Obtain state model for system represented by [8]
 $(d^3y/dt^3) + 6(d^2y/dt^2) + 11(dy/dt) + 10y = 3u(t)$
- b) Write short note on: [8]
- i) State diagram of standard state model
 - ii) Controllability and observability

Q9) a) Draw and explain ladder diagram for system having the following specifications: [10]

- i) Tank level control system in which a bottle is filled by opening the outlet valve.
- ii) The bottles are coming for filling one after the other periodically.
- iii) Assume 1 min. prefill for initialization.

b) Explain capacitance type level meter. [8]

OR

Q10) a) What is PLC? Draw and explain architecture of PLC [10]

b) Explain PD control mode, stating its characteristics. [8]

Q11) a) What are the basic steps involved in the design of Fuzzy controller? Explain with suitable example. [8]

b) Write short note on:

i) Artificial Neuron

ii) Biological Neuron [8]

OR

Q12) a) Explain how Fuzzy logic control scheme can be applied for temperature control of process. [8]

b) What is Fuzzy set and membership function? Explain with suitable example. [8]



Total No. of Questions : 12]

SEAT No. :

P781

[4263]-265

[Total No. of Pages : 3

**T.E. (Electronics Engineering)
POWER ELECTRONICS
(2008 Pattern) (Semester - I)**

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) What are phase controlled converters? Explain its need in Industries. [3]
- b) Explain with circuit diagram & waveforms, working of 3 ϕ semiconverter using inductive load. Suggest the method of improving the p.f. Deduce the equation for o/p voltage. [7]
- c) A 3 ϕ semiconverter is operated from a Y - connected 208 V, 50 Hz, supply & load resistance $R = 10\Omega$. If it is required to obtain an average o/p voltage of 50% of the maximum possible output voltage. Calculate, [8]
- i) Delay angle α .
 - ii) RMS & Average o/p currents.
 - iii) RMS & Average thyristor currents.
 - iv) η - efficiency

OR

- Q2)** a) What are reversible drives? Explain with circuit diagram & wave forms, working of 1 ϕ dual converter with circulating current mode operation. Derive the equation for circulating current. [10]
- b) 1 ϕ dual converter is operated from a 120 V, 60 Hz, supply & load resistance of 10Ω & circulating inductance of $LC = 40$ mH. Delay angles are $\alpha_1 = 60^\circ$ & $\alpha_2 = 120^\circ$. Calculate peak circulating current (I). [8]

P.T.O.

- Q3)** a) Explain the effect of source inductance on the performance of 3 ϕ full controlled converter. [5]
- b) What is chopper? Explain with circuit diagram & waveform working of 2 quadrant step - down chopper. [8]
- c) Justify why phase controlled converters are not preferred over chopper for power control applications. [3]

OR

- Q4)** a) Explain with circuit diagram & waveforms, working of 4 Q. chopper with suitable load comment on p.f. [8]
- b) A 4 quadrant chopper is driving a separately excited DC motor load. The motor performance are $R = 0.1 \Omega$, the supply volt = 200 V DC. If the rated current of motor is 10 A & driving the rated torque. Determine [8]
- i) Duty cycle of chopper if $E_b = 150 \text{ V}$
- ii) Duty cycle of chopper if $E_b = -110 \text{ V}$

- Q5)** a) What are DC to DC converters? Explain with circuit diagram & waveforms working of ZVS resonant converter with suitable load. Comment on p.f. state its advantages & disadvantages. [10]
- b) Explain in brief SLR half bridge converter (DC to DC) in low freq. mode. [6]

OR

- Q6)** a) Compare ZVS & ZCS. [5]
- b) What is cycloconverter? Explain with circuit diagram & waveforms working of cycloconverter. State its advantages & disadvantages. [8]
- c) What is soft - start? Explain. [3]

SECTION - II

- Q7)** a) What are Inverters? Explain with circuit diagram & waveforms working of 3 - phase VSI operating in 180° conduction mode. Load is assumed to be star connected Res. Load. [10]
- b) Compare VSI & CSI. [8]

OR

- Q8)** a) What are Level inverters? Explain in brief. [6]
- b) What are different types of Harmonic elimination techniques? Explain. [6]
- c) What is Auto - sequential current fed PWM Inverter? Explain. [6]

- Q9)** a) What is Electronic ballast? Explain with circuit diagram & characteristics. [6]
b) What is HVDC? Explain. [6]
c) Explain in brief, MOV. [4]

OR

- Q10)** a) What are Heat sinks. Explain any one type of cooling technique with its need in High power industries. [6]
b) Compare Linear, switched mode & Resonant converters. [6]
c) Explain in brief, what is CTPT? [4]

- Q11)** a) What is power quality? Explain different types of power line disturbances, preventive & nullifying measurement techniques. [10]
b) What is energy audit? Explain. [6]

OR

- Q12)** Write short notes on any three [16]
a) HF heating
b) Protection circuits.
c) Regenerative braking system in DC motors
d) SMPS
e) 12 - pulse converter.
f) CSI



Total No. of Questions : 12]

SEAT No. :

P782

[Total No. of Pages : 3

[4263] - 267

T.E. (Electronics)

SENSORS AND INTERFACES

(2008 Pattern) (Semester-II)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Explain with neat diagram the concept of relative humidity measurement using psychrometers and hygrometers. [8]
- b) Explain the concept of incremental optical disc shaft encoder to measure speed of rotation of electric motor. [8]

OR

- Q2)** a) List various types of proximity sensors. Explain any one in detail. [8]
- b) Compare thermocouple, RTD and semiconductor temperature sensors. [8]

- Q3)** a) Design a signal conditioning circuit for a PT100 RTD using Wheatstone's bridge and instrumentation amplifier. [10]
- b) Explain with neat diagram I/P and P/I converters. [8]

OR

- Q4)** a) Explain with circuit diagram voltage to frequency and frequency to voltage converters. [10]
- b) Write a short note on SMART and intelligent transmitters. [8]

P.T.O.

- Q5)** a) Describe working of a typical flash A/D converter for 4 bit operation.[8]
b) Explain interfacing of [8]
i) Electromechanical relay and
ii) Proximity switch to a PIC microcontroller.

OR

- Q6)** a) Draw and explain the interfacing of LCD to 8051 microcontroller.[8]
b) State different types of ADC and DAC and give the specifications of an ADC. [8]

SECTION - II

- Q7)** a) Explain the block diagram of data logger and make comparison between DAS and data logger. [8]
b) Write short notes on: [8]
i) IEEE 488 standard
ii) I2C bus

OR

- Q8)** a) Write short notes on Foundation field bus. [8]
b) Explain multichannel DAS and enlist its objectives and applications.[8]

- Q9)** a) What are actuators? Give their classification and explain Piston actuators in details. [8]
b) Explain the principle and operation of D.C motor. [8]

OR

- Q10)** a) What are valves ? Explain. [8]
i) Spool valve
ii) Poppet valve
iii) Rotary spool valve
iv) Pressure control valve
b) Explain the following terms related to control valve characteristics:[8]
i) Linear
ii) Quick opening
iii) Equal percentage

- Q11)** a) With block diagram explain PLC architecture. [6]
b) Explain the PLC operating cycle. [6]
c) Explain the importance of latching done in PLC with an example. [6]

OR

- Q12)** a) What are the various specifications of PLC? Explain them. [6]
b) How is PLC advantageous over the relay system? [6]
c) How the input channel is protected from input signal of sensors? [6]



Total No. of Questions : 12]

SEAT No. :

P785

[4263]-273

[Total No. of Pages : 7

T.E. (E&TC)

**NETWORK SYNTHESIS AND FILTER DESIGN
(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) *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) Explain the significance of poles and zeros in network synthesis. Also discuss the effect of poles and zeros on system function. [6]
- b) For the network shown in Figure 1, Find the expression for the following network functions : [8]

$$\frac{V_2}{V_1}, \frac{I_2}{I_1}, \frac{V_2}{I_1} \text{ and } \frac{I_2}{V_1}.$$

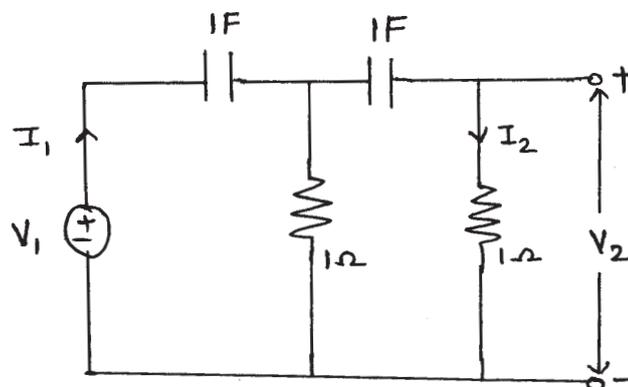


Fig 1 Q1(b)

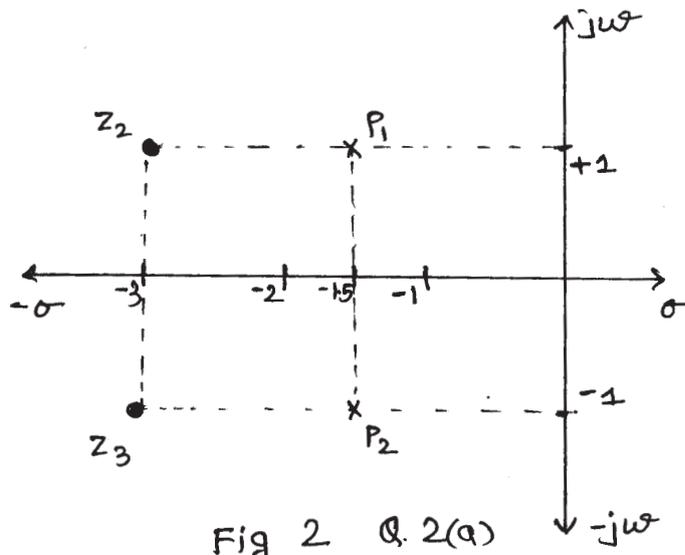
P.T.O.

c) Test whether the given polynomial is Hurwitz polynomial or not. [4]

$$P(s) = 2s^6 + s^5 + 13s^4 + 6s^3 + 56s^2 + 25s + 25$$

OR

Q2) a) The pole zero plot of a voltage transfer function is shown in figure. 2. The DC gain is 10. Find the transfer function. [6]



b) Find $\frac{V_o(s)}{V_{in}(s)}$ for the network shown in figure. 3. [6]

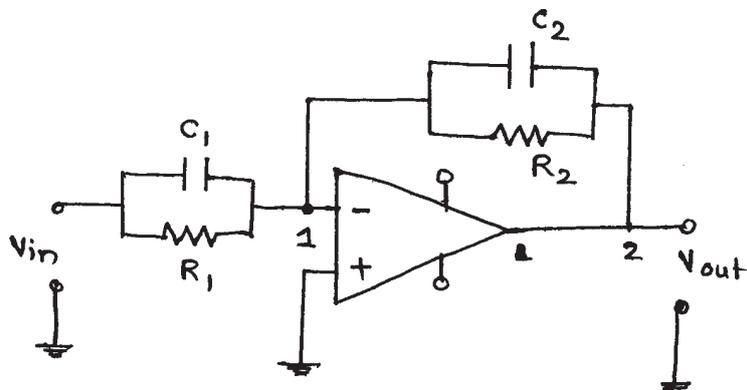


Fig 3. Q 2(b)

- c) Define stability of a network. State and explain the conditions for stability of a network. [6]

Q3) a) $Z(s) = \frac{k(s+3)(s+7)}{(s+2)(s+6)}$ and $Z(0) = 20$ Realize the function in the following two forms : [10]

i) Foster - I form

ii) Cauer - I form.

- b) State the properties of RLC driving point function and explain its synthesis procedure in Foster form. [6]

OR

Q4) a) Test which of the following functions is a RL network and synthesize it using Cauer I and II forms. [10]

i) $Z(s) = \frac{(s+1)(s+4)(s+8)}{s(s+2)(s+6)}$

ii) $Z(s) = \frac{s^4 + 9s^2 + 8}{s^3 + 4s}$

iii) $Z(s) = \frac{s^2 + 7s + 10}{s^2 + 4s + 3}$

iv) $Z(s) = \frac{2(s+1)(s+3)}{(s+2)(s+6)}$

- b) State the properties of LC impedance network. Explain the synthesis procedure of LC networks using the partial fraction expansion method. [6]

Q5) a) Explain the concept and significance of zeros of transmission in network synthesis. Any transfer function of a passive ladder network is always “minimum phase function”. Justify. [6]

- b) Synthesize $\frac{V_2}{V_1} = \frac{(s+2)(s+4)}{(s+3)(3s+4)}$ as a constant resistance bridged T - network connected in cascade. [8]
- c) State the properties of transfer function. [2]

OR

- Q6) a) Synthesize $Y_{21}(s) = \frac{s^2}{s^3 + 3s^2 + 4s + 2}$ to a LC n/w with 1Ω termination. [8]
- b) State the properties of open circuit and short circuit parameters. Synthesize the open circuit voltage ratio transfer function $\frac{V_2}{V_1} = \frac{k}{(s+2)(s+4)}$ using RC ladder network. [8]

SECTION - II

- Q7) a) Explain the concept and necessity of approximation technique in filter designing. [5]
- b) Determine the order of a low pass Butterworth filter that is to provide 40 dB attenuation at a frequency which is twice the cut - off frequency. [5]
- c) A LPF is shown in figure 4. Convert this filter into a HPF with cut off frequency of 10^6 rad/s and impedance of 500Ω . [6]

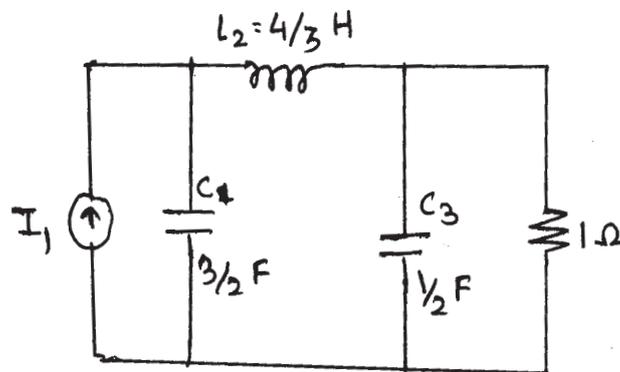


Fig 4 Q 7(c)

OR

Q8) a) Give the basic properties of Chebyshev filter. Obtain the transfer function of third order normalized low pass Chebyshev filter. [8]

b) Explain frequency normalization and impedance normalization.

Figure 5. shows a third order butterworth filter for $R_0 = 1 \Omega$ and $\omega_c = 1$ rad/s. Design a circuit for third order butterworth filter using frequency normalization for $\omega_c = 10^4$ rad/s and $R_0 = 500 \Omega$. [8]

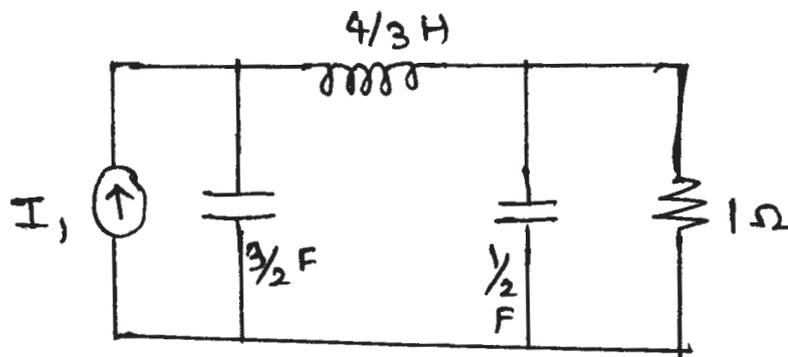


Fig 5 Q 8 (b)

Q9) a) Synthesize the given real pole transfer functions using an active RC circuit with only two op-amps. [8]

$$\frac{-s+8}{(s+3)(s+4)}$$

b) Explain different Biquad feedback topologies used in active filter designing. [4]

c) Write a short note on FDNR. [4]

OR

- Q10)** a) Design a Butterworth LPF of first order, with [6]
- i) Pass band gain of 10 dB.
 - ii) Cut - off frequency of 1 kHz use sallen key circuit.
- b) Write a short note on sallen key low pass circuits. [6]
- c) Explain the cascaded approach of active filter design. [4]

- Q11)** a) Explain the effect of CMRR on the performance of Active filters. The output voltage measured in the circuit shown in figure. 6 is 20 mV, if the input voltage is 2V. Find value of CMRR. [8]

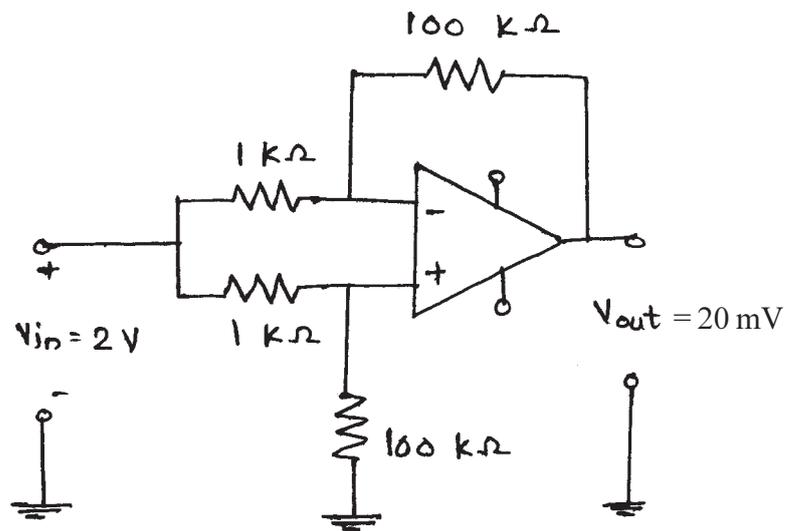


Fig. 6 Q.11(a)

- b) Define “Sensitivity” and it’s significance. Explain the “Dimension Homogeneity property” of sensitivity. [6]
- c) Define “Gain Sensitivity”. Explain the concept in brief. [4]

OR

Q12) a) Explain the effect of following OP-AMP characteristics on the performance of the filter. [8]

- i) Dynamic range.
- ii) Slew rate.
- iii) Offset voltage and currents.
- iv) Common mode signals.

b) Write a short note on multi element deviation. [6]

c) For a low pass filter shown in figure 7, calculate the sensitivity of the cut - off frequency (F_c) and the design impedance (R_k) with respect to L and C. [4]

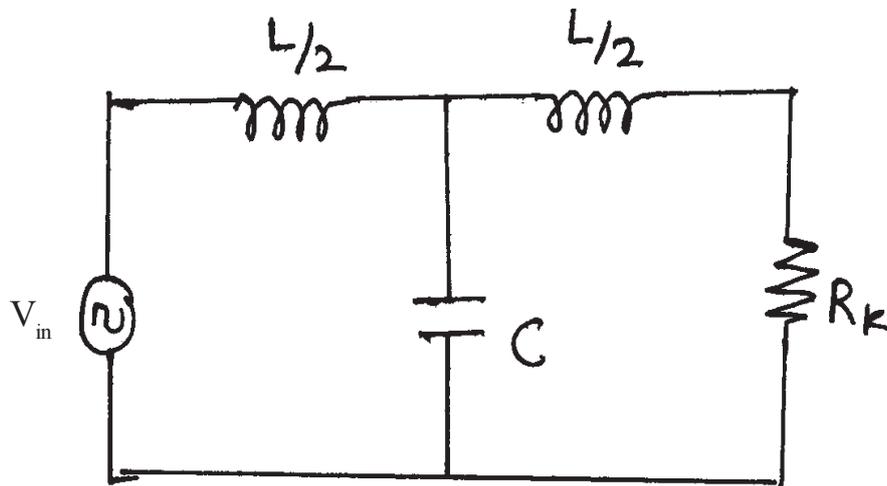


Fig 7 Q 12(c)



Total No. of Questions : 12]

SEAT No. :

P787

[4263]-275

[Total No. of Pages : 4

**T.E. (Electronics and Telecommunication)
DIGITAL SIGNAL PROCESSING
(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) Assume suitable data, if necessary.

SECTION - I

Q1) a) Draw the block diagram of a simplified generalized real time digital processing system and explain each block. **[8]**

b) Consider a difference equation **[10]**

$$y(n) + y(n - 1) - 2y(n - 2) = x(n) + x(n - 1)$$

With initial condition $y(-1) = y(-2) = 1$,

- i) Find impulse response $h(n)$ from given difference equation.
- ii) From the above obtained impulse response $h(n)$ show that step response $s(n) = n$, using direct convolution.

OR

Q2) a) Obtain the direct form - I and direct form - II structures for the following systems : **[12]**

i) $y(n) = 0.75y(n - 1) - 0.25y(n - 2) + x(n) + 2x(n - 1) - x(n - 2)$

ii) $y(n) = -0.25y(n - 1) - 0.05y(n - 2) + x(n) - 2x(n - 2)$

iii) $y(n) = 0.5x(n) + 0.25x(n - 1) + x(n - 2) - 0.25y(n - 3)$

b) Prove that for a causal system, **[6]**

$$h(n) = 0 \text{ for } n < 0$$

Q3) a) Compare Linear and Circular Convolution? How Linear Convolution is calculated Using circular convolution? Obtain the linear convolution using circular convolution for following sequence **[8]**

$$x_1(n) = \{1, 2, 3\} \text{ and } x_2(n) = \{2, 2, 2\}$$

b) Consider the following DT system

$$y(n) = 0.5x(n - 2) + 0.25x(n - 1) + 0.25x(n - 3)$$

Find system function $H(z)$, magnitude and phase spectra and sketch both. **[8]**

P.T.O.

OR

- Q4)** a) A analog signal $x(t) = \sin(2000\pi t)$ is sampled with sampling frequency $F_s = 4000$ Hz to obtain discrete time signal $x(n) = \sin(2\pi f n)$, Draw [8]
- Spectrum $X(\omega)$ (i.e.DTFT).
 - Spectrum $X(k)$ (i.e. DFT) for $N = 4$
 - Comment on above two spectrum
- b) Find $N = 8$ point DFT using Radix - 2FFT DIT algorithm for given sequence. [8]

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

- Q5)** a) Find the Z - Transform and ROC of the given sequence. [8]
- $x(n) = -2nu(-n - 1)$
 - $x(n) = (n^2 - 0.5)u(n)$
- b) Explain how Z - Transform can be used to find Causality and Stability of system? Hence, for the given system. [8]

$$H(z) = \frac{1 - 2z^{-1}}{1 - 2.25z^{-1} + 0.5z^{-2}}$$

comment on nature of $h(n)$ for the following conditions :

- if the system is stable.
- if the system is causal.

OR

- Q6)** a) Determine the impulse response and output response of the system [8]

$$y(n) = \frac{5}{6}y(n-1) - \frac{1}{6}y(n-2) + x(n)$$

to the input signal $x(n) = \delta(n) - \frac{1}{3}\delta(n-1)$

Show that because of the input signal, pole - zero cancellation occurred.

- b) Determine the z - transform and ROC of the signal. [8]

$$x(n) = a^n u(n) - b^n u(-n-1)$$

for the following condition :-

- $b < a$,
- $b = a$, and
- $b > a$

SECTION - II

- Q7)** a) Determine the coefficients $h(n)$ for $M = 7$, for the given low pass filter whose desired frequency response given below, using frequency sampling technique. [10]

$$H_d(\omega) = \begin{cases} 1.e^{j3\omega} & 0 \leq \omega \leq \frac{\pi}{2} \\ 0 & \frac{\pi}{2} \leq |\omega| \leq \pi \end{cases}$$

- b) If Transfer function of FIR LPF is $H(z) = 1 + 2z^{-1} + 3z^{-2} + 2z^{-3} + z^{-4}$ Show that [8]
- i) Impulse Response $h(n)$ is symmetry.
 - ii) Phase Delay τ_p and Group Delay τ_g are constant.

OR

- Q8)** a) Specification for the digital Butterworth low pass filter are given below $f_p = 1 \text{ kHz}$, $f_s = 3 \text{ kHz}$, $F_s = 8 \text{ kHz}$, $R_p = 3 \text{ dB}$ and $A_s = 30 \text{ dB}$ Using bilinear technique find Transfer function $H(z)$. [10]

- b) Derive the relation between S - Domain and Z - Domain, and relation between analog Frequency Ω and digital frequency ω in impulse invariant method. Why it is not possible to design High Pass Filter and Band Pass Filter using impulse invariant Method? [8]

- Q9)** a) With the aid of suitable diagram and mathematics explain advantages of Anti - Image and Anti - alias filter in Multirate Processing system. [8]
- b) For the given spectrum $X_1(\omega)$ draw the spectrum $X_2(\omega)$, $X_3(\omega)$, and $X_4(\omega)$ [8]

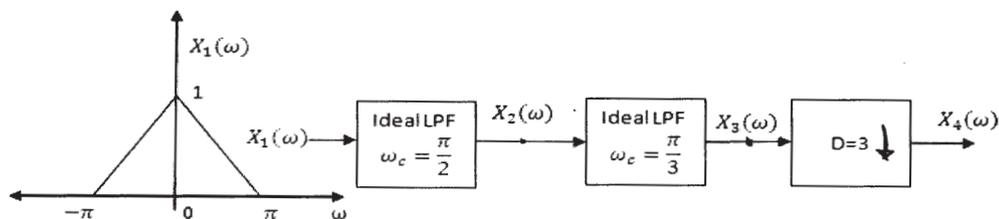


Figure 1

OR

- Q10)** a) With the aid of suitable diagram and mathematics explain polyphase filter and its advantages for interpolator (assume $I = 3$). [6]
- b) Explain how Multirate sampling can be used efficiently in [10]
- i) Acquisitions of high quality data.
 - ii) DAC in Compact Hi - Fi systems.

- Q11)** a) Explain the necessity of [8]
- i) MAC unit
 - ii) Circular Buffering
- b) Draw the functional block diagram of DSP TMS 320C6713 CPU. Explain any five salient features of TMS 320C6713 processor. [8]

OR

- Q12)** a) Draw the block diagram of a simplified generalized DSP processor system and explain each block. [8]
- b) Write short notes on : [8]
- i) Pipelining
 - ii) VLIW



Total No. of Questions : 12]

SEAT No. :

P797

[4263]-302

[Total No. of Pages : 4

**T.E. (Chemical Engg.)
MASS TRANSFER - I
(2008 Pattern) (Sem. - I)**

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Explain the mass transfer operation with example? [4]
b) Explain Choice of Separation methods? [4]
c) A volatile organic compound benzene costing Rs. 45 per kg is stored in a tank 10 m diameter and open at top. A stagnant air film 10 mm thick is covering the surface of the compound beyond which the compound is absent. If the atmospheric temperature is 25°C. Vapour pressure of the compound is 150 mm Hg and its molar diffusivity is 0.02 m²/hr. Calculate the loss of benzene in Rs/day. [8]

OR

- Q2)** a) What is general principle of Mass Transfer? Explain classification of the Mass Transfer Operations? [4]
b) What are the Design principles of any plant involving the Diffusional operations? [4]
c) Ammonia gas (A) is diffusing through a uniform tube 0.10 m long containing Nitrogen gas (B) at 1.0132×10^5 pa pressure & 298°K. At point (1) $PA_1 = 1.013 \times 10^4$ pa & at point (2) $PA_2 = 0.507 \times 10^4$ pa. The diffusivity $D_{AB} = 0.23 \times 10^{-4}$ m²/sec. [8]
i) Calculate the flux for Ammonia at steady state.
ii) Repeat for the flux of Nitrogen.

- Q3)** a) State and explain Maxwells law of diffusion? [6]

P.T.O.

- b) A tube 1 cm in inside diameter that is 20 cm long is filled with carbon dioxide and hydrogen at 2 atm total pressure at 0°C. The diffusion coefficient of the carbon dioxide hydrogen system under these conditions is 0.275 cm²/sec. If the partial pressure of carbon dioxide is 1.5 atm at one end and 0.5 atm at the other end. Find the rate of diffusion for [12]
- Steady state equimolar counter diffusion.
 - Steady state counter diffusion where $N_B = -0.75 N_A$.
 - Steady state diffusion of carbon dioxide through stagnant hydrogen.

OR

- Q4) a) State and explain Ficks law of Diffusion? Differentiate between molecular and eddy diffusion? [6]
- b) The solute A is being absorbed from a gas mixture of A & B in a wetted - wall tower with the liquid flowing as a film downward along the wall. At a certain point in the tower the bulk gas concentration $Y_{AG} = 0.38$ mol fraction and the bulk liquid concentration is $X_{AL} = 0.10$. The tower is operating at 298 K and 1.013×10^5 pa and the equilibrium data are as follows :

X_A	0	0.05	0.10	0.15	0.20	0.25	0.30	0.35
Y_A	0	0.022	0.052	0.087	0.131	0.187	0.265	0.385

The solute A diffuses through stagnant B in the gas phase and then through a non diffusing liquid.

Using correlations for dilute solutions in wetted - wall towers, the film mass - transfer coefficient for A in the gas phase is predicted as $k_y = 1.46 \times 10^{-3}$ kg mol A/s.m². mol frac. & for the liquid phase as $k_x = 1.967 \times 10^{-3}$ kg mol A/s.m². mol frac. Calculate the interface concentrations Y_{Ai} & X_{Ai} and the flux N_A ? [12]

- Q5) a) Explain choice of solvent for Absorption? [6]
- b) 5000 kg/hr of a SO₂- air mixture containing 5% by volume of SO₂ is to be scrubbed with 200000 kg/hr of water in a packed tower. The exit concentration of SO₂ is reduced to 0.15%. The tower operates at 1 atm. The equilibrium relation is given by : [10]

$$Y = 30X$$

Where Y = Mole SO₂/Mole air

X = Mole SO₂/Mole water.

If the packed height of tower is 0.42 m, calculate the height of transfer unit.

OR

- Q6)** a) Explain Absorption with Chemical Reaction? [6]
- b) In an experiment 200 liters of air - SO₂ mixture per minute is scrubbed continuously by water in counter - current fashion in a packed tower. The mixture contains 10% SO₂ by volume and is admitted at 20°C & 1000 mm Hg pressure into the tower. During absorption the tower temperature is maintained constant at 20°C by means of cooling arrangement. Determine the tower diameter required for absorbing 95% SO₂. It may be assumed that the height of the tower may have no limitation. Vapour pressure of SO₂ (gas) over aqueous SO₂ solution at 20°C is given below.

% concentration of SO ₂ in water (Wt.%)	0.5	1.0	2.0	3.0	5.0	10.0
Partial pressure of SO ₂ mm Hg	26	59	123	191	336	698

Maximum allowable flow rate of water is 200 lit./hr.m² [10]

SECTION - II

- Q7)** a) The air - water vapor mixture has a DBT of 55°C with humidity of 0.048 kmole water vapor/kmole dry air and 1 standard atmospheric pressure. Find [10]
- i) absolute humidity,
 - ii) humid volume,
 - iii) percentage humidity,
 - iv) humid heat and
 - v) total enthalpy.
- b) What are the different types of cooling towers? Explain any one in brief.[6]

OR

- Q8)** a) An air stream at 87.8°C having a humidity of 0.030 kg H₂O/kg dry air is contacted in an adiabatic saturator with water. It is cooled and humidified to 90% saturation. [8]
- i) What are the final values of humidity and temperature?
 - ii) For 100% saturation, what would be the values of humidity and temperature?
- b) Define the following terms: [8]
- i) humidity of saturation,
 - ii) unsaturated vapor - gas mixture,
 - iii) wet bulb temperature,
 - iv) dew point.
- Q9)** a) What are the various equipments used for gas-liquid contact. With neat sketch explain [8]
- i) Venturi Scrubber,
 - ii) Spray Towers.

- b) What are the different types of packing used in separation towers? Give classification. [4]
- c) What are the characteristics that tower packing should offer? [4]

OR

- Q10)** a) Differentiate between tray columns and packed columns. [4]
- b) What are the different types of trays used in plate column? Explain any one in brief. [4]
- c) Define the following terms [8]
- Murphree tray efficiency,
 - Point efficiency,
 - Overall tray efficiency,
 - Gas holdup and liquid holdup.

- Q11)** a) A filter cake is dried for 5 hours from an initial moisture content of 30% to 10% (wet basis). Calculate the time required to dry the filter cake from 30% to 6% (wet basis). Equilibrium moisture content is 4% (dry basis), critical moisture content is 14% (dry basis). Assume that the rate of drying in the falling rate period is directly proportional to the free moisture content. [10]
- b) Define the terms: [4]
- Bound moisture,
 - Unbound moisture,
 - Equilibrium moisture,
 - Funicular state.
- c) Explain the mechanism of moisture movement in solids. [4]

OR

- Q12)** a) A batch of wet solid, whose drying rate data is given below, is to be dried from free moisture content of 0.38 kg H₂O/kg dry solid. to 0.04kg H₂O/kg dry solid. The weight of dry solid is 399 kg. and area of top surface is 18.58 m². Calculate the total time for drying. [12]

X :- 0.480 0.350 0.250 0.195 0.150 0.100 0.065 0.050 0.040

N :- 1.20 1.51 1.51 1.51 1.21 0.90 0.71 0.37 0.27

Where X = kg H₂O/kg dry solid, N = kg H₂O/m². hr

- b) What is drying? Give detail classification of drying equipments. [6]



Total No. of Questions : 12]

SEAT No. :

P804

[4263]-315

[Total No. of Pages : 7

T.E. (Petroleum)

**PETROLEUM PRODUCTION OPERATIONS
(2008 Pattern) (Semester - I)**

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer 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 well head equipment to be used for three casing and one production tubing show and indicate all the components and accessories of it. **[12]**
- b) What is the role of a Petroleum Production Engineer in an E & P company? List the six important measures that he should take to improve the field performance and recovery factor. **[6]**

OR

- Q2)** a) Write the importance of well integrity and discuss the design considerations for a well head assembly, christmas tree and its components. **[12]**
- b) Explain how the H₂S containing environment can affect the performance of surface production equipment and facilities. **[6]**
- Q3)** a) Draw the schematic sketch and show the effect of length and force changes in production tubing. **[4]**
- b) What is API? Explain the importance of API standards and specifications in design, operational procedure and testing in petroleum Industry? Give the API specification number for any four production field equipment or tools. **[12]**

OR

P.T.O.

Q4) a) List the names of various bottom hole tools and or equipments used in wellbore along with functions of each in two lines. [10]

b) Draw typical DST graph for two sets of readings and write the functions or utility of it. [6]

Q5) a) A well is completed with 6300 ft., of 2.875 inch tubing. The bottom hole static pressure is 2,400 psi and the P.I. is 0.28 bbl/day/psi. Additionally, the GLR is 300 cubic feet/bbl. Assuming tubing head pressure of 100 psi, at what rate will the well flow? Use the given depth pressure gradient flow curves. (**Refer the Gilbert chart : figures on page 4 to 7**) [12]

b) Explain graphically, the Vertical Lift Performance showing need for artificial lifting for a given well conditions. If should indicate, [4]

i) typical IPR curve

ii) necessary draw down to be created by ALT method.

OR

Q6) a) Draw and explain choke performance curve along with analytical equation to calculate THP. [6]

b) Draw two separate typical graphs of bottom hole flowing pressure and tubing head pressure Vs production rate of a wellbore to demonstrate Vertical Lift Performance, tubing performance using two methods described by Gilbert. It should indicate following points in relevant method. [10]

i) IPR curve

ii) determination of optimum tubing size, if three tubing sizes are available.

iii) operating point selected by you

iv) pressure loss inside reservoir.

v) pressure loss inside optimum tubing

vi) pressure loss inside choke and THP curves or tubing performance curves for selected tubing sizes.

SECTION - II

Q7) a) Write the standard procedure of well completion from lowering of production casing to connection of the wellbore to surface production facility in brief. [6]

b) Decide the well trajectory, application, down hole features and draw the neat schematic sketches of any four types of well completions. [12]

OR

- Q8)** a) Explain well perforation operation and factors affecting perforation efficiency. [8]
 b) Discuss general design considerations for well completion programme. [10]

- Q9)** a) Construct typical generic nature of graphs in following cases. [9]
 i) Oil formation volume factor Vs reservoir pressure.
 ii) Solution GOR Vs Reservoir pressure.
 iii) Pressure loss as a function of production rate at various GLR's.
 b) Discuss Standing's extension of Vogel's work for damaged or improved wells. Also show that, $J^* = 1.8 q' / \text{average reservoir pressure (P)}$ [7]

OR

- Q10)** a) Draw the typical graph of gas formation volume factor Vs reservoir pressure and calculate gas formation volume factor for following data.
 Sp. gravity of dry gas 0.80, reservoir temperature 200° F, reservoir pressure 2300 psig, value of gas compressibility factor is 0.845. [8]

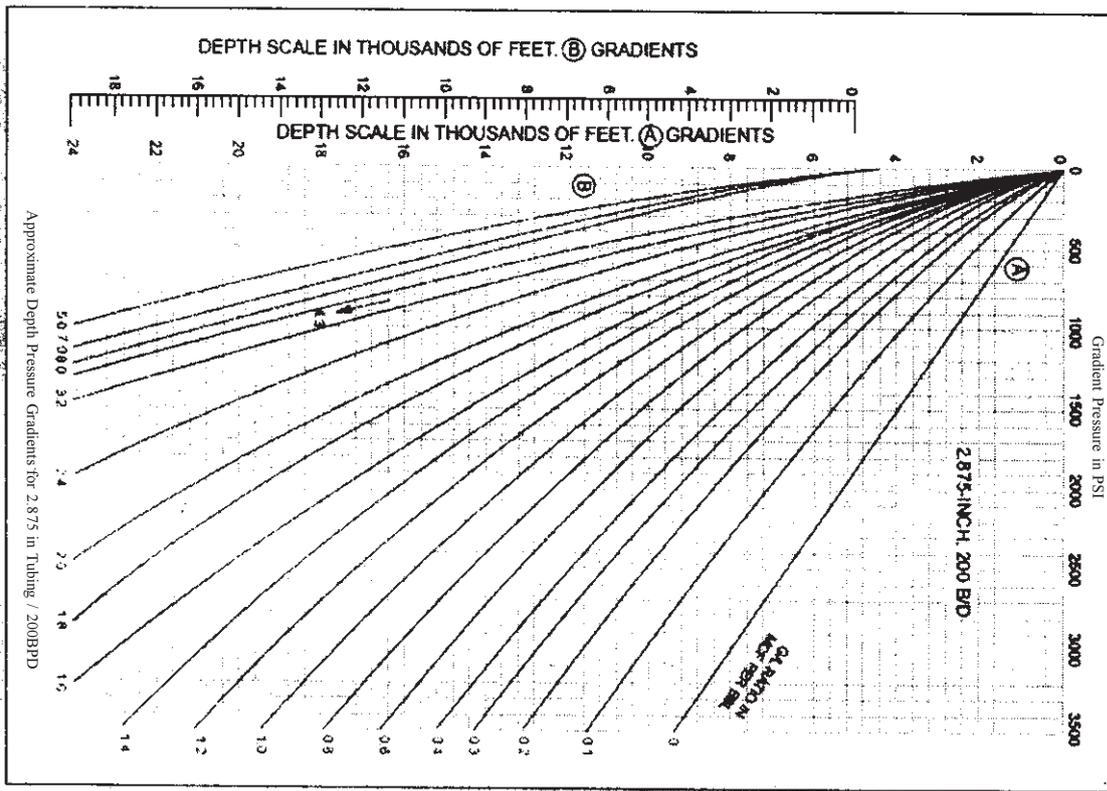
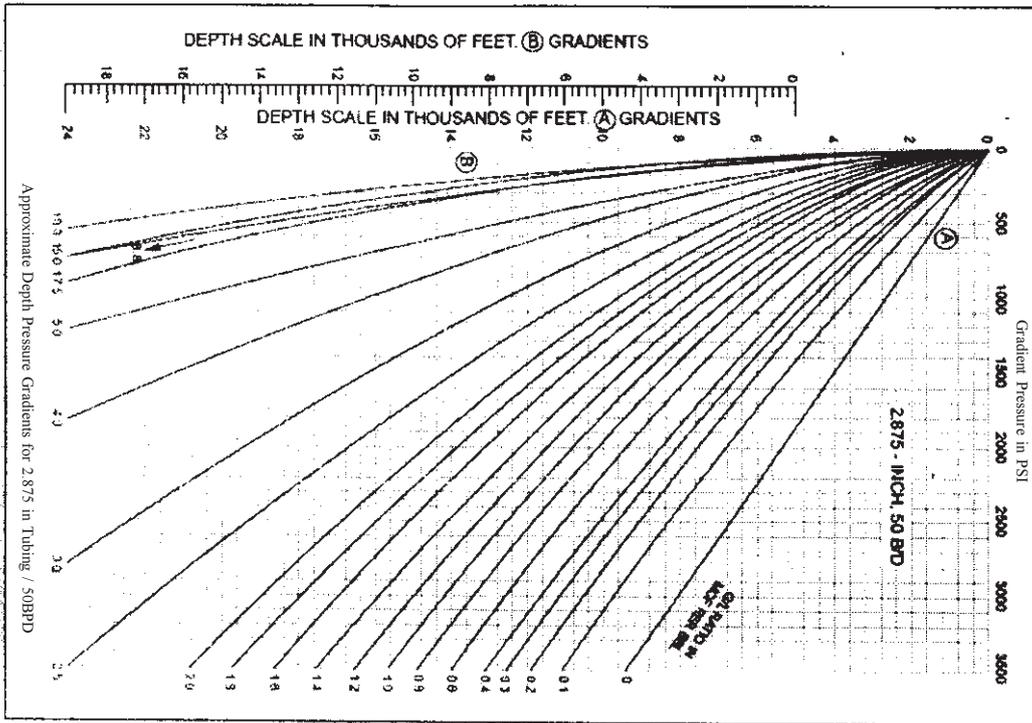
- b) Following data is available for a vertical well and reservoir in which flow conditions do not change with time. Calculate the production rate of the wellbore.

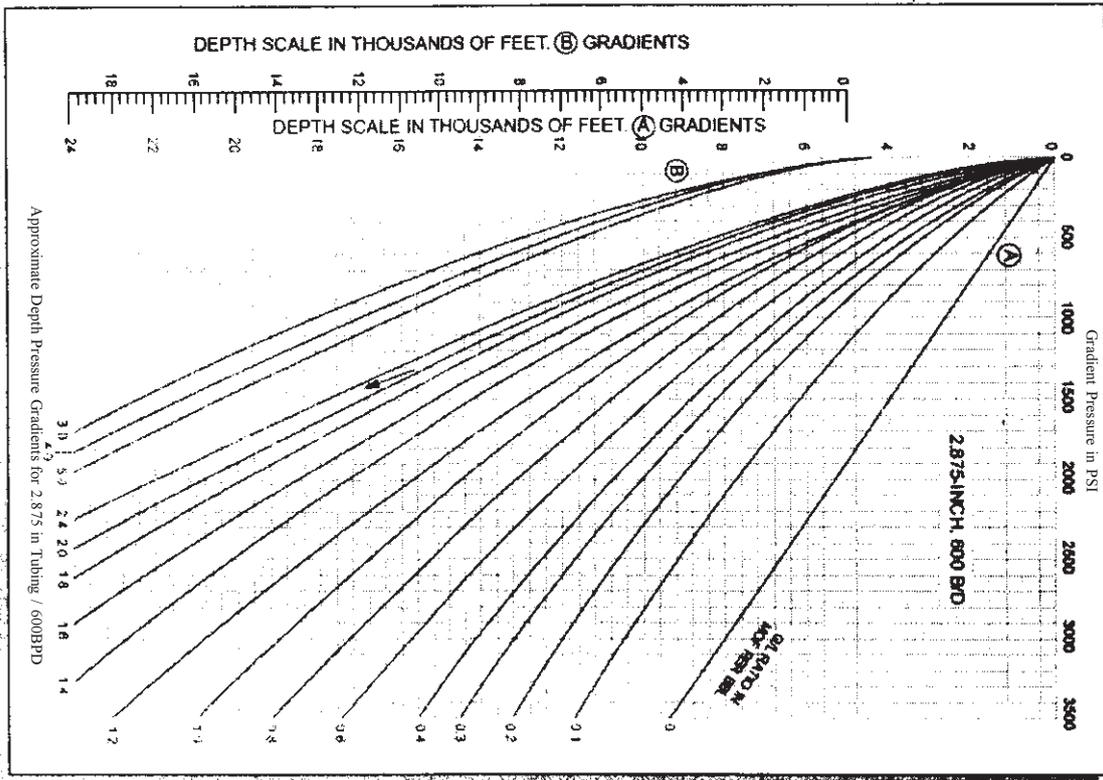
Reservoir pressure = 1800 psia. Permeability = 60 md. Net sand thickness = 24 ft. Oil viscosity = 4 cp. Oil formation volume factor = 1.19. The well is completed in 7 inch production casing. P.I. of the wellbore is 0.4 bbl/day-psi. Assume that this well drains effectively for given 100 acre spacing plan of field development. No formation damage. Bottom hole flowing pressure = 670 psi. [8]

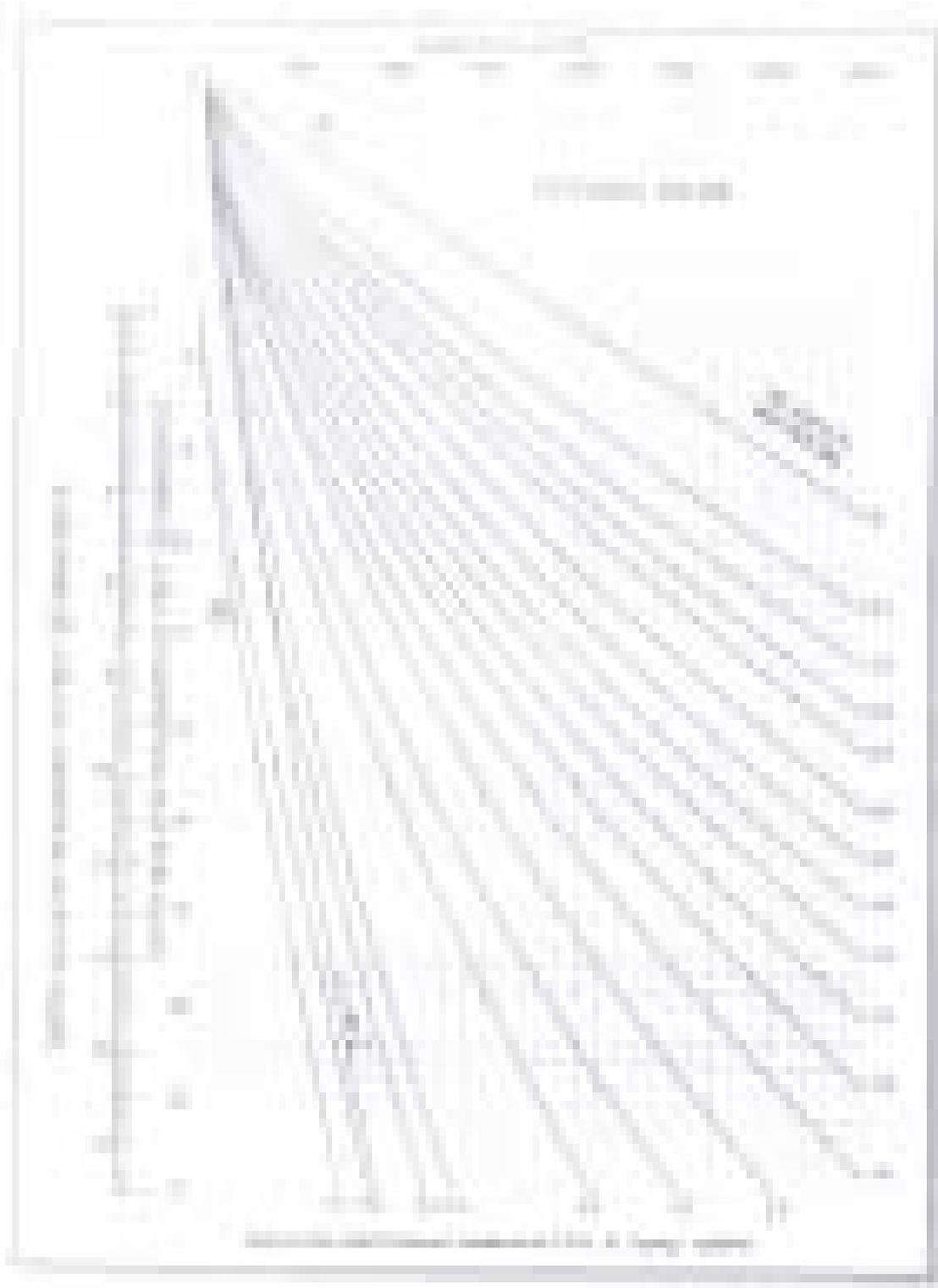
- Q11)** a) Explain the importance of services that extend the life of a producing wells by improving production performance or rectify critical issues pertaining to well integrity or safety. What is the name of this kind of services? Give two examples in brief. [8]
 b) List at least eight number of workover problems and explain in two - three lines remedy to solve the problem and improve the performance of a wellbore. [8]

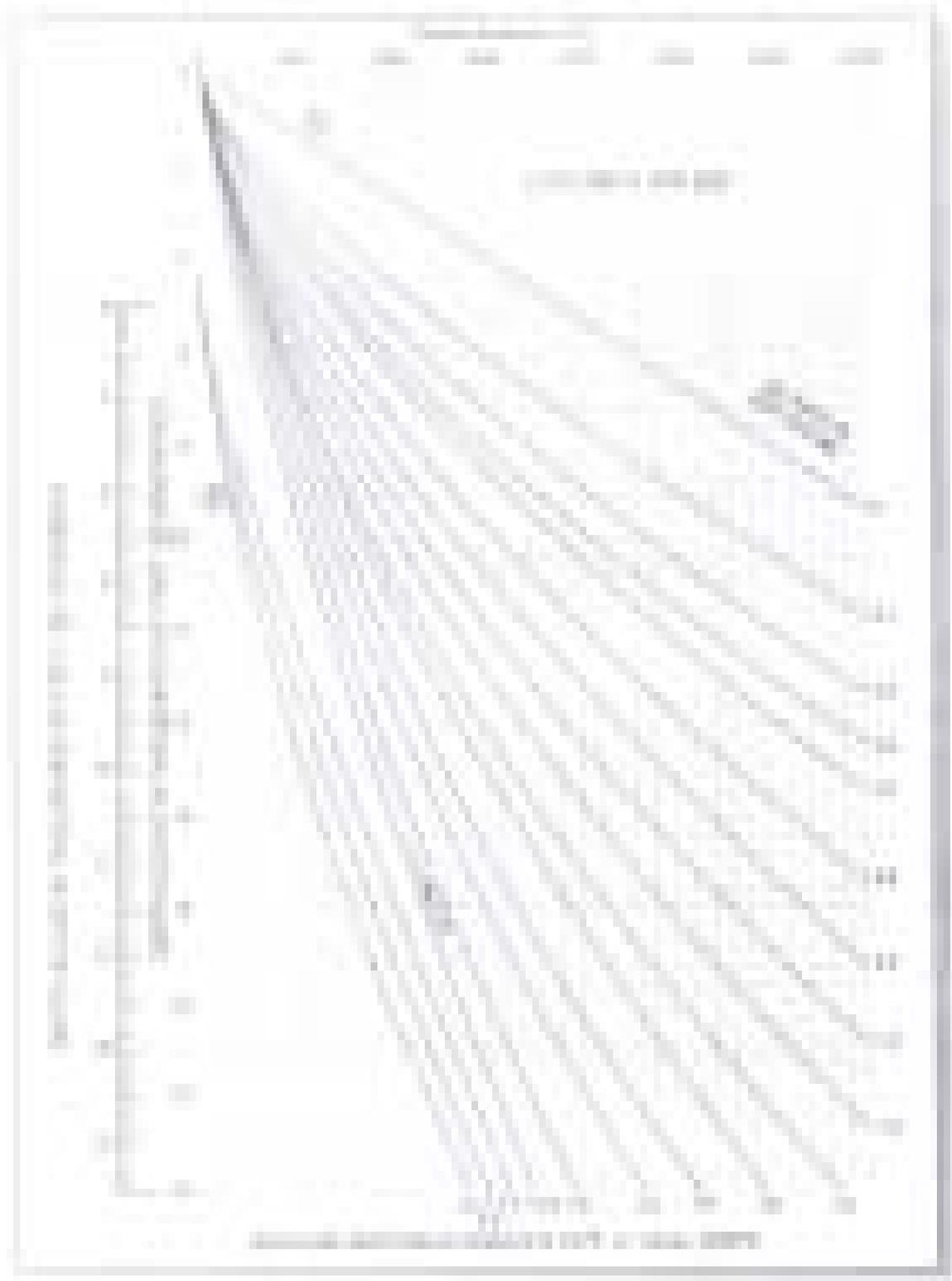
OR

- Q12)** a) Write in brief, short notes on any two of the following. [10]
 i) sequence of flow regimes in liquid loading of gas wells.
 ii) design considerations in well stimulation job.
 b) Draw neat schematic sketch of a gravel packed well completion. Name and indicate all the features of it. [6]









Total No. of Questions : 12]

SEAT No. :

P808

[4263]-323

[Total No. of Pages : 7

**T.E. (Petrochemical)
MASS TRANSFER - I
(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 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) Answer the following questions in brief : (Any Three) **[18]**

- a) Classify mass transfer operations by giving suitable example(s).
- b) State various empirical correlations for estimation of diffusion coefficient of gases and liquids.
- c) Contrast and compare molecular diffusion and eddy diffusion with suitable example(s).
- d) State and explain Fick's law of diffusion.
- e) The value of D_{AB} for a dilute solution of methanol in water at 288 K is given by $1.25 \times 10^{-5} \frac{\text{cm}^2}{\text{s}}$. Estimate D_{AB} for same solution for 373 K, using Wilke Chang correlation.

Data : μ_1 at 288 K = 1.15 C_p
 μ_2 at 373 K = 0.285 C_p
OR

Q2) a) Solve the following : **[8]**

- i) Prove that $D_{AB} = D_{BA}$
- ii) Prove that $J_A + J_B = 0$

P.T.O.

- b) Two large storage tanks containing natural gas mixtures, each maintained at a pressure of 10 atmosphere and 298 K as shown in Figure 1. They are connected by a pipeline 1 inch in diameter and 5 feet. In one tank, it contains mainly H₂S separate from the natural gas : 90% H₂S and 10% CH₄ by volume. The second tank contains clean natural gas : 100% CH₄. Accidentally, the valve is left open by an operator. At the initial tank conditions, the diffusivity between H₂S and CH₄ is $2.02 \times 10^{-6} \text{ m}^2/\text{s}$. Assume the mixtures behave like ideal gases. [10]

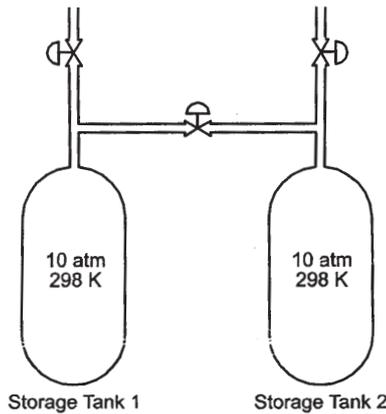


Figure 1: Storage tanks containing Natural gas

Determine the following :

- i) What is the steady rate of transfer (pseudo - steady state initially) of Methane, \bar{N}_{CH_4} , between the two tanks?
 - ii) What is the mass velocity of methane with respect to a stationary coordinate?
 - iii) What is the molar velocity of Methane with respect to Hydrogen sulfide?
 - iv) What are the mass concentrations in the two tanks?
- Q3)** a) Calculate the rate of diffusion of Butanol at 20°C under unidirectional steady state conditions through a 0.1 cm thick film of water when the concentrations of butanol at the opposite sides of the film are, respectively 10% and 4% butanol by weight. The diffusivity of butanol in water solution is $5.9 \times 10^{-6} \text{ cm}^2/\text{sec}$. The densities of 10% and 4% butanol solutions at 20°C may be taken as 0.971 and 0.992 g/cc respectively. [10]
- b) Explain the need for defining the interphase mass transfer resistance in terms of overall coefficients. How they are related to individual coefficients? [6]

OR

- Q4)** a) By what % would the rate of absorption be increased or decreased by increasing the total pressure from 100 - 200 kN/m² in the following cases :
- The absorption of NH₃ from a mixture of NH₃ and air containing 7.5% NH₃ by volume using pure water as a solvent. Assume that other resistance to mass transfer lies within the gas phase.
 - The same condition as (i) but the absorbing solution exerts a partial vapour pressure of NH₃ of 7.5 kN/m².

The diffusivity can be assumed to be inversely proportional to absolute temperature. [8]

- b) The average heat transfer coefficient for natural convection from a single sphere in a large body of fluid is given by :

$$\frac{h_d}{K} = 2 + 0.6 \left(\frac{d^3 \rho^2 g \beta \Delta}{\mu^2} \right)^{1/4} \left(\frac{C_p \mu}{K} \right)^{1/3} \text{ for } Gr^{1/4} Pr^{1/3} < 200$$

where, d is the diameter of the sphere and the fluid properties are evaluated at the mean temperature of the sphere and bulk fluid. Using the analogy between mass and heat transfer, calculate the instantaneous rate of sublimation at the surface of a naphthalene sphere in air at 145 °C and 1 atm.

Explain the analogy between : $Nu = Sh$, $Sc = Pr$, $Gr = Gr_{AB}$

Data : $P_{\text{naphthalene}}^{\text{vap}} = 0.13 \text{ atm}$, $D_{AB} = 5.85 \times 10^{-6} \text{ m}^2/\text{s}$, $d = 7.5 \times 10^{-2} \text{ m}$

$$\rho_{\text{air}} = 0.839 \text{ kg/m}^3, \mu_{\text{air}} = 2.3 \times 10^{-5} \text{ kg/m.s} \quad [8]$$

- Q5)** a) Discuss various theories of Mass transfer with their salient features. [8]
- b) H₂O containing dissolved air is to be deoxygenated by contact with N₂ in an agitated vessel 1 m in diameter. The H₂O will enter counter currently at bottom of the vessel and flow through an overflow pipe set in air side of vessel at an appropriate height. Neglecting gas density, estimate, mass transfer coefficient on liquid side if temperature is 298 K.

Use the following equations to solve this problem :

$$Sh_L = 2.0 + 0.31 Ra^{1/3} ; \text{ where, } Sh_L = \frac{F_L dp}{C.D_L}$$

and Ra = Rayleigh Number and is given by :

$$Ra = \frac{dp^3 (\rho_L - \rho_0) g}{D_L \mu_L}$$

Where,

d_p = Average bubble diameter in m; ρ_L = Density of liquid in kg/m^3

ρ_g = Density of gas in kg/m^3 ; D_L = Diffusivity of N_2 in water in m^2/sec .

μ_L = Viscosity in $\text{kg/m} \cdot \text{sec}$, the value of d_p may be calculated by :

$d_p = 2.88 \times 10^{-3} \cdot \phi_G^{0.4}$, Where ϕ_G = Gas hold up and is given by relation:

$\phi_G = \frac{7.067 \times 10^{-3}}{V_t \cdot 0.833}$, where V_t = Terminal settling velocity of bubble.

Data at 298 K : $V_t = 0.25 \text{ m/s}$; $D_L = 1.9 \times 10^{-9} \text{ m}^2/\text{s}$; $\mu_L = 8.9 \times 10^{-4} \text{ kg/m} \cdot \text{s}$

$\rho_L = 1000 \text{ kg/m}^3$. [8]

OR

Q6) a) Ammonia is absorbed by water in a wetted - wall column being operated at 20 °C and 1 std. atm. The overall gas coefficient is 1 k mole $\text{NH}_3/[(\text{m}^2)(\text{std.atm.})]$. At one point in the column, the gas contains 10 mole% ammonia and the liquid phase contains 0.155 mole ammonia per m^3 of solution. 96% of the total resistance is in the gas phase. Henry's law constant at 293 K is given by $4.247 \times 10^{-3} \text{ std.atm.}/(\text{mole } \text{NH}_3/\text{m}^3 \text{ solution})$.

Determine the interfacial film coefficient and the interfacial compositions. [10]

b) NH_3 is absorbed at 1 bar from an NH_3 air stream by passing it a vertical tube down which dilute H_2SO_4 is flowing. The following laboratory test data are available :

Length of the tube = 825 mm

Diameter of tube = 15 mm

Partial pressure of NH_3 at inlet = 7.5 kN/m^2

Partial pressure of NH_3 at outlet = 2 kN/m^2

The amount of NH_3 absorbed at this condition is $1.12 \times 10^{-6} \text{ kmole/sec}$.

Determine the overall transfer coefficient k_G based on gas phase. [6]

SECTION - II

Q7) Answer the following questions in brief : (Any Three) **[18]**

- a) Define all the humidity terms you know.
- b) Specify the important properties a packing material should possess for being used in mass transfer equipment. Name a few packing materials.
- c) How will express moisture content on dry basis and dry basis? What is basic difference between these two moisture content?
- d) Giving reasons, indicate the type of dryer that can be used for the following purpose :
 - i) Removal of the last 6 percent moisture from salt.
 - ii) Drying of cakes of soap.
 - iii) Drying of heat sensitive materials like pharmaceuticals.
- e) Explain in brief the working principle and industrial applications of Wetted wall column.

OR

Q8) a) Discuss in brief various types of industrial dryers and explain working principles of any one of dryer with neat sketch. **[9]**

- b) Distinguish between : **[9]**
- i) Total - moisture content.
 - ii) Free - moisture content.
 - iii) Equilibrium - moisture content.
 - iv) Unbound moisture.
 - v) Bound moisture.

- Q9)** a) For systems other than air - water, why is the wet - bulb temperature always higher than the adiabatic - saturation temperature. [4]
- b) A mixture of air and water-vapour has a dry bulb temperature of 60°C and an absolute humidity of 0.03 kg-water vapour/kg-dry air. The system pressure is at 1 atmosphere absolute. Evaluate the following : [12]
- Saturation absolute humidity.
 - Relative humidity or relative saturation.
 - Dew point temperature.
 - Humid volume.
 - Humid heat.
 - Adiabatic saturation temperature.

OR

- Q10)** a) Classify equipments for humidification and dehumidification operations. What are the different types of cooling towers used in process industries? Briefly explain them. [10]
- b) Discuss the significance and application of psychometric charts in simultaneous heat/mass transfer operations. [6]

Q11) A batch of solid is dried from 26% to 8% moisture, wet basis. The initial weight of solid is 360 kg and the drying surface is 0.15 m²/40 kg dry weight. The critical moisture content is 28% dry basis and the constant drying rate is 0.30 kg/hr. m². For the falling rate period, the following data are available :

Moisture content, %, dry basis	Rate of drying, kg/hr.m ²
25	0.30
21.9	0.27
19	0.24
16	0.21
13.6	0.18
11	0.15
8.2	0.07
7.5	0.044
6.4	0.025

Determine the time required for drying [16]

OR

Q12) Write short notes on (any Three) :

[16]

- a) Comparison of packed towers and Tray towers.
- b) Two Resistance Concept in Interphase Mass Transfer.
- c) Dimensionless Analysis to mass transfer and Buckingham Pi Theorem.
- d) Estimation of diffusivity of vapors by Winklemann's method.



Total No. of Questions : 12]

SEAT No. :

P810

[4263]-325

[Total No. of Pages : 4

T.E. (Petrochemical)

INSTRUMENTATION AND INSTRUMENTAL ANALYSIS

(2008 Pattern) (Semester - I)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Define the following terms **[6]**
- Accuracy
Resolution
repeatability
Sensitivity
Hysteresis
Time lag
- b) What are different types of static error? Explain each of them. List the different sources of error. **[4]**
- c) A thermometer is calibrated between 0 to 200°C. The accuracy is specified to be within- **[6]**
- i) $\pm 0.5\%$ of upper range value
 - ii) $\pm 0.25\%$ of actual reading of 100°C.

OR

- Q2)** a) Differentiate between first order system and second order system? Derive the expression representing dynamic response of a mercury thermometer considered as a first order system subjected to a step change. **[10]**
- b) A thermometer with time constant 0.1 min and showing a steady state temperature of 30°C is suddenly immersed in an oil bath at 100°C. Find **[6]**
- i) The time required for 85% response.
 - ii) The time required for a temperature reading of 85°C.
 - iii) The temperature reading on the thermometer after 12 seconds.

P.T.O.

- Q3)** a) Explain in detail the principle, construction and working of thermocouple. [9]
b) Describe in detail with neat diagram air purge or bubbler method of level measurement. [9]

OR

- Q4)** a) Give classification of pressure measuring instruments. Explain the principle construction and working of a bourdon pressure gauge. [9]
b) Describe the construction, working of optical pyrometer. [9]

- Q5)** a) Describe with a neat diagram the principle, construction and working of an electromagnetic flow meter. [8]
b) Compare the performance of venturi and orifice flow meters. A pitot static tube placed in the centre of a 200 mm pipe line has one orifice pointing upstream and the other perpendicular to it. If the pressure difference between the two orifices is 40 mm of water when the discharge through pipe is 1365 lit/min. Calculate the coefficient of the pitot tube. Take the mean velocity in the pipe to be 0.83 of the central velocity. [8]

OR

- Q6)** a) What are valve characteristics? Give the graphical representation of different types of valve characteristics. [8]
b) Define :
i) Turndown ratio.
ii) Rangeability
iii) Cavitation
iv) Valve flow coefficient, C_v [8]

SECTION - II

- Q7)** a) Give the principles of different chromatographic techniques used in analysis. [6]
b) On a 1000 cm wall coated open tubular column of 0.25 mm bore, the helium carrier gas velocity is 37 cm/sec. The retention time for decane is 1.27 min. peak width at half height is 0.88 sec. Calculate the retention time for a non-retained compound & partition ratio and effective number plate (N) and Height Equivalent to a Theoretical Plate (HETP). [4]
c) What do you mean by crude assay data? Explain the standard tests used for the analysis flash point and pour point of a petroleum product? [6]

OR

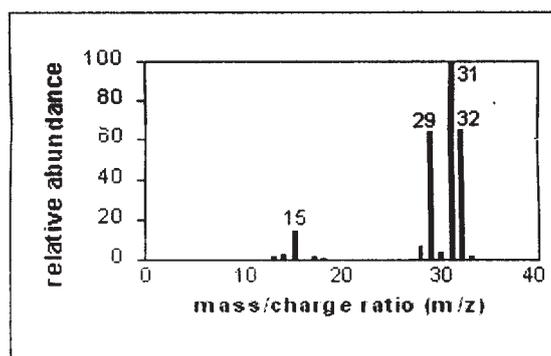
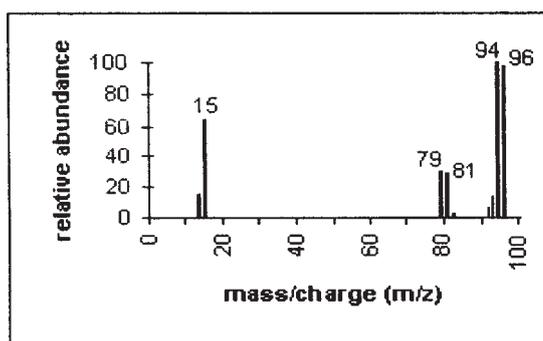
- Q8)** a) Explain in detail classification and compositional analysis of crude oil. [8]
b) Give the principles of each of the following analytical techniques : [8]
i) Mass spectroscopy
ii) X - ray spectroscopy

- Q9)** a) Explain with a neat diagram, the instrumentation for gas chromatography. [9]
b) Explain with a neat diagram, the principle, construction and working of a double beam UV spectrophotometer. [9]

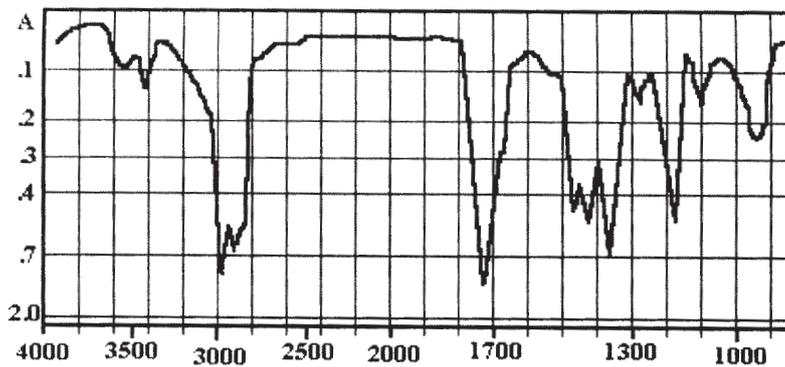
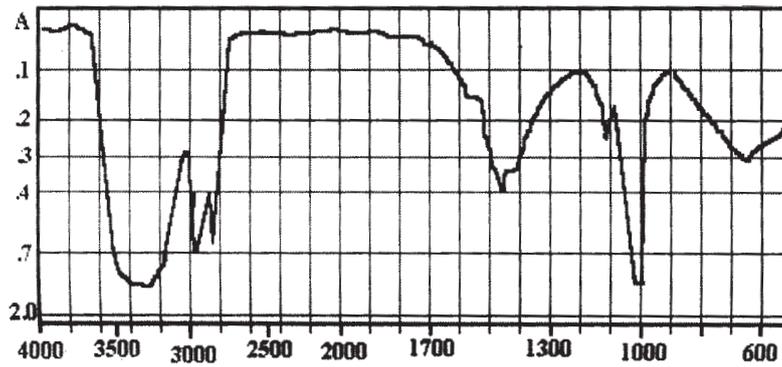
OR

- Q10)** a) Discuss the various IR sampling methods. [9]
b) Give the construction and working of HPLC. [9]

- Q11)** a) Identify the mass spectra of methyl bromide, methanol. [8]



Identify the IR spectra of ethanol, 2 butanone.



- b) Give the different constituents of lubricating oil and the additives used in it. [8]

OR

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

- i) Oxygen analyzer : Magnetic susceptibility method.
 - ii) Composition analysis by refractive index measurement. (Refractometer)
- b) Enlist the various fluid viscosity measurement methods. Describe any one of them. [6]



Total No. of Questions : 12]

SEAT No. :

P841

[4263]-363

[Total No. of Pages : 4

T.E. (Biotechnology)
HEAT TRANSFER
(2008 Pattern) (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) *Answer to the two sections should be written in a separate answer - book.*
- 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) Explain Fourier's law of heat conduction and Newton's law of cooling [4]
b) How is dimensional analysis useful in data reduction and data analysis? [4]
c) Explain convection and types of convection with suitable example. [4]
d) What is Buckingham pi-theorem and what are its limitations? [4]

OR

- Q2)** a) Several experiments were conducted to estimate the convection heat transfer coefficients for flow of a fluid through tube. Use Buckingham pi - theorem to develop an expression for correlating the experimental data. The factors affecting heat transfer coefficient are tube diameter, thermal conductivity of fluid, velocity of fluid, density of fluid, viscosity of fluid and specific heat of fluid. [12]
b) Discuss the mechanism of thermal conduction in gases and solids. [4]

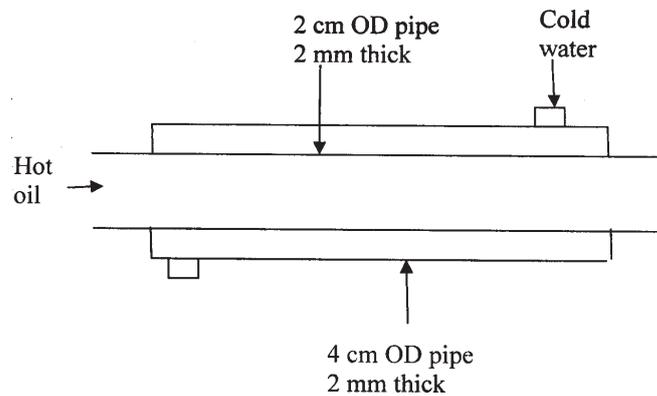
- Q3)** a) Calculate the critical radius of insulation for asbestos ($K = 0.17 \text{ W/m}^\circ\text{C}$) surrounding a pipe and exposed to room air at 20°C with $h = 3 \text{ W/m}^2^\circ\text{C}$. Calculate the heat loss from a 200°C , 5 cm diameter pipe when covered with the critical radius of insulation and without insulation. [8]
b) Show that when a system contains several different heat transfer resistances in series, the overall resistance is equal to the sum of the individual resistance. [8]
c) What are extended surfaces and how are they useful in heat transfer? [2]

OR

- Q4)** a) What is meant by thermal contact resistance? Upon what parameters does this resistance depend? [4]

P.T.O.

- b) Heat is transferred from hot oil to cold water in the concentric pipe heat exchanger shown in following figure. The heat transfer coefficient on the water side is $140 \text{ W/m}^2 \text{ K}$ and on the oil side is $150 \text{ W/m}^2 \text{ K}$. The pipes are made of galvanized iron (GI). Unfortunately, the rate of heat transfer is grossly inadequate and the oil is not cooled sufficiently. The engineer - in - charge decides to make the pipes out of copper (which has a higher thermal conductivity) instead of GI in order to increase the heat transfer rate. Has he made a good or a bad decision? [6]



- c) Calculate the heat flow rate per unit length through a long thick tube of inner diameter 2 cm and outer diameter 4 cm. Given (i) the thermal conductivity of the material of the tube is 0.58 W/mK (ii) the inner wall of the tube is at 70°C and the outer wall is at 100°C . [4]
- d) Define (i) fin effectiveness (ii) thermal boundary layer. [4]

- Q5)** a) An electric current is passed through a wire 1 mm diameter and 10 cm long. The wire is submerged in liquid water at atmospheric pressure, and the current is increased until the water boils. For this situation $h = 5000 \text{ W/m}^2 \text{ }^\circ\text{C}$. 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 ? (Thermal conductivity of GI = 30 W/mK) [6]
- b) What is boiling? What are its types? Explain the different regimes of pool boiling. [10]

OR

- Q6)** a) Differentiate between film condensation from dropwise condensation. [4]
- b) Derive the steady state two dimensional differential equation of heat convection in Cartesian co-ordinate. [12]

SECTION - II

- Q7)** a) Two parallel black plates 0.5 by 1 m are spaced 0.5 m apart. One plate is maintained at 1000 °C and the other at 500 °C. What is the net radiant heat exchange between the two plates? ($F_{12} = 0.285$ and $\sigma = 5.669 \times 10^{-8}$) [4]
b) State and explain the laws of black body radiation. [8]
c) Explain diffuse reflection. [4]

OR

- Q8)** a) Define [6]
i) Radiation.
ii) Black body
iii) Gray body
iv) Reflectivity
v) Shapefactor
vi) Emissivity.
b) Derive the equation for net exchange of radiant heat flux between two infinite parallel diffuse gray surfaces which are maintained at absolute temperatures T_1 and T_2 and have emissivities ϵ_1 and ϵ_2 , respectively. [10]

- Q9)** a) Hot, freshly sterilized nutrient medium is cooled in a double pipe heat exchanger before being used in a fermentation. Medium leaving the sterilizer at 121 °C enters the exchanger at a flow rate of 10 m³/h ; the desired outlet temperature is 30 °C. Heat from the medium is used to raise the temperature of 25 m³/h water initially at 15 °C. The system operates at steady state. Assume that nutrient medium has the properties of water. (i) What rate of heat transfer is required? (ii) Calculate the final temperature of the cooling water as it leaves the heat exchanger. [8]
b) A liquid stream is cooled from 70 °C to 32 °C in a double pipe heat exchanger. Fluid flowing counter currently with this stream is heated from 20 °C to 44 °C. Calculate the log mean temperature difference. [4]
c) What is LMTD? Draw the temperature profiles along the length for concurrent and countercurrent double pipe heat exchanger. [4]
d) Give the significance of Effectiveness - NTU method. [2]

OR

- Q10)** Water at the rate of 3.8 kg/s is heated from 38 to 55 °C in a shell and tube heat exchanger. On the shell side one pass is used with water as the heating fluid, 1.9 kg/s entering the exchanger at 93 °C. The overall heat transfer coefficient is 1419 W/m² °C, and the average water velocity in the 1.9 cm diameter tubes is 0.366 m/s. Because of space limitations the tube length must not be longer than 2.5 m. Calculate the number of tube passes, the number of tubes per pass, and the length of the tubes, consistent with this restriction. ($F = 0.88$) [18]

- Q11)** a) Write a material balance and energy balance over a single effect evaporator. [6]
- b) Define economy. Why economy of multiple effect evaporators is higher than single effect evaporator? [4]
- c) Explain feed forward feeding method in multiple effect evaporators. [6]

OR

- Q12)** a) An evaporator is to be fed with 5000 kg/h of solution containing 10% solute by weight. The feed at 40 °C is to be concentrated to a solution containing 40% by weight of the solute under an absolute pressure of 1.03 kg/cm². Steam is available at an absolute pressure of 3 atm (saturation temperature of 134 °C). The overall heat transfer coefficient is 1500 kcal/hr m² °C. Calculate (i) heat transfer area that should be provided (ii) the steam requirement. Treat the solutions as pure water for the purposes of enthalpy calculations. [12]

Temperature, °C	Enthalpy, kcal/kg	
	Vapor	Liquid
40	613.5	40.5
100	639.2	100
134	651.4	134.4

- b) Explain with neat sketch the working of agitated film evaporator. [4]



Total No. of Questions : 12]

SEAT No. :

P842

[4263]-364

[Total No. of Pages : 4

T.E. (Biotechnology)

COMPUTATIONAL TECHNIQUES AND BIOSTATISTICS

(2008 Pattern) (Semester - I)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Figures to the right indicate full marks.*
- 2) *Use of programmable calculator is not allowed.*
- 3) *Draw a neat sketch wherever necessary.*
- 4) *Make necessary assumptions wherever required.*
- 5) *Answer any three questions from Section I & any three questions from Section II.*

SECTION - I

- Q1)** a) In a certain experiment the mosquito morbidity rate “M” is related to the number of mosquitoes present per unit volume of air “V” by $M = a V^c$. Find the morbidity rate when the number of mosquitoes per unit volume of air is 45. **[9]**

M	350	400	500	600
V	61	26	7	26

- b) While testing a centrifugal pump the following data is obtained. It is assumed to fit the equation $y = a + bx + cx^2$, where “x” is the discharge in lit/sec and “y” is the head in meters of water. Find the values of a, b and c. Fit a function of the form $y = ax^b$ to the following data. **[9]**

x	2	2.5	3	3.5	4	4.5	5	5.5	6
y	18	17.8	17.5	17	15.8	14.8	13.3	11.7	9

OR

- Q2)** a) The following equation explains the relation between rise in blood sugar level “y” with the consumption of simple carbohydrates ‘x’ for a diabetic patient. Find the values of ‘a’ and ‘b’ which best fits the data? $y = ae^{bx}$ **[9]**

x	2	4	6	8	10
y	4.077	11.084	30.128	81.897	222.62

- b) The data gives the relation between the temperature T(°C) and length l (mm) of telephone cables during hot summer days. Test if this is so and find the best values of “a” and “b”. **[9]**

T	1	1.5	2	2.5
l	25	56.2	100	1.56

P.T.O.

- Q3)** a) The observed values of a function are 168, 120, 72 and 63 at the four positions 3,7,9 and 10 of the independent variable respectively. What is the best estimate you can give for the value of the function at position 6 of the independent variable. Apply Lagrange's formula? [8]

Independent Variable,x	3	7	9	10
Values of function,y	168	120	72	63

- b) Using Newton's method of Interpolation, estimate the number of employees earning Rs.240 or more but less than Rs. 250. [8]

Earning less than	200	250	300	350	400
Number of workers	296	599	804	918	966

OR

- Q4)** a) Evaluate $\Delta^2 \cos 2x$. [8]

- b) Express $3x^4 - 4x^3 + 6x^2 + 2x + 1$ as a factorial polynomial and find the differences of all orders. [8]

- Q5)** a) Find from the following table area bounded by the curve and x axis from $x = 7.47$ to $x = 7.52$. [6]

x	7.47	7.48	7.49	7.50	7.51	7.52
$f(x)$	1.93	1.95	1.98	2.01	2.03	2.06

- b) For a given set of data points $(x_0, y_0), (x_1, y_1), \dots, (x_n, y_n)$ of a function $y = f(x)$ where $f(x)$ is not known explicitly, $I = \int_a^b y dx$ between the limits a to b, derive Newton Cote's quadrature formula for numerical integration using Newton's forward difference formula. Deduce Trapezoidal rule from it. [10]

OR

- Q6)** Evaluate $I = \int_0^1 (1/(1+x)) dx$ between the limits 0 to 1 correct to three decimal places by using both Simpson's and Trapezoidal rule by using the following intervals. Compare the results in each case and test the accuracy for both methods. [16]

- a) $h = 0.5$
 b) $h = 0.25$
 c) $h = 0.125$

SECTION - II

- Q7)** a) Find a real root of the equation $f(x) = 1 + x - x^3 = 0$ by Bisection method. [8]
b) Find a real root of the equations $x^2 - y^2 + 3 = 0$ and $x^2 + y^2 = 13$ by Newton Raphson method. [8]

OR

- Q8)** a) Develop a recurrence formula for finding \sqrt{N} , using Newton Raphson method and hence compute $\sqrt{8}$ to three decimal places. [8]
b) Find a real root of the equation $3x^2 + 2x + 1 = 0$ by using Regula falsi method correct to three decimal places. [8]

- Q9)** a) Discuss in detail the factors to be considered while deciding sample size. [8]
b) Give a short notes on the principal objectives of classification of data. [8]

OR

- Q10)** a) Explain Judgment sampling? What are its merits and limitations? [8]
b) Write short notes on Semi logarithmic graphs. [8]

- Q11)** a) The table shown below summarizes the results obtained in a study conducted by a research organization with respect to the performance of four competing fairness creams among users. Test the hypothesis that incidence of fairness creams is independent of the brand of fairness creams used. The table values of chisquare for 6 degrees of freedom are 12.59 and 16.81 at 5% and 1% levels of significance respectively. [9]

	Brand A	Brand B	Brand C	Brand D	Total
No fairness	9	13	17	11	50
5% fairness	63	70	85	82	300
10% fairness	28	37	48	37	150
Total	100	120	150	130	500

- b) The Geometric mean of 10 observations was calculated as 28.6. It was later discovered that one of the observations was recorded as 23.4 instead of 32.4. Apply appropriate correction and calculate the correct geometric mean. [9]

OR

Q12) a) Data shows the particulars of fat content in cheese of 2 brands distributed to certain families as free samples. **[10]**

- i) Find the standard deviation of the combined data.
- ii) Which of the two distributions is more variable?

	Brand A	Brand B
Number of families	100	50
Mean fat content	60 gms	45 gms
Variance	9	4

b) For a random sample of 12 persons on a weight loss programme “A”, the decreased weight in pounds in a certain period were as follows. **[8]**

15 9 12 14 8 13 16 17 10 6

For another random sample of 12 persons, on a weight loss programme “B”, the decreased weight in pounds in the same period were as follows.

23 17 10 21 18 8 12 14 15 13 7 22

Test whether the weight loss programme “A” and “B” differ significantly as regards their effect on decrease in weight. Give the data.

Degrees of freedom 19 20 21 22 23

Value of “t” at 5% level 2.09 2.09 2.08 2.07 2.07



Total No. of Questions : 12]

P846

SEAT No. :

[Total No. of Pages : 4

[4263] - 368

T.E. (Biotechnology)

BIOSEPARATIONS - I

(Semester-II) (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 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) Describe the cell morphology of gram positive and gram negative bacteria. Explain in detail how morphological changes affect the choice selection of cell disruption process. **[6]**
- b) State different ways of mechanical & non-mechanical cell disruption technique. Discuss in detail methods of cell disruption with their advantages and disadvantages. **[10]**

OR

- Q2)** a) Write a short note on 'Bottlenecks in the field of downstream processing of bioproducts. **[8]**
- b) Explain in detail Rheological characteristics of fermentation broths'. **[8]**

P.T.O

- Q3)** a) Explain following methods of chromatography: [10]
- i) Displacement Analysis
 - ii) Elution Analysis
- b) Define the following terms with suitable formulae: [8]
- i) Resolution
 - ii) Retention time
 - iii) Separation factor
 - iv) Back Pressure

OR

- Q4)** a) What is thin layer chromatography? Describe the working procedure of TLC. [6]
- b) Discuss the concept of 'Tailing'. Explain in detail quality criteria for ideal chromatographic separation. [6]
- c) A chromatographic separation of a two component samples on a 60cm column gave the retention of two solutes X_1 and X_2 as 2.7 and 3.3 minute with base widths of the two chromatographic peaks being 0.24 and 0.3 minutes respectively. Calculate: [6]
- i) No. of theoretical plates
 - ii) Plate Height
 - iii) Resolution of two peaks
- Q5)** a) Explain with a neat sketch the construction and working of Disc stack centrifuge. List out its application. [8]
- b) What is Osmosis? Explain the principle of reverse osmosis with detail applications. [8]

OR

- Q6)** a) What is ultra filtration? Explain with neat sketches different modes of operation in ultrafiltration. [8]
- b) The centrifugal separation of a biomass of $80\ \mu\text{m}$ sized cells of density 1040kg/m^3 was carried out in a tabular centrifuge having diameter of 15cm and rotating at $1200\ \text{rpm}$. Calculate: [8]
- The residence time if the distance between the liquid surface and the axis of rotation was $0.8\ \text{cm}$, the liquid density and the liquid viscosity were $1000\ \text{kg/m}^3$ and $0.013\text{g/cm}\cdot\text{s}$ respectively.
 - What would be the volumetric capacity of the centrifuge if its length was $40\ \text{cm}$?
 - Calculate the sigma factor
 - What will be the time required for centrifuging $1000\ \text{lit}$ of broth?

SECTION - II

- Q7)** a) Explain basic principle of solvent extraction. How partition co-efficient plays important role in solvent extraction processes? [8]
- b) Explain in detail construction and working of rotary drum dryer and freeze dryer with a neat sketch. [10]

OR

- Q8)** a) Draw a neat sketch of saturation curve and explain steps involved in crystallization process [8]
- b) What is drying? Define terms bound moisture content and unbound moisture content with one example. [4]
- c) Draw a neat sketch of drying rate curve and explain how drying takes place in four stages. [6]

Q9) What is the scope of bioseparation techniques in research field? Explain how it differs from scope in industries. **[16]**

OR

Q10) What is scale up? Explain its importance in process economics aspect by giving one detailed case study. **[16]**

Q11) What are the processes used for the recovery of intracellular and extracellular products during primary recovery stage. **[16]**

OR

Q12) Write a detail note on 'Separation of Secondary Metabolites' with example. **[16]**

❖❖❖❖

Total No. of Questions : 12]

SEAT No. :

P934

[4263]-278

[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) *Attempt Q.No. 1 or Q.No. 2, Q.No. 3 or Q.No. 4, Q.No. 5 or Q.No. 6 from Section I.*
- 2) *Attempt Q.No.7 or Q.No. 8, Q.No. 9 or Q.No. 10, Q.No. 11 or Q.No. 12 from Section II.*
- 3) *Figures to the right indicate full marks.*
- 4) *Neat diagrams must be drawn wherever necessary.*
- 5) *Assume suitable additional data if necessary.*
- 6) *Use of nonprogrammable calculator is permitted.*

SECTION - I

- Q1)** a) Explain following addressing modes with suitable example. **[8]**
- i) Direct addressing mode.
 - ii) Indirect addressing mode.
 - iii) Base Index addressing mode.
 - iv) Branch addressing mode.
- b) Describe IEEE standard for single precision & double precision floating point numbers. **[4]**
- c) Draw & Explain Von Neumann Machine. **[4]**

OR

- Q2)** a) Perform following division using restoring & non - restoring algorithm.
Dividend = 1010 & Divisor = 0011 **[10]**
- b) Explain functional units of computer. **[6]**

- Q3)** a) Draw & explain multiple bus organization of processor unit with neat diagram. **[8]**
- b) Describe in brief any two methods of hardwired control unit design. **[8]**

OR

- Q4)** a) Write the control sequence for execution of instruction ADD R4, R5, R6 using single bus organization with flow chart. **[8]**
- b) Explain w.r.to micro - programmed control unit : **[8]**
- i) Microinstruction format.
 - ii) Microinstruction sequencing & encoding.

P.T.O.

- Q5)** a) Explain with neat diagram interface between printer and processor, Also explain communication between them. [10]
b) Discuss with suitable diagram programmed I/O & interrupt driven I/O. [8]

OR

- Q6)** Write short notes on : [18]
a) Cache memory.
b) USB Bus
c) PCI Bus

SECTION - II

- Q7)** a) Explain with neat diagram architecture of 8086 microprocessor. [8]
b) Write ALP to find largest number in array of 8-bit numbers. Array starts from memory location 3000 : 1000 to 3000 : 1009. Store result at 4000 : 1000. [8]

OR

- Q8)** a) State difference between software & hardware interrupt. Give example of each. Also explain action taken by processor to service these interrupts. [8]
b) Explain functions of following pins of microprocessor 8086. [8]
i) NMI
ii) $\overline{BHE/S7}$
iii) \overline{TEST}
iv) \overline{LOCK}
v) $READY$
vi) MN/\overline{MX}
vii) ALE
viii) M/\overline{IO}

- Q9)** a) Explain with neat diagram register model of 80386 microprocessor in protected mode. [8]
b) What is paging? How 80386 MMU performs linear to physical address translation with the help of page directory, page table & page frame. [10]

OR

- Q10)** Describe w.r.to to 80386 : **[18]**
- a) Describe TSS & its role in multitasking.
 - b) What is segment selector? Explain selector format in detail.
 - c) Draw & Explain flag register.

- Q11)**
- a) Draw & explain ARM core data flow model. **[6]**
 - b) Describe in brief different processor modes of ARM core. **[6]**
 - c) Draw & Explain CPSR register of ARM core. **[4]**

OR

- Q12)**
- a) Compare RISC & CISC processor. **[6]**
 - b) Write short note on : **[6]**
 - i) Tightly coupled multiprocessor system.
 - ii) Loosely coupled multiprocessor system.
 - c) Describe in brief super scalar & super pipelining. **[4]**



Total No. of Questions : 12]

SEAT No. :

P933

[4263]-269

[Total No. of Pages : 2

**T.E. (Electronics Engineering)
INDUSTRIAL MANAGEMENT
(2008 Pattern) (Semester - II) (New)**

Time : 3 Hours]

[Max. Marks : 100

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 and Q.11 or 12.
- 2) Answer to the two sections should be written in separate answer books.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Figures to the right indicate full marks.

SECTION - I

- Q1)** a) Explain principles and techniques of scientific management. [10]
b) What is the importance of decision making in a business? Describe the process of decision making under certainty, uncertainty and risk. [8]

OR

- Q2)** a) Explain organization chart. Explain types of organization with advantages and disadvantages. [10]
b) Write short note on Henry Fayol's Administrative model. [8]

- Q3)** a) Explain Mintzberg's 5P strategies. [8]
b) Which are the various features of strategic management? Explain with examples. [8]

OR

- Q4)** a) Explain BCG (Boston Consultant Group) matrix. [8]
b) Explain the significance of ETOP of an organization. Which steps are followed in preparation of ETOP? [8]

- Q5)** a) Define TQM & list out salient features of TQM implementation. [8]
b) What is Pokka Yoke? Explain its characteristics. [8]

OR

- Q6)** a) Write short note on Features of Kaizen. [8]
b) Write short note on Pareto chart and analysis. [8]

P.T.O.

SECTION - II

- Q7)** a) Which are the limiting factors of a project? Explain various stages in project life cycle. [10]
b) Explain PERT Concept of multiple times. [8]

OR

- Q8)** a) What is EOQ (Economic Order Quantity)? Give its advantages and disadvantages. [10]
b) What is project management? Discuss various primary challenges of project management. [8]

- Q9)** a) Discuss scope of Human Resource Management. Explain objectives of Human Resource Management. [8]
b) What are components of decision support system? Explain decision making tools. [8]

OR

- Q10)** a) State purpose of training. What are objectives of training? Also give benefits of training. [8]
b) Explain Human Resource Information System. [8]

- Q11)** a) Give achievements by using BPR model. Explain BPR implementation steps and tasks. [8]
b) Explain ERP Architecture along with modules included. What are benefits of ERP solutions? [8]

OR

- Q12)** a) Discuss E - Commerce system. Explain different business models of E - Commerce. [8]
b) Define BPR. State aspects of BPR model. What are fundamental tenets of BPR? [8]



Total No. of Questions : 12]

SEAT No. :

P958

[4263]-230

[Total No. of Pages : 3

T.E. (Automobile)

AUTOTRONICS

(2008 Pattern) (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) *Figures to the right indicate full marks.*

SECTION - I

- Q1)** a) Explain basic principles of measurement such as **[8]**
- i) Inductive
 - ii) Piezoelectric
- b) Explain following characteristics of measurement system **[8]**
- i) Sensitivity
 - ii) Dead Band
 - iii) Frequency Response
 - iv) Accuracy & Precision

OR

- Q2)** a) Explain components of measurement system and write a note on stages of measurement. **[8]**
- b) Write a short note on following : **[8]**
- i) Thermoelectric principle of measurement.
 - ii) Photovoltaic principle of measurement.

- Q3)** a) Write a note on temperature sensors used in Automobile. **[8]**
- b) Explain working of knock sensor and write note on how it is interfaced with on - board diagnosis. **[8]**

OR

- Q4)** a) Explain how air - fuel ratio is controlled in automobile to enhance mileage. Write down sensors used. **[8]**

P.T.O.

- b) Compare different temperature sensors based on following characteristics [8]
- i) Sensitivity
 - ii) Accuracy & Precision
 - iii) Principle of working

Q5) Write a note on following (Any Three) [18]

- a) A/D Converter
- b) Ladder diagram
- c) Nyquist frequency
- d) Components of power window
- e) Internal Relays & Counters

OR

Q6) Write a note on following (any three) [18]

- a) Types of D/A converters
- b) Engine control system
- c) Sequential logic
- d) Types of A/D converters

SECTION - II

Q7) a) List down components of EMS & explain its working. [8]

b) Explain working of fuel control MAPs [8]

OR

Q8) a) Explain working of sequential injection technique. [8]

b) Explain working of cold & warm starting of Engine [8]

Q9) a) Write down working of ABS system. [8]

b) Write a note on electronic control of suspension system. [8]

OR

Q10) a) Explain working of collision avoidance system in detail. [8]

b) What is meant by Cruise control & explain its working. [8]

Q11) Write a short note on following (any three)

[18]

- a) Electronic stability
- b) Air Bag system
- c) Variable valve Timing
- d) Collapsible steering system

OR

Q12) Write a short note on following (any three)

[18]

- a) Belt tensioner
- b) Central Locking
- c) Ride Height control system
- d) Self - diagnosis



Total No. of Questions : 8]

SEAT No. :

P1225

[Total No. of Pages : 2

[4263] - 16

T.E. (Petroleum Engg.)

DRILLING & PRODUCTION OPERATIONS

(2003 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) *Question Nos. 1 and 5 are compulsory. Out of the remaining attempt 2 questions from Section - I and 2 questions from Section - II.*
- 3) *Answers to the two sections should be written in separate books.*
- 4) *Neat diagrams must be drawn wherever necessary.*
- 5) *Figures to the right indicate full marks.*
- 6) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 7) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) Discuss different types & advantages of multilateral wells. **[10]**

b) Write the use of following: **[8]**

- i) Rotary table.
- ii) Draw works.
- iii) Kelly bushing.
- iv) Drill collars.

Q2) Discuss different down hole problems as **[16]**

- a) Reactive shale.
- b) Kick.
- c) Lost circulation.
- d) Stuck up.

P.T.O.

- Q3)** a) Draw circulation system on a drilling rig. Discuss different pressure losses in circulation of drilling fluid. [8]
b) What is Coring? Discuss conventional Coring method in detail. [8]
- Q4)** Write short notes on: [16]
a) BOP.
b) Hoisting system.
c) Water base Mud.
d) Functions of drilling fluid.

SECTION - II

- Q5)** a) Explain casing policy with suitable sketch. [10]
b) Explain conventional methods of well perforations in brief. [8]
- Q6)** a) Discuss primary cementing operation with suitable sketch. [8]
b) What are different well completion methods. [8]
- Q7)** a) Discuss different well stimulation techniques in brief. [8]
b) Discuss different work-over operations in detail. [8]
- Q8)** Write short notes on: [16]
a) X-Mas tree.
b) Wire line operations.
c) Well head equipments.
d) Packers.



Total No. of Questions : 8]

SEAT No. :

P1227

[Total No. of Pages : 2

[4263] - 222
T.E. (Mech. S/W)
BEHAVIOURAL SCIENCE
(2008 Pattern) (Sem. - I) (Elective - I)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Define the purpose of an Industrial enterprise? Discuss in detail factors influencing the governing the enterprise. **[8]**
- b) State and explain new Industrial Policy 2012 in India. **[8]**
- Q2)** a) Suggest and explain a suitable organisational structure for Automotive Industry. **[6]**
- b) Explain the following theories of motivation **[10]**
- i) Maslow's hierarchy of needs.
- ii) Herberg's two factory theory.
- Q3)** a) Explain the effect of social and political environment on Industrial behaviour. **[10]**
- b) Discuss influence of people on the performance of the enterprise. **[6]**

P.T.O.

Q4) Write a short note on (Any Three): **[18]**

- a) Stimulus - Response in connection in learning.
- b) Co-operative Society.
- c) Industrial licensing.
- d) Personality traits.
- e) Wage legislations.

SECTION - II

Q5) State and explain nature causes of conflict, what are the characteristics of interpersonal and intergroup conflicts. How conflicts will be resolved. **[16]**

Q6) a) State and explain types of groups, also discuss in detail characteristics of formal group and informal group. **[10]**

b) Define leadership. State functions of a leader and discuss quality required for a good leader. **[6]**

Q7) a) Explain in detail Homan's model of small group behaviour. **[6]**

b) Differentiate between Mc Gergor's theory X and theory Y. Which theory you suppose to be best in today's situation & why? **[10]**

Q8) Write a short note on (Any Three): **[18]**

- a) Group dynamics.
- b) Qualities of good interviewer.
- c) Principles of communication.
- d) Interview Technique.
- e) Written Communication.



Total No. of Questions : 6]

SEAT No. :

P1233

[Total No. of Pages : 2

[4263] - 293
T.E. (Printing)
COLOUR MANAGEMENT & STANDARDIZATION
(2008 Pattern) (Semester - I)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

Q1) Answer any four:

[16]

- a) Reflection and Absorption of Process Colour C,M,Y,K.
- b) Visible Spectrum.
- c) Trapping.
- d) Graybalance.
- e) Subtractive Colour Theory.

Q2) Solve any two:

[16]

- a) Human trichromancy and Opponency theory of human vision with neat diagram.
- b) Explain any two:
 - i) Simultaneous contrast.
 - ii) Human Matching Functions.
 - iii) Scotopic vision and Photopic vision.
- c) Explain the interaction of light with object in terms of transmission, absorption and scattering.

P.T.O.

- Q3) Answer any Three: [18]**
- Write down the Colour Temperature and tristimulus values of A, D65 and F2 Illuminant.
 - Calculate Lab values for sample : $X = 64.5$, $Y = 24.85$, $Z = 18$. Consider D50 and D65 Illuminant.
 - What is color tolerance ellipse? Explain it for various colour spaces.
 - Explain CIE xyY space with its application and disadvantages.

SECTION - II

- Q4) Answer any two: [16]**
- Differentiate Densitometer, Colorimeter and Spectrophotometer.
 - Explain the importance of viewing and illuminant geometry for color measurement.
 - Explain the term the color difference. Also explain basic delta E CIELAB colour difference equations.

- Q5) Answer any two: [16]**
- Explain Monitor Calibration and Monitor Profiling.
 - Explain the sentence 'Profile is valid for certain condition'.
 - Explain the 4 c's of color management.

- Q6) Solve any two: [18]**
- Explain the term standardization and need of press standardization.
 - How to determine Optimum Density value for specific ink/paper/press combination.
 - Short notes on:
 - Density.
 - Contrast.
 - Color management workflow.



Total No. of Questions : 6]

SEAT No. :

P1234

[Total No. of Pages : 3

[4263] - 295

T.E. (Printing)

**MANAGEMENT INFORMATION SYSTEM & COST ESTIMATION
(2008 Pattern) (Semester - I)**

Time : 3 Hours]

[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)** a) Explain the term Management with reference to P-D-C-A approach. [8]
b) List any eight characteristics of Sole proprietorship type of firm. [8]

OR

- a) Comment on the term 'Management by Objectives' with suitable examples. [8]
b) List any eight characteristics of Partnership type of firm. [8]

- Q2)** Explain various modules available in MIS software and their application in any small to medium size printing organization with suitable examples. [16]

OR

Explain the terms Order Qualifier and Order Winner with reference to Competitive Environment & with suitable examples. [16]

P.T.O.

- Q3)** a) Explain in brief perfect competitive, Imperfect competitive and Monopoly type of market with suitable examples. [9]
- b) Explain the terms 'Industry, Firm and Plant' with suitable example. [9]

OR

Explain the concept 'Stake Holders of an Organization' and their role in MIS with suitable examples. [18]

SECTION - II

- Q4)** a) Explain the Jobbing type of production activity with suitable examples. [8]
- b) Explain the term Database and its role in decision making with suitable examples. [8]

OR

- a) Explain the Batch type of production activity with suitable examples. [8]
- b) What are the various methods to ensuring the security of digital information, explain with suitable examples. [8]

Q5) The standard production of a particular product is 20 units / day & the rate of wages is Rs. 60 per unit if daily production is 20 units or more. The rate of wages is Rs. 50 / unit if the production is less than 20 units / day. Cost of material is Rs. 30 / unit. It is proposed to charge factory overhead according to one of the following method, [16]

- a) 100% on labor cost.
- b) 80% on prime cost.

Calculate the data in the form of suitable cost sheet statement finding out factory cost / unit under each of the above method if daily production is 15 units, 20 units and 25 units.

OR

- a) Explain various functions of costing in an organization with suitable examples. [8]
- b) Comment on 'Cost is a Fact, Profit is Opinion and Price is a Policy' with suitable examples. [8]

- Q6)** a) Find out the ream weight of paper in kgs. If the paper GSM is 130 and size 15" x 20". [9]
- b) Explain the term Estimation along with its purpose and function. [9]

OR

Find out the number of plates required to print the following job.

Text pages : 64 (Black & Magenta)

Cover pages : 04 (YMCK and special Gold)

Size of book : Demi $\frac{1}{4}$

Size of machine available for printing : 23" x 36"

Quantity to be printed : 3000. [18]



Total No. of Questions : 12]

SEAT No. :

P1303

[Total No. of Pages : 2

[4263] - 26

T.E. (IT)

SOFTWARE ENGINEERING

(2003 Pattern) (Semester - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates :

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

SECTION - I

- Q1)** a) Explain the incremental model with the help of a diagram. [8]
b) Explain the CMMI model. [8]

OR

- Q2)** a) Explain the spiral model with the help of a diagram. [8]
b) Explain how process patterns help in developing computer software. [8]

- Q3)** a) What are Hatley and Pirbhai extensions? Explain the relationship between data and control models. [8]
b) What is the importance of communication practices? What are the principles of communication practices? [8]

OR

- Q4)** a) What is the importance of testing practices? What are the principles of testing practices? [8]
b) Explain with the help of diagram product engineering hierarchy. [8]

- Q5)** a) Define the following terms with respect to data modeling with suitable example data object, attributes, relationship, cardinality and modality. [10]
b) Draw data flow diagram (level 0, 1, 2) for ATM. [8]

OR

- Q6)** a) Briefly discuss each of the elements of an analysis model, indicate what each contributes to the model, how each is unique and what general information is presented by each. [10]
b) List and explain the different requirement engineering tasks. [8]

P.T.O.

SECTION - II

- Q7)** a) Explain in detail following architectural style : **[8]**
i) Data-Centered Architecture.
ii) Data-Flow Architecture.
iii) Call and Return Architecture.

- b) Explain how the analysis model is translated into design model. **[8]**

OR

- Q8)** a) Explain the different design concepts. **[8]**

- b) Explain the architectural context diagram in detail with an example. **[8]**

- Q9)** a) What are direct and indirect measures of software processes? Explain size-oriented-metrics and function-oriented-metrics. **[8]**

- b) Explain web engineering project metrics. **[8]**

OR

- Q10)** a) What are the objectives of measurements? Explain object oriented metrics. **[8]**

- b) Explain the four Ps of the management spectrum for project management. **[8]**

- Q11)** a) What is meant by software restructuring? Explain the code and data restructuring. **[10]**

- b) Explain in detail software reengineering process model. **[8]**

OR

- Q12)** a) What is the need for software configuration management? What are SCM features? **[10]**

- b) Explain forward engineering for client/server architecture. **[8]**

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Total No. of Questions : 12]

SEAT No. :

P721

[Total No. of Pages : 3

[4263] - 2
T.E. (Civil)
GEOTECHNICAL ENGINEERING
(2003 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 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) Clearly explain the use of knowledge of geotechnical in construction of
- i) Earth Dam.
 - ii) Road Construction. [6]
- b) Explain soil as a three phase system. [6]
- c) Define the terms : Water content, state different methods to find water content of a given soil. [6]

OR

- Q2)** a) State the different methods to determine field density of soil. Explain any one of them. [6]
- b) A soil sample 5.20 N in wet condition and 4 N in dry condition. If its volume is found to be 270 ml than what is [8]
- i) Water content.
 - ii) Dry density (ρ_d).
 - iii) Void ratio (e).
 - iv) Degree of saturation.
- c) What is soil exploration and list out the purpose of it. [4]
- Q3)** a) Explain with neat sketch falling head permeability test. [6]
- b) Calculate the coeff. of permeability of a soil sample, 6cm in height and 50cm² in cross sectional area, if quantity of water equal to 430ml passed down in 10 minutes under an effective constant head of 40cm. [6]
- c) State and explain the factors affecting permeability of soil. [4]

P.T.O.

OR

- Q4)** a) Explain with neat sketch constant head permeability test. [6]
b) In a falling head permeability test on a silty clay sample, the following result were obtained : sample length 120mm, sample diameter 80mm, initial head 1200mm, final head 400mm, time for fall in head 6 minutes, stand pipe diameter is 4mm. Find the coefficient of permeability of soil in mm/sec. [6]
c) What are the properties of flow net. [4]

- Q5)** a) State and explain any four factors which influence compaction of soil. [6]
b) Draw a moisture density curve and obtained MDD and OMC with following records. [6]

Bulk wt. density (kN/m³)	16.50	17.80	19.50	19.80	18.50	18.00
Water Content %	10	13	16.5	20	24.5	29

- c) What is pressure bulb? Explain its use. [4]

OR

- Q6)** a) Write a short note on Neutral and effective Stress. [4]
b) Explain the following methods of stress distribution in soil. [6]
i) Equivalent point load method.
ii) Approximate stress distribution method.
c) State Boussinesq's equation for analysis for stress distribution in soil due to a concentrated load and meaning of all terms. [6]

SECTION - II

- Q7)** a) Write a note on Vane Shear Test. [6]
b) What are the advantages and disadvantages of direct shear test. [6]
c) The shear strength parameters of a given soil are, $C = 0.26 \text{ kg/cm}^2$ and $\phi = 21^\circ$. Undrained triaxial tests are to be carried out on specimens of this soil. Determine deviator stress at which failure will occur if the cell pressure be 2.5 kg/cm^2 . [6]

OR

- Q8)** a) What are the three standard triaxial shear tests with respect to drainage condition? [6]
b) What are the factor affecting shear strength of soil. [6]
c) A Vane 10.8cm long, 7.2cm in diameter, was pressed in to the soft clay at the bottom of the bore hole. Torque was applied and value at failure was 45 Nm. Find the shear strength of the clay on a horizontal plane. [6]

- Q9)** a) State assumption in Rankine's earth pressure theory. [4]
b) What is Taylor's stability numbers? What is its utility in the analysis of stability of slopes. [6]
c) Define the terms Active Earth Pressure Passive Earth Pressure with sketches. [6]

OR

- Q10)** a) What is 'earth pressure at rest' and state equation for the same. [4]
b) Differentiate between Rankine's and Coulomb's theories of earth pressure. [6]
c) Explain effect of wall moment with respect to earth pressure. [6]

- Q11)** a) What are different modes of failure of rocks? [6]
b) Explain durability of rocks. [4]
c) Write a short note on : [6]
i) Porosity of rocks.
ii) Permeability of rocks.

OR

- Q12)** a) What are different index properties of rocks? [6]
b) Write a short note on : [10]
i) Geological classification of rocks.
ii) Shear strength of rocks.

XXXX

Total No. of Questions : 12]

SEAT No. :

P723

[Total No. of Pages : 4

[4263]-5
T.E. (Civil)
TRANSPORTATION ENGINEERING - I
(2003 Pattern)

Time :3 Hours]

[Max. Marks :100

Instructions to the candidates :

- 1) *Solve Q1 or 2, Q3 or 4, Q5 or 6 from Section I & Q7 or 8, Q9 or 10, Q11 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, electronic pocket calculator and steam tables is allowed.*
- 6) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Discuss the role played by the Indian Railways in economic and industrial progress of a nation. [4]
- b) Describe the classification of Indian Railways on speed criteria. [4]
- c) State and explain the factors affecting the choice of a particular gauge. [4]
- d) Write a short note on concept of Over Dimensioning Consignment (ODC). [4]

OR

- Q2)** a) Explain in a brief working of a Krautkrammer Rail Flaw detector. [4]
- b) State and explain in a brief the stresses produced in a railway track. [4]
- c) Define sleeper density. What are the various factors governing the sleeper density. [4]
- d) Write a short note on Types of Ballast. [4]
- Q3)** a) What are the advantages of welded rails. Explain in brief the Alumino Thermit welding. [4]
- b) Describe in a brief the different types of surveys to be carried out in the case of a new railway project. [4]
- c) What is Elastic fastening. What are the requirements of elastic fastening. [4]

P.T.O.

- d) State the limits of Grade compensation for BG, MG & NG. If the ruling gradient is 1 in 150 on a particular section of a BG track and at the same time a curve of 4 degree is situated on this ruling gradient, what should be the allowable ruling gradient. [6]

OR

- Q4)** a) If a 8 degree curve track diverges from a main curve of 5 degree in an opposite direction in the layout of a B.G. yard, calculate the superelevation and the speed on the branch line, if the maximum speed permitted on the main line is 45 kmph. [6]
- b) Write a short note on Grade Compensation on curves. [4]
- c) Define the following terms : [4]
- i) ANC and TNC
 - ii) Facing points and Trailing points of Turnouts.
- d) Explain the following terms in brief : [4]
- i) Momentum Gradient.
 - ii) Pusher Gradient.
- Q5)** a) What is plate laying. Explain any one method in brief. [4]
- b) Define a railway station. What points are to be considered while selecting a site for a new railway station. [4]
- c) Write a short note on STOP or Semaphore signal. [4]
- d) Define Signalling. What are objects of providing Signalling. [4]

OR

- Q6)** a) Write a short note on working of a Triangle. [4]
- b) Explain in brief the necessity of Metro railway and sky bus in Metro cities of India. [4]
- c) Describe in brief the necessity of Track maintenance, Also enlist the items of track maintenance. [4]
- d) Write a short note on 'Marshalling Yards'. [4]

SECTION - II

- Q7)** a) What factors decide the method to be adopted for tunnelling. [4]
- b) Explain in brief the following : [6]
- i) Egg shape Tunnel
 - ii) Horse shoe shape Tunnel
 - iii) Shaft
 - iv) Pilot Tunnel

- c) State the various types of drilling patterns. What factors govern the selection of a particular drilling pattern. [4]
- d) Describe NATM method of tunnelling. [4]

OR

- Q8)**
- a) Explain the following terms : [6]
 - i) Hard Ground
 - ii) Running Ground
 - iii) Soft Ground
 - iv) TBM
 - b) State the usual cross sections adopted for tunnel. Which section is suitable to carry sewage and why. [4]
 - c) Define Twin Tunnels. Under what circumstances are they useful. [4]
 - d) Explain in detail full face method of tunnelling. [4]
- Q9)**
- a) What are the various types of explosives used in tunnel driving operation. How quantity of explosive required is estimated. [4]
 - b) Define ventilation. What are the requirements of a tunnel ventilation system. [4]
 - c) Write a short note on Rock Bolting. [4]
 - d) Explain the importance of lighting in tunnel. [4]

OR

- Q10)**
- a) Why dust control is necessary during tunnel driving. How it is controlled. [4]
 - b) Define Mucking. State the various methods of mucking. Explain any one in brief. [4]
 - c) Write a short note on safety precautions to be taken while tunnelling through hard Rock. [4]
 - d) Bring out the sequence of operation for concrete lining in tunnel. [4]
- Q11)**
- a) What are the various points to be considered while selecting a site for a harbour. [4]
 - b) Differentiate between : [4]
 - i) Harbour and Port
 - ii) Dry Dock and Wet Dock
 - c) Differentiate between Natural and seminatural Harbour. [4]
 - d) What is jetty and how does it differs from wharf. [4]

OR

- Q12)** a) Define the following terms : **[4]**
- i) Dolphins
 - ii) Breakwater
 - iii) Fender
 - iv) Quay
- b) Comment on a statement 'Every port is a harbour but every harbour is not a port'. **[4]**
- c) Explain in brief merits & demerits of water transportation. **[4]**
- d) Write a short note on classification of Harbours. **[4]**



Total No. of Questions : 12]

SEAT No. :

P724

[Total No. of Pages : 2

[4263]-6

**T.E. (Mechanical Sandwich)
PLANT ENGINEERING
(2003 Pattern) (Elective - I)**

Time :3 Hours]

[Max. Marks :100

Instructions to the candidates :

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

SECTION - I

- Q1)** a) What do you understand by Plant Engineering? Explain Scope of it. [8]
b) Discuss roll of the following in Plant Engineering [8]
i) Material handling system.
ii) Facilities Planning.

OR

- Q2)** a) What is Productivity? How it affected in improving plant efficiency. Explain. [8]
b) State advantages, disadvantages and applications of Various layout used in Industry. [8]
- Q3)** a) State and discuss various factors affecting on selection of site. [8]
b) What do you understand by Systematic Layout Planning? Discuss with suitable example. [8]

OR

- Q4)** a) Describe in brief the following with reference to plant layout. [8]
i) PQRST Analysis.
ii) REL Chart.
b) Explain Role of Computers in Planning and Evaluation of Plant. [8]
- Q5)** a) Explain and describe various Material Handling equipments used in Plant layout. [8]
b) What are the types of Plant Maintenance? Describe them in detail. [10]

P.T.O.

OR

Q6) Write Short note on the following (Any Three) : **[18]**

- a) Concept of Flow.
- b) Group Technology.
- c) Management Information System.
- d) Types of Layouts.
- e) Kings Rank order Clustering.

SECTION - II

Q7) Describe various Safety measures to be taken for the Chemical Industry. Justify your answer with examples. **[16]**

OR

Q8) a) Explain the following provisions made in industry for Safety measures. **[8]**

- i) Fire Prevention and Fire fighting.
- ii) Accident prevention practices.

b) What do you understand by Auxiliary services in industry? Explain. **[8]**

Q9) a) What methods and provisions are incorporated for Waste disposal in today's industry? Explain. **[8]**

b) Describe the following with regards to work piece control. **[8]**

- i) Equilibrium theory.
- ii) Geometry Theory.

OR

Q10) What do you understand by Systems Engineering? What is its structure and constraints, explain. **[16]**

Q11) a) Explain role of CRAFT and CORELAP in location of new plant equipment in existing plant. **[8]**

b) How to evaluate techno-economic life of a plant? Explain. **[10]**

OR

Q12) Write short note on the following (Any three) : **[18]**

- a) L.C.C.
- b) Replacement Strategy.
- c) Failure rate and Hazard rate.
- d) Alternate location Theory.
- e) Total Productive Maintenance.



Total No. of Questions : 12]

SEAT No. :

P725

[Total No. of Pages : 2

[4263]-7
T.E. (Production)
MANUFACTURING PROCESSES - II
(2003 Pattern)

Time :3 Hours]

[Max. Marks :100

Instructions to the candidates :

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

SECTION - I

- Q1)** a) Explain with neat sketch TIG welding process and write advantages of it? [8]
b) Discuss the standard marking system of welding electrodes? [8]

OR

- Q2)** a) Explain the MIG and discuss advantages and disadvantages of GMAW. [8]
b) What is the arc blow and write it causes? [8]
- Q3)** a) Explain the reducing flame with its application? [8]
b) Discuss resistance welding process in detail? [8]

OR

- Q4)** a) Explain gas cutting flame with its application? [8]
b) Explain the spot and seam welding processes? [8]
- Q5)** a) Explain the friction welding and write its advantage and limitation. [10]
b) Write short notes on 'Thermit welding'. [8]

OR

- Q6)** a) Compare welding, braze welding and brazing? [10]
b) Explain various types of solders and process? [8]

P.T.O.

SECTION - II

- Q7)** a) Explain directional solidification with neat sketch. [8]
b) Compare Pressurized gating system and Unpressurized gating system. [8]

OR

- Q8)** a) Explain function and purpose of gating system in detail. [8]
b) What is gating ratio? Explain in detail. [8]

- Q9)** a) What is gear shaping and discuss its advantage and disadvantage? [8]
b) Explain the gear hobbing, with its application? [8]

OR

- Q10)** a) What is the gear shaving? Explain in detail? [8]
b) Discuss the gear generating and gear cutting processes? [8]

- Q11)** a) Explain with neat sketch thread rolling process in detail? [10]
b) Discuss thread milling? [8]

OR

- Q12)** a) Explain thread grinding and write its advantage? [10]
b) Discuss thread whirling? [8]



Total No. of Questions : 12]

SEAT No. :

P726

[Total No. of Pages : 3

[4263]-10
T.E. (Electrical)
ELECTRICAL MACHINES - II
(2003 Pattern)

Time :3 Hours]

[Max. Marks :100

Instructions to the candidates :

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

SECTION - I

- Q1)** a) Explain with neat sketches, how rotating magnetic field is developed when 3 phase balanced supply is given to the stator windings of a 3 phase induction motor. Give the frequency of such field and its magnitude. **[10]**
- b) The frequency of the e.m.f. in the stator of a 4 pole induction motor is 50 Hz and that in the rotor is 1.5 Hz. Calculate : **[8]**
- i) synchronous speed
 - ii) slip
 - iii) at what speed is the motor running?

OR

- Q2)** a) Sketch the torque-slip characteristics of a 3 phase induction motor indicating starting torque, maximum torque and the operation region. How do starting and maximum torque vary with the rotor resistance?**[10]**
- b) A 3 phase slip ring induction motor gives a reading of 60 V across slip rings when at rest with normal stator voltage applied. The rotor is star connected and has an impedance of $(0.8 + j6) \Omega$ per phase. Find the rotor current when the machine is, **[8]**
- i) at standstill with the slip rings joined to a star connected starter with a phase impedance of $(4 + j3) \Omega$.
 - ii) running normally with a 5% slip.

P.T.O.

- Q3)** a) Starting from the first principle, develop the equivalent circuit of 3 phase induction motor. Draw and explain the phasor diagram. [8]
- b) A 6 pole, 50 Hz 3- ϕ induction motor running on full load develops a useful torque of 150 Nm at a rotor frequency of 1.5 Hz. Calculate the shaft power output. If the mechanical torque lost in friction is 10 Nm, determine :
- rotor copper loss,
 - the input to the motor,
 - the efficiency.
- The total stator loss is 700 W. [8]

OR

- Q4)** a) In a 3 phase induction motor show that,
 $P_g : P_{rc} : P_{md} = 1 : S : (1-S)$
 Where, P_g = input power to rotor
 P_{rc} = rotor copper loss
 P_{md} = mechanical power developed by the rotor. [8]
- b) What are the various losses occurs in a 3 phase induction motor? Mention where they occur. Describe a method for separation of friction and windage losses from the no load losses of the motor. [8]
- Q5)** a) Explain with the help of diagram, construction and principle of operation of a double cage induction motor. Draw its torque speed characteristics. [8]
- b) A 3-phase cage induction motor has a short-circuit current equal to 5 times the full load current. The full load slip is 4%. Find the starting torque as a percentage of full load torque if the motor is started by,
- direct switching to the supply,
 - star delta starter. [8]

OR

- Q6)** a) Describe the working of a star delta starter and a direct on line starter with the help of connection diagram. [8]
- b) Draw the circle diagram for a 3- ϕ , 6 pole, 50 Hz, 400 V, star connected induction motor from the following data (line values)
 No load test: 400 V, 10A, 1400 W
 Short circuit test : 200 V, 55A, 7000W.
 The stator loss at standstill is 60% of the total copper loss and full load current is 30A. From the circle diagram determine: Power factor, slip, efficiency and torque at full load. [8]

SECTION - II

- Q7)** a) Explain the principle of induction generator. What are its limitations? [8]
b) Explain phenomena of cogging, crawling and noise production in a 3 phase induction motor. [8]

OR

- Q8)** a) Explain v/f method for speed control of 3 phase induction motor? [8]
b) What are the various methods of braking of a 3 phase induction motor? Explain any one method with a circuit diagram. [8]

- Q9)** a) Using double revolving field theory, explain why a single phase induction motor is not self starting? Hence draw its torque – slip characteristics for both forward and backward running motor. [8]
b) Explain the working principle of : [8]
i) Split phase.
ii) Capacitor start single phase induction motor with the help of neat sketches.

OR

- Q10)** a) Discuss the procedure for determining the parameters of equivalent circuit of a single phase induction motor. [8]
b) Explain with suitable sketches the construction and working of a single phase shaded pole motor. How will you reverse the direction of rotation of this motor? Show this with the help of suitable diagram. [8]

- Q11)** a) Briefly describe the construction of a fractional kW single phase series motor. Sketch its phasor diagram. Mark various emf s and voltage drops on it. State the expressions for the magnitude of various emfs induced in its windings and their frequencies. [10]
b) Draw the circle diagram of a universal motor and indicate on it various performance parameters of the motor. [8]

OR

- Q12)** a) What problems are noticed when a d.c. series motor is connected across a.c. supply of an equivalent voltage rating? How these problems are overcome? [6]
b) Explain construction and working of a universal motor? [6]
c) What are the differences in construction between A.C. and D.C. series motor? [6]



Total No. of Questions : 12]

SEAT No. :

P727

[Total No. of Pages : 3

[4263]-12

T.E. (Printing Engineering & Communication)
PRINTING PROCESS INSTRUMENTATION
(2003 Pattern)

Time :3 Hours]

[Max. Marks :100

Instructions to the candidates :

- 1) *Solve Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4, Q. No. 5 or Q. No.6 from section-I and solve 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) *Answer 3 questions from Section-I and 3 questions from Section-II.*
- 3) *Answers to the two sections should be written in separate books.*
- 4) *Neat diagrams must be drawn wherever necessary.*
- 5) *Figures to the right indicate full marks.*
- 6) *Use of logarithmic tables, slide rule, Mollier Charts, electronic pocket calculator and steam tables is allowed.*
- 7) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Draw and explain the block diagram of automatic control system. Give the suitable examples. [10]
- b) Explain the following static characteristics : [8]
- i) Accuracy
 - ii) Precision
 - iii) Resolution
 - iv) Reproducibility

OR

- Q2)** a) Define the term servomechanism. Explain it with suitable examples. [10]
- b) List and explain different types of errors in measurement system. [8]
- Q3)** a) Define the term transducers. Classify the transducers with suitable examples. [8]
- b) Explain in detail Pyrometers. [8]

OR

P.T.O.

Q4) a) Define the term absolute humidity, relative humidity and dew point. Explain any one method for humidity measurement. [8]

b) Define the term vacuum pressure. Which units are used for its measurement. Explain any one method in detail. [8]

Q5) a) Write a short note on LASCR [8]

b) Explain LDR in brief. Explain role of optodevices in printing applications. [8]

OR

Q6) a) Draw and explain Instrumentation amplifier using three op-amps. Derive equation for its overall gain. [8]

b) Explain first order high pass Butterworth filter in detail. [8]

SECTION - II

Q7) a) List the different types of discontinuous controllers. Explain any one in detail. [8]

b) Define the term final control operation. Explain it with suitable block diagram. [10]

OR

Q8) a) Define the following terms : [10]

i) Degree of Freedom

ii) Process Load

iii) Process Lag

iv) Control Lag

v) Process Equation

b) Why integral controller is called reset controller. Explain how integral controller will eliminate the offset. [8]

Q9) a) Explain in detail op-amp based on-off controller. [8]

b) Explain microprocessor based flow control system in detail. [8]

OR

Q10) a) Explain in detail pneumatic PI controller. [8]

b) Explain electronic PID controller. [8]

- Q11)** a) Define the term PLC. Draw and explain the architecture of PLC. [8]
b) Explain advantages of PLC over relay logic control. [8]

OR

- Q12)** a) Write a short note on SCADA. [8]
b) Explain multichannel data logger system in detail. [8]



Total No. of Questions : 12]

SEAT No. :

P728

[Total No. of Pages : 3

[4263]-17

T.E. (Petroleum Engg.)

PRINCIPLES OF CHEMICAL ENGINEERING - I

(2003 Pattern) (Semester - I)

Time :3 Hours]

[Max. Marks :100

Instructions to the candidates :

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

SECTION - I

- Q1)** a) Differentiate between Heat Pump and Refrigerator. [4]
- b) Derive expression for work of Adiabatic Process and that of Isothermal Processes. [6]
- c) With help of neat sketch write a short note on absorption refrigeration? Highlight how it deviates from normal refrigeration cycle. [6]

OR

- Q2)** a) State 2nd law of Thermodynamics and provide mathematical expression. [4]
- b) Discuss Joule Thomson Expansion and its usefulness. [4]
- c) Define: Closed system, Path Function, Enthalpy, Entropy, Isobaric Process. [8]
- Q3)** a) Write down different models for non-Newtonian flow. Show their nature via-a-vis Newtonian fluid with help of neat diagram. [6]
- b) With help of diagram discuss various flow regimes possible for vertical two phase flow. [6]
- c) Discuss general characteristics of Centrifugal Pump. [6]

OR

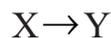
P.T.O.

- Q4)** a) Discuss flow of compressible fluid moving through Converging – Diverging nozzle. Draw neat sketches. [6]
b) With help of diagram explain working of a compressor. [6]
c) What is cavitation in pump, how it can be removed? In this context explain the importance of NPSH. [6]

- Q5)** a) Obtain rate expression for an ideal continuous stirred tank reactor. [6]
b) Discuss importance of Chemical Reaction Engineering. [6]
c) Discuss stepwise procedure of catalytic reaction. [4]

OR

- Q6)** a) Define: Flash Point, Fire Point, Detonation. [6]
b) Discuss the necessity of studying Combustion for Petroleum Engineers. [4]
c) If rate constant for the following 1st order elementary reaction be 142.5 min^{-1} at 250°C , what will be rate constant at 375°C . [6]



Activation energy for the reaction = 2000 kCal/kmol

SECTION - II

- Q7)** a) What is the need of modifications to ideal gas laws. Discuss all the modifications in details. In this context write down van der Waal's equation of state with proper discussion on all the symbols. [10]
b) Write down three different equations of state for real gases – Explain all the symbols associated with them. [6]

OR

- Q8)** a) Define supercritical state and highlight its importance. [6]
b) With help of neat diagram explain PVT behavior of fluids. [6]
c) Write down short note on Compressibility Factor. [4]

- Q9)** a) What is partial molar property? Discuss its importance and usage. [8]
b) What do you mean by vapour liquid equilibrium? Briefly discuss how VLE of a system can be determined experimentally. [8]

OR

- Q10)** a) What is fugacity? Define fugacity coefficient. [4]
b) Define bubble point. Discuss the stepwise procedure to obtain bubble point of a multi-component mixture. [6]
c) Write down mathematical expression of Raoult's law. Highlight its significance. [6]

- Q11)** a) Gas hydrates may be the main reason behind Sunami – Elaborate and explain. [6]
b) Name six gases which can produce gas hydrates. [6]
c) With help of phase diagram explain formation of Gas Hydrates. [6]

OR

- Q12)** a) What are the technical challenges to utilize Gas Hydrates as possible source of energy. Discuss the present scenario. [6]
b) With help of neat diagram explain different structures possible for gas hydrates – discuss their stabilities as well. [6]
c) 1 m^3 of methane gas hydrate contain almost 520 m^3 of methane gas at STP and 1 m^3 of water. From this information calculate the density of the gas-hydrate. [6]



Total No. of Questions : 8]

SEAT No. :

P729

[Total No. of Pages : 2

[4263]-18

T.E. (Petroleum Engg.)

PETROLEUM FIELD INSTRUMENTATION AND CONTROL

(2003 Pattern) (Semester - I)

Time :3 Hours]

[Max. Marks :100

Instructions to the candidates :

- 1) Attempt any 3 questions from each section.*
- 2) Figures to the right indicate full marks.*
- 3) Use of electronic calculators, is allowed.*
- 4) Draw neat sketch wherever necessary.*

SECTION - I

Q1) Write short notes on : **[18]**

- a) Calibration of an instrument.
- b) Characteristics of an instrument.
- c) Classification of instruments.

Q2) a) Explain with proper diagram different valve characteristics. **[8]**

b) Describe in brief various valves used in Petroleum industry. **[8]**

Q3) a) Explain the Instrumentation involved in Separation of oil and gas. **[8]**

b) Explain the role of Pressure measuring instruments in Petroleum field with examples. Give details of any one Pressure transducer. **[8]**

Q4) a) Explain the instrumentation involved in drilling and production operation. **[8]**

b) With the help of neat sketch explain the instrumentation of a shell and tube heat exchanger. **[8]**

SECTION - II

Q5) a) Explain the role of Hardware components of a control system. **[8]**

b) Give the application of Programmable logic control in blending unit. **[8]**

P.T.O.

- Q6)** a) Derive the Transfer Function of a first order system. [6]
b) Define : [6]
 i) Time constant
 ii) Damping coefficient
 iii) Decay ratio
c) Distinguish between Positive feed back and negative feedback loop. [6]
- Q7)** a) Explain how controller tuning is done and what precautions are taken?[8]
b) Discuss PID control actions and its utility in process industry. [8]
- Q8)** Explain : [16]
a) Ratio control
b) Cascade control
c) Feedforward control
d) SCADA system



Total No. of Questions : 12]

SEAT No. :

P730

[Total No. of Pages : 3

[4263]-19
T.E. (Petroleum)
PETROLEUM PRODUCTION ENGINEERING - I
(2003 Pattern)

Time :3 Hours]

[Max. Marks :100

Instructions to the candidates :

- 1) *Answer Q.No.1 or 2, Q.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) Define and explain all the PVT properties with the help of graph. [12]
b) Draw and explain the generic nature of an IPR curve for a solution gas drive reservoir below and above bubble point pressure. [6]

OR

- Q2)** a) State and explain any two correlations used to construct IPR curve. [9]
b) Draw the generic trend of Pressure, GOR and P.I. against time for reservoirs having gas cap drive and water drive mechanism. [9]

- Q3)** a) Draws the schematic sketch and explain in brief various types of flow regimes during flow through horizontal pipe line. [6]
b) Discuss in brief the Gilbert's method to select optimum tubing size and operating point for the given IPR curve, reservoir data and production conditions. Draw the typical graph of vertical lift performance. [10]

OR

- Q4)** a) Draw the schematic sketch of a surface choke and write the functions of it. [8]
b) What is the difference between GOR and GLR? Write the unit of it. Draw the relevant graphs and explain the concept of optimum GLR. [8]

P.T.O.

- Q5)** a) What is hydraulic fracturing? Describe the necessary elements and the general design considerations to accomplish a hydraulic fracturing job. [10]
b) Write the meaning of fracture gradient, fracture conductivity and fracture geometry. [6]

OR

- Q6)** a) Discuss in detail matrix acidization operation. [10]
b) What is the purpose of well stimulation job? Explain. [6]

SECTION - II

- Q7)** Write short notes on the following : [18]
a) Liquid loading of gas well.
b) Water and gas coning.
c) Sand control.
d) General reasons for decrease in well productivity.

OR

- Q8)** a) Explain any two workover problems and their solution in brief. [12]
b) Write the applications of Horizontal Well Technology. [6]

- Q9)** a) Design a two phase horizontal separator using the following data : [10]

Gas flow rate (Q_g) = 10 MMscf/day

Oil flow rate (Q_o) = 2300 bbls/day for 32° API

Operating Pressure = 960 psia

Operating Temperature = 60°F

Specific Gravity of Gas = 0.6

Gas Compressibility = $Z = 0.87$

From graph, value of $k = 0.280$ (Constant based on liquid gas properties)

Liquid drop to be separated = $d_m = 100$ micron

Assume slenderness ratio of 3 & 4. Retention time 2 minutes.

- b) Discuss the mechanism of oil and gas separation used in three phase oil and gas separator. [6]

OR

- Q10)** a) Draw the neat schematic sketch and explain the principle of operation and working of three phase vertical separator in detail. [12]
b) Explain 'mist extractor' in brief. [4]

- Q11)** a) Write the various possible safety issues at production facility and their solution in brief. [8]
- b) Discuss the general stages involved in oil and gas transportation till central processing facility. [8]

OR

- Q12)** Explain the following : [16]
- a) Heater treater.
- b) Emulsion treating methods.
- c) Skimmer tank.
- d) Theory of emulsion.



Total No. of Questions : 12]

SEAT No. :

P731

[Total No. of Pages : 3

[4263]-20
T.E. (Petroleum)
PRINCIPLES OF CHEMICAL ENGINEERING - II
(2003 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 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 concentration profile and flux for single solute diffusing across a thin membrane. **[6]**
- b) Draw a neat diagram for Tray Tower and clearly indicate all its internals. Discuss advantages of Tray Column. **[8]**
- c) If a distillation column is operated at minimum reflux ratio, what will be the number of stages required for the column. **[4]**

OR

- Q2)** a) Describe mechanism of flow through porous media- Give neat sketches. **[6]**
- b) Explain the concept of HETP and discuss its significances. **[4]**
- c) Write down stepwise procedure for McCabe Thiele Method. **[8]**
- Q3)** a) Discuss principle of operation of cooling tower. Explain with help of neat diagram. **[8]**
- b) Differentiate between physical adsorption and chemisorption. **[8]**

OR

P.T.O.

- Q4)** a) Discuss the analogy between Heat, Mass and Momentum Transfer. Write down Reynolds analogy and its usefulness. [8]
 b) Give real life examples of Humidification and dehumidification and explain the processes involved. [8]
- Q5)** a) Discuss importance of baffles for shell and tube heat exchangers. [4]
 b) Write a short note on selection of fluids through shell and tube side for conventional mutipass Shell and Tube Heat Exchangers. [6]
 c) Write down stepwise procedure for design of a shell and tube heat exchanger. [6]

OR

- Q6)** A speciality chemical W is to be cooled from 180°C to 40°C at a rate of 570 kg/hr in a countercurrent double pipe heat exchanger, with water as coolant flowing through inner tube side. Raw water is available at 28°C and maximum temperature rise possible is of 7°C. [16]
- a) Obtain heat duty of the exchanger.
 b) Calculate flow rate of raw water.
 c) If overall heat transfer coefficient be 662.3 W/(m².K), obtain the length of the required exchanger.

Data :

Inner Tube: ID = 18 mm, OD = 21 mm, $k_{wall} = 74.5$ W/(m.K)

Outer Pipe: ID = 37 mm, OD = 41 mm

For Chemical S : $C_p = 1.88$ kJ/ (kg. °C), $\mu = 0.37$ cP, $\rho = 860$ kg/m³ and $k = 0.154$ W/(m.K)

For raw water : $\mu = 0.77$ cP and $k = 0.613$ W/(m.K)

SECTION - II

- Q7)** a) What is Environmental Impact Analysis (EIA). [6]
 b) What is HAZOP study? With a suitable example explain the HAZOP study also highlight its necessity. [6]
 c) Discuss the major pollutants for air. Indicate the immediate and long term impacts of these pollutants on human and animal life. [6]

OR

- Q8)** a) What is BOD test. Discuss its importance in effluent treatment. [6]
 b) Write Short Note on: Acid Rain, Ozone Layer Depletion. [6]
 c) With help of neat diagram explain the operation of effluent treatment plant (ETP). [6]

- Q9)** a) Write a short note on plot plan development. [4]
b) Discuss in details the development of P&ID for a chemical process and role of various persons involved. In this context explain the need and usefulness of the developed P&ID. [8]
c) Discuss the role of plant layout engineer. [4]

OR

- Q10)** a) A petroleum processing unit decided to set up its new plant. Discuss the important factors to be considered while choosing appropriate location of the plant. Elaborate all the points appropriately. [8]
b) With help of neat sketch discuss all the major sections of a typical Rig Layout. Highlight importance of the Rig. [8]
- Q11)** a) Write down advantages of Cross Country piping over other methods of transport. [6]
b) What is non destructive testing? Discuss its usefulness. Explain any one method in details. [6]
c) Write a short note on Assembly and Erection of Equipments. [4]

OR

- Q12)** a) Define economic diameter of a pipe - Explain its significance. [4]
b) Name four insulating materials. How insulation is done – discuss in brief. [6]
c) With help of neat diagram explain working of (any two) : [6]
i) Butterfly Valve
ii) Plug Valve
iii) Gate Valve



Total No. of Questions : 12]

SEAT No. :

P732

[Total No. of Pages : 2

[4263] - 23
T.E. (Information Technology)
MULTIMEDIA SYSTEMS
(2003 Pattern)

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 DDA line drawing algorithm. Is it better than Bresenham line drawing algorithm? Justify your answer. [10]
b) State and explain vector scan and raster scan display devices. [6]

OR

- Q2)** a) What is Multimedia? Explain any one authoring tool for multimedia. [10]
b) State the concept of display buffer with the example. [6]

- Q3)** a) Explain steps in boundary filling algorithm for filling a polygon. [8]
b) Is a circle polygon? Justify. [4]
c) State different types of polygons with example. [4]

OR

- Q4)** a) Consider a triangle square with vertices A (0, 0), B (2, 0) and C (0, 2). Scale it three times w.r.t. origin. Then translate it horizontally by 4 units and vertically also by 4 units. Calculate the vertices of triangle after the transformations using homogeneous coordinate system. [10]
b) Explain composite coordinate system? [6]

- Q5)** a) Explain with example Cohen Sutherland outcode algorithm. [10]
b) What are various storage media for multimedia systems? [8]

OR

P.T.O.

- Q6)** Write short notes on (any three) : **[18]**
- a) Principle of segmentation in 2D animation.
 - b) Inside outside test.
 - c) Building blocks of Multimedia.
 - d) Homogenous co-ordinate system.

SECTION - II

- Q7)** a) Explain important frames with respect to MPEG compression technique. **[8]**
b) Describe audio file format supported by windows. **[8]**

OR

- Q8)** a) What is audio compression? How it is achieved using ADPCM? **[8]**
b) Describe WAV file format in detail. **[8]**

- Q9)** a) Describe in detail RGB color model. **[8]**
b) Compare NTSC and PAL video standards. **[8]**

OR

- Q10)** a) Explain different steps in designing an animation sequence. **[8]**
b) Explain color model used for CRT display. **[8]**

- Q11)** a) State the importance of data compression. **[4]**
b) Describe the run length encoding technique. **[6]**
c) Describe BMP file format. **[8]**

OR

- Q12)** Write short notes on : **[18]**
- a) Color models.
 - b) Categories of compression techniques.
 - c) JPEG compression.



Total No. of Questions : 12]

SEAT No. :

P733

[Total No. of Pages : 2

[4263] - 24

T.E. (I.T.)

DATA COMMUNICATION & NETWORKING

(2003 Pattern) (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) Assume suitable data, if necessary.

SECTION - I

- Q1)** a) Explain CRC generation method with suitable example. [8]
b) Explain the shift keying techniques with suitable diagram and constellation pattern for the following : [10]
i) PSK ii) FSK
iii) ASK iv) QAM

OR

- Q2)** a) Discuss the hamming code technique. Calculate hamming code if data to be sent is 1001101. [9]
b) Explain the following error detection methods with suitable examples. Comment on the performance of each method. [9]
i) Vertical redundancy check. ii) Longitudinal redundancy check.
iii) Cyclic redundancy check. iv) Checksum.

- Q3)** a) Discuss ADSL, DMT, HDSL technologies in brief. [8]
b) Explain cable modem technology with suitable diagram. [8]

OR

- Q4)** a) Describe the T1 frame structure. Also state the capacities of E1, E2, E3 and E4 lines. [8]
b) Compare Circuit Switching, Message Switching and Packet Switching. [8]
- Q5)** a) Explain with suitable examples guided transmission media and unguided transmission media. [8]
b) Explain the coaxial cable and its various categories. Also state the data rate and the use of every category. [8]

P.T.O.

OR

- Q6)** a) Compare : [8]
i) Single mode and multimode fiber.
ii) Step index and graded index fiber.
b) Explain the losses in the fiber in detail. [8]

SECTION - II

- Q7)** a) Explain the TCP/IP Protocol stack. [8]
b) Compare : [8]
i) Repeater & Bridge. ii) Hub & Switch.

OR

- Q8)** a) Describe four ways of organizing a local area network with neat diagram. [8]
b) Explain the merits and demerits of star, bus, ring and mesh topologies. [8]
- Q9)** a) Discuss the Link Control Protocol (LCP) of the point-to-point (PPP) stack in brief. [10]
b) Explain PPP in brief. [4]
c) What is gateway? Explain its function. [4]

OR

- Q10)** a) Discuss CSMA/CD Random Access techniques. How is collision avoidance achieved in the same. [10]
b) Explain the working of switch and router. [4]
c) Write a short note on HDLC. [4]
- Q11)** a) Write a short note on Gigabit Ethernet. Compare Gigabit Ethernet with traditional Ethernet. [8]
b) Differentiate : 10 Base 5, 10 Base 2, 10 Base T specification. [8]

OR

- Q12)** a) Discuss the working of VLAN. Also state its advantage. [8]
b) Discuss SONET with reference with following : [8]
i) Device Types. ii) Payloads & Frames.

☒☒☒☒

Total No. of Questions : 12]

SEAT No. :

P734

[Total No. of Pages : 2

[4263] - 25
T.E. (I.T.)
HUMAN COMPUTER INTERFACE
(2003 Pattern)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates :

- 1) *Answer Question 1 or 2, 3 or 4, and 5 or 6 from section-I and Question 7 or 8, 9 or 10, and 11 or 12 from section-II.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Discuss human factors related metrics to evaluate any interface. [8]
b) Explain the difference between slips and mistakes with the help of suitable example. [8]

OR

- Q2)** a) What are some design concerns pertaining to cultural and international diversity? [8]
b) How the Human Computer Interaction and user Interface design are related. Explain in detail. [8]

- Q3)** a) List and explain seven stages of action model. [8]
b) Explain task objects and task actions as well as interface objects and interface actions to build computer interface for medical store. [10]

OR

- Q4)** a) Explain GOMS and keystroke level model. [8]
b) List and explain Shneiderman's eight golden rules of interface design. [10]
- Q5)** a) Explain three Pillars of Interface Design. [8]
b) Explain how scenarios help in the design process of interactive system. [8]

OR

P.T.O.

- Q6)** Write short note on : **[16]**
- a) Participatory Design.
 - b) Affordances and Design.

SECTION - II

- Q7)** a) Explain different dialog design notations. **[8]**
- b) List and explain various interaction styles. **[8]**

OR

- Q8)** a) What are different issues while designing multiple window interfaces for an application? **[8]**
- b) What are the factors you would need to take into account when designing a screen layout for a database application? **[8]**

- Q9)** a) List and explain advantages and disadvantages of online help and off line help. **[8]**
- b) You are supposed to design an interface for your college web site. Discuss important design issues that need to be considered in designing a web page. **[8]**

OR

- Q10)** a) Explain an importance of hypertext over linear paper document. List important considerations for creating a good hypertext document. **[8]**
- b) Specify four error messages encountered by you in GUI based interactive system. What guidelines can you suggest for presenting these error messages in an effective style? **[8]**

- Q11)** a) Some of the favorite techniques of web pages these days include automatic scrolling text boxes, moving marquees, and constantly running animations (e.g. for icons). Discuss these features in terms of web design guidelines. **[8]**
- b) Give four benefits and three problems of touch screens and voice recognition input. **[10]**

OR

- Q12)** Write short notes on : **[18]**
- a) Shared Editors.
 - b) Ethnographic observation.
 - c) Role of HCI in animation industry.



Total No. of Questions : 12]

SEAT No. :

P735

[Total No. of Pages : 3

[4263] - 29

T.E. (E & TC/Electronics)

DIGITAL DESIGN AND COMPUTER ORGANISATION

(2003 Pattern)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates :

- 1) In section-I : Attempt Q. 1 or Q.2, Q. 3 or Q. 4, Q. 5 or Q. 6. In section-II : Attempt Q. 7 or Q. 8, Q. 9 or Q. 10, Q. 11 or Q. 12.
- 2) Answers to the two sections should be written in separate books.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Figures to the right indicate full marks.
- 5) Assume suitable data, if necessary.

SECTION - I

- Q1)** a) The digital system has input pin 'W'; output pin 'Z' and clock input pin 'CLK'. The output pin 'Z' will be high (logic 1) only when two successive input bits are '1'. Implement the design with Moore machine. Use D flip flops. [8]
- b) Explain the working of serial adder with the help of a state diagram. [6]
- c) Explain the difference between asynchronous and synchronous sequential circuits. [2]

OR

- Q2)** a) Explain with a simple example, significance of various symbols used in constructing an ASM chart for a sequential circuit. [8]
- b) Explain Hazards and its different types in Combinational Circuits. [6]
- c) Enlist various encoding techniques used to represent state machine. [2]

- Q3)** a) State and explain different sequential statements with syntax used in VHDL. [8]
- b) Write a VHDL code for 4:1 multiplexer using with select statement. [8]

OR

- Q4)** a) Explain the difference between signal and variable. [6]
- b) Write a VHDL code for 8-bit latch register. [6]
- c) Explain wait on statement with example. [4]

P.T.O.

- Q5)** a) Draw a flow chart and explain the Booth's Algorithm used for signed number multiplication. [8]
 b) Briefly explain the operation of look ahead carry generator. [6]
 c) What are the limitation of sign magnitude representation of a number. [4]

OR

- Q6)** a) Perform the following division using restoring and non-restoring division algorithm : [12]
 Dividend = 1010
 Divisor = 0011
 b) Represent $(178.1875)_{10}$ in single and double precision floating point format. [6]

SECTION - II

- Q7)** a) Explain any four addressing modes along with one example each. [8]
 b) What do you mean by branching? [4]
 c) What are condition codes? Give examples. [4]

OR

- Q8)** a) Draw and explain the multiple bus organisation of the CPU. Explain its advantages. [8]
 b) Explain various assembler directives used in the assembly language programming. [4]
 c) Compare stacks and queues. [4]
- Q9)** a) Explain interface between keyboard and processor. Also explain the communication between them. [8]
 b) Explain I/O interfacing techniques. [4]
 c) Draw and explain the programmable parallel port. [4]

OR

- Q10)** a) What is Bus Arbitration? Explain and compare Daisy Chaining and polling methods of Bus Arbitration. [8]
 b) Explain the drawbacks in programmed I/O and interrupt driven I/O. [4]
 c) What do you mean by privilege exceptions? [4]
- Q11)** a) Explain the concept of virtual memory. How is virtual address translated to physical address? [8]
 b) State and explain the performance characteristics of memory. [6]
 c) What are the advantages of RAID. [4]

OR

Q12) a) Draw and explain : **[12]**

- i) Direct cache mapping.
- ii) Associative cache mapping.
- iii) Set Associative cache mapping techniques along with its merits and demerits.

b) Explain DVD and Magnetic disk. **[6]**



Total No. of Questions : 12]

SEAT No. :

P736

[Total No. of Pages : 2

[4263] - 30

T.E. (Electronics / E & TC)

**ANALOG INTEGRATED CIRCUIT DESIGN AND APPLICATION
(2003 Pattern)**

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates :

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

SECTION - I

- Q1)** a) Derive the expression for CMRR of differential amplifier by using Ac analysis. [12]
- b) An op-amp has differential gain of 60dB and CMRR 65dB, If $V_1 = 1.5V$ and $V_2 = 1V$. Calculate the differential and common mode output values. [6]

OR

- Q2)** a) What are the different methods of improving CMRR? Explain any two methods. [10]
- b) Design and implement the following equation using single op-amp. [8]
 $V_0 = 2.5V_1 + 1.25 V_2 - V_3$
- Q3)** a) What is Guarding and Shielding, Demonstrate it with suitable circuits. [8]
- b) For an ideal integral the RC time constant is 200 msec. Determine the o/p voltage 2 sec after applying a voltage of 0.4V to the input. How long will it take to reach - 12V? [8]

OR

- Q4)** a) Explain drift parameters with their effects. [8]
- b) Design an instrumentation amplifier using three op-amps with a gain that can be varied from 1 to 200. [8]
- Q5)** a) Draw basic sample and hold ckt, incorporate various modification in it and explain their relevance. [10]
- b) What are the limitation of op-amp as a comparator. [6]

P.T.O.

OR

- Q6)** a) What are the application of comparator, demonstrate any two with neat ckt and waveforms. [10]
b) Explain any four performance parameters of S/H circuit. [6]

SECTION - II

- Q7)** a) Explain with neat ckt and waveforms monostable multivibrator using op-amp. [8]
b) Design astable m.v. for an output frequency of 5kHz and variable duty cycle of 30% to 60% use $c = 0.1\mu\text{F}$. [8]

OR

- Q8)** a) Explain with neat ckt and waveforms any two application of monostable m.v. using IC 555. [8]
b) Explain triangular wave generator using op-amp also derive the expression for output frequency. [8]

- Q9)** Write short notes : [18]
a) Frequency transformation.
b) Elliptical and Bessel approximation.
c) Specification of butterworth LPF.

OR

- Q10)** a) 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 $\omega = 1.5 \text{ rad/sec}$. [12]
b) Differentiate between Active and Passive filters. [6]
- Q11)** a) Derive and explain square rooting by using analog multiplier. [9]
b) Explain with neat block diagram and waveforms VCO. [7]

OR

- Q12)** a) Derive and explain output voltage expression for Temperature Compensated Log Amplifier. [9]
b) Explain any two application of PLL. [7]

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Total No. of Questions : 12]

SEAT No. :

P737

[Total No. of Pages : 2

[4263] - 31
T.E. (E & TC)
MECHATRONICS
(2003 Pattern)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates :

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

SECTION - I

- Q1)** a) Define the term mechatronics. Explain the role of mechatronics in design of elevator system in detail. **[10]**
- b) Explain different types of errors involved in the measurement system. How to reduce these errors. **[8]**

OR

- Q2)** a) Explain the terms static characteristics and dynamic characteristics. Explain the terms : **[10]**
- i) Speed of Response.
 - ii) Measuring Lag.
 - iii) Fidelity.
- b) Justify with suitable examples scope and importance of mechatronics with respect to interdisciplinary approach. **[8]**
- Q3)** a) Define the term pressure. What are the units used in pressure measurement. Explain in detail LVDT for pressure measurement. **[8]**
- b) A strain gauge with a gauge factor of 4 has a resistance of 120Ω when unstrained. If strain gauge undergoes a change in length from 0.25mm to 0.255mm. Find the new value of resistance. **[8]**

OR

P.T.O.

- Q4)** a) Explain position measurement system using ultrasonic method. [8]
b) Write a short note on proximity sensors. [8]

- Q5)** a) What are the important specifications of ADC and DAC. Explain them. [8]
b) Define the term PLC. List the different specifications of PLC. Which different inputs and outputs used in PLC. [8]

OR

- Q6)** a) Write a short note on AD 633. [8]
b) It is required to measure and control water flow through closed pipeline from 0 – 1000 ltrs/hr. Design and explain control system using PIC microcontroller to control flow. Justify selection of components. [8]

SECTION - II

- Q7)** a) Explain multichannel data logger system in detail. [8]
b) Write a short note on HART protocol. [8]

OR

- Q8)** a) With suitable diagram explain principle and working of magnetic recorder. [8]
b) Explain RS232 standard in detail. [8]

- Q9)** a) Define the term actuator. Explain electropneumatic actuator in detail. [8]
b) Define the term control valve. Explain different factors for selection of control valve. [8]

OR

- Q10)** a) List the different specifications of stepper motor. Explain in detail stepper motor as electrical actuator. [8]
b) Explain construction and working of double acting cylinder. [8]

- Q11)** a) Explain mechanical and electronic design in detail for Robot walking machine. [10]
b) Explain in detail skip control of CD player. [8]

OR

- Q12)** a) A electronic weighing machine is used to measure 0 – 50 kg. of weight. Design weighing machine system by using strain gauge. Justify the selection of components. [10]
b) Explain mechatronics design of a coin counter. [8]

☒☒☒☒

Total No. of Questions : 12]

SEAT No. :

P738

[Total No. of Pages : 3

[4263] - 32

T.E. (Electronics/E & TC)
ADVANCED MICROPROCESSOR
(2003 Pattern) (Semester - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates :

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

SECTION - I

- Q1)** a) Draw and explain the architecture of 8086. [8]
b) Explain any four dedicated interrupts of 8086. [4]
c) Compare micro and procedure. [4]

OR

- Q2)** a) Explain segmentation concept in detail and list its advantages. [4]
b) Explain PUSH and POP instructions of 8086. [4]
c) Explain with suitable example following addressing modes : [8]
i) Register Indirect.
ii) Direct.
iii) Relative Based Indexed.
iv) Register Relative.

- Q3)** a) Explain in detail control register of 80386. List all registers used in protected mode of 80386. [8]
b) What is segment selector? Explain selector format in detail. [4]
c) List the feature of protected mode. [4]

OR

- Q4)** a) How 80386 MMU performs linear to physical address translation with the help of page directory, page table and page frame. [8]
b) Define DPL, CPL & RPL. What is the use of privileged instructions? [6]
c) How many pages are created in 4GB physical address space of 80386? [2]

P.T.O.

- Q5)** a) Explain data encoding formats used for storing a data on magnetic disk. [6]
b) State the features and working of CGA graphics adaptor. [6]
c) Explain with block diagram pentium mother board. [6]

OR

- Q6)** a) Explain with suitable diagram memory organization in personal computer. [8]
b) Explain following mouse interface type : [6]
i) Serial mouse interface.
ii) PS/2 mouse interface.
c) Write pins of PS/2 mouse. [4]

SECTION - II

- Q7)** a) State advantages of USB over conventional serial BUS. [4]
b) Explain the use of LCR and LSR registers of UART. [6]
c) List the specification of ISA BUS. [6]

OR

- Q8)** a) List the feature of PCI BUS and explain how the address can be captured from PCI BUS. [8]
b) What is the functionality of following pins of standard parallel port? [8]
i) $\overline{\text{ACK}}$
ii) $\overline{\text{STROBE}}$
iii) BUSY
iv) IMIT

- Q9)** a) Explain different types of operating system used in practice. [8]
b) What is device driver? Explain structure of MS-DOS device driver. [8]

OR

- Q10)** a) What is process? Explain any two ways of implementing interprocess communication. [8]
b) With respect to file system explain : [4]
i) File attribute.
ii) File structure.
c) What is TSR and what is it's utility? [4]

- Q11)** a) List the feature of ARM processor. [6]
b) What is the use of CPSR in ARM processor? Explain basic layout of program status register. [6]
c) Differentiate between RISC and CISC architecture. [6]

OR

- Q12)** a) With suitable example explain the role of barrel shifter in ARM processor. [8]
b) Explain following ARM instructions : [10]
i) MOV PC, LR.
ii) LDR RO, [R1], # 4
iii) BL Next.
iv) Add R1, R2, R3.
v) MOV R2, R3, LSL # 2.

☒☒☒☒

Total No. of Questions : 12]

SEAT No. :

P739

[Total No. of Pages : 3

[4263] - 33

T.E. (Elex.)

ELECTROMAGNETIC WAVES AND RADIATING SYSTEMS

(2003 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.
- 4) Use of electronic pocket calculator is allowed.
- 5) Assume suitable data, if necessary.

SECTION - I

- Q1)** a) Define Electric flux density \bar{D} . State and prove the differential form of Gauss's law. [8]
b) Derive the expression for energy stored in electrostatic field. [8]

OR

- Q2)** a) State and derive Biot-Savart law. [8]
b) Derive the magneto static boundary conditions at an interface between two different media. [8]

- Q3)** a) State and explain Poynting Theorem. Also show that instantaneous power flow contains stored energy and the total power flowing in volume. [8]
b) If $\bar{D} = 10x \hat{a}_x - 4ya_y + k_z \hat{a}_z \mu\text{C}/\text{m}^2$ and $\bar{B} = 2a_y \text{ mT}$. Find the value of k to satisfy the Maxwell's equation for region $\sigma = 0, \rho_v = 0$. [8]

OR

- Q4)** a) State and explain Maxwell's equation in phasor form for time harmonic, electromagnetic fields in a linear, isotropic and homogenous medium. [8]
b) If $\bar{E} = 200 e^{(4x - kt)} \hat{a}_y \text{ V/m}$ in free space. Use Maxwell's equation to find H , knowing that all fields vary with time as e^{-kt} . [8]

- Q5)** a) What do you mean by skin depth or depth of penetration? Derive an expression for good conductor in terms of α or β . Find the highest frequency up to which earth can be considered as good conductor. Take $\sigma/\omega\epsilon > 10$. Given $\epsilon_r = 10, \sigma = 0.005 \text{ s/m}$. [10]

P.T.O.

- b) What do you mean by uniform medium? Also explain the difference between plane wave, cylindrical wave, and spherical wave? [8]

OR

- Q6)** a) Explain the concept of electromagnetic uniform plane waves. Explain vector Helmholtz equation and properties for attenuation constant, phase constant and phase velocity for lossless dielectric. [10]
b) Define polarization of waves. Which are the different types of polarizations? Explain in details. [8]

SECTION - II

- Q7)** a) What is impedance matching in a transmission line? Explain quarter wave transformer matching. [8]
b) A lossless transmission line with $Z_0 = 75\Omega$ and of electrical length $l = 0.3\lambda$ is terminated with load impedance of $Z_L = (40 + j20)\Omega$. Determine the reflection coefficient at load, SWR of line, input impedance of the line. [8]

OR

- Q8)** a) Prove that the characteristic impedance of finite line is geometric mean of open and short circuit impedances. [8]
b) What are different types of distortions? Derive condition for distortion less transmission line. [8]

- Q9)** a) Explain reciprocity property of the antenna. [8]
b) Find current required to radiate a power of 100W at 100 MHz from a 0.01 m Hertzian dipole. [8]

OR

- Q10)** a) Write a short note on antenna parameters (any four). [8]
b) The total resistance of an antenna having effective height of 62 meters is 48.5Ω . The rms current of the antenna is 40 amperes at 550 kHz. Calculate : [8]
i) Radiation resistance of the antenna
ii) Radiated power from this antenna
iii) Efficiency of an antenna

- Q11)** a) Calculate the directivity and gain of a broadside and end fire array having 10 isotropic elements separated by distance of $\lambda/4$. [8]
- b) Write a short note on (any two) : [10]
- i) Helical antenna.
 - ii) Antenna towers.
 - iii) Horn antenna.

OR

- Q12)** a) Derive the necessary equations, values for a typical broadside array. Also sketch the radiation pattern for the same. [8]
- b) Write a short note on (any two) : [10]
- i) Parabolic reflector.
 - ii) Yagi-Uda antenna.
 - iii) Rhombic antenna.



Total No. of Questions : 12]

SEAT No. :

P740

[Total No. of Pages : 3

[4263] - 34

T.E. (Electronics)

INFORMATION THEORY AND CODING TECHNIQUES

(2003 Pattern) (Semester - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates :

- 1) Answer any three questions from each section.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

SECTION - I

- Q1)** a) Prove that the mutual information of a channel is symmetric
i.e $J(X, Y) = J(Y, X)$. [8]
- b) For the given channel matrix, find out the mutual information given that
 $P(X1) = 0.6$, $P(X2) = 0.3$, $P(X3) = 0.1$ [8]

$P(Y/X) =$

	Y1	Y2	Y3
X1	$\frac{1}{2}$	$\frac{1}{2}$	0
X2	$\frac{1}{2}$	0	$\frac{1}{2}$
X3	0	$\frac{1}{2}$	$\frac{1}{2}$

OR

- Q2)** a) Encode the following source using Shanon Fano & Calculate average length, efficiency. [8]
 $P = [1/4, 1/8, 1/16, 1/16, 1/16, 1/4, 1/16, 1/18]$
- b) Determine the Lampel-Ziv code for the following bit stream : [8]
01001111100101000001010101100110000 recover the original sequence from the encoded stream.
- Q3)** a) A voice grade telephone channel has a bandwidth of 3400Hz if the signal to ratio on the channel is 30db. Determine the capacity of the channel, if the above channel is to be used to transmit 48Kbps of data, determine the minimum SNR required for the channel. [8]
- b) Explain the sphere packing problem in information capacity theorem. [8]

OR

P.T.O.

- Q4)** a) Explain Shanon Fano and Huffman algorithm with suitable examples. [8]
 b) Explain the rate distortion function. [8]

- Q5)** a) For a (7, 4) linear block code, the generator matrix is given by [10]

$$\begin{vmatrix} 1 & 0 & 0 & 0 & 1 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 & 1 & 1 \\ 0 & 0 & 1 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 & 0 & 1 & 0 \end{vmatrix}$$

- i) Obtain parity check matrix
 ii) Calculate d_{min}
 iii) Calculate all the code words
- b) Explain ARQ techniques. [8]

OR

- Q6)** a) Obtain generator matrix and parity check matrix for (7, 3) systematic cyclic code verify the result with syndrome. [12]
 b) Compare the syndrome decoding techniques with maximum likelihood decision rule based decoding. [6]

SECTION - II

- Q7)** a) Explain Virterbi's algorithm with the suitable example. [6]
 b) Comment on : [5]
 i) Distance bound
 ii) Performance bound
 related to the convolutional codes.
 c) What are unger bock's TCM design rules. Explain asymptotic coding gain. [7]

OR

- Q8)** a) A rate 1/3 convolution encoder has generating vectors as $g_1 = (110)$, $g_2 = (111)$, $g_3 = (011)$.
 i) Sketch the encoder
 ii) If the input message sequence is 10110, determine the output sequence of the encoder
 iii) Draw the state diagram and trellis diagram [12]
 b) Design a (3, 1) cyclic repetition code and its decoding method. Find the corrected codewords for 1) 010. [6]

- Q9)** a) Explain the following terms in connection with convolution codes. [8]
i) Code tree
ii) State diagram
iii) Code trellis
b) Implement RSA algorithm [8]

OR

- Q10)** a) Compare the performance of the following systems with optimum system (ideal system) [10]
i) Amplitude modulation (SSB, DSB).
ii) Frequency modulation.
iii) Pulse code modulation (PCM).
b) Consider the (31, 15) Reed - Soloman code, [6]
i) How many bits are there in a symbol of the code?
ii) What is the block length in bits?
iii) What is minimum distance of the code?
iv) How many symbols in error can the code correct?

- Q11)** a) Explain in detail with analysis satellite system power budget. [10]
b) Explain delay spread and doppler spread. [6]

OR

- Q12)** a) Draw and explain the block diagram of space diversity technique. [6]
b) Compare GSM with IS-95 standards for mobile communication system. [5]
c) Define E.I.R.P., antenna bandwidth and aperture efficiency of antenna. [5]



Total No. of Questions : 12]

SEAT No. :

P741

[Total No. of Pages : 3

[4263] - 35

T.E. (Production Engineering/Sandwich)
METAL CUTTING AND TOOL DESIGN
(2003 Pattern)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates :

- 1) *Attempt one question of each unit form Section-I and Section-II.*
- 2) *Answer to the questions should be written on separate books.*
- 3) *Draw neat diagram wherever necessary.*
- 4) *Assume suitable data, if required.*

SECTION - I

Unit - I

- Q1)** a) In an orthogonal cutting operation the following data have been observed cutting speed 2m/sec, uncut chip thickness = 0.13 mm, width of the cut - 6.4 mm, chip thickness = 0.23 mm, Rake angle 20 degree, the cutting force = 570 N and feed force 230 N, calculate :
shear plane angle, friction angle, shear strain in chip, shear strain rate, shear stress along shear plane, power of cutting operation. [8]
- b) Explain lathe tool dynamometer. [7]
- c) Explain procedure for measurement of power required for cutting. [5]

OR

- Q2)** a) During machining of C - 25 steel with 0-12-7-7-8-90-1 mm (ORS) shaped cutting tool, the following observations have been made. [10]
- i) Depth of cut = 2 mm,
 - ii) Feed = 0.25 mm/rev
 - iii) Speed = 100 m/min,
 - iv) Tangential cutting force = 900 N,
 - v) Feed thrust force = 500 N,
 - vi) Chip thickness = 0.4 mm.
- Calculate :
- i) Shear force,
 - ii) Normal force at shear plane,
 - iii) Friction force,
 - iv) Coefficient of friction
 - v) Specific energy in cutting.

P.T.O.

- b) Explain with sketch the effect of tool geometry and cutting variables on cutting forces in turning. [10]

Unit - II

- Q3)** a) State different type of coatings on tool and its importance. Explain in short any one method for coating of a tool. [8]
b) Explain any two type of non conventional tool geometry. [7]

OR

- Q4)** a) What is tool signature? Explain tool signature in ASA method. [7]
b) Sketch a reamer and explain various elements of it. [8]

Unit - III

- Q5)** a) Define machinability and machinability index? State the factors affecting on it. [5]
b) Write a short note on : [10]
i) Tool life and factors affecting on tool life,
ii) Economics of tooling

OR

- Q6)** a) Explain with neat sketch heat affected zone in metal cutting and different ways to minimise heat in cutting operation. [10]
b) Explain different of tool wears? [5]

SECTION - II

Unit - IV

- Q7)** a) What are formed tools? Explain flat form and circular form tool. [7]
b) Explain the various design aspect of a plain milling cutter. [8]

OR

- Q8)** a) Mild steel jobs are to be reamed to obtain hole of 25 ± 0.3 mm, calculate the tolerances on the reamer and wear allowance, if the over size cut by the reamer varies from 4 to 10 microns and manufacturing tolerance extends up to 20 microns. Draw the sketch of tolerance zone for above reamer diameter and show the dimension on it. [8]
b) With neat sketch explain various elements of a twist drill. [7]

Unit - V

- Q9)** a) Explain the design considerations in jig and fixture design. [7]
b) Write a short note on : [8]
i) fool proofing principle.
ii) universal fixture.

OR

- Q10)** a) What are the clamping? Explain design aspect of strap clamping. [8]
b) Explain selection criteria for locators. [7]

Unit - VI

- Q11)** Design a jig for drilling 4 holes equispaced of Φ 12 mm holes for a component shown in fig. no.1. [20]

OR

- Q12)** Design a Milling fixture for machining 6 mm wide slots for a component shown in fig. no.2. [20]

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.

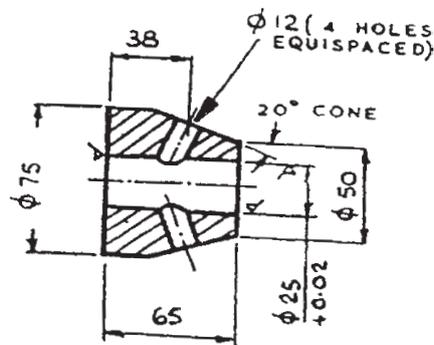


Fig NO.1

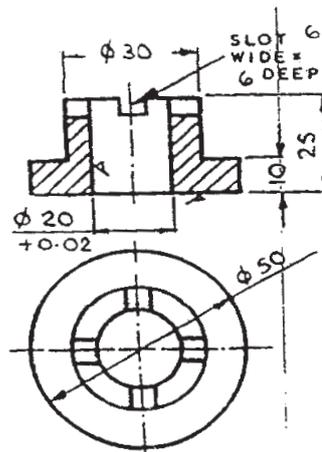


Fig. No. 2



[4263] - 211
T.E. (Mechanical)
MACHINE DESIGN - I
(2008 Pattern) (Semester - I)

Time : 4 Hours]

[Max. Marks : 100

Instructions to the candidates :

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

SECTION - I

Unit - I

- Q1)** Fig.1 shows a shaft supported on bearings 'A' and 'C' and carrying keyed helical gears 'B' and 'D'. Pitch circle diameters of gears 'B' and 'D' are 200 mm and 300 mm while weights are 30.58 kg and 45.87 kg. respectively. Various forces act at gear quadrant points 'P' and 'Q' as shown. If the shaft is to be made up of 50C4 with $S_{ut} = 700 \text{ N/mm}^2$ and $S_{yt} = 460 \text{ N/mm}^2$. Find out its optimum diameter according to ASME code, assume $k_t = 1.5$ and $k_b = 1$.

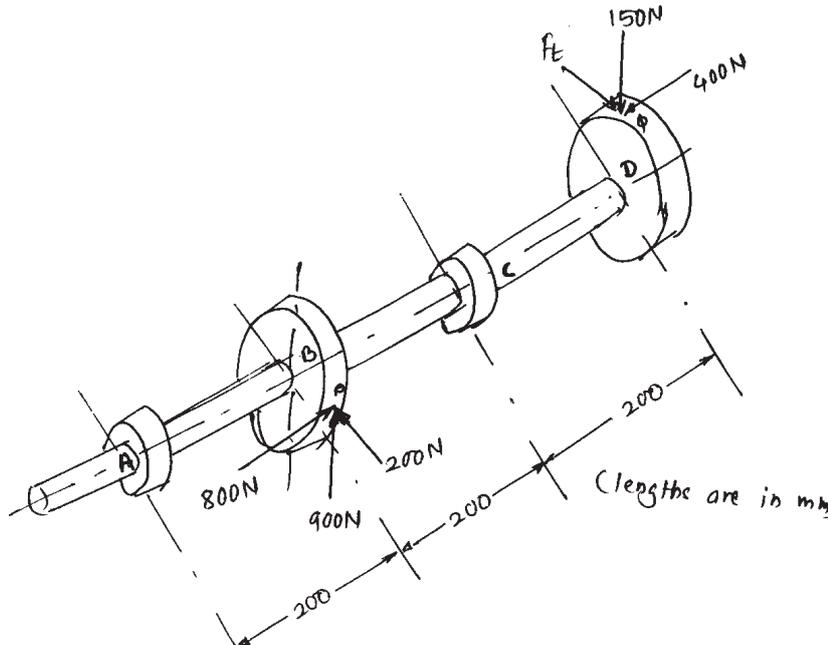


Fig. 1.

If modulus of rigidity of shaft material is 80000 N/mm^2 , find whether the twist in the shaft is less than the allowed limit of $2.5^\circ/\text{meter}$. [16]

OR

- Q2)** a) Find the deflection at free end of cantilever beam of length 'L' subjected to UDL of intensity 'W' N/mm by using castigliano's theorem. Assume uniform flexural rigidity. [6]
- b) Two 35 mm shafts are connected by a flanged coupling. The flanges are fitted with 6 bolts on 125 mm bolt circle. The shaft transmit a torque of 800 N. m at 350 rpm. For the safe stresses mentioned below. Calculate :
- Diameter of bolts
 - Thickness of flanges
 - Key dimensions
 - Hub length, and
 - Power transmitted

Safe shear stress for shaft material = 63 MPa.

Safe stress for bolt material = 56 MPa.

Safe stress for CI coupling = 10 MPa.

Safe stress for key material = 46 MPa. [10]

Unit - II

- Q3)** a) Explain self locking and over-hauling screw. [4]
- b) A triple-threaded power screw used in a screw jack has a nominal diameter of 50 mm and pitch at 8 mm. The threads are square and length of nut is 48 mm. The screw jack is used to lift a load of 7.5 kN. The coefficient of friction at the threads is 0.12 and the collar friction is negligible, calculate :
- Principle shear stress in screw body
 - The transverse shear stresses in screw and nut
 - The unit bearing pressure

Also state whether screw is self locking [12]

OR

- Q4)** a) Derive the relation for : [8]
- Torque required to raise the load against thread friction.
 - Torque required to lower the load against thread friction.
- b) The cylinder head of steam engine is subjected to a steam pressure of 0.7 N/mm^2 . It is held in position by means of 12 bolts. A soft copper gasket is used to make the joint leak-proof. The effective diameter of cylinder is 300 mm. Find the size of bolts so that the stresses in the bolts is not to exceed 100 MPa. [8]

Unit - III

- Q5)** a) Explain with suitable sketch any four types of screw fastenings. [8]
- b) Fig.2 shows a bracket fixed to the support by means of three bolts. The dimensions are given in figure. The bolts are made of plain carbon steel having tensile yield strength of 380 N/mm^2 . If the factor of safety is 2.5, determine the bolt size. Use the following relationship. [10]
- $$d = dc / 0.84$$

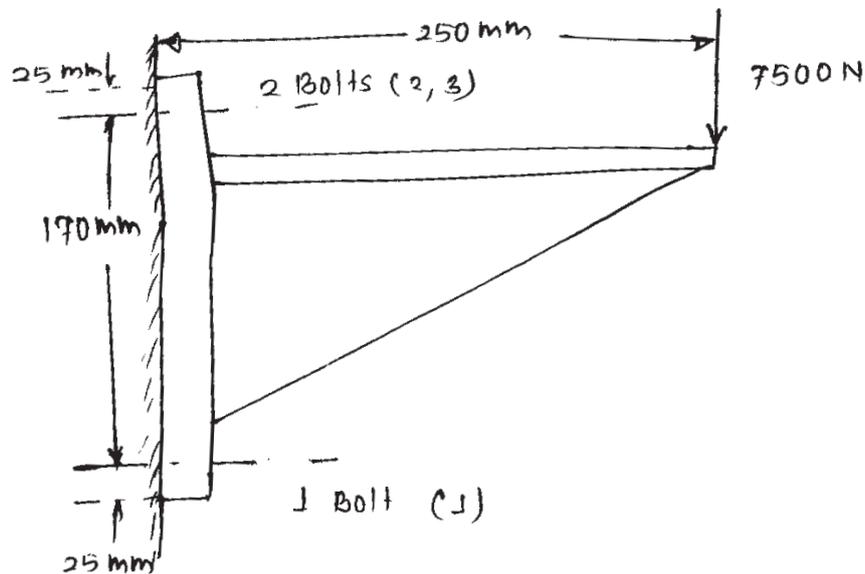


Fig. 2

OR

- Q6)** a) Fig.3 shows a rectangular steel plate is welded as a cantilever to a vertical column and supports a single concentrated load 'P' as shown.

Determine the weld size if shear stress in the same is not to exceed 140 MPa. [12]

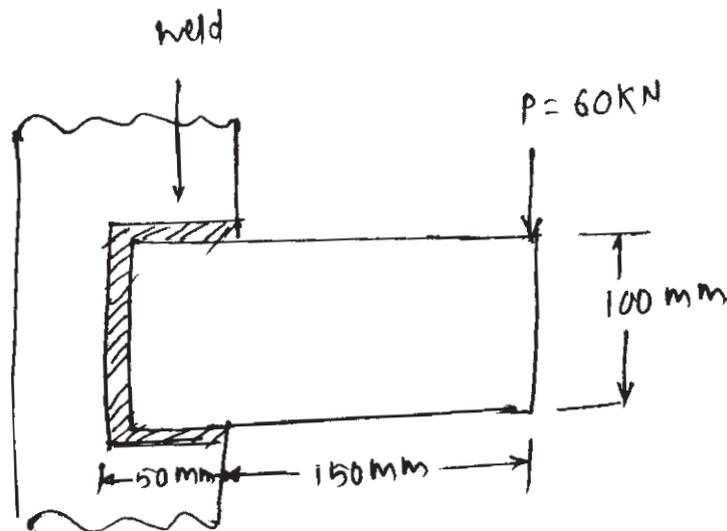


Fig. 3.

- b) State advantages and disadvantages of welded joints over riveted joint/ threaded joint. [6]

SECTION - II

Unit - IV

- Q7)** a) Explain the following terms : [4]
- Maximum fluctuation of energy.
 - Coe-fficient of fluctuation of speed.

- b) The load torque of machine is given by $1000 + 400 \sin \theta$ where θ is crank angle. The machine is driven by constant torque electric motor that running at mean speed at 800 rpm. The fluctuation of speed is within 2%, a rimmed flywheel made of FG 200 with material density 7050 kg/m^3 . The rim contribute 90% flywheel effect. Cross-section of rim is rectangular with width to thickness ratio 1.5. The number of arms are 6 having elliptical cross-section. With major axis twice the minor axis. The factor of safety is 10. Design the flywheel. The allowable shear stress for flywheel is taken as 115 N/mm^2 . [14]

OR

- Q8) A mechanical press is designed to punch 20 mm diameter hole in 15 mm thick plate. The material of plate has $\sigma_{ut} = 380 \text{ N/mm}^2$. The press is designed to punch 60 holes/min. and punch one hole/stroke. The hole is punched 75° if the eccentric travel. The eccentric shaft is connected to flywheel through gear train ratio 6 : 1. The overall efficiency of press 75%. The fluctuation of speed and mean diameter of flywheel rim are limited to 16% and 1.1m respectively.

Design the rim type CI flywheel with 8 arms of elliptical cross-section. The permissible tensile stress for CI may be taken as 10 N/mm^2 . Assume flywheel rim width to thickness ratio 1.5. Also determine kW rating of electric motor required to drive the press. Rim contribute 90% flywheel effect. Assume major axis twice the minor axis for elliptical arm. [18]

Unit - V

- Q9) A concentric spring consist of two helical compression spring one inside the other. The free length of the outer spring is 15 mm greater than the inner spring. The wire diameter and mean coil diameter of inner spring are 5 mm and 30 mm respectively, also wire diameter and mean coil diameter of outer spring are 8 mm and 10 mm resp. Assume same material for two spring and modulus of rigidity of spring 81370 N/mm^2 . The composite spring is subjected to maximum axial force of 1000 N. Calculate :
- Compression of each spring.
 - Force transmitted by each spring.
 - Maximum torsional shear stress induced in each spring. [16]

OR

Q10) a) What is nipping of leaf spring. Explain with neat sketch. **[4]**

b) Following data refers to a helical compression spring.

- Maximum axial load - 8 kN
- Spring rate - 72 kN/m
- Mean coil diameter - 125 mm
- Sut for spring material - 550 N/mm²
- Modulus of rigidity for spring material - 80000 N/mm²
- Permissible shear stress for spring wire - $0.5 \times S_{ut}$

Available standard spring diameters - 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28 and 30 mm.

Determine,

- i) Wire diameter.
- ii) Number of active coils. **[12]**

Unit - VI

Q11) a) Explain the procedure of selection of flat belt from manufacturer's catalogue. **[5]**

b) A pulley of 750 mm diameter is driven by an open. Flat belt from 20 kW 720 rpm electric motor. The pulley on motor shaft is of 400 mm diameter and centre distance between the shaft is 2.5 m. Allowable tensile stress for belt material is 2 N/mm². Coe. of friction between belt and pulley is 0.3. The density of belt material is 900 kg/m³. if width of belt is 100 mm,

Determine,

- i) Thickness of belt
- ii) Length of belt
- iii) Initial tension required in belt **[11]**

OR

- Q12)** a) Discuss stresses developed in wire rope. [3]
- b) Explain any one belt tensioning method with suitable sketch. [4]
- c) A single V-belt used to transmit power from a grooved pulley of pitch diameter 200 mm running at 1500 rpm to a flat pulley of diameter 600 mm. The centre distance between the pulley is 1000 mm. The mass of the belt is 0.3 kg per meter. The coe. of friction between the belt and pulley is 0.25. The v-belt pulley groove angle is 38° . If allowable tension in belt is 800 N. Determine :
- i) Power transmitting capacity.
- ii) Initial tension required in belt. [9]



Total No. of Questions : 12]

SEAT No. :

P753

[Total No. of Pages : 3

[4263] - 215
T.E. (Mechanical / Automobile)
COMPUTER ORIENTED NUMERICAL METHODS
(2008 Pattern) (Semester - I)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates :

- 1) *Answer three questions from each section.*
- 2) *Answers to each section should be written in separate books.*
- 3) *Neat diagram must be drawn wherever necessary.*
- 4) *Figure to right indicate full marks.*
- 5) *Assume suitable data if necessary.*
- 6) *Use of programmable calculator is not permitted.*

SECTION - I

- Q1)** a) Solve using Newton Raphson Method $e^x \cdot \cos(x) - 1.4 = 0$. Find the value of root up to the accuracy of 0.01. **[8]**
- b) Draw the flowchart for successive approximation method. **[8]**

OR

- Q2)** a) Evaluate using Trapezoidal Rule. Take $h = k = 0.5$ **[8]**
- $$\int_0^1 \int_0^1 e^{(x+y)} dx dy$$
- b) Explain the trapezoidal rule, simpson's 1/3rd method and simpson's 3/8th rule, using graphical representation. **[8]**

- Q3)** a) Following table shows enthalpy at different pressures. Find out the enthalpy at pressure of 2.1 bar using suitable interpolation method. **[8]**

Pressure (bar)	1.9	2.2	2.4	2.6
Enthalpy (kJ/kg °K)	497.9	517.6	529.6	540.9

- b) Draw the flowchart for calculation and printing of forward difference table. **[8]**

OR

P.T.O.

- Q4)** a) Find dy/dx at $x = 0.2$ for following data points. [8]

x	0.2	0.4	0.6	0.8	1
y	0.81873	0.67032	0.54881	0.44933	0.36787

- b) For a hydrodynamic bearing, the temperature viscosity relationship is given as follows : [8]

t in $^{\circ}\text{C}$	40	41	42	43	44	45
μ in cp	52.5	50	47.5	45	43	41

Calculate the viscosity of the lubricant for the temperature of 43.2°C .

- Q5)** a) Solve the following set of simultaneous equations using Gauss Elimination Method. [10]

$$\begin{aligned} 10x_1 + x_2 + x_3 &= 12 \\ 2x_1 + 11x_2 + 2x_3 &= 15 \\ 3x_1 + 4x_2 + 9x_3 &= 16 \end{aligned}$$

- b) Draw the flowchart for the Gauss Seidal with relaxation method. [8]

OR

- Q6)** a) Solve the following set of simultaneous equations using Gauss Seidal Method. [10]

$$\begin{aligned} 9x_1 + 2x_2 + 4x_3 &= 20 \\ x_1 + 10x_2 + 4x_3 &= 6 \\ 2x_1 - 4x_2 + 10x_3 &= -15 \end{aligned}$$

- b) Draw the flowchart for Thomas Algorithm for Tri-diagonal Matrix. [8]

SECTION - II

- Q7)** a) Determine the values of a and b so that the equation $Q = ah^b$ best fits the following data by the method of least squares : [10]

h :	25	20	12	9	7	5
Q :	0.22	0.2	0.15	0.13	0.12	0.1

- b) Derive least square criteria for straight line. [6]

OR

- Q8)** a) The pressure of the gas corresponding to various volume V is measured, given by the following data : [10]

V (cm^3) :	50	60	70	90	100
P (kg/cm^2) :	64.7	51.3	40.5	25.9	78

Fit the data to the equation $P V^{\gamma} = C$

- b) Explain types of errors with suitable example : [6]
- i) Rounding Error.
 - ii) Truncation Error.
 - iii) Absolute Error.
 - iv) Relative Error.

Q9) a) An object having surface area of 0.1m^2 is initially at 0°C is dipped in a hot water bath. Water is initially at 95°C . Find the temperature of object after 10 sec, taking $\delta t = 2$ sec.

Take mass of the object 1.2 kg, $C_p = 450$ J/kg K, heat transfer coefficient = 1200 W/m²k. $(dT/dt = h^*A (T - T_p) / -m^*C_p)$. [10]

b) Draw flow chart for solution of simultaneous differential equations. [6]

OR

Q10) a) Using 'Runge Kutta method of order 4, find y for $x = 0.1, 0.2, 0.3$ given that $dy/dx = xy + y^2, y(0) = 1$. Continue the solution at 0.4 using Milne's method. [10]

b) Draw flowchart for 'Modified Euler's Method'. [6]

Q11) a) Solve $\delta^2 u / \delta t^2 = 4. \delta^2 u / \delta x^2$ with boundary conditions $u(0, t) = u(4, t) = 0$ and the initial condition $u_t(x, 0) = 0$ and $u(x, 0) = x(4 - x)$ taking $h = 1, k = 1/2$. [10]

b) Draw a flowchart for solving Elliptical equation. [8]

OR

Q12) a) Solve the equation $\nabla^4 u = -10(x^2 + y^2 + 10)$ over the square with sides $x = 0, y = 0$ and $x = 3, y = 3$ with $u = 0$ on the boundary and the mesh length = 1. [10]

b) Draw a flowchart for solving Laplace's equation. [8]



Total No. of Questions : 12]

SEAT No. :

P760

[Total No. of Pages : 3

[4263] - 226
T.E. (Mechanical S/W)
MECHATRONICS
(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 books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 5) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Explain the following static characteristics: **[6]**
- i) Hysteresis.
 - ii) Threshold.
 - iii) Resolution.
- b) Derive the expression for Gauge Factor of strain gauge. **[5]**
- c) Compare the characteristics of RTD and Themocouples. **[5]**

OR

- Q2)** a) The temperature range 20° to 120° is linearly represented by the standard current range of 4 to 20 mA. What current will result from 66°C? What temperature does 6.5 mA represent? **[5]**
- b) Explain with a neat sketch working principle of Load cell and state the applications of it. **[5]**
- c) Write a short note on: **[6]**
- i) Bridge circuits
 - ii) Filters.

P.T.O.

- Q3)** a) Differentiate between Incremental encoder and absolute encoder. [6]
- b) Explain the working principle of Rotary potentiometer and state its advantages and limitations. [5]
- c) State the typical specifications of LVDT. [5]

OR

- Q4)** a) The output of LVDT is connected to a 5V voltmeter through an amplifier of amplification factor 250. The voltmeter scale has 100 divisions and the scale can be read to $\frac{1}{5}$ th of a division and output of 2mV appears across the terminals of the LVDT when the core is displaced through a distance of 0.5 mm. Calculate the sensitivity of LVDT and the sensitivity of the entire set up. [8]
- b) Explain capacitive and self inductance principle for displacement measurement. [8]

- Q5)** a) Define the term transfer function and mention its features. [6]
- b) Explain the building blocks of Fluid system. [6]
- c) An 8 bit DAC using R-2R technique has a 5V dc reference. Calculate full scale output voltage and output voltage for input word 1011 10112. [6]

OR

- Q6)** a) Explain the building blocks of Thermal system. [6]
- b) Compare A/D and D/A converter. [6]
- c) Write a short note on SCADA. [6]

SECTION - II

- Q7)** a) Explain the following process characteristics : [6]
- i) Process load.
- ii) Process equation.
- iii) Capacity.
- b) Compare open loop and closed loop control system. [5]
- c) A controlling variable is a motor speed that varies from 800 to 1750 r.p.m. If the speed is controlled by a 25 to 50V DC signal [5]
- Calculate :
- i) Speed produced by an input of 38V.
- ii) Speed calculated as a percent of span.

OR

- Q8) a)** Explain the following terms : [8]
i) Process variable.
ii) Process error.
- b) Explain Feed forward control system with suitable example. [8]

- Q9) a)** State the factors to be considered for a selection of controller for a particular application. [5]
- b) Explain proportional control mode in detail. How offset occurs in this mode and how it is eliminated? [6]
- c) How would a derivative controller with $K_d = 4$ sec. respond to an error that varies as $C_p = 2.2 \sin (0.04 t)$? [5]

OR

- Q10) a)** Explain P+I+D controller with its mathematical equation. [6]
- b) State the typical specifications of controller. [5]
- c) An integral controller has a reset action of 2.2 minutes. Express the integral controller constant in s^{-1} . Find the output of this controller after 2 sec. to a constant error of 2.2%. [5]

- Q11) a)** Explain the various criteria that need to be considered for selection of a PLC. [6]
- b) Draw the ladder program for following logic: [6]
i) AND.
ii) OR.
iii) NAND.
- c) Write a short note on: [6]
i) Latching.
ii) Sequencing.

OR

- Q12) a)** Develop a ladder diagram for bottle filling plant. [8]
- b) Compare relay logic and PLC. [4]
- c) Write a short note on: [6]
i) Timers.
ii) Counters.



[4263] - 227
T.E. (Automobile Engineering)
MACHINE DESIGN
(2008 Pattern) (Sem. - I)

Time : 4 Hours]

[Max. Marks : 100

Instructions to the candidates :

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

SECTION - I**Unit - I**

- Q1)** A steel shaft made of 40C8 is used to drive a machine. The pulleys X, Y and bearings A, B are located as shown in Fig.1 Belt tensions are also shown. Determine diameter of the shaft using ASME code. Take S_{yt} of the shaft material as 330N/mm^2 and $S_{ut} = 600\text{N/mm}^2$. Assume $K_b = 1.5$ and $K_t = 1.2$. If the rectangular key is made of the same material, design the key. [16]

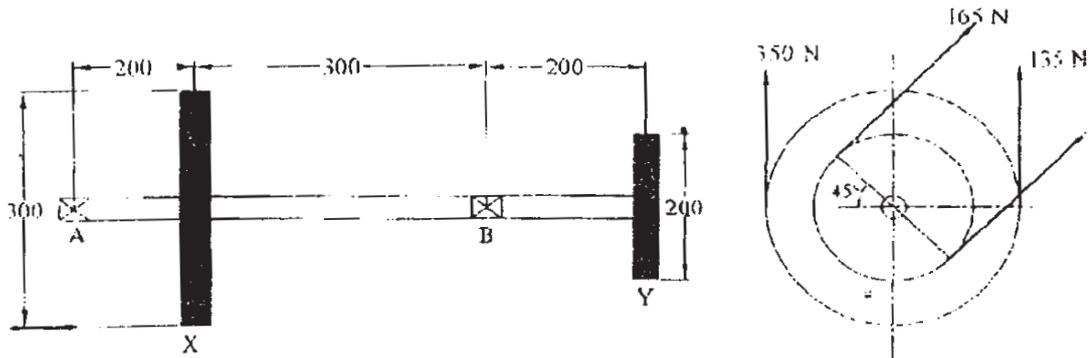


Fig. 1

OR

- Q2)** a) Compare the weights of equal length of hollow shaft and solid shaft to transmit a given torque for the same maximum shear stress. The material for both shafts is same and inside diameter is $2/3$ of outside diameter for hollow shaft. [6]

P.T.O.

- b) A protected type rigid flange coupling is used to transmit 25 kW power at 500 RPM from an engine to a machine. Design a coupling for an overload capacity of 25%. Assume following permissible stresses for the component of a coupling. Assume number of bolts as 6. [10]

	C.I. (Flange)	M.S. (Shaft & Key)	Plain Carbon Steel (Bolt)
Allowable tensile stress, N/mm ²	20	60	60
Allowable shear stress, N/mm ²	12	35	28
Allowable compressive stress, N/mm ²	60	60	60

Unit - II

- Q3)** a) A power screw of a screw press is required to transmit a maximum load of 100 kN at 60 RPM. The coefficient of friction for screw threads is 0.12. The torque required for collar friction and journal bearing is about 10% of the torque required to drive the load considering the screw friction. The maximum permissible compressive stress for screw is 100 MPa, While the screw has single start square threads. Determine : [12]

- i) The screw dimensions.
- ii) The screw efficiency ; and
- iii) The motor power required to drive the screw.

d (mm)	36	38	42	44	48	50
dc	30	31	35	37	40	42
p	6	7	7	7	8	8

- b) Write a note on 'Bolts of uniform strength'. [4]

OR

- Q4)** a) Derive the condition for avoiding joint separation in case of bolted joints. [4]

- b) A welded connection as shown in Fig.2, is subjected to a torsional moment of 12 kN-m about the centre of gravity of welds. If the permissible shear stress in weld deposit is 35 N/mm², calculate the throat and leg dimensions of weld. [12]

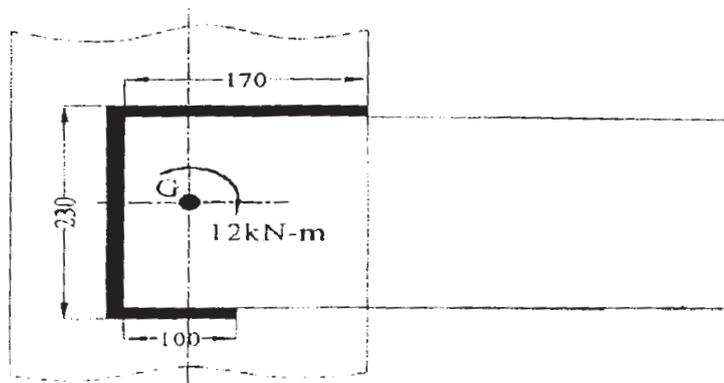


Fig.2

Unit - III

Q5) a) Explain the terms with neat sketches : [8]

- i) Soderberg diagram.
- ii) Goodman diagram.
- iii) Modified Goodman diagram.

b) A cantilever beam made of cold drawn carbon steel of circular crosssection as shown in Fig.3, is subjected to a load which varies from $-f$ to $3f$. Determine the maximum load that this member can withstand for an indefinite life using a factor of safety as 2. The theoretical stress concentration factor is 1.42 and notch sensitivity is 0.9. Assume the following values : [10]

Ultimate stress = 550 MPa.

Yield stress = 320 MPa.

Endurance limit = 275 MPa.

Size factor = 0.85.

Surface finish factor = 0.89.

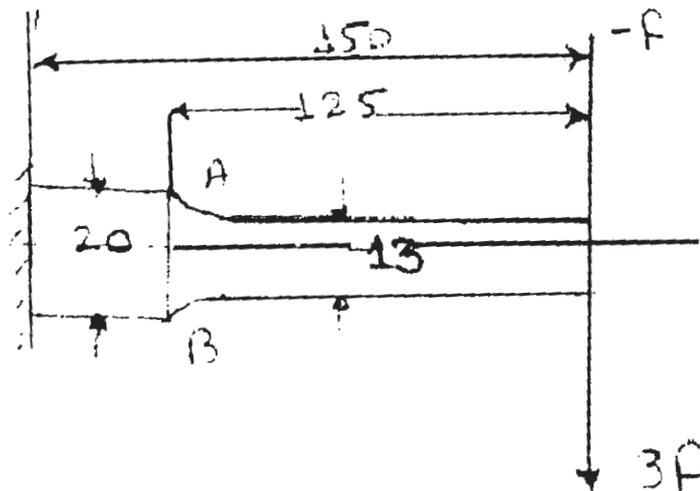


Fig. 3

OR

Q6) a) Explain the effect of following modifying factors on endurance strength.

- i) Surface finish factor.
- ii) Size factor.
- iii) Reliability factor.
- iv) Modifying factor to account stress concentration. [8]

b) A helical compression spring made of oil-hardened and tempered steel wire ($S_{ut} = 1300 \text{ N/mm}^2$) and ($G = 81500 \text{ N/mm}^2$) is to be used in the exhaust valve mechanism of diesel engine. The operating force on the spring varies continuously between 200 N and 500 N. The maximum valve lift is 21.5 mm. If the required f.o.s. is 1.5, determine :

- i) The spring diameter.
- ii) The mean coil diameter.
- iii) The no. of active coils.

The spring index can be assumed as 8.

[10]

SECTION - II

Unit - IV

Q7) a) Derive the expression for stress and deflection of a helical Compression Spring. [6]

b) A railway wagon moving at a velocity of 1.5 m/s is brought to rest by a bumper consisting of two helical compression spring arranged in parallel. The mass of the wagon is 1500 kg. The springs are compressed by 150 mm in bringing the wagon to rest. The spring index can be taken as 6. The springs are made of oil-hardened and tempered steel wire with ultimate tensile stress of 1250 N/mm² and modulus of rigidity of 81370 N/mm². The permissible shear stress can be taken as 50% of the ultimate tensile stress. Design the springs and calculate : [10]

- i) Wire diameter;
- ii) Mean coil diameter;
- iii) Number of active coils;
- iv) Solid Length and free length;
- v) Pitch of the coil;
- vi) Required Spring rate ; and
- vii) Actual Spring rate.

OR

Q8) a) Write short note on : [6]

- i) Wahl's Factor;
- ii) Nipping of leaf springs.

b) It is required to design a helical torsion spring for the window shade. The spring is made of patented and cold drawn steel wire of grade 4. The yield strength of the material is 60% of the ultimate tensile strength and the factor of safety is 2. From space consideration, the mean coil diameter is kept as 18 mm. The maximum bending moment acting on the spring is 250 N-mm. The modulus of elasticity of the spring material is 207×10^3 N/mm². The stiffness of the spring should be 3 N-mm/Radian Determine the wire diameter and number of active coils. Use following data for wire diameter and minimum tensile strength for grade 4 material.

Wire diameter	1.0	1.2	1.4	1.6	1.8	2.0	2.5	3	3.6
Minimum Ultimate tensile strength Sut (N/mm ²)	2400	2340	2290	2250	2190	2160	2050	1980	1890

[10]

Unit - V

- Q9)** a) Derive Petroff's equation to find out the coefficient of friction in journal bearing. [5]
- b) A single-row deep-groove ball bearing is used to support the lay shaft of a four-speed automobile gearbox. It is subjected to the following loads in respective speed ratios. The lay shaft is fixed to the engine shaft and rotates at 1750 rpm. The static and dynamic load carrying capacities of the bearings are 11.6 kN and 17.6 kN respectively. The bearing is expected to be in use for 4000 Hrs of operation. Find out the reliability with which the life could be expected. The work cycle is as shown in **table 1**.

Gear	% of time Engaged	Radial Load (N)	Axial Load (N)
1	1%	4000	3250
2	3%	2750	500
3	21%	2750	50
4	75%	Nil	Nil

Table 1 (Q1. B)

F_a/C_o	$(F_a/F_r) \leq e$		$(F_a/F_r) > e$		e
	X	Y	X	Y	
0.025	1	0	0.56	2.0	0.22
0.040	1	0	0.56	1.8	0.24
0.070	1	0	0.56	1.6	0.27
0.130	1	0	0.56	1.4	0.31
0.250	1	0	0.56	1.2	0.37
0.500	1	0	0.56	1.0	0.44

Table 2 (Radial and thrust factor for Single row deep groove ball bearing). [12]

OR

- Q10)** a) Derive Stribeck's equation for static capacity of a roller bearing. [5]
- b) Following data is given for 360° hydrodynamic bearing.
- Radial load = 10 kN
 - Journal Speed = 1440 rpm
 - Unit bearing pressure = 1000 KPa
 - Clearance ratio (r/c) = 800
 - Viscosity = 30 MPa-S
 - Length to diameter ratio = 1

Assuming that the total heat generated in the bearing is carried by the total oil flow in the bearing. Calculate

- i) The dimensions of the bearings.
- ii) The coefficient of friction.
- iii) The power lost in the friction.
- iv) The total flow of oil.

- v) The side leakage.
- vi) The temperature rise.
- vii) The average temperature (inlet temperature is 40° C) and
- viii) The maximum pressure.

Use the data given in **table 3**

[12]

Table 3

l/d	ϵ	(h_0/c)	S	ϕ	$(r/c)f$	$(Q/r c n s l)$	(Q_s/Q)	(p/p_{max})
	0.0	1.0	∞	85	∞	π	0	--
	0.1	0.9	0.33	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
1	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	0.003	0.00474	15.47	0.514	4.82	0.973	0.152
	1.0	0	0	0	0	0	0	0

Unit - VI

Q11) It is required to design a spur gear speed reducer for a compressor running at 250 rpm driven by 7.5 kW, 1000 rpm electric motor. The centre distance between the axes of the gear shaft should be exactly 250 mm. The starting torque of the motor can be assumed to be 150% of the rated torque the gears are made of carbon steel 50C4 ($S_{ut} = 700$ MPa) The pressure angle is 20°. The factor of safety is 2 for preliminary design based on the use of Barth (velocity) factor.

- a) Design the gears and specify their dimensions ;
- b) Assume that the gears are manufactured to meet the specifications of grade 6 and calculate the dynamic load by using Buckingham’s equation;
- c) Calculate the effective load ;
- d) What is the actual factor of safety against bending failure, and
- e) Using the same factor of safety against the pitting failure, specify suitable hardness for the gears.

Use following data for the design :

- Velocity factor = $3/3 + v$
- Lewis form factor (Y) :

Number of teeth	20	21	22	23	24	25	28	30
Y	0.320	0.326	0.330	0.333	0.337	0.340	0.352	0.358

- First preference value of module 'm' in mm : 1, 1.25, 1.5, 2, 2.5, 3, 4, 5, 6, 8, 10, 12, 16, 20.
- For grade 6 ; Tolerance for adjacent pitch error (e) in micrometer $e = 8 + 0.63 T_f$ in micrometer.

'Where T_f is tolerance factor = $m + 0.25 \sqrt{\text{PCD}}$; where PCD is pitch circle diameter in mm,

- Dynamic load $P_D = 21 V [c e b + P_T] / 21 V + \sqrt{c e b + P_T}$ where ' P_T is tangential load in N.
- Deformation factor 'C' in N/mm^2 for 20 degree full depth teeth are

Pinion material	Gear material	Deformation factor 'C' in N/mm^2
Grey C.I	Grey C.I	5700
Steel	Grey C.I	7900
Steel	Steel	11400

- Load stress factor $K = \sigma_c \sin \alpha \cos \alpha [1/E_p + 1/E_g]/1.4$.
- E_p and E_g are young's modulus of elasticity for pinion and gear material = 206×10^3 MPa.
- α is pressure angle.
- σ_c = Surface endurance strength in MPa = $0.27 (g)$ BHN in MPa.
- g is acceleration due to gravity. [17]

OR

Q12) a) What is the different mode of gear tooth failure? [5]

b) The following data is given for a steel spur gear pair transmitting 5 KW Power from a shaft rotates at 3000 r.p.m. to another parallel shaft rotating at 1500 rpm.

- Module = 4 mm
- Number of teeth on pinion = 18
- Ultimate tensile strength for pinion and gear = 630 MPa
- Face width = 10 times module
- Surface hardness = 400 BHN
- Combined teeth error (e) = 15 microns
- Tooth System = 20 degree full depth involute
- Deformation factor (C) = 11400 e N/mm^2

Where e is a is tolerance factor = $m + 0.25 \sqrt{\text{PCD}}$; where PCD is pitch circle diameter in mm,

Calculate;

i) Factor of safety against bending failure.

ii) Factor of safety against pitting failure.

Use following data :

- Dynamic load $P_D = 2IV [C b + P_{Tmax}] / 2IV + \sqrt{(C b + P_{Tmax})}$

Where ' P_{Tmax} ' is maximum tangential load
in N.

- Lewis form factor for 20 degree full depth involute system.

$$Y_p = 0.484 - 2.87/\text{Number of teeth.} \quad [12]$$



Total No. of Questions : 12]

SEAT No. :

P762

[Total No. of Pages : 2

[4263] - 231

T.E. (Production Engineering)

METROLOGY & MECHANICAL MEASUREMENTS

(2008 Pattern) (Semester - I)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates :

- 1) *Solve any three questions from each section.*
- 2) *Figures to the right indicate full marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Assume suitable data, wherever necessary.*

SECTION - I

- Q1)** a) What is standard, explain different types of it. [6]
b) Describe with neat sketch and principal working of Autocollimator and state its application. [10]

OR

- Q2)** a) Write a short note on : sine bar and sine center. [8]
b) Discuss the following : [8]
i) Precision and accuracy.
ii) Errors in measurement.

- Q3)** a) Describe Hole basis & Shaft basis system with sketch. [8]
b) A hole & shaft have a basic size of 25mm & are to have a clearance fit with maximum clearance of 0.02 & minimum clearance of 0.01 mm. The hole tolerance is to be 1.5 the shaft tolerance. Determine limit for both hole and shaft. Using 1.Hole & Shaft basis system. [10]

OR

- Q4)** a) What is fit & explain any three types of fit with sketch. [8]
b) Design and make drawing of general purpose Go and No GO Ring gauge for Inspecting of a shaft of 30 f8. Use data with usual notations.
 $FD = - 5.5D^{0.41}$ [10]

- Q5)** a) Explain in detail pitch error with all types. [8]
b) Describe with neat sketch and principal working of sigma comparator and state its advantages & disadvantages. [8]

P.T.O.

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 5mm & pressure angle 20°. [10]
b) Explain with sketch & meaning representation of surface roughness. [6]

SECTION - II

- Q7)** a) List different types of working standards. Describe any one of them. [8]
b) Draw a generalized block diagram of instrumentation system and state the function of it. [8]

OR

- Q8)** a) What is sensor? Explain one sensor in detail and the selection criteria for transducers. [8]
b) Describe the selection criteria used for transducer for application. [8]

- Q9)** a) Describe the construction and operating principle of a dead weight tester. [10]
b) Define : [8]
i) Atmospheric pressure.
ii) Vacuum pressure.
iii) Absolute pressure.
iv) Gauge pressure.

OR

- Q10)** a) Classify temperature measuring instruments based upon nature of change produced in temperature sensing elements. [10]
b) What is thermister? Give the characteristic of thermister. [8]
- Q11)** a) Explain the techniques of measurement on rotating shaft. [8]
b) Discuss calibration system for force measurement. [8]

OR

- Q12)** a) Explain the characterization of the performance of a force measuring system and explain the working of torque testing dynamometer with neat sketch. [8]
b) Discuss the basic methods of force measurements. [8]

⊗ ⊗ ⊗ ⊗

Total No. of Questions : 12]

SEAT No. :

P763

[Total No. of Pages : 3

[4263] - 233
T.E. (Production)
MATERIAL FORMING
(2008 Pattern) (Semester - I)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

UNIT - I

- Q1)** a) What are the assumptions in material forming? What are the different methods used for the analysis of forming processes. **[8]**
- b) Explain and draw Mohr's circle for various two and three dimensional stress conditions. **[8]**

OR

- Q2)** a) Derive an equation for the work done in elastic and plastic deformation. **[8]**
- b) Explain the effect of temperature, strain rate and friction on metal forming process. **[8]**

UNIT - II

- Q3)** a) Explain in detail how the stock size is calculated in impression die forging. **[8]**
- b) Explain briefly the following with neat sketch. **[8]**
- i) Shot blasting and tumbling process.
 - ii) Isothermal forging.

OR

P.T.O.

Q4) Write short note:

- a) Orbital forging. [6]
- b) Parting line selection. [6]
- c) Isothermal forging. [4]

UNIT - III

Q5) Derive an equation for the drawing stress (σ_d) in tube drawing operation using moving cylindrical mandrel. [18]

OR

- Q6)** a) Explain with neat sketch the various forces acting on a tube during tube drawing operation using fixed plug. [5]
- b) Show that the maximum permissible reduction in strip drawing using tapered dies is 60%. Assume coefficient of friction, $\mu=0.05$ and semi die angle $\alpha=15^\circ$. [8]
- c) Explain construction and working of slip stepped cone wire drawing machine and multistage wire drawing machine. Also state its advantages and limitations. [5]

SECTION - II

UNIT - IV

- Q7)** a) Explain the methods used to reduce the separating force in rolling. [4]
- b) Explain four high rolling mills with neat sketch its advantages. [4]
- c) Explain the breakdown pass in rolling with its principal series [sequence] [8]

OR

- Q8)** a) Explain mill spring, mill modulus, ragging, overshooting and hunting in rolling. [8]
- b) Explain AGC. Discuss the methods of AGC. [8]

UNIT - V

- Q9)** a) Derive an equation for work done in extrusion. [8]
- b) Explain types of flow patterns with neat sketches in extrusion. State various extrusion defects. [8]

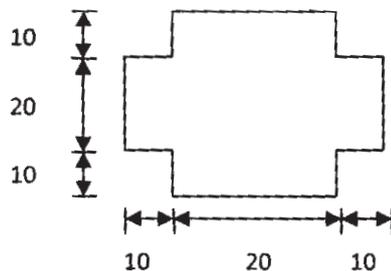
OR

Q10) a) Explain the variation of extrusion pressure with ram travel in direct, indirect and hydrostatic extrusion process with suitable graph. [6]

b) An aluminium billet of 50mm diameter and 1m long is extruded to the final shape as shown in Figure.

Explain and Calculate the following: [10]

- i) Extrusion ratio
- ii) CCD
- iii) Shape factor
- iv) Work done



UNIT - VI

Q11) a) Define spinning. State the applications of metal spinning. Explain vertical power spinning machine with neat sketch. [8]

b) Explain the importance of field shaper and drivers in electro-magnetic forming. [5]

c) Distinguish between explosive forming and electro-hydraulic forming. [5]

OR

Q12) a) Explain manual spinning process with neat sketch. [6]

b) Explain stretch forming method with neat sketch. State the advantages of stretch forming. [8]

c) Explain types of coils used in EMF with proper sketch state their applications. [4]



Total No. of Questions : 12]

P764

SEAT No. :

[Total No. of Pages : 4

[4263] - 234
T.E. (Production)
PRODUCTION MANAGEMENT
(2008 Pattern) (Semester - I)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

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

SECTION - I

Unit - I

- Q1)** a) With the help of block diagram, explain the process of production system. [8]
- b) Define Operation Management and discuss the history of Operations Management. [8]

OR

- Q2)** a) Compare the types of Production system with any eight characteristics. [8]
- b) Define Production, Production Management and state the objectives of Production Management. [8]

Unit - II

- Q3)** a) Explain with the help of block diagram functions of Production Planning and Control. [8]
- b) With the help of figure explain the stages in Product Life Cycle. [8]

OR

- Q4)** a) Differentiate between Production Planning and Production Control.[8]
- b) What are the objectives of PPC? Explain the essential information required for production planning. [8]

P.T.O.

Unit - III

- Q5)** a) Define Plant Layout, Explain the factors influencing plant layout. [10]
b) Consider a following assembly network relationship of a product. maximum three tasks can be combined in one workstation

Operation No.	Immediate Preceding Task	Duration (Min)
1	-	3
2	A	2
3	A	5
4	B	4
5	B	8
6	C	2
7	E	4
8	G	6

- i) Draw the precedence diagram [2]
ii) What is the desired cycle time? [2]
iii) What is the theoretical number of workstation? [2]
iv) What are the efficiency and balance delay of the solution obtained? [2]

OR

- Q6)** a) Define Material Handling System. State the principles of Material Handling system. [10]
b) Explain different types of Material handling equipments with its applications. [8]

SECTION - II

Unit - IV

- Q7)** a) Define Sales forecasting. What are the short term and long term objectives of sales forecasting? [8]
b) Calculate the trend of sales using 3 & 4 years moving average sales data for the years as given below : [10]

Years	1985	86	87	88	89	90	91	92	93	94	95
Sales	12	15	14	16	18	17	19	20	22	25	24

Forecast the demand for the year 1996.

OR

- Q8) a)** Explain any two methods of Sales forecasting. [8]
b) Find the coefficient of correlation between of production and sales price for which data is as [10]

Period	1	2	3	4	5	6
Cost	100	118	130	142	160	175
Price	125	140	152	164	188	198

Unit - V

- Q9) a)** Explain Forward and Backward scheduling in detail. [8]
b) There are seven jobs each of which has to go through the machines M1 and M2 in the order of M1M2. Processing time in hours are given as :

Jobs	1	2	3	4	5	6	7
Machine M1	3	8	7	4	9	8	7
Machine M2	4	3	2	5	1	4	3
Machine M3	6	7	5	11	5	6	12

Determine a sequence of these jobs that will minimize the total elapsed time and idle time associated with machine M2 and machine M3. [8]

OR

- Q10)a)** Explain in brief steps involved in scheduling. [8]
b) The activity details and their predecessors are given below along with their activity times. Construct the network diagram and compute the critical path. [8]

Activity	Predecessors	Activity Time (Weeks)
A	--	8
B	--	12
C	--	16
D	C	8
E	A,B	16
F	E,D	8
G	D	6
H	F, G	6

Unit - VI

- Q11***)a) Explain in short Just-in-Time (JIT) system. [8]
b) List the advanced manufacturing philosophies and explain any two of them. [8]

OR

- Q12***)a) Write a short note on Lean Manufacturing. [8]
b) Explain in short Energy Audit. [8]



Total No. of Questions : 12]

P765

SEAT No. :

[Total No. of Pages : 4

[4263] - 235
T.E. (Production Engineering)
CUTTING TOOL ENGINEERING
(2008 Pattern) (Semester - I)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) Attempt one question of each unit from Section - I and Section - II.*
- 2) Answers to the questions should be written in separate books.*
- 3) Draw neat diagram wherever necessary.*
- 4) Assume suitable data, if required.*
- 5) Drawing could be made through proportional free hand sketches.*

SECTION - I

Unit - I

- Q1)** a) Sketch Merchant's circle and explain the different equations involved. State the various assumptions made. [7]
- b) During the metal cutting test under orthogonal cutting it was found that cutting force is 1000 N and feed force is 900 N when the cutting at 30 m/min, the rake angle of tool is 10 degree, shear plane angle was found to be at 29 degree, find [8]
- i) Shear velocity,
 - ii) Chip flow velocity,
 - iii) Work done per minute in shearing the metal and work done against friction.
- c) Explain chip contraction coefficient. How is the chip contraction coefficient used to measure the degree of plastic deformation? [5]

OR

- Q2)** a) State the requirements of tool dynamometers. What is the basic principle on which tool dynamometers works. [7]
- b) While machining C-20 steel with a triple carbide tool of 0-8-6-7-10-70-1 mm (ORS), the following forces have been recorded on a two dimensional dynamometer-cutting force 1200N, Feed force-700N, feed-0.2mm/rev, depth of cut-2mm and chip thickness -0.4mm calculate-chip thickness ratio, shear plane angle, coefficient of friction, shear force, frictional force, specific energy of friction. [8]
- c) Explain the conditions that leads to continuous chip, discontinuous chip and BUE chip formation. [5]

P.T.O.

Unit - II

- Q3)** a) Describe the special features of the following tool materials and state their applications : [8]
- i) HSS,
 - ii) Ceramics.
- b) With the help of necessary diagram, illustrate the basic parts and the geometric elements of hand reamer. [7]

OR

- Q4)** a) What is negative rake inserts and positive rake inserts? Explain any one method of clamping and tooling system for external turning tool holder. [7]
- b) Explain with suitable sketches following tooth characters of a face milling cutter : [8]
- i) axial and radial rake angle,
 - ii) face and peripheral relief angle,
 - iii) face cut edge angle,
 - iv) peripheral cut edge angle,
 - v) chamfer.

Unit - III

- Q5)** a) What are the various factors which leads to maximum temperature of cutting tool? Discuss heat dissipated by [7]
- i) chip,
 - ii) tool,
 - iii) work for a turning operation.
- b) Following data were obtained for a turning operation of C-30 steel using HSS tool [8]
- i) for cutting velocity of 20m/min, tool life was 150 min,
 - ii) for cutting velocity of 25m/min, tool life was 30 min. find out optimum cutting speed and corresponding tool life for minimum cost for machining operation, for k_1 = Operating cost 20 paise/Min, K_2 = Tool cost/cutting edge, 2 Rs/tool failure, t_c = tool changing time 2 min.

OR

- Q6) a)** What do you understand by machinability? Explain the different criteria of measuring the machinability rating [7]
- b)** A 60 minute tool life was obtained while turning operation for following data $V =$ cutting speed = 30 m/min, $f =$ feed = 0.3 mm/rev, $d =$ depth of cut = 2.5mm
- Calculate the change in tool life if the cutting parameters are changed by 20% individually and also taken together. Use tool life equation = $VT^{0.13} f^{0.77} d^{0.37} = C$ [8]

SECTION - II

Unit - IV

- Q7) a)** Enumerate the various considerations for designing broach. Also draw a typical sketch of key way broach and show its various elements. [8]
- b)** Design a circular form tool graphically for following job shown in fig. 1 Rake angle = 12° , Relief angle = 10° , Minimum chip disposal thickness = 5mm. [7]

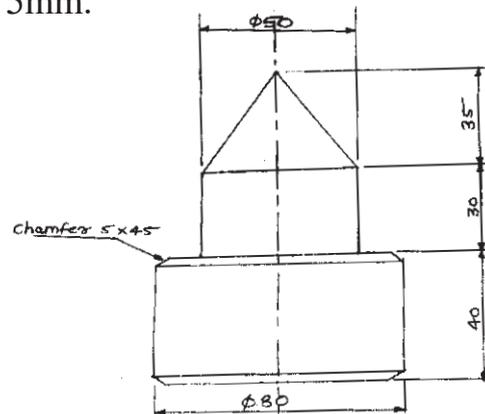


Fig.No.1

OR

- Q8) a)** With neat sketch explain the various design aspect of a reamer. [7]
- b)** Draw a neat sketch of a slab mill cutter with its nomenclature. [8]

Unit - V

- Q9) a)** Discuss the principle of perpendicular locating planes. [5]
- b)** Write a short note on : [10]
- i) box type of jig,
 - ii) Economics of jig and fixture

OR

Total No. of Questions : 12]

SEAT No. :

P767

[Total No. of Pages : 3

[4263] - 240

T.E. (Production Engg.) (Common to Production S/W)

PRODUCTION METALLURGY

(2008 Pattern) (Semester - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates :

- 1) Answer Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6 from section-I and Q. 7 or Q. 8, Q. 9 or Q. 10, Q. 11 or Q. 12 from section-II.
- 2) Answers to the two sections should be written in separate books.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Figures to the right indicate full marks.
- 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 self explanatory ray diagram of Metallurgic Microscope. [4]
b) Discuss slow cooling of AISI 1060 from its Austenitic temperature to room temperature, calculate percentage of individual phases by the application of lever rule wherever there is change in phase and draw the microstructure for the same at room temp. [6]
c) What do you understand by : [4]
i) St45.
ii) AISI020.
iii) 35S18.
iv) T35 Cr5Mo1V30.
d) Widmanstatten structure is preferred in hyper eutectoid steel explain. [4]

OR

- Q2)** a) Draw Iron Carbon Equilibrium diagram. Explain importance of all critical temperatures on it. [6]
b) Define : [4]
i) Dark field illumination.
ii) Austenite.
iii) Resolving power of objective.
iv) Ferrite.
c) Write a short note on Flow line detection. [4]
d) Discuss Non equilibrium cooling and its effect with respect to equilibrium diagram. [4]

P.T.O.

- Q3)** a) Explain the process to draw TTT diagram for C80. [4]
b) Which heat treatment you will suggest for coarse grained AISI1030 to improve its strength and hardness? Explain. [4]
c) Write a short note on Jominey End Quench Test. [4]
d) Explain transformation mechanism of Austenite to Pearlite. [4]

OR

- Q4)** a) Differentiate between Annealing and Normalizing. [4]
b) If a gear needs to be machined after Hardening, which heat treatment do you suggest to improve the machinability explain. [4]
c) Show the following cooling curves on TTT diagram. [4]
i) 50% pearlite + 50% Austenite.
ii) 100% Bainite.
iii) 100% fine pearlite.
iv) 100% Martensite.
d) Write characteristics of Martensitic transformation. [4]

- Q5)** Write short notes on : [16]
a) Flame hardening.
b) Pack carburizing.
c) Nitriding.
d) Martempering.

OR

- Q6)** a) Which heat treatment is used for measuring equipments to improve its hardness? Justify your answer. [4]
b) Suggest suitable heat treatment for following applications and justify. [9]
i) Heavy casting of steel.
ii) Shaft.
iii) Gears used in Automobile.
c) Explain Isothermal Annealing heat treatment. [3]

SECTION - II

- Q7)** a) Explain advantages of alloy steels over plain carbon steel? [4]
b) What is chilled cast Iron? [2]
c) Explain Austenitic and Martensitic stainless steels with respect to their chemical composition, mechanical properties and min one use of each type. [6]
d) Draw the microstructure of the following : [6]
i) Ferritic Gray cast Iron.
ii) Ferrite pearlitic Spheroidal Cast Iron.

OR

- Q8)** a) What are the advantages of Cast Iron over plain carbon steel. [4]
b) Explain heat treatment for tool steel. [4]
c) What is HCHC & OHNS? [4]
d) What do you mean by graphitization? Which elements are present in cast iron as graphitizer? Explain their role. [4]
e) What is Carbon equivalence in cast Iron? [2]

- Q9)** a) Tin bronzes show pronounced coring explain. [4]
b) Give typical composition and uses for the following : [8]
i) Muntz metal.
ii) LM13.
iii) Elinvar.
iv) Dura Nickel.
c) To increase the hardness of Alfa brasses cold working is used. Explain. [4]

OR

- Q10)** a) What is Beryllium Bronze? Give its typical composition, properties and uses. [4]
b) Explain the phenomena of Dezincification. [4]
c) What is high tensile brass. [2]
d) What are the requirements of bearing metals? How it is achieved in babbitts? [6]

- Q11)** Write short note on : [16]
a) Nano materials.
b) Materials used in Sports.
c) Biomaterials.
d) Fiber Reinforced composite.

OR

- Q12)** a) What is Aspect ratio? What is its effect on the properties of composite? Explain with suitable graph. [4]
b) What is an Aramide fiber? Which are the two commercially available fibers are? [4]
c) Describe Dispersion strengthened composite. [4]
d) What are MMCS? Explain in brief. [4]



Total No. of Questions : 12]

SEAT No. :

P768

[Total No. of Pages : 3

[4263] - 242

T.E. (Prod S/W)

KINEMATICS DESIGN OF MACHINE

(2008 Course) (Sem. - II) (311124)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates :

- 1) Solve Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No.4, Q. No. 5 or Q. No. 6 from section-I and Q. No. 7 or Q. No. 8, Q. No. 9 or Q. No. 10, Q. No. 11 or Q. No. 12 from section-II.
- 2) Answers to the two sections should be written in separate books.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Figures to the right indicate full marks.
- 5) Assume suitable data, if necessary.
- 6) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

SECTION - I

Unit - I

- Q1)** a) Explain various Kinematics principles used in the operation of gear hobbing machine used to generate helical gear. [10]
- b) Explain the following terms related to Kinematic Synthesis. [6]
- i) Function Generation.
 - ii) Dimensional Synthesis.
 - iii) Path Generation.

OR

- Q2)** a) Explain the following Kinematic chain representation with figure : [8]
- i) E - 21.
 - ii) C - 13.
 - iii) K - 25.
 - iv) K - 23.
- b) 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 12 rad/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.

P.T.O.

Unit - II

Q3) a) Define following terms : **[4]**

- i) Notch Sensitivity.
- ii) Fatigue.

b) At a section of steel shaft where the diameter changes from 430mm to 300mm, the fillet radius provided is 7.5mm. The shaft is finished by fine turning. The section is subjected to a constant bending moment of 470kNm. Endurance strength of 10mm diameter specimen with 50% reliability in reverse bending is 210MPa.

Use following data :

Yield strength of shaft material = 350 MPa.

Notch sensitivity of material = 0.8

Surface finish factor = 0.8

Size factor = 0.75

Ultimate tensile strength = 500 MPa

The theoretical stress concentration factor K_t may be interpolated from the following table, where r_f = fillet radius and d = shaft diameter.

r_f/d	0.025	0.05	0.1
k_t	2.6	2.05	1.66

Determine the life expected in revolution of the shaft. **[12]**

OR

Q4) a) Explain the various factors influencing the fatigue strength of components. **[4]**

b) A transmission shaft made of cold drawn steel 45C8 ($S_{ut} = 630\text{N/mm}^2$ and $S_{yt} = 360\text{N/mm}^2$) is subjected to a fluctuating torque which varies between 600Nm clockwise and 400Nm clockwise, determine the diameter of the shaft. Use maximum shear stress theory of failure. Use the following data : **[12]**

Surface finish factor = 0.8

Size factor = 0.85

Reliability factor = 0.897

Factor of safety = 2

Unit - III

Q5) a) What is the significance of formative number of teeth in the design of helical gear? **[4]**

- b) The following data is given for a spur gear pair made of steel and manufactured by shaping.

Module	= 6mm
Center distance	= 240 mm
Permissible bending stress	
For pinion & gear	= 60N/mm ²
Pinion speed	= 1500 rpm
Gear speed	= 500 rpm
Face width	= 10 module
Tooth system	= 20° full depth involute
Application factor	= 1.5
Factor of safety	= 2.0

$$\text{Velocity factor } K_v = \frac{6}{6+v}$$

Assuming the velocity factor accounts for the dynamic load; calculate the rated power that the gear can transmit. Suggest the surface hardness. **[14]**

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 and 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 and Spott's equation for dynamic load. Use following data :

$$\text{Dynamic Factor } K_v = \frac{5.6}{5.6 + \sqrt{V}}$$

$$\text{For Grade 7, } e = 11.0 + 0.9 (m_n + 0.25 \sqrt{d})$$

$$\text{Lewis Factor, } Y' = 0.484 - \frac{2.87}{Z'}$$

$$F_d = \frac{e \cdot n_p \cdot Z_p \cdot b \cdot r_p \cdot r_g}{2527 \sqrt{r_p^2 + r_g^2}} \times \cos \phi_n \cos \phi$$

Notations have usual meaning.

- b) What are the different types of gear tooth failures explain? **[6]**

SECTION - II

Q7) a) A single row deep groove ball bearing is subjected to the following work cycle : **[12]**

Element No.	Element Time%	Radial Load	Thrust Load	Radial Factor	Thrust Factor
-------------	---------------	-------------	-------------	---------------	---------------

b) Comment on : **[5]**

- i) Distance bound.
- ii) Performance bound.

related to the convolutional codes.

c) What are unger bock's TCM design rules. Explain asymptotic coding gain? **[7]**

OR

Q8) a) A rate 1/3 convolution encoder has generating vectors as $g_1 = (110)$, $g_2 = (111)$, $g_3 = (011)$.

- i) Sketch the encoder.
- ii) If the input message sequence is 10110, determine the output sequence of the encoder.
- iii) Draw the state diagram and trellis diagram. **[12]**

b) Design a (3, 1) cyclic repetition code and its decoding method. Find the corrected codewords for 1) 010. **[6]**

Q9) a) Explain the following terms in connection with convolution codes. **[8]**

- i) Code tree.
- ii) State diagram.
- iii) Code trellis.

b) Implement RSA algorithm. **[8]**

OR

Q10) a) Compare the performance of the following systems with optimum system (ideal system) **[10]**

- i) Amplitude modulation (SSB, DSB).
- ii) Frequency modulation.
- iii) Pulse code modulation (PCM).

b) Consider the (31, 15) Reed - Soloman code, **[6]**

- i) How many bits are there in a symbol of the code?
- ii) What is the block length in bits.
- iii) What is minimum distance of the code.
- iv) How many symbols in error can the code correct.

- Q11)** a) Explain in detail with analysis satellite system power budget. [10]
b) Explain delay spread and doppler spread. [6]

OR

- Q12)** a) Draw and explain the block diagram of space diversity technique. [6]
b) Compare GSM with IS-95 standards for mobile communication system. [5]
c) Define E.I.R.P., antenna bandwidth and aperture efficiency of antenna. [5]



Total No. of Questions : 12]

P769

SEAT No. :

[Total No. of Pages : 3

[4263] - 251

T.E. (Electrical Engineering)
ENGINEERING ECONOMICS & MANAGEMENT
(2008 Pattern) (Semester - I)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) *Answer any one question from each unit.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Figures to the right indicate full marks.*

SECTION - I

Unit - I

- Q1)** a) What do you mean by organisation? Distinguish between public company & private company. [8]
- b) Explain the following types of business organisation [8]
- i) Private public partnership.
 - ii) Co-operative society's.

OR

- Q2)** a) Define Economics. Discuss its nature & scope. [8]
- b) What is the role of Govt. in Macro. Economics. [8]

Unit - II

- Q3)** a) What are the various functions of management? [8]
- b) Elaborate the contribution put forth by 'Henry fayol' towards evolution of management thoughts. [8]

OR

P.T.O.

- Q4)** Explain the following terms : **[16]**
- | | |
|-------------------|--------------------------|
| a) ISO-standards. | b) Lean Manufacturing. |
| c) EOQ. | d) Inventory Management. |

Unit - III

- Q5)** a) What is 'Marketing Management'? Explain the various functions of marketing management? **[9]**
- b) Write a short note on : **[9]**
- i) Marketing Planning.
- ii) Marketing Research.

OR

- Q6)** a) Explain the various methods of costing. **[9]**
- b) What do you mean by Merger & Acquisition? What are the advantages of Merger & Acquisition. **[9]**

SECTION - II

Unit - IV

- Q7)** a) Define Motivation. Explain 'Maslow theory' of motivation in detail. **[8]**
- b) Explain 'X & Y' theory of motivation. **[8]**

OR

- Q8)** a) What is the role played by Govt. to promote 'Entrepreneurship' culture in India. **[8]**
- b) Explain different styles of leadership. **[8]**

Unit - V

- Q9)** a) What is Industrial Relation? Discuss scope & objectives of Industrial Relation. **[8]**
- b) Explain the concept of labour welfare. **[8]**

OR

- Q10)**a) What is the meaning of the term 'Personality'? How can personality be developed. [8]
- b) Explain the following terms : [8]
- i) Professional Ethics.
 - ii) Process of learning.

Unit - VI

- Q11)**a) What do you mean by Disaster Management? Explain its scope & Importance. [9]
- b) State & Explain various types of disasters. [9]

OR

- Q12)** Prepare a detail Disaster Management plan for 'Tsunami'. [18]



Total No. of Questions : 12]

SEAT No. :

P770

[Total No. of Pages : 2

[4263] - 252
T.E. (Electrical)
MICROCONTROLLER AND ITS APPLICATIONS
(2008 Pattern) (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) *Figures to the right indicate full marks.*
- 3) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Classify the microcontrollers based on number of bits, memory architecture, instruction set, memory devices and family. **[8]**
b) Explain the internal RAM structure of 8051 microcontroller also explain programme memory and Data Memory with use of \overline{EA} pin. **[10]**

OR

- Q2)** a) Draw and explain Architecture of 8051 Microcontroller and hence explain Memory Organization of 8051. **[10]**
b) Explain PSW in 8051. What are the flags that associate with ALU operation in 8051. **[8]**

- Q3)** a) Square the content of R4 and put the result in R3 (higher byte) and R2 (lower byte). Also send result at External Location 20h (higher byte) and 21h (lower byte). **[8]**
b) Explain stack organization and enlist stack related instructions. **[8]**

OR

- Q4)** a) Add the content of Ram locations 20h - 30h. Store the result at 40h (lower byte) and 41h (higher byte). **[8]**
b) Random numbers are present at R0 to R5. Find largest number and put it in R6. **[8]**

- Q5)** a) Write a program for the 8051 to transfer letter 'A' serially at 4800 baud rate, continuously. Also explain SCON register. **[10]**
b) Explain SPI communication bus. **[6]**

OR

P.T.O.

- Q6)** a) What is interrupt? Hence explain Programming interrupts, Timer interrupts, External interrupts, Serial interrupts and multiple interrupts. [10]
b) Explain 12C communication bus. [6]

SECTION - II

- Q7)** a) Write need of simulator, assembler and compiler for 8051 microcontroller and hence explain it's function in microcontroller development tool. [8]
b) Show the design of 8255 connection to 8051 where port A has the address 20H. Then program the 8255 to get the data from port B and send it to both ports A and C. [10]

OR

- Q8)** a) 8kb of program ROM and 8kb data RAM are to be interfaced with 8051. Draw a diagram showing interfacing of these memories with 8051 such that following maps are realized : [10]

Program ROM 0000H-1FFFH

Data RAM 8000H-9FFFH

- b) Explain serial communication of 8051 with computer through RS232 port. [8]
- Q9)** a) Draw and explain interfacing diagram of ADC with 8051. [8]
b) Write assembly language program to rotate stepper motor through 360deg using 4 step sequence in clockwise direction. [8]

OR

- Q10)** a) Draw interfacing diagram DAC with 8051. Write an assembly language program to generate triangular wave using DAC. [8]
b) Explain with suitable diagram, temperature measurement using 8051. [8]

- Q11)** a) Explain power measurement using 8051. [8]
b) Draw and explain matrix keyboard interfacing with 8051. [8]

OR

- Q12)** a) Draw and explain 8051 based speed control of DC motor. [8]
b) Draw the interfacing diagram of LCD with 8051. Explain function of pins of LCD. [8]



Total No. of Questions : 12]

P771

SEAT No. :

[Total No. of Pages : 4

[4263] - 253
T.E. (Electrical)
ELECTRICAL MECHINES - II
(2008 Pattern) (Sem. - I)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) What is meant by short circuit ratio in case of alternator. Elaborate its significance. **[4]**
- b) A three phase 50 Hz 2 pole star connected alternator generates 6 kV between lines on open circuit. It has 54 slots with 4 conductors per slot. The pitch of the coils is less than the pole pitch by 2 slots. Assuming sinusoidal flux distribution, find the flux per pole. **[6]**
- c) A 100 kVA 3000V, 50Hz, 3 phase star connected alternator has effective armature resistance of 0.2Ω . The field current of 40A produces short circuit current of 200A and an open circuit emf of 1040V (line). Calculate the full load voltage regulation at 0.8 lagging p.f. and 0.8 leading p.f. **[8]**

OR

- Q2)** a) Compare salient pole type construction with non salient pole type construction in case of 3 phase alternator. **[4]**
- b) State different methods of finding voltage regulation of alternator. Which method gives more accurate results? Why? **[4]**

P.T.O.

- c) A 10 kVA, 440V, 50Hz, 3 phase star connected alternator has the open circuit characteristics as given below.

If (Amp)	1.5	3	5	8	11	15
Voc line (Volts)	150	300	440	550	600	635

with full load zero p.f., the excitation required is 14 Amp to produce 500V of terminal voltage. On short circuit, 4 Amp excitation is required to give full load current. Determine voltage regulation at full load 0.8 p.f. lagging. Neglect R_a . [10]

- Q3)** a) State three important features possessed by 3 phase synchronous motor. What do you mean by 'V' curves and Inverted 'V' curves of synchronous motor. [6]
- b) A 10 kVA, 380V, 50Hz 3 phase star connected salient pole alternator has direct axis and quadrature axis synchronous reactance of 12Ω & 8Ω respectively. The armature has resistance of 1Ω per phase. The generator delivers rated load at 0.8 p.f. lagging with the terminal voltage being maintained at rated value. Calculate the excitation voltage of alternator (line value). [6]
- c) State necessary conditions of synchronisation of 3 phase alternators. [4]

OR

- Q4)** a) A 2 MVA, 3 phase 8 pole alternator is connected to 600V, 50Hz busbar & has synchronous reactance of 4Ω per phase. Calculate the synchronizing power and synchronizing torque per mechanical degree of rotor displacement at no load. Assume normal excitation. [6]
- b) A synchronous motor has synchronous reactance of 10Ω per phase and negligible resistance. It takes an input power of 5 kw per phase when operating at 250 V per phase. Find its induced emf and angle of retard. Assume unity power factor. [6]
- c) Explain the dark lamp method used for synchronizing of alternators. [4]
- Q5)** a) Write a short note on 3 phase synchronous Induction Motor. [8]
- b) Why v/f ratio is to be kept constant for speed control of Induction Motor. With neat circuit diagram, explain speed control of 3 phase Induction Motor using rotor resistance control. [8]

OR

- Q6)** a) Write a short note on 3 phase Induction voltage regulator. [8]
b) Explain operation of 3 phase Induction motor as an induction generator. State its advantages & applications. [8]

SECTION - II

- Q7)** a) What do you mean by universal motor? Compare the performance on a.c. and d.c. supply. [6]
b) Draw the phasor diagram of a plain series motor and explain it ignoring leakage fluxes, magnetising current and currents in short circuited armature coils. [6]
c) What are the types of compensated series motor? Describe each with circuit diagram. [6]

OR

- Q8)** a) Describe in detail the transformer and rotational e.m.f.'s in plain series motor. [6]
b) What do you mean by commutation in compensated series motor? State the methods to improve the commutation? [4]
c) Draw the circle diagram of a plain a.c. series motor and describe how to find out motor input, torque, output & speed. [8]
- Q9)** a) Explain principle of operation of linear Induction motor. Draw its characteristics. State its important applications. [8]
b) Explain the construction, working and applications of permanent magnet type stepper motor. [8]

OR

- Q10)** a) Define time & space harmonics. What are their effects on an Induction motor and synchronous generator. [8]
b) Describe the working, characteristics and applications of permanent magnet D.C. motor. [8]

- Q11)a)** What are the methods to make single phase Induction motors self starting? Explain in detail operation, characteristics & applications of capacitor start motors. [8]
- b) What are the tests to determine the parameters of a equivalent circuit of a single phase induction motor? Draw and explain the equivalent circuit of a single phase induction motor, without considering losses. [8]

OR

- Q12)a)** Explain the double revolving field theory in case of single phase induction motor. Hence draw its torque - speed characteristics. [8]
- b) A 220V, single phase induction motor gave the following tests :
Blocked rotor test : 120V, 9.6A, 460W.
No load test : 220V, 4.6A, 125W.
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 and windage losses. [8]



Total No. of Questions : 12]

SEAT No. :

P773

[Total No. of Pages : 3

[4263] - 257
T.E. (Electrical)
ENERGY AUDIT & MANAGEMENT
(2008 Pattern) (Semester - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

- Q1)** a) Explain briefly the latest reforms going on in Indian energy sector. [8]
b) Give salient features of Energy Conservation Act 2001. [8]

OR

- Q2)** a) What are the adverse impacts of fossile fuel based power generation? [8]
b) Classify various energy resources. Also compare Indian energy scenario with rest of the world on basis of use, availability, capacity ranking etc. [8]
- Q3)** a) Explain energy management strategies to adopted by industrial consumers. [10]
b) What is supply side management? Why it is found out to be inadequate to manage system? [8]

OR

- Q4)** a) With suitable examples explain various options available for load curve wave shaping in demand side management. What are society benefits of DSM? [10]

P.T.O.

- b) What is energy management? Define clearly the objectives of it. Also explain principles involved in it. [8]

Q5) a) Explain phases involved in energy audit. [8]

- b) What are essential elements of monitoring systems? [8]

OR

Q6) a) What is data analysis? With suitable example explain various data processing techniques to understand energy conservation potential. [8]

- b) What are least cost options in energy conservation? What is executive summary? [8]

SECTION - II

Q7) a) Discuss criteria for appraisal of investment. Also compare IRR and NPV on their relative merits. [9]

- b) An investment of Rs. 1 Lakh is made for a variable speed drive at the beginning of the year, which is also the date of first operation. Savings expected over 4 years are Rs. 10,000, Rs. 20,000, Rs. 30,000 and Rs. 35,000 respectively. Find out the Net Present Value at the end of the fourth year, if the discount rate is 18%. Would you invest in this measure? Comment on your decision. [9]

OR

Q8) a) The energy and demand savings analysis for retrofit LED exit signs is given below

Retrofit cost	Energy & demand savings	Maintenance savings
Rs. 32500	6000 kWh/month and Rs. 3800/year as demand charges	Annual maintenance savings will be Rs. 2000/-

The key data of energy savings are based on Rs. 4/kWh. Life of LED is 10 years. There is no escalation in energy price. Calculate NPV of the project and justify economic feasibility of the project. Take discounting factor as 12%. [10]

- b) Explain following tariff structures:- [8]
- i) Time of the day tariff
 - ii) Apparent energy tariff

- Q9)** a) Describe few characteristics of load which influence the efficient use of diesel generators. [8]
- b) Enlist various energy conservation measures in lighting systems. [8]

OR

- Q10)** a) State various heat losses in boiler. Also explain methods to minimize them. [8]
- b) How fans, blowers and compressors are differentiated on the basis of air pressure exerted? Give energy conservation opportunities in air compressors. [8]

- Q11)** a) Why it is important to reduce T & D losses? Discuss various methods for reducing technical losses. [8]
- b) What will be your recommendations for energy conservation in energy audit studies carried out in sugar industry? [8]

OR

- Q12)** a) Make out your salient observations when energy and power quality audit is carried out for thermal power station. [8]
- b) Write comments on following observations for large commercial organization [8]
- i) Despite of automatic power factor correcting equipment average power factor recorded is less.
 - ii) Operating hours of diesel generator are considerable along with heat rejection rate of flue gases can it advocate use of vapour absorption chiller.



Total No. of Questions : 12]

SEAT No. :

P774

[Total No. of Pages : 3

[4263] - 258
T.E. (Electrical)
UTILIZATION OF ELECTRICAL ENERGY
(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 books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 6) *Assume suitable data, if necessary.*

SECTION - I

Unit - I

- Q1)** a) A 50kW 3 phase 440 volts resistance oven is to provide three star connected heating element of thickness 0.3 mm. If the temperature of heating element is to be 1500°C and that of the charge is to be 1000°C calculate suitable length and width of strip. Take resistivity of material for heating element as 1.016×10^{-6} ohm-meter, emissivity as 0.91 and radiant efficiency as 0.6. **[8]**
- b) State the various methods of controlling the temperature in resistance heating furnace. **[6]**
- c) What should be the properties of heating element material used in resistance oven? State the different types of heating materials used. **[4]**

OR

- Q2)** a) Describe the construction and working of Ajax Wyatt induction type furnace. **[8]**
- b) Write note on the method of Laser beam welding. State its advantages over the conventional methods of electric welding methods. **[6]**
- c) Dielectric heating is adopted for heating of an insulating material slab of size 10cm × 15cm × 1cm. The power required is 50 watts at source frequency of 40 MHz. the loss factor of material is 0.2. Calculate the voltage necessary. Take relative permittivity of insulating material as 5. **[4]**

P.T.O.

Unit - II

- Q3)** a) With neat diagram of refrigeration cycle explain the function of four main parts of refrigeration cycle. [8]
- b) State the various applications of electrolytic process and write note on anodizing. [6]
- c) Explain the difference between the off delay timer and on delay timer. [2]

OR

- Q4)** a) Write note on electroplating. [8]
- b) Draw the electric circuit diagram of window air conditioner and explain it. Out of starting and running capacitor which is of greater value and why? [8]

Unit - III

- Q5)** a) Define the terms : [6]
- i) luminous flux.
- ii) illumination and
- iii) luminance. State the units for these terms.
- b) A small light source with intensity of light uniform in all the direction is mounted at a height of 8 meters above a horizontal plane surface. The two points A and B both lie on this surface with point A directly beneath the source. How far is point B from the point A if illumination at B is only one half as great as at A? [5]
- c) Compare filament lamp with the sodium vapor lamp. [5]

OR

- Q6)** a) A hall 30 meter long and 12 meter wide is to be illuminated by 300 watt lamps and illumination required is 50 lumens/meter². The output of each lamp is 4700 lumens. Take depreciation factor as 1.3 and coefficient of utilization as 0.5 and calculate the number of lamps required. Draw the layout of lamps and determine space height ratio. Take mounting height as 5 meter. [8]
- b) Write note on polar curve and explain how mean hemispherical candle power is determined from the polar curve. [8]

SECTION - II

Unit - IV

- Q7)** a) What are the various methods of track electrification? Discuss any one in brief. [8]
- b) Explain the pantograph and bow collector. [8]

OR

- Q8)** a) Draw a general block diagram for electric locomotive and explain the function of each part. [8]
b) Describe single phase low frequency A.C system for track electrification with its merits and demerits. [8]

Unit - V

- Q9)** a) Draw a typical trapezoidal speed-time curve between the two stations and explain the different sections in it. Define average speed, crest speed and schedule speed. [9]
b) A 200 tonne motor coach having 4 motors, each developing 6000 N-m torque during acceleration, starts from rest. If up gradient is 30 in 1000, gear ratio 4, gear transmission efficiency 90%, wheel radius 45cm., train resistance 50 N/tonne, addition of rotational inertia 10%, calculate time taken to attain speed of 50 Km/h. If line voltage is 3000V.D.C. and efficiency of motors 85%, find the current taken during notching period. [9]

OR

- Q10)** a) Derive an expression for specific energy output on level track using simplified speed time curve. [9]
b) Calculate the specific energy consumption if a maximum speed of 12.2 m/s and for a given run of 1,525 metres an acceleration of 0.366 m/s² are required. Train resistance during acceleration is 52.6 N/1,000kg and during coasting is 6.12 N/1,000kg, 10% being allowable for rotational inertia. The efficiency of the equipment during the acceleration period is 50%. Assume a quadrilateral speed-time curve. [9]

Unit - VI

- Q11)** a) What is transition? Compare the shunt transition and bridge transition. [8]
b) State and explain the desired electrical and mechanical characteristics of motors for traction duty. [8]

OR

- Q12)** a) What are the advantages of regenerative braking? Also explain how regenerative braking can be obtained in D.C locomotive. [8]
b) Explain with the energy diagram how the energy is saved with series parallel starting in case of a locomotive engine using four motors for the operation. [8]



Total No. of Questions : 12]

SEAT No. :

P775

[Total No. of Pages : 4

[4263] - 259
T.E. (Electrical)
DESIGN OF ELECTRICAL MACHINES
(2008 Pattern) (Semester - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Write a short note on - **[8]**
- i) Pulsation loss.
 - ii) Rotational hysteresis loss.
- b) Define the following: **[8]**
- i) Leakage coefficient.
 - ii) Stacking factor.
 - iii) Real flux density.
 - iv) Apparent flux density.

OR

- Q2)** a) State and explain the principle components of leakage flux for Polyphase rotating machines. **[8]**
- b) Explain the utility of Carter's Fringe Curve. **[8]**
- Q3)** a) Draw the heating curve and cooling curve. Define the heating time constant, cooling time constant and discuss the concept of final steady temperature - rise. **[10]**
- b) The initial temperature of a machine is 45°C. Calculate temperature of machine after 1 hour, if final steady temperature rise is 75°C and heating time constant is 2 hours. The ambient temperature 28°C. **[8]**

P.T.O.

OR

- Q4)** a) Derive an Output equation for Three Phase transformer. [8]
- b) Determine the main dimensions of core and the number of turns of HV and LV windings of 250 kVA, 11/0.4 kV, delta/star, 50Hz, 3 - phase core type distribution transformer.
- Take , current density (δ) = 2.3 A/mm², copper space factor = 0.3, Core cross section = 3 stepped for which area factor = 0.6 and width of the largest stamping = 0.92d, Maximum flux density = 1.3 tesla, stacking factor = 0.95, Ratio of, height of window To width of window = 4, Constant, K = 0.45 [10]

- Q5)** a) Obtain an expression for leakage reactance of three phase core type transformer. [8]
- b) A 500 kVA, 6600/415 volts, delta/star, 50 Hz, 3-phase, core type transformer have the following data, [8]
- i) Width of LV winding = 25 mm,
 - ii) Width of HV winding = 20 mm,
 - iii) Width of duct between LV and HV = 10mm,
 - iv) Height of windings = 0.35 metre
 - v) Mean length of turn = 1.2 metre,
 - vi) Turns on HV winding = 200,
 - vii) Resistance referred to HV = 0.5 ohm,
- Estimate, the leakage reactance and percentage regulation at 0.8 power factor lagging on full load condition.

OR

- Q6)** a) With reference to mechanical forces developed under short circuit conditions- [8]
- i) Draw neat sketches of leakage fields, axial leakage fields, radial leakage fields and associated mechanical forces,
 - ii) Discuss forces due to asymmetry and
 - iii) Bracing of windings

- b) Calculate the no-load current of a 400 volts, 50 Hz, 1-phase, core type transformer from the following details: [8]
- i) Length of mean magnetic path = 200 cm,
 - ii) Gross core area = 100 cm²
 - iii) Maximum flux density = 0.7 tesla,
 - iv) Specific core loss at frequency 50 Hz and flux density of 0.7 tesla = 0.5 watts/kg,
 - v) Stacking factor = 0.9,
 - vi) Density of core material = 7.5×10^3 kg/m³,
 - vii) Magneto motive force (AT) required to develop 0.7 tesla flux density in core = 2.2 at/cm
 - viii) Joints equivalent to 0.2 mm air gap.

SECTION - II

- Q7)** a) Derive output equation of 3 phase induction motor. [8]
- b) Determine the main dimensions of a 20kW, 3ϕ , 415 V, 50Hz, 2980 rpm, squirrel cage induction motor having an efficiency of 0.88 and a full load power factor of 0.9. Assume specific magnetic loading = 0.7 wb/m² and specific electric loading = 21000 A/m.

Take the rotor peripheral speed approximately as 20 m/s at synchronous speed, and winding factor of 0.955 for double layer winding. [10]

OR

- Q8)** a) With reference to AC windings, compare – [9]
- i) Single layer winding & double layer winding.
 - ii) Fractional slot winding & integral slot winding
 - iii) 2 plane overhang & 3 plane overhang
- b) Draw a winding diagram for a – 4 pole, 24 slot, 3 phase mush connected armature. [9]

- Q9)** a) Derive the equation for end ring current of squirrel cage induction motor. [8]
- b) Which factors should be considered when estimating the length of air gap of an induction motor. Why the air gap should be as small as possible? [8]

OR

- Q10)** a) Discuss various methods to reduce harmonic torques in an induction motor. [8]
- b) Explain the phenomena of crawling and cogging as applicable to squirrel cage induction motor. What steps are taken while designing to avoid their occurrence? [8]

- Q11)** a) Explain the MMF calculations in magnetic circuit of 3ϕ induction motor. [10]
- b) Explain the effect of ventilating ducts on calculation of magnetizing current. [6]

OR

- Q12)** a) Explain the method of calculation of loss component of NO load current of 3ϕ induction motor. [8]
- b) A 15kW, 415V, 50Hz, 6 pole, 3ϕ , λ connected I.M. has 58 stator slots, each containing 9 conductors. Calculate the values of bar & end ring currents & their cross sections, if the current density is 7A/mm^2 . The number of rotor bars 64, efficiency of machine is 85% & power factor as 0.86. The rotor mmf may be assumed as 85% of stator mmf. [8]



Total No. of Questions : 12]

SEAT No. :

P778

[Total No. of Pages : 4

[4263] - 262
T.E. (Electronics)
DATA COMMUNICATION
(2008 Pattern) (Sem. - I)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates :

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

SECTION - I

- Q1)** a) What is auto-correlation and cross - correlation? State and explain any two properties of each. **[6]**
- b) Explain Binomial and Gaussian probability models with their probability distribution functions. **[6]**
- c) If $f_x(X) = C(x - 1) \dots\dots 1 \leq x \leq 4$
 $= 0 \dots\dots$ Otherwise
then find,
- i) Value of constant C for $f_x(X)$ to be probability density function of a random variable X.
 - ii) $P(2 \leq X \leq 3)$. **[4]**

OR

- Q2)** a) Explain following terms and their significance with respect to a random variable, **[8]**
- i) Mean value.
 - ii) Standard Deviation.
 - iii) Variance.
 - iv) Moment.
- b) Prove that mean and variance of a continuous random variable X having Uniform Distribution in interval [a, b] are,
 $\mu = (a + b) / 2$ and $\sigma^2 = (a - b)^2 / 12 = (b - a)^2 / 12$. **[8]**

P.T.O.

Q3) a) What is need of synchronization in digital Multiplexing? Mention different types of bit synchronizers. Explain any one bit synchronizer with neat diagram. [10]

b) Explain Properties of line codes and plot frequency spectrum. [6]

OR

Q4) a) What is Inter Symbol Interference and Eye Pattern? Explain interpretation of an eye pattern with neat diagram. [8]

b) Draw line code formats for 10101101 for [8]

- i) Unipolar RZ.
- ii) Polar NRZ.
- iii) Polar RZ.
- iv) Manchester.
- v) Differential Manchester.
- vi) AMI.
- vii) ASI.
- viii) Polar Quaternary.

Q5) a) For a (6, 3) systematic LBC, three parity bits are given as, $C_4 = d_1 + d_2$, $C_5 = d_1 + d_3$, $C_6 = d_1 + d_2 + d_3$, [10]

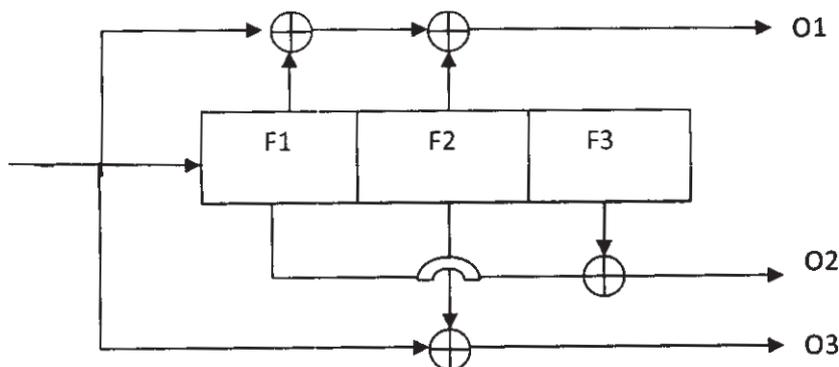
- i) Determine generator matrix.
- ii) Construct code generated by this matrix.
- iii) Determine error capacity of the code.
- iv) Prepare syndrome decoding table.
- v) If received vector is 101011, determine message word.

b) Explain FEC and ARQ systems of error control. Also explain [8]

- i) Stop and wait ARQ.
- ii) Go back N ARQ.
- iii) Selective Repeat ARQ with neat diagram.

OR

Q6) a) For the convolution encoder shown in the figure below : [10]



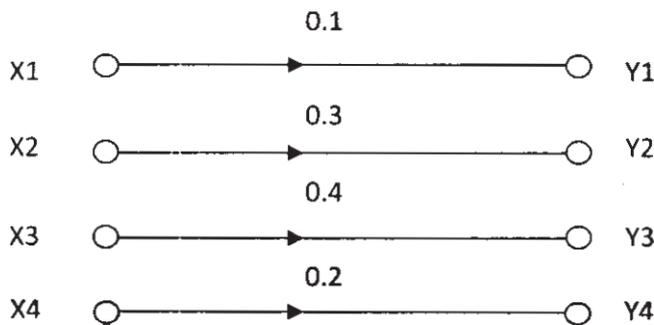
- i) Determine constraint length and dimensions of the code.
 - ii) Construct code tree, trellis diagram and state diagram.
 - iii) Encode input sequence 10110 using trellis diagram.
- b) Explain in detail Viterbi decoding algorithm with an example. [8]

SECTION - II

- Q7)** a) State and explain Shannon Hartley theorem for channel capacity of a continuous channel. [4]
- b) Derive expression for the channel capacity of an ideal AWGN channel with infinite bandwidth. [6]
- c) A voice grade channel of a telephonic network has Bandwidth of 3.4kHz. [6]
- i) Calculate channel capacity of a telephone channel for signal to noise ratio of 30dB.
 - ii) Calculate minimum SNR required to support information transmission through the telephone channel at the rate of 4800 bits/sec.

OR

- Q8)** a) Determine different entropies, mutual information and channel capacity for following channel : [8]



- b) Explain what is self information and mutual information? Also prove [8]
- i) $I(x, y) = I(y, x)$.
 - ii) $I(x, y) = H(x) + H(y) - H(x, y)$.

- Q9)** a) Explain QPSK transmitter and receiver with neat block diagram and mathematical analysis. [8]
- b) Explain the concept of phase continuity in MSK. Also compare MSK with QPSK. [8]

OR

- Q10)** a) Draw signal space diagram for BASK, BPSK, QPSK, and QASK. Compare them with reference to Euclidean distance and noise immunity. [8]
b) Derive expression for error probability of BPSK. [8]
- Q11)** a) What is PN sequence? State and explain properties of PN sequence. [6]
b) Explain working of DSSS transmitter and receiver with its mathematical analysis. [6]
c) What is multiple access? Compare TDMA, FDMA and CDMA techniques. [6]

OR

- Q12)** a) The information bit duration in DS-BPSK spread spectrum communication system is 5ms, while chipping rate is 1MHz. Assuming average probability of error is 0.5×10^{-5} for proper detection of message signal, calculate jamming margin. [4]
b) Explain operation of FHSS technique with the neat diagrams. [6]
c) Explain working principle of slotted ALOHA, ALOHA, CSMA and CSMA/CD. [8]



Total No. of Questions : 12]

SEAT No. :

[Total No. of Pages : 4

P783

[4263] - 270

T.E. (Electronics)

DISCRETE TIME SIGNAL PROCESSING

(2008 Pattern) (Sem. - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates :

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

SECTION - I

- Q1)** a) Explain the role of digital signal processing in sound processing. [6]
b) A difference equation of a discrete time system is given below [6]

$$y(n) - \frac{1}{8}y(n-1) + \frac{2}{8}y(n-2) = x(n) + \frac{1}{2}x(n-1).$$

Draw direct form - I and direct form - II structures.

- c) The difference equation of the system is given by [6]
 $y(n) = 3y(n-2) + 2y(n-1) + x(n)$

$$x(n) = \left(\frac{1}{2}\right)^n u(n) \text{ and}$$

$$y(-1) = 1, y(-2) = 0$$

Find :

- i) Zero input response.
- ii) Zero state response.
- iii) Total response.

OR

- Q2)** a) Determine the range of values 'a' & 'b' for which the LTI system with impulse response. [6]

$$h(n) = a^n \quad \text{for } n \geq 0 \\ = b^n \quad \text{for } n < 0$$

is stable.

- b) State the advantages of DSP over Analog Signal Processing. [6]
c) State the sampling theorem? Draw the spectrum of a sampled signal and explain aliasing. [6]

P.T.O.

- Q3)** a) Given $x(n) = 2^n$ and $N = 8$, find $X(k)$ using DIT - FFT algorithm. [8]
 b) Compute 4 point DFT of the following sequence $x(n) = \cos \frac{n\pi}{4}$. [8]

OR

- Q4)** a) The first five points of 8 point DFT of a real valued sequence are $\{0.25, -j0.3018, 0, 0.125, -j0.05 \text{ } \perp \text{ } 8\}$. Determine remaining three points of the DFT. [8]
 b) A long sequence $x(n)$ is filtered through a filter with impulse response $h(n)$ to yield the output $y(n)$.
 If $x(n) = \{ \perp, 4, 3, 0, 7, 4, -7, -7, -1, 3, 4, 3 \}$ and $h(n) = \{1, 2\}$.
 Compute $y(n)$ using overlap add method. Use only five point circular convolution in your approach. [8]

- Q5)** a) Determine inverse Z transform of $X(z) = \frac{\perp}{(\perp + z^{-1})(\perp - z^{-1})^2}$,

ROC ; $|z| > \perp$. [8]

- b) Compute the response of the system $y(n) = 0.7 y(n-1) - 0.\perp 2 y(n-2) + x(n-1) + x(n-2)$ to the input $x(n) = n u(n)$. Is the system stable? [8]

OR

- Q6)** a) State and prove the convolution property of the Z - transform. Compute the convolution $x(n)$ of the signals using Z - transform. [8]

$$x_1(n) = \{4, -2, 1\}$$

$$x_2(n) = \begin{cases} \perp & 0 \leq n \leq 5 \\ 0 & \text{otherwise} \end{cases}$$

- b) Determine the impulse response and unit step response of system described by the difference equation.
 $y(n) = 0.7 y(n-1) - 0.1 y(n-2) + 2x(n) - x(n-2)$. [8]

SECTION - II

- Q7)** a) Realize a linear phase FIR filter with the following impulse response. [6]

$$h(n) = \delta(n) + \frac{1}{2} \delta(n-1) - \frac{1}{4} \delta(n-2) + \delta(n-4) + \frac{1}{2} \delta(n-3).$$

Give necessary equation.

- b) Obtain the direct form (I), direct form (II), cascade and parallel form realization for the following system.

$$y(n) = 0.75y(n-1) - 0.125y(n-2) + 6x(n) + 7x(n-1) + x(n-2). \quad [6]$$

- c) The system function of analog filter is given as

$$H_a(s) = \frac{(s+0.1)}{(s+0.1)^2 + 9}$$

obtain the system function of the IIR digital filter by using impulse invariance method. [6]

OR

- Q8)** a) Realize the following system function of FIR filter.

$$H(z) = 1 + \frac{3}{4}z^{-1} + \frac{17}{8}z^{-2} + \frac{3}{4}z^{-3} + z^{-4} \text{ in}$$

- i) Direct form structure.
ii) Cascade form structure. [6]

- b) The system function of the first order low pass Butterworth filter is

given as, $H_a(s) = \frac{\Omega_c}{s + \Omega_c}$. Here Ω_c is the 3 - dB cut off frequency of

analog filter. Apply bilinear transformation to this filter such that the digital filter will have 3 - dB frequency of 0.2π . [6]

- c) Determine the impulse response $h(n)$ of a filter having desired frequency response,

$$H_d(e^{j\omega}) = \begin{cases} e^{-\frac{j(N-1)\omega}{2}} & \text{for } 0 \leq |\omega| \leq \frac{\pi}{2} \\ 0 & \text{for } \frac{\pi}{2} \leq |\omega| \leq \pi \end{cases}$$

$$N = 7$$

Use frequency sampling method. [6]

- Q9)** a) Design a linear phase FIR filter that satisfies the following specifications based on single and two stage multirate structure. [8]

Sampling rate : ≥ 0 kHz

Pass band : $0 \leq f \leq 60$

Transition band : $60 \leq f \leq 65$

Ripple : $\delta_p = 10^{-1}, \delta_s = 10^{-3}$

- b) Write short note on Multi rate Narrowband filtering. [8]

OR

- Q10)** a) i) How the frequency range is stretched in down sampling process, justify. [4]
ii) Explain the need of filtering operation prior to down sampling. Hence give the specifications of the used filter in this filtering operation. [4]
b) Explain the sampling rate conversion by non-integer factors. [8]

- Q11)** a) State the desirable features of DSP processors. [8]
b) Explain Von-Neumann architecture and modified Harvard architecture. [8]

OR

- Q12)** a) Write short note on : [8]
On - chip peripherals of DSPS.
b) Explain with neat schematic diagram. [8]
i) TMS 320 C 28 XX based triggering of $\perp\phi$ full converter.
ii) Speed control of a separately excited DC motor drive using TMS 320C28 XX Digital Signal Processor.



Total No. of Questions : 12]

SEAT No. :

P784

[Total No. of Pages : 4

[4263] - 272
T.E. (E & TC)
DIGITAL COMMUNICATION
(2008 Pattern) (Semester - I)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates :

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

SECTION - I

Q1) a) Explain with help of diagram the formatting steps for textual, analog and digital data with example. **[8]**

b) A signal $m(t)$ band-limited to 3kHz is sampled at a rate $33\frac{1}{3}\%$ higher than the Nyquist rate. The maximum acceptable error in the sample amplitude (the max. quantization error) is 1% of peak amplitude m_p . The quantized samples are binary coded. Find the minimum bandwidth of a channel required to transmit the encoded binary signal. If 24 such signals are time-division-multiplexed, determine the minimum transmission bandwidth required to transmit the multiplexed signal. **[8]**

OR

Q2) a) What is the necessity of companding? Explain the A law and μ law of companding graphically with expression. **[8]**

b) Consider a sinusoidal signal $e_m(t) = A \sin(2\pi f_m t)$. Applied to a delta modulator with representation level $\pm d$. Show that in order to avoid slope overload distortion it is necessary that : **[8]**

$A < d/(2\pi f_m T_s)$, where T_s is sampling period.

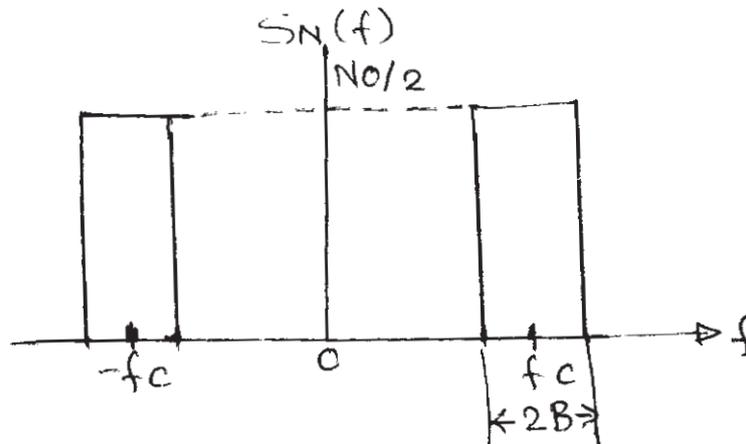
Q3) a) Explain Inter Symbol Interference. With the help of baseband binary data transmission system derive expression of ISI. **[10]**

P.T.O.

- b) Consider the following sequences of 1's and 0's : [8]
- An alternate sequence of 1's and 0's.
 - A long sequence of 1's followed by a long sequence of 0's.
 - A single "0" and then a long sequence of 1's. Sketch the waveform for each of these sequences using Unipolar RZ and Alternate Mark Inversion signalling.

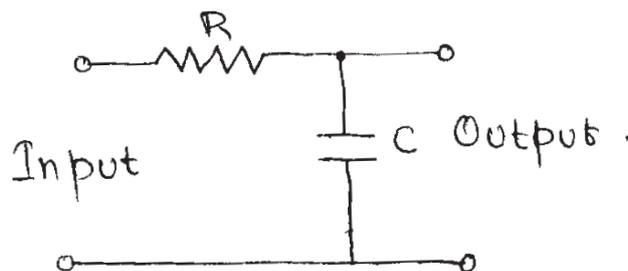
OR

- Q4)** a) Derive and sketch the power spectral Density of polar RZ and polar NRZ signalling. [10]
- b) What is a synchronizer? Explain any one type of bit synchronizer and need for frame synchronization with relevant diagram. [8]
- Q5)** a) Classify and explain different types of Random Processes. [8]
- b) Consider a Gaussian noise $n(t)$ with zero mean and the power spectral density $S_N(f)$ shown in figure.
- Find the probability density function of the envelope of $n(t)$.
 - What are the mean and variance of this envelope? [8]



OR

- Q6)** a) Explain narrowband Noise and represent an narrowband noise in terms of inphase and quadrature components. [8]
- b) A random telegraph signal $x(t)$, characterized by the autocorrelation function $R_x(\tau) = \exp(-2\nu|\tau|)$ where ν is constant is applied to the low-pass RC filter of figure. Determine the power spectral density and auto correlation function of the random process at the filter output. [8]



SECTION - II

- Q7)** a) Draw the block diagram of QPSK Receiver and explain the working in detail with mathematical expressions. [8]
b) State advantages of MSK over QPSK and sketch the waveforms for I/P pattern 11010111. [10]

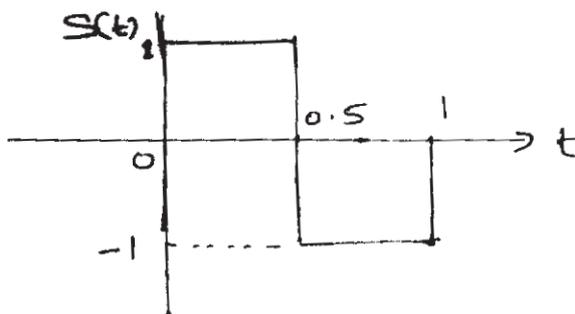
OR

- Q8)** a) Compare the performance of BPSK, FSK, M-ary PSK, M-ary FSK with respect to bandwidth, euclidian distance and probability of error. [10]
b) For an input stream of 110100010 explain the encoding and decoding process for DPSK with the help of waveforms and expressions. [8]

- Q9)** a) Binary data has to be transmitted over a telephone link that has a usable bandwidth of 3000 Hz, and a maximum achievable signal-to-noise power ratio of 6dB at its output.
i) Determine the maximum signalling rate and probability of error of a coherent ASK scheme is used for transmitting binary data through this channel.
ii) If the data is maintained at 300 bits/sec calculate the error probability.
 $Q(3.4) = .0003$, $Q(6.4) = 10^{-10}$, $Q(5.25) = 10^{-7}$. [8]
b) Derive the expression for error probability for optimum filter. [8]

OR

- Q10)** a) Consider the signal $s(t)$ in figure below : [8]
i) Determine the impulse response of a filter matched to this signal and sketch it as a function of time.
ii) Plot the matched filter output as a function of time.
iii) What is the peak value of the output.



- b) A BPSK signal is received at the input of a coherent optimal receiver with amplitude 10mV and frequency 10kHz. The signal is corrupted with white noise of PSD 10^{-9} W/Hz. If data rate is 10^4 bits/sec.
- Find error probability.
 - Find error probability if the local oscillator has a phase shift of $\pi/6$ rad with input signal.
 - Find error probability if there is 10% mismatching in bit synchronization.
- erfc (1.58) = 0.0254, erfc (1.36) = 0.0528, erfc (1.26) = .073 erfc (1.09) = 0.1214. [8]

- Q11)** a) What is PN sequence? Verify the three properties of PN sequence with the help of 4 stage shift register. [8]
- b) Explain different types of multiple access techniques with help of suitable diagram. [8]

OR

- Q12)** a) The signal has the following parameters.
 Number of bits per MFSK symbol $K = 2$
 Number of MFSK tone $M = 2^K = 4$
 Length of PN segment per hop $K = 3$
 Total No. frequency hops $2^K = 8$
 sketch the output transmitted frequency of fast FH/MFSK signal. [8]
- b) Explain in brief : [8]
- Friss Free Space equation.
 - Frequency reuse.
 - Cell splitting.
 - Tamming Margin.



Total No. of Questions : 12]

SEAT No. :

P795

[Total No. of Pages : 2

[4263] - 292

T.E. (Printing)

**PRINTING NETWORK TECHNOLOGY AND OPTO-ELECTRONICS
(2008 Pattern) (Semester - I)**

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates :

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

SECTION - I

Q1) a) Explain FDM (frequency division multiplexing) and TDM (Time Division Multiplexing) with suitable diagram. [12]

b) Explain quantization and its types with example. [6]

OR

Q2) a) What is pulse modulation? Explain all types of pulse modulation with neat diagrams. [12]

b) Write definition of modulation. Explain Amplitude modulation with suitable diagram. [6]

Q3) a) Explain all types of fiber optic cable with neat diagrams. [12]

b) Explain modal dispersion taking place in fiber optic cable with neat diagram. [4]

OR

Q4) a) Explain any four losses taking place in optical fiber communication. [8]

b) Explain currency note counting and paper thickness measurement application of optical communication in field of printing. [8]

Q5) a) Explain Wi-Fi technology with suitable diagram. [10]

b) Explain working of RFID technology with suitable diagram. [6]

OR

Q6) a) Explain different types of RFID tags with diagram. [8]

b) Explain any two applications of RFID. [8]

P.T.O.

SECTION - II

Q7) a) What is operating system? Explain different types of operating system. [10]

b) Explain any four UNIX commands with example. [8]

OR

Q8) a) Explain different features of MAC operating system. [10]

b) Explain any four design issues of operating system. [8]

Q9) Explain following protocols in details (any four) : [16]

a) FTP.

b) SMTP.

c) POP3.

d) ICMP.

e) IMAP.

OR

Q10) a) Explain working of TCP/IP reference model with diagram. [8]

b) Explain any four design issues in layered structure of network operating system. [8]

Q11) Write short notes on following internetworking devices (any four) : [16]

a) Repeaters.

b) Hubs.

c) Switches.

d) Gateways.

e) Bridges.

OR

Q12) a) What is modem? Explain different types of modem. [8]

b) Explain VSAT and VPN with suitable diagram. [8]

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Total No. of Questions : 12]

SEAT No. :

P800

[Total No. of Pages : 4

[4263] - 305

T.E. (Chemical)

CHEMICAL ENGINEERING THERMODYNAMICS - II

(2008 Pattern) (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) Answers to the two sections should 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) Derive the following equation. [8]

$$\partial \left(\frac{nG^R}{RT} \right) = \frac{nV^R}{RT} dP - \frac{nH^R}{RT^2} dT + \sum_i \frac{G_i^{-R}}{RT} dni$$

b) The molar volume of binary liquid mixture at T and P is given by $V = 120x_1 + 70x_2 + (15x_1 + 8x_2) x_1 x_2$, cm³/mol. Find expressions for partial molar volumes of species 1 and 2 at T and P. [8]

OR

Q2) a) It is required to prepare 3m³ of 60 mole percent ethanol water mixture. Determine the volumes of ethanol and water to be mixed in order to prepare the required solution. The partial molar volumes of ethanol and water in 60 mole percent mixture are $\bar{V}_1 = 57.5 \times 10^{-6}$ m³/mol (ethanol), $\bar{V}_2 = 16 \times 10^{-6}$ m³/mol (water).

The molar volumes of pure components are Ethanol, $V_1 = 57.9 \times 10^{-6}$ m³/mol and water, $V_2 = 18 \times 10^{-6}$ m³/mol. [8]

b) Determine the fugacity and fugacity coefficient for an equimolar mixture of n-butane and n-octane at 600k and 16 bar using the Van der Waals equation of state.

$$a = 2.4405 \text{ Pa (m}^3/\text{mol)}^2, b = 0.1767 \times 10^{-3} \text{ m}^3/\text{mol},$$

$$z = 0.928, \text{ Molar volume of mixture} = 2.8933 \times 10^{-3} \text{ m}^3/\text{mol}. [8]$$

P.T.O.

Q3) a) Derive expressions for entropy and enthalpy of mixing of two ideal gases. [8]

b) The volume change of mixing (cm^3/mol) for the system ethanol (1)/methyl butyl ether (2) at 298 K is given by the equation.

$$\Delta v = x_1 x_2 [-1.026 + 0.220 (x_1 - x_2)]$$

Given that $v_1 = 58.63$ and $v_2 = 118.46 \text{ cm}^3/\text{mol}$, what volume of mixture is formed when 750 cm^3 of pure species 1 is mixed with 1500 cm^3 of species 2 at 298 K? What would be the volume if an ideal solution were formed? [10]

OR

Q4) a) The molar enthalpy of a binary solution is given by the equation.

$h = 500 X_1 + 1000 X_2 + (50 X_1 + 40 X_2) X_1 X_2$, J/mol. Determine \bar{h}_1 and \bar{h}_2 as functions of X_1 and the numerical values of pure component enthalpies. Also determine partial molar enthalpies at infinite dilution. [8]

b) The activity coefficient of component 1 in a binary solution is given by $\ln x_1 = a x_2^2 + b x_2^3 + c x_2^4$ where a, b, c are constants independent of concentrations. Obtain an expression for x_2 in terms of x_1 . [10]

Q5) a) Benzene (1) and toluene (2) form an ideal solution. The vapor pressures of both compounds are given by Antoine equation.

$$\log_{10} P = A - \frac{B}{t + c}, \text{ P in Torr and t is in } ^\circ\text{C. Prepare a T - x - y diagram at}$$

101.325 kPa (760 Torr). [12]

	A	B	C
Benzene (1)	6.87987	1196.760	219.161
Toluene (2)	6.95087	1342.310	219.187

b) Explain Raoult's law and modified Raoult's law. [4]

OR

Q6) The system n-pentane (1), n-hexane (2), n-heptane (3) forms an ideal solution. If a feed stream of overall composition $x_1 = 0.30$, $x_2 = 0.30$ and $x_3 = 0.40$ is continuously fed to a flash vaporiser maintained at 200 kPa and 90°C , determine the compositions of liquid and vapor streams leaving the flash unit and the fraction of feed vaporized in the unit.

$$P_1^{\text{sat}} = 470.7 \text{ kPa}, P_2^{\text{sat}} = 187.99 \text{ kPa}, P_3^{\text{sat}} = 78.61 \text{ kPa.} \quad [16]$$

SECTION - II

- Q7)** a) The following isothermal VLE data for 1-propanol and 2-chlorobenzene at 95°C was reported. Test whether the data is thermodynamically consistent or not. $P_1^{\text{sat}} = 681.77$ kPa, $P_2^{\text{sat}} = 248.48$ kPa. [10]

P (kPa)	x_1	y_1
350	0.0550	0.3500
446	0.1290	0.5110
518	0.2120	0.5990
609	0.4300	0.6970
665	0.6380	0.7590
691	0.8720	0.8830

- b) Explain a T – x – z diagram. [6]

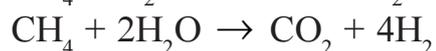
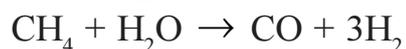
OR

- Q8)** a) Test whether the following data is thermodynamically consistent or not. $P_1^{\text{sat}} = 512.38$ kPa, $P_2^{\text{sat}} = 254$ kPa. [10]

P (kPa)	x_1	y_1
315.32	0.0556	0.2165
339.70	0.0903	0.2910
397.77	0.2152	0.4495
448.88	0.3970	0.5832
472.84	0.5300	0.6621
485.16	0.6047	0.7081
506.89	0.8088	0.8360
513.20	0.9636	0.9636

- b) Explain LLE diagrams on rectangular coordinates. [6]

- Q9)** a) A system consisting of 2 mol methane and 3 mol water is undergoing the following reaction.



Derive expressions for mole fractions in terms of the extent of reaction. [8]

- b) The equilibrium constant k_c for the reaction.

$\text{CH}_3\text{COOH}(\text{l}) + \text{C}_2\text{H}_5\text{OH}(\text{l}) \rightarrow \text{CH}_3\text{COOC}_2\text{H}_5(\text{l}) + \text{H}_2\text{O}(\text{l})$ at 100°C is 2.92. Determine the equilibrium concentration if 1m³ of an aqueous solution containing 5 kmol acetic acid, 10 kmol ethanol and 10 kmol water at 100°C is allowed to reach a state of equilibrium. [10]

OR

Q10) a) For the cracking reaction $C_3H_8(g) \rightarrow C_2H_4(g) + CH_4(g)$ the equilibrium conversion is negligible at 300 K but becomes appreciable at temperature above 500 K for a pressure of 1 bar determine :

- i) The fractional conversion of propane at 600 K.
- ii) The temperature at which the fractional conversion is 80%. [12]

b) Explain phase rule for non reacting species. [6]

Q11) a) For a gas phase reaction explain the relation of equilibrium constant with composition. [6]

b) Carbon black is produced by the decomposition of methane $CH_4(g) \rightarrow C(S) + 2H_2(g)$. For equilibrium at 923 K and 1 bar.

- i) What is the gas phase composition if pure methane enters the reactor and what fraction of methane decomposes?
- ii) Repeat part (a) if the feed is equimolar mixture of methane and nitrogen. The equilibrium constant at 923 K is 4.24. [10]

OR

Q12) a) The following simultaneous reactions occur in a mixture.



Estimate the equilibrium composition at 1 bar if an equimolar mixture of A and B are fed to a reactor for producing D. The reaction mixture can be assumed to be an ideal gas mixture. [12]

b) Write a note on multireaction equilibria. [4]



Total No. of Questions : 12]

SEAT No. :

P801

[Total No. of Pages : 3

[4263] - 309
T.E. (Chemical Engg.)
MASS TRANSFER - II
(2008 Pattern) (Semester - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates :

- 1) *Answer Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6 from section-I and Q. 7 or Q. 8, Q. 9 or Q. 10, Q. 11 or Q. 12 from section-II.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 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 limitations of differential distillation method? **[4]**
b) A feed containing 50 mole % hexane and 50% octane is flash distilled. If the fraction of liquid feed vaporized is 0.5 calculate the vapour and liquid stream compositions. Equilibrium data for the system : **[8]**

x	1	0.69	0.4	0.192	0.045	0
y	1	0.932	0.78	0.538	0.1775	0

where x = mole fraction of hexane in liquid phase

y = mole fraction of hexane in vapour phase

- c) What are azeotropes? **[4]**

OR

- Q2)** a) What is positive and negative deviation from ideality? **[8]**
b) A mixture of 70 mole % benzene and 30 mole % toluene is differentially distilled at atmospheric pressure until 65% of the original mixture is distilled. Calculate the compositions of distillate and residue if the equilibrium data is as given : **[8]**

x	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8
y	0.22	0.385	0.52	0.625	0.71	0.79	0.85	0.91

where x & y are mole fractions for benzene in liquid and vapour respectively.

P.T.O.

- Q3)** a) Derive the equation for q - line. [8]
 b) A liquid containing 30 mol % A and 70 mol % B is fractionated to give a distillate containing 96% A (by mole). 96% of A present in feed is found in the distillate feed is half vapour and a reflux ratio of 3.5 is used. If the relative volatility is 2.5 find the number of stages in each section and the minimum reflux ratio. [10]

OR

- Q4)** a) Write a note on partial condenser and cold feed. [8]
 b) A mixture of 55 mol % benzene and 45 mol % toluene is to be separated by distillation to give top product containing 96% by mol of benzene and bottom product containing 95% by mole of toluene. If the relative volatility is 2.2 and a reflux ratio of 1.5 times the minimum is used find the number of ideal stages and location of feed tray if feed is 2/3rd vapour. [10]

- Q5)** a) Explain binodal curve on a right-angled triangle. [8]
 b) A 5% nicotine in water solution is to be extracted using kerosene in 5 cross-current stages using 30kg solvent in each. For 100kg feed is to be treated find the percentage extraction and concentration of the final raffinate if the equilibrium relationship is $X = 1.11 Y$
 where $X = \text{kg nicotine/kg water}$
 and $Y = \text{kg nicotine/kg kerosene}$ [8]

OR

- Q6)** a) What are the criteria for solvent selection in extraction? [8]
 b) An aqueous solution containing 0.7 kmol/m³ of solute is extracted in a packed column counter currently using an organic solvent containing 0.004 kmol/m³ of solute. The exit raffinate stream has a solute concentration of 0.68 kmol/m³. The organic phase flow rate is 20 l/h and that of aqueous phase is 30 l/h. The column height is 1.4m and its cross-sectional area is 0.0045m². Determine the volumetric mass transfer coefficient if the equilibrium relation is $C_{org} = 0.025 C_{aq}$. [8]

SECTION - II

- Q7)** a) Explain constant and variable under flow. [6]
 b) Seeds containing 25% by weight of oil are to be extracted in a countercurrent leaching plant and 90% of the oil is to be recovered in a 55% by weight (of oil) solution. The underflow retains 1kg solution per 2kg insoluble matter if the solvent used is fresh determine the number of theoretical stages. [12]

OR

- Q8)** a) Explain the functioning of a Rotocel extractor. [6]
b) Describe the triangular method for finding number of stages for a continuous countercurrent leading process. [12]

- Q9)** a) Explain the process of ion-exchange. [8]
b) Explain break through curve. [8]

OR

- Q10)** a) Deuolorization of oil has the following equilibrium relation $x = 4y^2$ where $x = g$ colour adsorbed/g of adsorbent and $y = g$ of colour/g of colour free oil. If 100kg oil containing 30% colour is treated with 30kg adsorbent find the colour removed : [10]
i) If all 30kg is used in one stage.
ii) If 2 cross-current stages are used with 15kg adsorbent in each.
b) What is pressure swing adsorption. [6]

- Q11)** a) Explain microfiltration with example and relevant equation. [8]
b) What is cross-flow and its advantages. [8]

OR

- Q12)** a) Explain mier's supersaturation theory. [8]
b) Explain the functioning of Oslo Evaporative crystallizer. [8]



Total No. of Questions : 8]

SEAT No. :

P805

[Total No. of Pages : 2

[4263] - 317
T.E. (Petroleum Engineering)
RESERVOIR ENGINEERING - I
(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) *Questions No. 4 (four) and No. 6(six) are compulsory.*
- 3) *Attempt three questions from each section.*
- 4) *Figures to the right indicate full marks.*
- 5) *Neat diagrams should be drawn wherever necessary.*
- 6) *Use of a non-programmable calculator is allowed.*
- 7) *Assume suitable data if necessary.*

SECTION - I

Q1) Write notes on porosity, permeability, capillary pressure and wettability. **[16]**

Q2) Draw phase diagrams of single, two, three and multiphase fluids and explain. **[16]**

Q3) 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 127ft. Gas viscosity is 0.012 cp, $z = 0.9$. If the well is flowing at 3150 psia and $r_w = 0.4$ ft, calculate

i) Flow rate,

ii) BHP if rate is increased to 9.5 MMSCF / D.

[4]

Q4) Derive an expression for linear laminar flow of a gas. Explain Klinkenberg effect. **[18]**

P.T.O.

SECTION - II

Q5) Write a note on drive indices and explain in detail drive mechanisms. [16]

Q6) Derive the generalized material balance equation. [18]

Q7) Write a detailed note on recovery factors. [16]

Q8) Derive an expression for gas in place and explain the p/z graph. [16]



Total No. of Questions : 12]

SEAT No. :

P806

[Total No. of Pages : 3

[4263] - 318
T.E. (Petroleum)
PETROLEUM PRODUCTION ENGINEERING - I
(2008 Pattern) (Semester - II)

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) Write the different types of artificial lift techniques their merits, and demerits over each other in various types of well conditions. **[18]**

OR

- Q2)** a) Draw the schematic sketch of continuous gas lift system and explain its working in brief. **[9]**
- b) Draw the schematic sketch of tubing pressure operated gas lift valve and explain its working in brief. **[9]**

Q3) a) Use the following data and decide depth for point of gas injection. Also prove that, for a continuous flow injection, **[10]**

$$P_{wh} + G_{fa}.L + G_{fb}(D-L) = P_{wf}.$$

Depth = 8589 ft. Expected rate = 980 bbls/day. Tubing size = $2\frac{3}{8}$ inch.

$P_{wh} = 157$ psig, SBHP = 2956 psig. P.I. = 2.8, solution GOR = 290, SCF/STB, Sp. Gravity of injection gas = 0.65, S/C available pressure = 980 psig, °API = 40, S/C Temp. = 122 °F B.H. Temp. = 222 °F. 275 psi/1000 ft = flowing gradient of FBHP. 22.5 psi/1000 ft = casing pressure gradient. Subtract 100 psi from point of balance.

P.T.O.

- b) Calculate the total injection gas necessary if, optimum GLR = 650 SCF/STB, Formation GLR = 289 SCF/STB while desired oil production (100% oil) is 1000 bbls/day. [6]

OR

Q4) Explain in detail design procedure of intermittent gas lift system. [16]

Q5) a) A pump with a $1\frac{3}{4}$ inch plunger is set on 4560 ft of $\frac{3}{4}$ inch rods. The fluid level is known to be low and the tubing anchored with pumping at 20.5 SPM and 64 inch stroke length. The production is to the tune of 350 BOPD of specific gravity of 0.87. Calculate the effective plunger stroke. Assume, elasticity of steel is 30×10^6 psi. [6]

b) Explain design considerations of sucker rod pumping system. [10]

OR

Q6) a) Derive the equation to calculate ideal counterbalance effect in SRP system. [10]

b) Draw typical dynagraph curves and indicate various operational stages of SRP system on it. [6]

SECTION - II

Q7) List various components of electrical submersible pumping system. Explain the working and functions of each. [18]

OR

Q8) Design and draw subsurface details for an ESP. Following data is known : [18]

Casing size = $8\frac{5}{8}$ " , O.D.

Tubing size = $5\frac{1}{2}$ " O.D. (New)

Depth = 2100 ft

Perforations = 1900 - 2100 ft

Power source = 12,500 V primarily

Temperature = 120°F

Static fluid level = 400 ft from S/C

Water S.G. = 1.1

P.I. = 10 bbl/d/ft of drawdown

Desired rate = 10,000 b/d

Friction loss in hrz. line = 55 ft / 1000 ft

Tubing friction loss = 1.5 ft / 1000 ft

One stage develops 5.5 ft of head and 6.1 hp/stage

S/C flow line = 2000 ft of 4 inch with elevation = 30ft

Q9) Draw the schematic sketch of a Petroleum Production system, indicate various features of it and explain nodal analysis for any two nodes in details. [16]

OR

Q10) What are the objectives of system or nodal analysis? What are the advantages of it for an oil and gas field or wells in it. Draw typical relevant graphs and show optimization of tubing and surface pipe line for given IPR of a reservoir. Also explain choke selection using choke performance curves. [16]

Q11) Write and explain chemical reactions for matrix acidization of Sandstone system in brief. Discuss the necessary planning and calculations required for field job. [16]

OR

Q12) What is the range of skin factor for a damaged and improved well conditions? Explain the procedure to be conducted in hydraulic fracturing job. Also, draw a typical surface read-out graph of this job and indicate all the features on it. [16]



Total No. of Questions : 12]

SEAT No. :

P807

[Total No. of Pages : 4

[4263] - 322
T.E. (Petrochemical)
APPLIED HYDROCARBON THERMODYNAMICS
(2008 Pattern) (Semester - I)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates :

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

SECTION - I

- Q1) a) Answer the following (any four) : [12]**
- i) Write in brief the importance of thermodynamics in Petrochemical Engineering.
 - ii) Define Intensive and Extensive Properties with examples.
 - iii) State the third law of thermodynamics. Give its significance.
 - iv) What do you mean by thermodynamic equilibrium?
 - v) Body temperature of a healthy person is around 37°C. Express it in °F, K, °R.
- b) A system consisting of a gas confined in a cylinder is undergoing the following series of processes before it is brought back to the initial conditions : [6]
- Step 1* : A constant pressure process when it receives 50 J of work and gives up 25 J of heat.
- Step 2* : A constant volume process when it receives 75 J of heat.
- Step 3* : An adiabatic process.
- Determine the change in internal energy during each step and the work done during the adiabatic process.

OR

- Q2) a) Derive the first law of thermodynamics for steady state flow process.[8]**

P.T.O.

- b) A block of copper at a temperature of 825K and weighing 5kg is dropped into 50kg of water at 300K. If there are no heat losses, what is the change in entropy of (a) copper, (b) water and (c) copper and water both considered together?

Given : C_p of copper is 0.4 kJ/kg K and water is 4.2 kJ/kg K. [6]

- c) It is required to freeze 1 kg of water at 273 K by means of a refrigeration machine which operates in the surrounding of 300 K. The latent heat of fusion of ice at 273 K is 334.11 kJ/kg. Determine :
- The minimum amount of work required.
 - The heat given up to the surroundings. [4]

- Q3)** a) Calculate the molar volume of ammonia at 373 K and 10 bar using van der Waal's equation. Given : Critical temperature is 405.5 K and critical pressure is 112.8 bar. [8]
- b) State the principle of corresponding states and discuss the utility of compressibility charts. [8]

OR

- Q4)** a) Using the Virial equation, calculate the molar volume and compressibility factor of isopropanol vapour at 473 K and 10 bar. The Virial coefficients are :
- $B = -3.88 \times 10^{-4} \text{ m}^3/\text{mol}$ and $C = -2.6 \times 10^{-8} \text{ m}^6/\text{mol}^2$. [8]
- b) Explain the significance of triple point and critical point with the help of phase diagrams. [4]
- c) Determine the molar volume of a perfect gas at 600 N/m² and 30°C. [4]

- Q5)** a) Define Helmholtz free energy and show that at constant temperature, decrease in work function measures maximum available work. [8]
- b) If the pressure inside a pressure cooker 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. [4]
- c) Write a note on phase rule. [4]

OR

- Q6)** a) Derive the first Maxwell equation from the fundamental property relations. [8]
- b) At 200 K, the compressibility factor of oxygen varies with pressure as given below. Evaluate the fugacity of oxygen at this temperature and 100 bar. [8]

P, bar	1	4	7	10	40	70	100
Z	0.997	0.988	0.978	0.969	0.873	0.776	0.687

SECTION - II

Q7) a) A mixture contains 45% (mol) methanol (A), 30% (mol) ethanol (B) and the rest n-propanol (C). Liquid solution may be assumed to be ideal and perfect gas law is valid for the vapour phase. Calculate the following at a total pressure of 101.3 kPa. [12]

- i) The bubble point and vapour composition.
- ii) The dew point and liquid composition.

The vapor pressure of pure liquids are given below :

Temp, K	333	343	353	363
P_A , kPa	81.97	133.29	186.61	266.58
P_B , kPa	49.32	73.31	106.63	166.61
P_C , kPa	39.32	62.65	93.30	133.29

b) Write a note on chemical potential. [6]

OR

Q8) a) A hydrocarbon mixture contains 25% (mol) propane, 40% (mol) n-butane and 35% (mol) n-pentane at 1447.14 kPa. Assume ideal solution behavior and calculate the temperature and composition of liquid and vapour in equilibrium when 45% of the initial mixture is vaporized.

Use the following data for K values. [12]

	K values			
	T = 355 K	T = 366K	T = 377 K	T = 388 K
Propane	2	2.3	2.6	2.9
n-Butane	0.78	0.9	1.1	1.3
n-Pentane	0.33	0.4	0.5	0.61

b) Write a note on the equilibrium vaporization constant. Give the significance of DePriester's charts. [6]

Q9) a) From the vapour-liquid equilibrium measurements for ethanol-benzene 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 for the system. [10]

b) Discuss the various methods of determination of partial molar properties. [6]

OR

Q10) a) Ethyl alcohol and hexane form an azeotrope at 33.2% (mol) ethanol. It boils at 331.9 K at 101.3 kPa. At 331.9 K, the vapour pressures are 44.25 kPa for ethanol and 72.24 kPa for hexane. Determine the van Laar constants. **[10]**

b) What are azeotropes? Discuss the maximum and minimum boiling azeotropes. **[6]**

Q11) a) n-butane is isomerized to i-butane by the action of catalyst at moderate temperatures. It is found that the equilibrium is attained at the following compositions.

Temperature, K	mol %, n-butane
317	31
391	43

Assuming that activities are equal to the mole fractions, calculate the standard free energy of the reaction at 317 K and 391 K and the average value of heat of reaction over this temperature range. **[10]**

b) How is equilibrium constant K related to the standard free energy change? **[6]**

OR

Q12) a) Calculate the equilibrium constant at 673 K and 1 bar for the reaction $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightarrow 2\text{NH}_3(\text{g})$

Assuming that the heat of reaction remains constant in the temperature range involved. Take the standard heat of formation and standard free energy of formation at 298 K be -46100 J/mol and -16450 J/mol respectively. **[10]**

b) Discuss the effect of pressure on equilibrium constant. **[6]**

XXXXX

Total No. of Questions : 12]

SEAT No. :

P811

[Total No. of Pages : 3

[4263] - 326

T.E. (Petrochemical)
TRANSPORT PHENOMENA
(2008 Pattern) (Semester - II)

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 is allowed.*
- 4) *Draw neat sketch wherever necessary.*

SECTION - I

Q1) a) Explain what you mean by momentum transfer in a fluid. A fluid with viscosity 0.018 g/cm.s, is flowing through two parallel flat plates separated by a distance of 0.6 cm, at 273 K, the velocity of lower plate is 8 cm/s while upper plate velocity is stationary. Calculate the shear stress and velocity gradient. [8]

b) Explain the significance of estimation of diffusion coefficient. [8]

OR

Q2) a) Explain the significance of estimation of thermal diffusivity. [8]

b) Explain in detail the role of Transport phenomena in Distillation separation operation. [8]

Q3) a) Explain the physical interpretation of Navier Stokes equation for conservation of energy. [8]

b) State and explain any four dimensionless numbers in heat transfer. [8]

OR

Q4) a) Explain the physical interpretation of Navier Stokes equation for conservation of mass. [8]

b) State and explain any four dimensionless numbers in Mass transfer. [8]

P.T.O.

- Q5)** a) Write a short note on boundary layer approximation. [9]
b) What do you understand by intensity of turbulence and scale of turbulence? Explain with the help of equations. [9]

OR

- Q6)** a) Explain the following terms : Instantaneous velocity, fluctuating velocity and time average velocity. What is eddy viscosity? How does it differ from dynamic viscosity? [9]
b) A plate 3 m* 1.5 m is held horizontally in water moving at 1.25 m/s parallel to its length. The flow in the boundary layer is laminar at the leading edge of the plate, find the distance from leading edge where the boundary layer changes from laminar to turbulent, find the boundary layer thickness. Also find frictional drag on the plate consisting both its sides. Take dynamic viscosity of water as 0.01 poise and assume that laminar boundary layer exists up to $Re = 5 \times 10^5$. [9]

SECTION - II

- Q7)** a) Draw a neat sketch of a standard stirred tank vessel with a flat blade turbine agitator. Give the standard design specifications. [9]
b) A flat – blade turbine agitator with disk having flat six blades is installed in a tank. It is desired to scale up the system where equal rate of mass transfer is desired. Give the scale up procedure. [9]

OR

- Q8)** a) What is Power Number? Derive the power number for the Stirred tank vessel. [9]
b) Explain the flow patterns in a stirred tank vessel. State the provisions made to increase mixing and turbulence in the vessel. [9]

- Q9)** a) The heat flow in a metal rod is governed by the equation $\left(A \frac{\partial^2 T}{\partial x^2} = \frac{\partial T}{\partial t} \right)$
Derive the finite difference expression to give the variation of Temperature with respect to time at various locations of x over the metal rod. [8]
b) Derive one dimensional unsteady state heat conduction equation over a metal rod specifying the initial and boundary conditions. [8]

OR

- Q10)** a) Write a short note on convective heat transfer. [8]
b) Write a short note on convergence of a numerical solution. [8]

- Q11)** a) Write a short note on prediction of mass transfer coefficients from experimental data. [8]
b) Write a short note on convective mass transfer. [8]

OR

- Q12)** a) Give the numerical procedure to solve one dimensional unsteady state molecular diffusion in a slab of finite width exposed to a flowing fluid. [8]
b) Write a short note on dimensionless numbers in mass transfer. [8]



Total No. of Questions : 12]

SEAT No. :

P812

[Total No. of Pages : 4

[4263] - 327
T.E. (Petrochemical)
MASS TRANSFER - II
(2008 Pattern) (Semester - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

Q1) Answer the following:

[18]

- a) Derive Raleigh's equation for simple distillation.
- b) What is the equation for q line? What are the five possible feed conditions?
- c) Explain the procedure to determine number of stages for distillation column by Ponchon - Savarit Method.

OR

Q2) Carbon disulphide is to be absorbed from a dilute gas mixture of $CS_2 - N_2$ into pure non-volatile oil at atm. pressure in a counter - current absorber. The mole fraction of CS_2 in inlet gas stream is 0.05 and the flow rate of gas stream, G is 1500 k mole/hr. the equilibrium relation is given by

$$y = 0.45 x$$

Where x = mole fraction of CS_2 in liquid stream. It is desired to reduce the mole fraction of CS_2 in the exit gas stream to 0.005.

Calculate the minimum value of $\frac{L}{G}$ where L is the liquid flow rate in k mole/hr

Derive the equation for the operating line if $\frac{L}{G}$ is equal to 1.5 times the minimum value.

[18]

P.T.O.

Q3) A continuous fractionating column has to be designed for separating a liquid mixture of 4500 kg/hr containing equimolar amounts of methanol and water into an overhead product of 93% methanol and residue containing 5% methanol. The feed is 30% vaporized.

Calculate:

- Molar flow rate of overhead and bottom products.
- The number of actual plates assuming tray efficiency of 75%
- Use a reflux ratio of 1.5 times the minimum reflux, locate the feed tray

Equilibrium data:

x	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
y	0.41	0.57	0.66	0.72	0.78	0.82	0.87	0.91	0.95

[16]

OR

- Q4)** a) Derive Kremser - Brown - Souders equation for the calculation of number of theoretical stages for absorption in a stage wise contact tower. [10]
- b) Write Short Notes on: [6]
- Steam and vacuum Distillation.
 - Optimum reflux ratio.
 - Flooding and Loading characteristics in packed towers.

Q5) a) Vapor pressures of chlorobenzene and water are given below: [8]

Pressure, mm Hg	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

If steam is blown into the still containing a mixture of these two components and the total pressure is 130 mm Hg, estimate the temperature of boiling and the composition of the distillate. The two components are immiscible in the liquid.

- b) Indicate how the use of the enthalpy - composition diagram and McCabe-Thiele diagram could be utilized for the design of distillation columns. Specify the application of each method. Explain by means of both the methods to determine: [8]
- Minimum reflux.
 - The number of plates at total reflux and the Location of the correct feed plate in the fractionation of liquid mixture in a bubble plate column using open steam.

OR

Q6) A mixture of acetone vapour and air containing 5% by volume of acetone is to be freed of its acetone content by scrubbing it with water in a packed bed absorber. The flow rate of the gas mixture is 760 m³/hr of acetone-free air measured at NTP and that of water is 1400 kg/hr. The absorber operates at an average temperature of 20°C and a pressure of 101 kPa. The scrubber absorbs 98% acetone. The equilibrium relation for the acetone vapour - water system is given by : $Y^* = 1.75 X$

Where, $Y = k$ mole acetone/ k mole dry air

$X = k$ mole acetone/ k mole water

Calculate : a) Mean driving force for absorption,
b) Mass transfer area if the overall mass transfer coefficient is given by:

$K_G = 0.45 k$ mole of acetone/m². hr (k mole acetone/per k mole dry air). [16]

SECTION - II

Q7) In order to extract acetic acid from dilute aqueous solution with isopropyl ether, the two immiscible phases are passed counter-currently through a packed column 3.05 m in height and 7.6 cm in diameter.

It is found that if 1950 kg/hr m³ of pure ether is used to extract 975 kg/hr m² of 4% acid by weight then the ether phase leaves the column with a concentration of 1% acid by weight.

Calculate:

- the number of overall transfer units based on raffinate phase;
- overall extraction co-efficient based on raffinate phase.

The equilibrium relationship is given by:

Wt. % acid in ether phase = 0.3 times the wt. % acid in water phase. [18]

OR

Q8) a) Classify the commercial extraction equipments. State working principles of any one equipment. [10]

b) Discuss the ternary diagram for liquid-liquid extraction by taking suitable example. [8]

Q9) a) Discuss in brief Process principles involved in PSA and TSA. [8]

b) Discuss various adsorption isotherm models with their mathematical equations. [8]

OR

Q10) It is required to extract picric acid from a dilute aqueous solution containing 0.1 mole picric acid per litre of solution using benzene as solvent with a recovery of 80% of the picric acid originally present. Determine the quantity of benzene required per litre of aqueous solution by employing

- single - stage extraction and
- three - stage extraction (crosscurrent) using equal amounts of fresh solvent in each stage. The equilibrium data for benzene -picric acid -water system at 25°C is given by,

$C_B \times 10^2$	0.0932	0.225	1	2	5	10	18
$m = \frac{C_B}{C_A}$	2.23	1.45	1.705	0.505	0.32	0.24	0.187

where, C_B and C_A are the equilibrium concentrations of picric acid in benzene and aqueous phases respectively in mole/litre. [16]

- Q11)**
- Differentiate physical or chemical adsorption. [6]
 - Discuss the principles involved in Ultrafiltration and Nanofiltration. What are the industrial applications. [6]
 - Why the reflux is used and how does it affect the size of the distillation tower? [4]

OR

- Q12)** Write short notes on: [16]
- Classification of membrane separation processes.
 - Reverse Osmosis - Principles and applications.
 - Membrane Modules.



Total No. of Questions : 12]

SEAT No. :

P814

[Total No. of Pages : 2

[4263] - 331

T.E. (Polymer Engineering)
POLYMER CHEMISTRY - I
(2008 Pattern) (Semester - I)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates :

- 1) *All questions are compulsory.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Figures to the right indicate full marks.*

SECTION - I

- Q1)** a) Explain the following with suitable examples/reactions/figures. [8]
i) Oligomers.
ii) Percentage conversion versus MW graph of step and chain mechanism
b) Explain the principle, construction and working of static membrane osmometer. [8]

OR

- Q2)** a) Explain the following with suitable examples/reactions/figures. [8]
i) Molecular weight distribution curve for three polydispersed polymer samples.
ii) Construction of vapor pressure osmometer. (well labeled figure only).
b) Discuss sedimentation equilibrium method in detail. [8]

- Q3)** a) Write any two structures each for free radical initiators belonging to four different classes. [8]
b) Give any two structures each for vinyl, allyl, olefin and diene monomers. [8]

OR

- Q4)** a) Give the reactions involved in poly-*p*-xylene synthesis by gas phase polymerization. [8]
b) Explain the terms 'CMC' and 'latex'. With suitable schematic diagram show the details of emulsion polymerization. [8]

P.T.O.

- Q5)** a) Discuss the details of interfacial condensation. [9]
b) Derive the kinetic expression for step polymerization. [9]

OR

- Q6)** a) Explain the reaction mechanism of ethylene oxide polymerization. [9]
b) Give one mechanism each for polyaddition reaction of vinyl monomer and monomer with reactive functional groups. [9]

SECTION - II

- Q7)** a) Derive copolymer composition equation. Explain its importance. [8]
b) Write a note on Q-e scheme. [8]

OR

- Q8)** a) Write in detail about various copolymerization behaviors. [8]
b) Enlist and mention distinguishing properties and applications of any three commercial copolymers. [8]

- Q9)** a) Write a note on following polymer reactions. [8]
i) Hydrolysis.
ii) Acidolysis.
b) Discuss polymer recycling steps in detail. [8]

OR

- Q10)** a) Write a note on following functional group containing polymer reactions. [8]
i) Aldehyde.
ii) Carboxyl.
b) Discuss biodegradation of polymers. [8]

- Q11)** a) Discuss ditacticity in polymers with suitable illustrations. [9]
b) Discuss how properties of stereoregular polymers are different from usual polymers. [9]

OR

- Q12)** a) Write a full note on Zirconocene catalyst, its working and the reaction mechanism. [9]
b) Explain the difference between monometallic and bimetallic mechanism. [9]

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Total No. of Questions : 12]

SEAT No. :

P819

[Total No. of Pages : 2

[4263] - 337

T.E. (Polymer Engineering)
POLYMER CHEMISTRY - II
(2008 Pattern) (Semester - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates :

- 1) *All questions are compulsory.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Figures to the right indicate full marks.*

SECTION - I

- Q1)** a) Write in detail curing reactions of urea based polymers and their applications. [8]
b) Explain compounding of PF resin in detail. [8]

OR

- Q2)** a) Explain in detail applications of silicone polymers considering their properties. [8]
b) Compare synthetic reactions involved in UF and MF resin. [8]

- Q3)** a) Give the distinguishing properties of vinyl ester resins and correlate with the structure. [8]
b) Write a note on polyester coating resins. [8]

OR

- Q4)** a) Explain manufacture of unsaturated polyester resins. [8]
b) Discuss anhydrides and glycols used in the preparation of polyesters as raw materials. [8]

- Q5)** a) Write a note on epoxies as adhesive materials. [9]
b) Explain amine and acid hardening systems for epoxy resin. Give reactions. [9]

OR

- Q6)** a) Write a note on various raw materials used in PU resin manufacture. [9]
b) Write a note on polyurethane rubbers and foams. [9]

P.T.O.

SECTION - II

- Q7)** a) Give structure of any two polyamides. Discuss their properties. [8]
b) Differentiate the aliphatic and aromatic polyamides on the basis of structure and properties and raw materials. [8]

OR

- Q8)** a) Differentiate polyamides and polyimides on the basis of properties and structure. [8]
b) Give the synthesis of modified polyimides. [8]

- Q9)** a) Give the synthesis, Properties and applications of PPO. [8]
b) Based on the structure discuss the properties and applications of PPS. [8]

OR

- Q10)** a) Elaborate on membrane applications and required properties for polysulphone. [8]
b) Differentiate poly (ether - ketones) and poly (ether - ether - ketones). [8]

- Q11)** a) Compare smectic, nematic and cholesteric phases with suitable diagram. [9]
b) Explain the synthesis of polyaniline. Comment on its conducting behavior. [9]

OR

- Q12)** a) Write a note on controlled release drug delivery polymers and its working mechanism. [9]
b) Write a note on polymers in biomedical engineering. [9]

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Total No. of Questions : 12]

SEAT No. :

P821

[Total No. of Pages : 3

[4263] - 340
T.E. (Polymer)
POLYMER RHEOLOGY
(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 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) Give the chart that explains different types of fluids with egs. [12]
b) Explain the term dieswell with egs. and give reasons behind it. Give methods used to reduce dieswell. [6]
- OR
- Q2)** a) Explain what is power law model and give the significance of “n”. [3]
b) Derive continuity equation. [9]
c) Explain stress tensor as well as strain tensors with any one eg. [6]
- Q3)** a) Explain Maxwell model. [8]
b) Explain the term creep compliance and stress relaxation. [4]
c) Give the significance of WLF equation. [4]
- OR
- Q4)** a) Explain what happens at T_g and also explain free volume theory. [4]
b) Explain what is Doi-Edw and theory. [6]
c) Explain and derive voigt model for stress relaxation condition. [6]
- Q5)** a) Give the effect of pressure on viscosity. [5]
b) Give the effect of M.W and M.W.D. on viscosity. [5]
c) Give effect of plasticiser and explain when does it act as antiplasticiser. [6]

P.T.O.

OR

- Q6)** a) Give the effect of temperature and fillers on melt viscosity. [8]
b) Explain the role of copolymerisation and crystallinity on polymer flow properties. [8]

SECTION - II

- Q7)** a) Derive an expression for velocity profile and shear rate at wall for a Non-Newtonian fluid through a rectangular cross-section. [8]
b) Derive an expression for pressure drop due to shear through a conical cylindrical section. [8]

OR

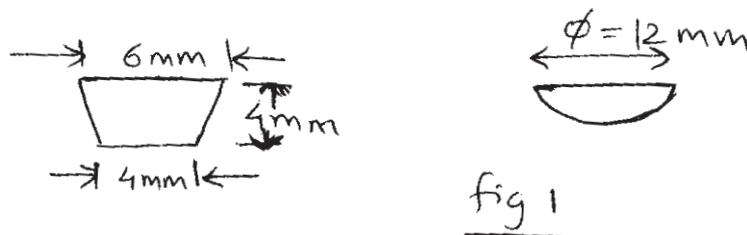
- Q8)** a) Derive an expression for swelling due to tensile stresses in a short capillary. [6]
b) Write a note on Hank's criterion. [6]
c) Explain the term substitute radius as defined by schenkel. [4]

- Q9)** a) Write a note on constructional features and working of a capillary rheometer. [6]
b) Derive an expression which relates torque and apparent viscosity in a cone and plate rheometer. [6]
c) A cone and plate rheometer with cone angle 2° and cone radius 8cm is used for measurement for polymer solution. The solution is Newtonian with viscosity as 0.2 Pa - s. Calculate the torque if the cone rotates at an angular velocity of 50 rpm. Calculate torque for a non-Newtonian fluid obeying the power law $\tau = 50 \dot{\gamma}^{0.75}$. [4]

OR

- Q10)** a) Explain Robinowitsch correction and also Bagley's correction. [6]
b) Explain the constructional features of a Brookfield viscometer. [6]
c) Explain the terms : Loss modulus and storage modulus. [4]

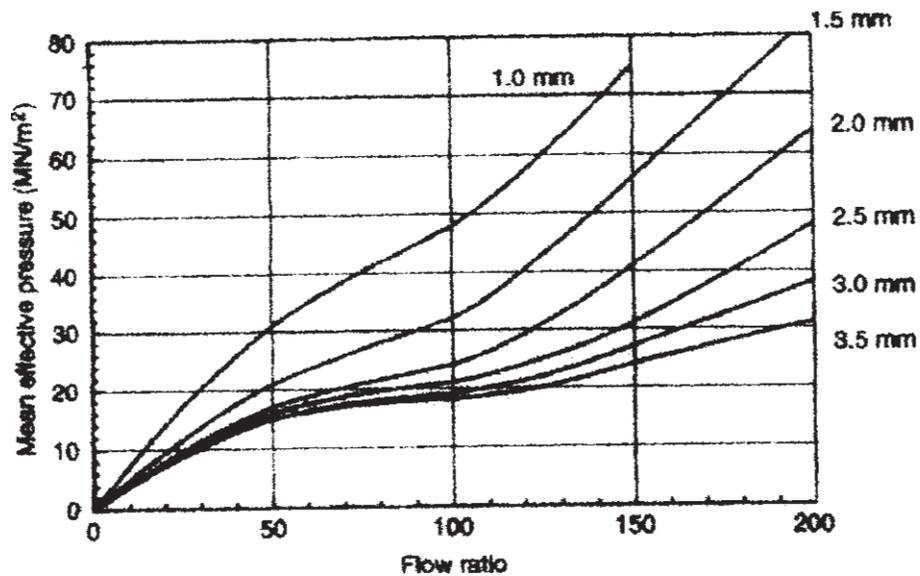
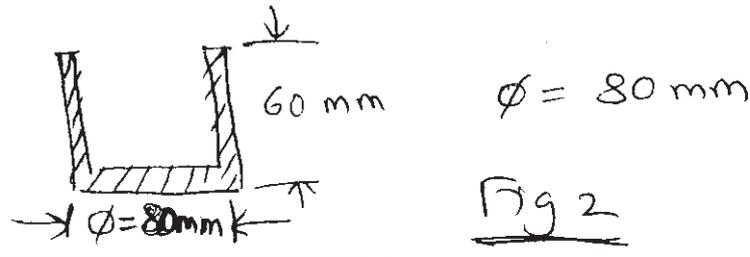
- Q11)** a) A polymer melt obeys the powerlaw model as $\tau = 1,35,000 \dot{\gamma}^{0.35}$. Calculate pressure drop for this melt flowing through a trapezoidal runner and semicircular if the mass flow rate is 0.20 g/s. Melt density is 0.76 gm/cc. Refer to fig.1 as shown : [10]



- b) Derive an expression relating the platen force F needed to compression mold a disc of thickness H in time t_1 . [8]

OR

- Q12) a) Derive an expression for damping force during injection molding for a circular and rectangular cavity. [8]
- b) Calculate the damping force required for the component in fig.2. Wall thickness is 1mm. Length from sprue to cavity is 45mm. The cup is side gated. Refer to graph in fig.3. [10]



Claming pressures for different cavity geometries (typical values for easy flow materials).

Fig 3



Total No. of Questions : 12]

SEAT No. :

P822

[Total No. of Pages : 3

[4263] - 341
T.E. (Computer/ I.T. Engg.)
DATABASE MANAGEMENT SYSTEMS
(2008 Pattern) (Semester - I)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates :

- 1) *Solve Section-I Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6.*
- 2) *Solve Section-II Q. 7 or Q. 8, Q. 9 or Q. 10, Q. 11 or Q. 12.*
- 3) *Answers to the two sections must be written in separate books.*
- 4) *Neat diagrams must be drawn wherever necessary.*
- 5) *Assume suitable data if necessary.*

SECTION - I

- Q1)** a) Explain various components and database system structure with the help of neat diagram. **[10]**
- b) Explain multi-user DBMS architecture. **[4]**
- c) Specify the CODD's norms to be specified by RDBMS. **[4]**

OR

- Q2)** a) What are the various features of extended E-R diagrams [EER]. Explain in details with the help of example. **[10]**
- b) What is a data abstraction? **[4]**
- c) What is integrity constraint? Explain referential integrity constraints. **[4]**

- Q3)** a) Consider the relational database : **[8]**

dept (dept _ no, dname, LOC)
emp (emp _ no, ename, designation)
project (proj _ no, proj _ name, status)
empproject (emp _ no, proj _ no)
dept and emp are related as 1 to many
proj and emp are related as 1 to many

Write relational expressions for the following :

- i) List all employees of 'INVENTORY' department of 'PUNE' location.
- ii) Give the names of employees who are working on 'Blood Bank' project.
- iii) Give the name of managers from 'MARKETING' department.
- iv) Give all the employees working under status 'INCOMPLETE' projects.

P.T.O.

b) Explain stored procedures and triggers with example. [8]

OR

Q4) a) Explain various join operations with example. [8]

b) What is cursor? Explain various types of cursor. [8]

Q5) a) State and prove Armstrong's axioms for functional dependencies. [8]

b) A set of FD's for the relation R (A, B, C, D, E, F) is $AB \rightarrow C$, $C \rightarrow A$, $BC \rightarrow D$, $ACD \rightarrow B$, $BE \rightarrow C$, $EC \rightarrow FA$, $CF \rightarrow BD$, $D \rightarrow E$. Find the minimum canonical cover for this set of FD's. [8]

OR

Q6) a) What is decomposition? Suppose that we decompose the schema $R = (A, B, C, D, E)$ into (A, B, C) and (A, D, E) , show that this decomposition is a lossless decomposition if the following set F of functional dependencies holds :

$A \rightarrow BC$, $CD \rightarrow E$, $B \rightarrow D$, $E \rightarrow A$. [8]

b) Define Boyce-Codd normal form. How does it differ from 3NF? Why is it considered a stronger form of 3NF? [8]

SECTION - II

Q7) a) Construct a B^+ tree for the following set of key values.

(2, 3, 5, 7, 11, 17, 19, 23, 29, 31)

Assume order of tree is 4. [8]

b) Explain the role of "selection" operation in query processing. [8]

OR

Q8) a) What is ordered indices? Explain the types of ordered indices with suitable example. [8]

b) Explain equivalence rules for query optimization. [8]

Q9) a) Which are different crash recovery methods? Explain any one in detail? [8]

b) What is meant by "Transaction"? Explain obstruct transaction model with state diagram. [8]

OR

Q10) a) Explain two-phase locking protocol. How does it ensure serializability? [8]

b) Explain shadow paging recovery and log-based recovery scheme. [8]

Q11) Write a short note on any three :

[18]

- a) Data warehouse.
- b) Association rules for data mining.
- c) Distributed database system.
- d) Persistent programming languages.

OR

Q12) a) Compare relational model Vs object-oriented model.

[6]

b) What is fragment of a relation? What are the main types of fragments?
Why is fragmentation a useful concept in distributed database design?**[8]**

c) Explain the need of backup and replication.

[4]



Total No. of Questions : 12]

SEAT No. :

P823

[Total No. of Pages : 2

[4263] - 342

T.E. (Computer Engineering)

DATA COMMUNICATION

(2008 Pattern) (Sem. - I) (Theory)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates :

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

SECTION - I

- Q1)** a) Explain WDM and CDMA multiplexing techniques. [8]
b) What is FSK? Explain FSK generation bandwidth of FSK signal and detection of FSK. [10]

OR

- Q2)** a) Compare ASK, PSK, FSK techniques. [10]
b) Calculate maximum bit rate for a channel having bandwidth 1600 Hz if
i) S/N ratio is 0 dB.
ii) S/N ratio is 20 dB. [8]

- Q3)** a) Explain with block diagram PCM Encoder and Decoder. [8]
b) Encode the following binary data stream into RZ, NRZ, AMI and Manchester codes. 11001010. [8]

OR

- Q4)** a) Draw a block diagram of DELTA modulation Transmitter and Receiver. Comment on slope overload error. [8]
b) Find Nyquist rate and interval for the signal $10 \sin c(100)t$. [8]

- Q5)** a) List and explain all types of ARQ system. [8]
b) Explain Huffman encoding Algorithm. [8]

OR

P.T.O.

- Q6)** a) Calculate CRC for the frame 1101011011 and generate polynomial $x^4 + x + 1$ and write transmitted frame. [8]
b) Explain why error detection and correction required. [8]

SECTION - II

- Q7)** a) List and explain DSL technology. [10]
b) Write a short note on PSTN. [8]

OR

- Q8)** a) Explain Bluetooth Protocol Architecture. [10]
b) Write a short note on Network Topology. [8]

- Q9)** a) Write the comparison between circuit switching, Packet switching and message switching. [8]
b) Write a short on Wireless Transmission media. [8]

OR

- Q10)** a) Write the functions of repeater, Hub, NIC, Switch, Router and Bridge. [8]
b) Give a brief description of [8]
i) Twisted pair cable.
ii) Co-axial cable.
iii) Fiber Optic cable.

- Q11)** a) Explain frame types of HDLC. [8]
b) Explain in brief Pure ALOHA, slotted ALOHA and CSMA/CD mentioning efficiency of each. [8]

OR

- Q12)** a) Write a short note on stop and wait protocol. [8]
b) What is VLAN? State the advantages of VLAN. Explain how to setup VLAN using Layer-2 switches. [8]

☒☒☒☒

Total No. of Questions : 12]

SEAT No. :

P827

[Total No. of Pages : 3

[4263] - 346

T.E. (Computer Engg.)

PRINCIPLES OF PROGRAMMING LANGUAGES

(2008 Pattern) (Semester - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates :

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

SECTION - I

- Q1)** a) What are various programming language paradigms? Explain in brief with suitable examples. [8]
- b) What is binding and binding times? What are the different binding times. [4]
- c) What do you mean by activation records? How this feature is used for implementing recursive function calls. [6]

OR

- Q2)** a) Explain following characteristics of a good programming language. [6]
- i) Orthogonality.
 - ii) Uniformity.
 - iii) Implementability.
- b) What is type checking? What is static and dynamic type checking. [6]
- c) Give an example statement in C, C++ or JAVA that is particularly unreadable rewrite that statement in a more readable style. [6]
- Q3)** a) Explain the difference between C and PASCAL. [6]
- b) What are design principles for procedural programming specification? [6]
- c) Explain data types in PASCAL. [4]

OR

- Q4)** a) What are undesirable characteristics of imperative programming? [6]
- b) Explain block oriented and statement oriented structure programming. [6]
- c) Explain pointer in PASCAL with suitable example. [4]

P.T.O.

- Q5)** a) What are benefits of object oriented programming language? Compare it with procedural programming language. Use suitable example. [8]
b) Explain the concept of multithreading with respect to java. [6]
c) Explain Information-hiding. [2]

OR

- Q6)** a) Explain Run-time Type identification with respect to Java. [6]
b) Explain various pre-defined exception classes in Java with proper example. [6]
c) Compare Java abstract class and java interface in Java. [4]

SECTION - II

- Q7)** a) What is microsoft .NET Technology? What are the web services and their importance from business perspective. List web services protocols supported by Industry. [10]
b) Explain following object oriented concepts of .NET framework class object with suitable example. [8]
i) Finalizers.
ii) IDisposable.
iii) Delegates.
iv) Events.

OR

- Q8)** What do you meant by strongly typed language?
a) Comment on “C # is strongly typed language”. [6]
b) Explain value type and reference type variable with respect to C#. [6]
c) Explain the structure of C# program with suitable example. [6]
- Q9)** a) State and explain key features of Logical Programming Specification. [8]
b) Consider following PROLOG Database. [8]

Likes - to - eat (cat, Fish)

Likes - to - eat (cat, Butter)

Likes - to - eat (Dog, Fish)

Likes - to - eat (Cow, Grass)

Likes - to - eat (Cat, Mouse)

Likes - to - eat (Dog, Roti)

Likes - to - eat (Horse, Grass)

Likes - to - eat (Cow, Roti)

What is the result in each of the following cases :

- i) Goal : Likes - to - eat (Cow, X) and Likes - to - eat (Dog, X).
- ii) Goal Likes - to - eat (Cow, X) and Likes - to - eat (Y, X).
- iii) Specify the goal to list all animals who Likes - to - eat Roti.
- iv) Specify the goal to list other likings of animals who Likes - to - eat Fish.

OR

- Q10)** a) What is forward chaining and backward chaining in prolog. [8]
b) Write a PROLOG program to add two numbers. [8]

- Q11)** a) Write a LISP program to check whether given number is prime or not. [6]
b) What do you mean by association list with respect to LISP. [4]
c) Write short note on Binding in LISP. [6]

OR

- Q12)** a) Consider Two Lists : [6]
X = (a b c d e) Y = Reverse of X write output of following :
- i) (caddr X)
 - ii) (nth 2 (cdr X))
 - iii) (append Y X)
 - iv) (length (append X (nth 2 (cdr X))))
 - v) (caar X)
 - vi) (atomp Y)
- b) Explain numeric predicate functions supported by LISP. [4]
c) Explain reduction rule in functional programming lang. [6]

☒☒☒☒

Total No. of Questions : 12]

SEAT No. :

P828

[Total No. of Pages : 2

[4263] - 347

T.E. (Computer Engg.)

COMPUTER NETWORKS

(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 books.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Assume suitable data if necessary.
- 5) Figures to the right indicate full marks.

SECTION - I

- Q1)** a) Assume that you are accessing a web page through a browser on a computer. Explain step by step various things that happen at various layers on client side and server side. Assume both uses TCP/IP protocol stack. [8]
- b) Compare file transfer using SMTP and HTTP methods. [8]

OR

- Q2)** a) What is DNS? Explain with suitable example process of delivering of requested web page on your computer? [8]
- b) Explain in brief functionality of Web server, Proxy server, Mail server. [8]

- Q3)** a) What is a 3-way handshake in TCP? Explain in brief why it is required? [6]
- b) Draw UDP header structure, Explain significance of each field in UDP header. What is pseudo-header? [6]
- c) Explain multiplexing and de-multiplexing in transport layer. [6]

OR

- Q4)** a) "UDP does not guarantee reliability in data transfer but delivered data is error free" Justify this statement. [6]
- b) What is socket? List and explain various socket primitives required in TCP socket program on client and server side. [6]
- c) Explain significance of following flags in TCP header SYN, RST, FIN, PSH. [6]

P.T.O.

- Q5)** a) Describe metrics measuring QoS (Quality of Service) [8]
b) What is congestion? List various network parameters affected due to congestion. [8]

OR

- Q6)** a) Explain in brief the terms RTT, CW (Cong Win) and AIMD for TCP. [8]
b) Describe any link scheduling algorithm. [8]

SECTION - II

- Q7)** a) Describe in short the importance and working of ARP protocol? What is ARP cash. [8]
b) Draw and explain IPV6 header. Explain the significance of extension header. [8]

OR

- Q8)** a) Consider a class-C network which needs to be subnetted into 3 subnets. Calculate the appropriate network mask. How many number of hosts can be supported by each subnet. [8]
b) Describe in brief ICMP error and query messages (at least 2 each). [8]

- Q9)** a) What is path vector routing? Discuss its advantages over Distance Vector routing. [8]
b) Explain routing protocols RIP and BGP. [8]

OR

- Q10)** a) Explain in brief hierarchical routing and discuss its advantages. [8]
b) What is a difference between forwarding and routing? Describe link state routing algorithm. [8]

- Q11)** a) Explain the working of Hubs, Switches and Routers. [6]
b) Draw and explain ATM Cell Header Structure for user Network interface. [6]
c) Explain the working of PPP. [6]

OR

- Q12)** a) Draw and Explain HDLC frame format. [6]
b) Differentiate between Bridge, Router and Switches. [6]
c) Explain in brief working of MPLS. [6]



Total No. of Questions : 12]

SEAT No. :

P829

[Total No. of Pages : 2

[4263] - 348

T.E. (Computer Engg.)

FINANCE AND MANAGEMENT INFORMATION SYSTEMS

(2008 Pattern) (Theory) (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) Figures to the right indicate full marks.
- 3) Assume suitable data, if necessary.
- 4) All questions are compulsory.

SECTION - I

Unit - I

- Q1)** a) With neat diagram, explain system approach to management process. [10]
b) Explain the social responsibilities of a manager. How role of manager changes at different positions in the organization? [8]

OR

- Q2)** a) What is a performance appraisal and carrier strategy? Explain with example. [10]
b) Explain the concept of International Business Management. What are the benefits to host nation with the international business. [8]

Unit - II

- Q3)** a) State and explain different forms of business organization. Also explain the benefits and challenges of those types of organization. [8]
b) Explain in detail Mergers, acquisition, takeover, privatization and Divestitures. [8]

OR

- Q4)** a) Explain Time value of money, present and future value of single amount. [8]
b) Explain Corporate Security and International Corporate Security with proper example. [8]

Unit - III

- Q5)** a) Explain the Role of MIS in decision making and strategic planning. [8]
b) Explain Knowledge Management process and business process reengineering in detail. [8]

P.T.O.

OR

- Q6)** a) Explain DSS and its type in detail. [8]
b) Explain the role of MIS as a tool to support management functions. [8]

SECTION - II

Unit - IV

- Q7)** Write notes on any three : [18]
a) Web enabled business.
b) Content management system.
c) Security threats to e-commerce.
d) Modern business technology

OR

- Q8)** Explain any three : [18]
a) e-collaboration.
b) Security challenges to e-business.
c) Real time enterprise.
d) Enterprise portal.

Unit - V

- Q9)** a) How ERP helps to grow the organization in competitive business environment? Explain in detail. [8]
b) Explain Supply chain management system and its advantages to the organization. [8]

OR

- Q10)** a) Explain the process of Global management of IT infrastructure, in detail. [8]
b) What are different information security challenges in e-business? Explain in detail. [8]

Unit - VI

- Q11)** a) How IT act 2005 helps organization to minimize the cyber problems? Explain in detail. [8]
b) Elaborate Copyright and Patent acts with suitable examples. [8]

OR

- Q12)** a) How Cyber crimes are a critical issue in an organization? Explain in detail. [8]
b) What are challenges with Right to information act (RTI)? Explain in brief. [8]

☒☒☒☒

Total No. of Questions : 12]

SEAT No. :

P830

[Total No. of Pages : 3

[4263] - 349

T.E. (Computer Engg.)

SYSTEMS PROGRAMMING AND OPERATING SYSTEMS

(2008 Pattern) (Semester - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) What are language processing activities give details of each activity? [6]
b) What is the use of literals and how assembler processes the literals? [6]
c) What is the need of two pass assembler? [4]
OR
- Q2)** a) Which data structures are required in the design of two pass assembler give their formats. [8]
b) Draw a flow chart for single pass macro processor. [8]
- Q3)** a) What are the functions of loader? [4]
b) How relocation and linking is done in direct linking loader? [6]
c) Explain the usage of GEST and LESA in Direct linking loader. [6]
OR
- Q4)** a) What is the need of DLL? How dynamic linking can be done with or without imports? [6]
b) What is the use of call back function in DLL? [4]
c) Draw the flowchart for pass I of two pass direct linking loader. [6]

P.T.O.

- Q5) a)** Enlist basic functions of an operating system. [6]
b) Consider the following set of processes [12]

Process	Arrival Time	Burst Time
P1	0	3
P2	1	5
P3	3	2
P4	9	5
P5	12	5

Calculate waiting time, turnaround time for the following method.

- i) FIFO
ii) SJF
iii) Round Robin with 2 as slot time

OR

- Q6) a)** What are the different types of Kernel? Explain. [6]
b) Write short notes on any THREE: [12]
i) Distributed OS.
ii) Real time scheduling.
iii) System calls.
iv) Multiprogramming.

SECTION - II

- Q7) a)** Explain the necessity for mutual exclusion. Describe various ways to achieve mutual exclusion. [8]
b) What are pipes? Explain with examples. [4]
c) Explain deadlock detection algorithm with suitable example. [6]

OR

- Q8) a)** Discuss Reader writer problem. Give a solution to reader writer problem using semaphores considering readers have priority. Also explain Binary and counting semaphore. [10]
b) Explain deadlock detection algorithm with suitable example. [8]

- Q9) a)** Given the following page reference string **[10]**
1, 2, 3, 2, 5, 6, 3, 4, 6, 3, 7, 3, 1, 6, 3, 4, 5, 3, 2, 4, 3, 4, 5, 1
Number of page frames are 4
Show the page trace and calculate the number of page frames for following page replacement policies
- i) LRU.
 - ii) Optimal.
 - iii) Fifo.
- Also explain Bledy's anomaly.
- b) Explain fixed and dynamic partitioning scheme for memory management. Also state its advantages and disadvantages. **[6]**

OR

- Q10) a)** What is virtual memory management? Explain Address Translation in a paging system for virtual memory. **[10]**
- b) Explain the following terms in brief - **[6]**
- i) Translation lookaside buffer
 - ii) Thrashing.
- Q11) a)** Explain disk free space management techniques. **[8]**
- b) Why I/O buffering is necessary? State and explain different I/O buffering techniques. **[8]**

OR

- Q12) a)** Describe the following: **[8]**
- i) File Sharing.
 - ii) Disk performance parameters.
- b) What is RAID? Describe the seven layers of RAID. **[8]**



Total No. of Questions : 12]

SEAT No. :

P831

[Total No. of Pages : 2

[4263] - 350
T.E. (Computer Engg.)
SOFTWARE ENGINEERING
(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 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 working and throwaway prototypes? Explain how they are used in prototyping model? [6]
- b) Explain the water fall model with its advantages and disadvantages. [6]
- c) State the generic process framework activities. [4]

OR

- Q2)** a) Explain the phases of unified process model. [6]
- b) State the myths of the practitioner and the realities. [6]
- c) Why is the formal methods model used in critical software development? [4]

- Q3)** a) Explain the scenario based modeling with an example. [8]
- b) Give the scope and modeling of association and dependencies between the classes for a Payroll Management System. [8]

OR

- Q4)** a) State and explain the methods for eliciting requirements. [8]
- b) What is the significance of data flow modeling? Create level one DFD for an ATM system. [8]

- Q5)** a) Explain the quality attributes, considered in software design. [8]
- b) What are the characteristics of a well formed design class? [6]
- c) Differentiate between abstraction and refinement. [4]

OR

P.T.O.

- Q6)** a) Explain the user interface design steps. [8]
b) What are the design principles for reducing the user's memory load in user interface design? [6]
c) Explain in brief call and return architecture. [4]

SECTION - II

- Q7)** a) What is unit testing? Explain the unit testing process. [8]
b) Explain the strategic approach to software testing. [6]
c) Compare the software testing with debugging. [4]

OR

- Q8)** a) Basis path testing is covers all statements in a program module. Justify with example. [8]
b) Explain any two system testing methods. [6]
c) Differentiate between white box and black box testing. [4]

- Q9)** a) What do you mean by software project estimation? Explain the process based estimation with an example. [8]
b) Explain defect removal efficiency as a metric for project and process. [8]

OR

- Q10)** a) What is empirical estimation model? Explain with any one technique. [8]
b) Explain the decision tree technique for make/buy decision. [8]

- Q11)** a) Write short notes for the following : [8]
i) Risk identification.
ii) Software configuration process.
b) Discuss the techniques used in tracking the project schedule. [8]

OR

- Q12)** a) What is time line chart? How it is used in scheduling of software project? [8]
b) Explain the change control process in software configuration process. [8]



Total No. of Questions : 12]

SEAT No. :

P834

[Total No. of Pages : 2

[4263] - 354
T.E. (I.T.)
SOFTWARE ENGINEERING
(2008 Pattern) (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.*

SECTION - I

- Q1)** a) Define software engineering. What are the software characteristics? What are the various categories of software? [10]
b) Explain in detail Spiral model with its merits/demerits. [8]

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]

OR

- Q4)** a) Draw E-R diagram for relationship between customer and banking system. [6]
b) What are the characteristics that requirement must meet? [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]

- Q5)** a) What is software architecture? Give the importance of software architecture. What is structural partitioning? [8]
b) What is information hiding? What is stepwise refinement? What is refactoring? [8]

OR

- Q6)** a) What are the design quality guidelines? [8]
b) What are the interface design principles and guidelines? [8]

P.T.O.

SECTION - II

- Q7)** a) What is the objective of white box testing? [2]
b) What is cyclomatic complexity? Explain with a suitable example. [8]
c) What is integration testing? What is bottom up integration testing? Explain with appropriate figure. [8]

OR

- Q8)** a) What is the objective of black box? [2]
b) What is verification testing and validation testing? Explain in brief. [8]
c) What is system testing? Explain in detail. [8]

- Q9)** a) What is the objective of software scope and software project planning? Explain in brief. [4]
b) What is the relevance of four P s in project planning? Explain in detail. [12]

OR

- Q10)** a) What are the ways in which software estimation can be classified? Elaborate. [6]
b) What is FPA? Explain in brief. [10]

- Q11)** a) What are the types of risks? Explain in brief. [6]
b) What is risk mitigation, risk monitoring, risk management? Explain in brief. [10]

OR

- Q12)** a) What is the objective of SCM? [4]
b) What are the software quality factors? Explain any four. [12]



Total No. of Questions : 12]

SEAT No. :

P840

[Total No. of Pages : 3

[4263] - 362

T.E. (Biotechnology)

FERMENTATION TECHNOLOGY - I

(2008 Pattern) (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) Answers to the two sections should be written in separate answer books.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Figures to the right indicate full marks.
- 5) Assume suitable data, if necessary.

SECTION - I

Q1) What is upstream processing? Show component parts of a fermentation process in diagram and explain it in detail. [16]

OR

Q2) a) What is production kinetics in cell culture? Write classification of all fermentation products with respect to cellular energy generation in relation with product formation. [4]

b) Mention all the criteria's for good inoculum. Explain the development of inocula for bacterial processes. [12]

Q3) The Plackett-Burman design is used to study effect of medium composition and ultrasonication on xylanase production by *Trichoderma harzianum* MTCC 4358 on novel substrate. Eleven variables were used including peptone (A), urea (B), KH_2PO_4 (C), $\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$ (D), Tween 80 (E), $(\text{NH}_4)_2\text{SO}_4$ (F), $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ (G), FeSO_4 (H), $\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$ (I), $\text{COCl}_2 \cdot 6\text{H}_2\text{O}$ (J) and MnSO_4 (K) at two levels (H and L). The signs 'H' and 'L' represent the two different levels (higher and lower) of the independent variable under investigation. The total number of experiments performed was $n + 1$ according to PB design, where n is the number of variables. Find the substrate which show maximum effect on production of xylanase enzyme. [16]

P.T.O.

Trial No.	A	B	C	D	E	F	G	H	I	J	K	Enzyme Activity (U/g of Dry Substrate)
1	H	H	H	H	H	H	H	H	H	H	H	7.53
2	L	H	H	L	H	L	L	L	H	H	H	7.09
3	H	H	L	H	L	L	L	H	H	H	L	7.76
4	H	L	H	L	L	L	H	H	H	L	H	7.28
5	H	H	H	H	H	H	H	H	H	H	H	7.53
6	H	L	L	L	H	H	H	L	H	H	L	7.65
7	H	H	H	L	H	H	L	L	H	L	L	8.27
8	H	H	L	H	H	L	H	H	L	L	H	8.33
9	L	H	H	H	L	H	H	L	L	L	L	7.18
10	H	L	H	H	L	H	L	L	H	H	H	7.34
11	L	L	H	H	H	L	H	H	L	H	L	6.57
12	L	H	L	L	L	H	H	H	L	H	H	6.99
13	L	L	L	H	H	H	L	H	H	L	H	6.63
14	H	H	H	H	H	H	H	H	L	H	H	7.53
15	L	H	L	L	L	L	L	L	L	L	L	6.42

OR

Q4) What is a need for medium sterilization. Explain the design of batch sterilization processes. **[16]**

Q5) Write flow sheets for following production processes : (06 M Each, any Three). **[18]**

- a) Acetic acid.
- b) Gluconic acid.
- c) Beer.
- d) Glycerol.

OR

Q6) a) Write two names of microorganisms producing citric acid from following category. **[9]**

- i) Fungi.
- ii) Yeast.
- iii) Bacteria.

Explain biochemistry of citric acid production.

b) Explain in detail lactic acid fermentation of various food products like sauerkraut. **[9]**

SECTION - II

Q7) Enlist the industrially important enzymes. Select any one enzyme from the list and explain its production process based on following points : [16]

- a) Source of enzyme (Microbial, plants, fruits etc.)
- b) Fermentation for microbial enzyme production.
- c) Downstream processing.
- d) Final purification and packaging.
- e) Application of enzyme.

OR

Q8) a) Define immobilization, explain types and applications of it in detail. [8]
b) Name some antibacterial and antifungal antibiotics. Explain mechanism of action of one antibiotic from each group. [8]

Q9) a) Name all types of submerged fermenters. Draw neat sketch of each type of fermenter with label. [4]
b) Differentiate between SLF and SSF. [4]
c) What are disposable fermenters? Explain its application with one case study. [8]

OR

Q10) What is Solid state fermentation (SSF)? Explain the process with following points. [16]

- a) Microorganisms.
- b) Substrate.
- c) Types of Bioreactors.
- d) Mass and Heat Transfer.

Q11) Define Scale Up, describe the process in depth for any fermentation process. Underline the importance of pilot plant development in process of scale up. [18]

OR

Q12) Write short notes on (06 M each) : [18]

- a) GMP.
- b) Downstream Processing.
- c) Economics of Fermentation Processes.



Total No. of Questions : 12]

SEAT No. :

P844

[Total No. of Pages : 4

[4263] - 366
T.E. (Biotechnology)
REACTION ENGINEERING
(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) *Make necessary assumptions wherever required.*
- 6) *Use of programmable calculator is not allowed.*

SECTION - I

- Q1) a)** Explain the temperature dependency of rate constant by Thermodynamics. Derive Van't Hoff's Equation given below. **[8]**

$$\frac{d \ln K}{dT} = \frac{\Delta H}{RT^2}$$

- b) What is the difference between order and molecularity? Why is it necessary to specify the components in the reaction to which the rate constant is referred? Discuss it with suitable examples. **[8]**

OR

- Q2) a)** Define rate of reaction with one example and give factors affecting rate of reaction. **[4]**
- b) 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/l and time in hours, what would be the value and units of rate constant? **[6]**
- c) At 1000k, the rate of a bimolecular reaction is ten times the rate at 600k. Find the activation energy of this reaction from Arrhenius law. **[6]**

P.T.O.

Q3) The laboratory measurements of rate v/s conversion for reactant A are given below. Compare the volumes of a CSTR and plug flow reactor required to achieve 60% conversion. The feed conditions are same in both cases and molar flow rate of A entering a reactor is 10 mol/s. **[16]**

X_A	0	0.2	0.4	0.6	0.8
$-r_A, (\text{mol/l.s})$	0.182	0.143	0.10	0.0667	0.0357

OR

Q4) Obtain the equations relating time, initial concentration and conversion of an ideal batch reactor for the following cases: **[16]**

- Constant density system
- Variable density system

Q5) a) Derive the expression of Residence Time Distribution (RTD) in case of Plug Flow Reactor. **[10]**

b) Write a short note on: **[8]**

- Dispersion model.
- Segregated flow model.

OR

Q6) Derive expressions for residence time distribution for the following functions: **[18]**

- Step Input method.
- Pulse Input method.

SECTION - II

Q7) Derive the expression relating time and conversion for shrinking core model for spherical particles of Radius 'R' and unreacted core radius ' r_c ' of unchanging size for the following cases: **[16]**

- Diffusion through gas film control
- Diffusion through ash layer controls

OR

- Q8) a)** Calculate the time needed to burn spherical particles of graphite in 12% oxygen stream at 900°C at 1 atm completely when the radius of graphite particle is 12 mm and bulk density is 2.4 g/cm³. Surface reaction rate constant is $k = 25$ cm/s. Gas film resistance is assumed to be negligible. [10]
- b) Explain two different models based on the behavioral differences of solid catalyst particles when reaction is carried out in fluid phase. [6]

- Q9) a)** Write a short note on: [10]
- Packed bed reactors
 - Trickle bed reactor
- b) Discuss the significance of Thiele Modulus in case of solid catalyzed reactions. [6]

OR

- Q10) a)** Determine the amount of catalyst required in a packed bed reactor (Assume plug flow) for 35% conversion of A to R for a feed of 2000 mol/h of pure gaseous A at a 3.2 atm and 117°C if the stoichiometry and rate is given by [8]
- $$A \rightarrow 4R, -r_A = 96.55 \text{ (l/h.Kg Cat)}C_A$$
- b) Describe the various contacting patterns in fluid - solid reactors. [8]

- Q11)** Carbohydrate A decomposes in presence of enzyme E. Carbohydrate B affects the decomposition. Runs were conducted and data is obtained: [18]
- Find a rate equation for the decomposition.
 - Determine the role of B in decomposition.
 - Suggest a mechanism for the decomposition

C_{A0} , mol/m ³	C_A , mol/m ³	C_{B0} , mol/m ³	C_{E0} , mol/m ³	V , cm ³ /min
200	50	0	12.5	80
900	300	0	5	24
1200	800	0	5	48
700	33.3	33.3	33.3	24
200	80	33.3	10	80
900	500	33.3	20	120

OR

- Q12)** a) Explain types of inhibitors encountered in enzyme kinetics. [10]
b) Write Short notes on: [8]
- Substrate limiting microbial fermentation.
 - Monod Growth Kinetics.
 - Factors affecting microbial growth kinetics.



Total No. of Questions : 12]

P887

SEAT No. :

[Total No. of Pages : 3

[4263] - 230-A
T.E. (Automobile)
VEHICLE BODY ENGINEERING
(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) *Use of calculator is allowed.*
- 6) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) List and explain the component of aerodynamic drag. [8]
b) Calculate aerodynamic drag of a car running at 70 km/h and having frontal area 2.8 m², dimensionless drag coefficient is 0.28, ambient temperature is 30°C and gas constant for air is 287 SI units, atmospheric pressure is 1.03 bar. [8]

OR

- Q2)** a) Explain with neat sketch constructional features of wind tunnel. [8]
b) What are various aerodynamic forces and moments acting on vehicle while in motion. [8]

- Q3)** a) Sketch five types of cars classified as per styling forms. Write two constructional features of each with application. [10]
b) Explain the terms visibility and blind area. [6]

OR

- Q4)** a) Sketch and explain typical car body nomenclature terms. [10]
b) Explain various safety features you would incorporate in car body. [6]

P.T.O.

- Q5)** a) Prepare a suitable layout for seating layout for luxury bus with their features. [6]
b) Explain the difference between frame and shell construction. [6]
c) What factor you will consider for designing a passenger vehicle carrying passenger within city area. [6]

OR

- Q6)** a) Write six difference between double deck bus and single deck bus.[6]
b) What are motor rules regarding driver seats. [6]
c) List four factor considered for design emergency door. [6]

SECTION - II

- Q7)** a) What factors you will consider for designing a commercial vehicle carrying? [8]
i) LPG gas from Mumbai to Kolhapur.
ii) Milk form Pune to Mumbai.
iii) Heavy unshaped component form Delhi to Mumbai.
b) List six major requirement of driver cabinet. What factor to be considered to design driver cab for truck. [8]

OR

- Q8)** a) Sketch the different types vehicle body also write their features and application. [8]
b) What are the different design consideration for commercial vehicle body work? [8]

- Q9)** a) What is open integral structure? Explain how structure take bending and torsion with neat diagram. [10]
b) Explain shear pannel method of structural analysis of vehicle body.[6]

OR

- Q10)**a) What is close integral structure? Explain how structure take bending and torsion with neat diagram? [10]
b) Define and explain with sketches working and non-working joints.[6]

- Q11)a)** Write and explain safety devices which are incorporated in the vehicle. [6]
- b) What is ergonomics. How it can be applied in designing drivers seat in luxury bus. [6]
- c) Explain how to obtain tensional rigidity in open structure. [6]

OR

- Q12)a)** Explain why and how energy absorbing system is used in automobile.[6]
- b) Sketch the different seat used in automobile. [6]
- c) Explain the any two safety system used in Automobile. [6]



Total No. of Questions : 12]

SEAT No. :

P888

[Total No. of Pages : 4

[4263] - 239

**T.E. (Production) (Common to Prod. S/W)
NUMERICAL TECHNIQUES AND DATABASE
(2008 Pattern) (Sem. - II)**

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

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

SECTION - I

Unit - I

- Q1)** a) What 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.

Unit - II

- Q3)** a) Explain with an example the primary key and foreign key concepts in databases. [6]
b) Create a table 'emp' with the following columns by assuming suitable data type and size with correct syntax in SQL. [4]
Emp_id, Ename, City, State, Salary, Age, Hire_date
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 'Ma'.
ii) List all the employees name and salary whose age is less than 20 years.
iii) Select the employees whose salary is between Rs. 10000 and Rs. 60000.

P.T.O.

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.

Unit - III

- Q5)** a) Define electronic commerce. List the consumer's benefits of electronic commerce? [7]
b) What is electronic fund transfer? How does it work? [6]
c) Explain the difference between conventional and artificial intelligent computing. [5]

OR

- Q6)** Explain the following in brief : [18]
a) Data warehousing.
b) Intelligent agents.
c) Electronic data interchange.
d) IT in marketing and sales system.

SECTION - II

Unit - IV

- Q7)** a) Write a C program to determine the area of a triangle using the formula
$$\text{area} = \sqrt{s(s-a)(s-b)(s-c)}$$
, where $s = \frac{a+b+c}{2}$. [6]
b) Compute the percentage of error in the time period $T = 2\pi\sqrt{\frac{l}{g}}$ for
 $l = 1\text{m}$, if the error in the measurement of l is 0.01 [5]
c) Find a real root of $e^x = 3.x$ by bisection method. [5]

OR

- Q8) a)** If $u = 2.V^6 - 5.V$, find the percentage error in u at $V = 1$, if error in V is 0.05 [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 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]
- $$4x_1 - 2x_2 + x_3 = 4$$
- $$x_1 + 2x_2 + x_3 = 0.75$$
- $$3x_1 - 3x_2 + 5x_3 = 5.5$$

Unit - V

- Q9) a)** Fit a second degree parabola to the following data taking y as dependent variable : [8]

x	1	2	3	4	5	6	7	8	9
y	2	6	7	8	10	11	11	10	9

- b) Use Lagrange's interpolation formula to fit a polynomial to the data

$$x : \quad -1 \quad 0 \quad 2 \quad 3$$
$$u_x : \quad -8 \quad 3 \quad 1 \quad 12$$

Hence or otherwise find the value of u_1 [8]

OR

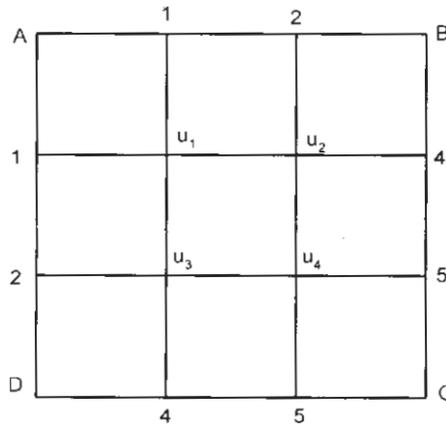
- Q10)a)** Write an algorithm for solving the interpolation using Newton forward difference method? [8]

- b) Compute $f(27)$ from the following data using Lagrange's interpolation formula : [8]

$$x \quad : \quad 14 \quad 17 \quad 31 \quad 35$$
$$f(x) : \quad 68.7 \quad 64.0 \quad 44.0 \quad 39.1$$

Unit - VI

- Q11)a)** Solve the elliptic equation $u_{xx} + u_{yy} = 0$ for the following square mesh with shown boundary values. Iterate until the maximum difference between two successive values at any point is less than 0.001. [9]



- b) Given $dy/dx = y - x$, $y(0) = 2$. Find $y(0.1)$ and $y(0.2)$ correct to four decimal places using Runge – Kutta method. [9]

OR

- Q12)a)** Solve the differential equation $d^4y/dx^4 - 16y = x$ for $y(0.25)$, $y(0.5)$ and $y(0.75)$ using finite difference method, given that $y(0) = 0$, $y'' = 0$, $y(1) = 0$ and $y'(1) = 0$. [9]
- b) Solve $dy/dx = yz + x$, $dz/dx = xz + y$ by using Runge – Kutta method given that $y(0) = 1$, $z(0) = -1$ for $y(0, 1)$, $z(0, 1)$. [9]



Total No. of Questions : 12]

SEAT No. :

P889

[Total No. of Pages : 2

[4263] - 244

T.E. (Production Sandwich)

PRODUCTION & INDUSTRIAL MANAGEMENT - II

(2008 Pattern) (Sem. - 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, 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) *Neat diagrams must be drawn wherever necessary.*
- 5) *Assume suitable data, if necessary.*
- 6) *Use of logarithmic tables, slides rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*

SECTION - I

Unit - I

- Q1)** a) Explain ABC Analysis. [6]
b) Explain Enterprise Resource Planning (ERP). [8]
c) Explain the concept of equilibrium in supply and demand. [4]

OR

- Q2)** a) Explain different forms and function of Money. [8]
b) Explain EOQ. [6]
c) Explain Law of Demand. [4]

Unit - II

- Q3)** a) Discuss Time estimate and Time standard. [8]
b) Explain the important parameters in Process sheet. [8]

OR

- Q4)** a) Discuss the general considerations while deciding sequence of machining operations. [8]
b) What are the functions of Process engineering? [8]

P.T.O.

Unit - III

- Q5)* a) What is the Purpose and utilization of Tolerance chart? [8]
b) Discuss different types of tool holders. [8]

OR

- Q6)* a) Explain in brief Basic manufacturing processes. [8]
b) Define 3-2-1 location system. [8]

SECTION - II

Unit - IV

- Q7)* a) Discuss Single and Double sampling plan. [8]
b) Discuss types of quality characteristics. [8]

OR

- Q8)* a) Discuss Producers and Consumers risk. [8]
b) Explain Construction of C chart. [8]

Unit - V

- Q9)* a) Discuss Deming's 14 Points in detail. [12]
b) What is Poka Yoke? [4]

OR

- Q10)* a) Explain Quality Function Deployment (QFD). [8]
b) Explain Concurrent engineering. [8]

Unit - VI

- Q11)* a) Explain Fault Tree Analysis. [8]
b) State the elements of Quality System. [8]
c) Define "TPM". [2]

OR

- Q12)* a) Explain the concept of "Total Productive Maintenance". [8]
b) Explain Taguchi Method. [8]
c) Define : Reliability. [2]



Total No. of Questions : 12]

P891

SEAT No. :

[Total No. of Pages : 3

[4263] - 288

T.E. (Instrumentation & Control)
PROCESS LOOP COMPONENTS
(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, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 4) *Assume suitable data, if necessary.*

SECTION - I

- Q1) a)** Define & explain the following using a typical level loop. **[10]**
- i) Process.
 - ii) Disturbance.
 - iii) Manipulated Variable.
 - iv) Load variable.
 - v) Controlled Variable.
- b) A sensor outputs a voltage ranging from 0 to 30 mV. For interface to an ADC the signal needs to be in the range of 0 to 2.5V. Develop the signal conditioning circuit. **[8]**

OR

- Q2) a)** Draw P & ID symbols for the following & give examples for the same. **[10]**
- i) Control valve.
 - ii) Hydraulic signal.
 - iii) I/P converter.
 - iv) High/Low alarm.
 - v) Orifice.
- b) Resistances in a bridge circuit are $R_1 = R_2 = R_3 = 130\Omega$. $R_4 = 131\Omega$. If the supply voltage is 12V. Find the offset voltage. Also design a signal conditioning circuit to get output 0 to 5V. **[8]**

P.T.O.

OR

- Q10)**a) How a positioner enhances the performance of control valve. [8]
b) Explain fail safe action [Air to Open (ATO) and Air to Closed (ATC) valve applications]. [8]

- Q11)**a) Explain cavitations and flashing in details. [8]
b) Explain effects and remedies for cavitations and flashing. [8]

OR

- Q12)**Write short notes on : [16]
a) Control valve sizing (Cv).
b) Selection criteria of control valve.



Total No. of Questions : 8]

P896

SEAT No. :

[Total No. of Pages : 4

[4263] - 319

T.E. (Petroleum Engineering)
NATURAL GAS ENGINEERING
(2008 Pattern) (Semester - II)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) *Answer three questions from each section.*
- 2) *Answers to the two sections must be written in separate answer books.*
- 3) *Questions 4 and 8 are compulsory.*
- 4) *Figures to the right indicate full marks.*
- 5) *Neat diagrams should be drawn wherever necessary.*
- 6) *Use of a non-programmable calculator is allowed.*
- 7) *Assume suitable data if necessary and clearly state it.*
- 8) *Graph of z factor attached.*

SECTION - I

Q1) Given the gas mixture whose composition is shown below

Component	Mole Fraction, y_i	Critical Temp, T_{ci} (deg R)	Critical Pressure, P_{ci} (psia)
C1	0.8	343.3	666.4
C2	0.12	549.9	706.5
C3	0.06	666.1	616
n-C4	0.02	765.6	550.6

Calculate the density of this gas mixture at 1000 psi and 150 degree F, treating it as

a - Ideal gas

b - Real gas

What is the error in % between the calculated densities above? [16]

P.T.O.

- Q2)** a) Explain the flow meter constants. [6]
- b) Determine the gas flow rate through an orifice meter for the following conditions [10]
- | | |
|-------------------------|---------------------------------------|
| i) Hw = 40 in. of water | ii) Pf = 143 psig (measured upstream) |
| iii) Tf = 84 deg F | iv) Psc = 14.4 psia |
| v) Tsc = 60 deg F | vi) D = 4.026 in. |
| vii) Do = 1.50 in. | viii) $\gamma_g = 0.7$ |
| ix) Y = 0.9971 | x) Z = 0.98 |
| xi) Fb = 460.79 | |

- Q3)** a) Explain in detail, the various types of flow regimes that affect the Inflow Performance Curve. [6]
- b) Given Data :
- | | |
|--|----------------------|
| i) Pr = 5100 psia | ii) Re = 2100 ft |
| iii) H = 30 ft | iv) k = 15 md |
| v) Rw = 0.45 ft | vi) $\gamma_g = 0.7$ |
| vii) Tr = 200 deg F | viii) S = 0 |
| ix) Pwf = 0, 1000, 2000, 3000, 4000, 5000 psia | |

Calculate the inflow performance curve relationship using pressure squared approach. [10]

- Q4)** Write short notes on the following : [18]
- Phase diagram of a gas reservoir.
 - Tubing intake curve.
 - Gas flow metering.

SECTION - II

- Q5)** Draw a process flow diagram and explain the removal of CO₂ in a gas stream. [16]

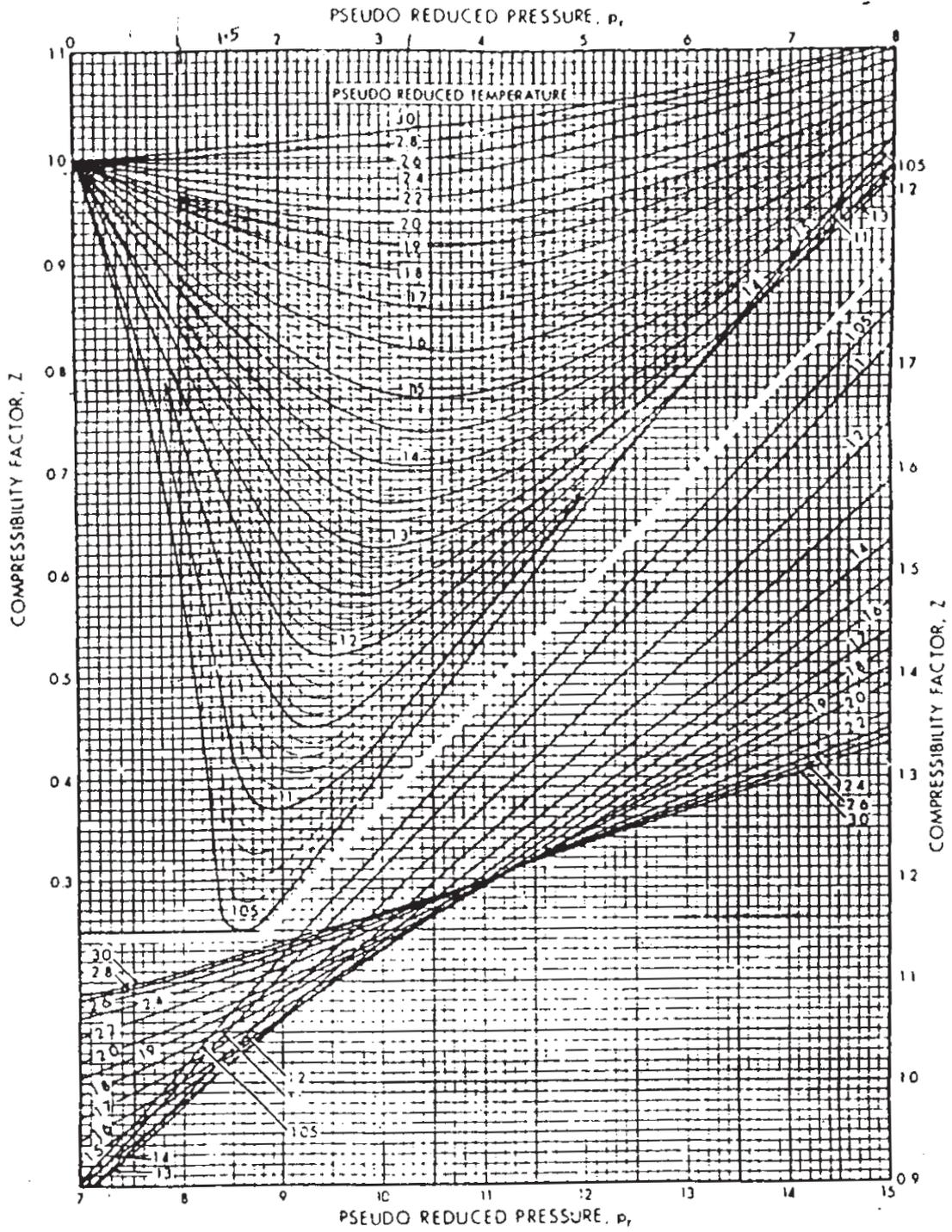
- Q6)** Compare and contrast centrifugal and reciprocating compressors. [16]

Q7) Using the following data, calculate the flow capacity of the pipeline, using the Weymouth, Panhandle A and Panhandle B equations. Which is the best? Why? **[16]**

- | | |
|----------------------|--------------------------|
| a) $P_1 = 900$ psia | b) $P_2 = 600$ psia |
| c) $d = 25.375$ in. | d) $L = 100$ miles |
| e) $\gamma_g = 0.67$ | f) $T_{avg} = 505$ deg R |
| g) $Z_{avg} = 0.846$ | |

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

- a) Impurities in NG stream.
- b) Compression cycles on a mollier chart.
- c) Derive any pipeline flow equation.



Total No. of Questions : 8]

P897

SEAT No. :

[Total No. of Pages : 3

[4263] - 320

T.E. (Petroleum Engineering)

PETROLEUM EQUIPMENT DESIGN AND DRAWING

(2008 Pattern) (Semester - II)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) *Question Nos. 1 and 5 are compulsory. Out of the remaining attempt 2 questions from Section - I and 2 questions from Section - II.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Describe "General Design Procedure" in detail. [8]
b) Describe different types of keys and Explain design procedure of square key. [8]
c) What is Factor of safety? [2]
- Q2)** a) Derive an expression for length of open belt. [6]
b) A helical spring is made of a wire of 8 mm diameter and has outside diameter of 86 mm. If permissible shear stress is 400 MPa and modulus of rigidity is 85 kN/mm². Find axial load which the spring can carry and deflection per active turn. [6]
c) Give detailed classification of pumps. [4]
- Q3)** a) Length of 5" × 4.276", 19.5 ppf Drill Pipe is 10000 ft
Length of 6" × 3" Drill Collar is 1200 ft
Borehole diameter = 8"
Mud Weight = 11.5 ppg

P.T.O.

Double acting Duplex Pump :- liner diameter = 6"
Piston rod diameter = 2.5"
Stroke length = 16"
Pump efficiency = 90%
Pump RPM = 110

Calculate : -

- i) Pumping capacity
 - ii) No. of pump cycles and time required for one cycle of mud circulation.
 - iii) If the hole is filled up after tripping 12 stands of drill pipe from a mud tank of 10 ft width and 20 ft length what will be drop of mud level in pit. [12]
- b) Explain different modes of chain failure. [4]
- Q4)** a) A solid CI iron disc 1m in diameter and 0.2 m thick, is used as a flywheel. It is rotating at 400 rpm. It is brought to rest in 1.5 sec by means of a brake. Calculate :
- i) the energy absorbed by brake,
 - ii) torque capacity of brake. [8]
- b) Classify gears. [4]
- c) Considering Drill String as a hollow shaft, which types of stresses will induce in it during drilling operation? And why? [4]

SECTION - II

- Q5)** a) Classify and explain the different types of heat exchangers in detail with neat sketches. [10]
- b) Explain design procedure in detail for fixed roof cylindrical tank with necessary formulae. [10]
- Q6)** a) In a mixing operation a shaft of 60 mm in diameter, transmits a torque 12400 kg-cm. A square key is used whose length is equal to 1.5 times the shaft diameter and whose one side is equal to 1/4th of shaft diameter. Determine the dimensions of key and check the key for its induced shearing and crushing stresses. Also determine factor of safety of key in shear and crushing when yield stress in shearing and crushing are 3900 kg/cm² and 4650 kg/cm² respectively. [7]
- b) Enlist types of three phase separators and explain any two with neat sketches. [8]

- Q7) a)** Write design considerations of subsea crude oil storage tank in detail. [10]
- b) What is breather valve? Explain. [5]
- Q8) a)** A cylindrical pressure vessel 1.8m in diameter and 5m in height is subjected to an internal pressure of 8kg/cm^2 . Corrosion allowance is 2 mm. If the vessel is fabricated as :
- Class B vessel with $J = 0.85$
- Class C vessel with $J = 0.5$ and $J = 0.7$
- What will be the minimum thickness of vessel?
- If a strip of suitable size is welded all along the longitudinal joint, (joint efficiency = 1.0) what will be the thickness of vessel and how much percentage saving in the material can be achieved? [10]
- b) For pressure vessel, Describe Skirt support, and Bracket support. [5]



Total No. of Questions : 10]

P898

SEAT No. :

[Total No. of Pages : 4

[4263] - 330

T.E. (Petrochemical Engg.)

PROCESS EQUIPMENT DESIGN & DRAWING

(2008 Pattern) (Semester - II)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) Answers three questions from each section. Que. 5 and Que. 10 are compulsory.
- 2) Answers to the two sections should be written in separate books.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Figures to the right indicate full marks.
- 5) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam table is allowed.
- 6) Assume suitable data, if necessary.

SECTION - I

- Q1)** a) How codes and standards are helpful for designing of any equipment? Discuss with help of example/case study, what different problem may arise if Standards & Codes are not used for any design. [6]
- b) What are the factors on which selection of material depends for equipment design? [6]
- c) Discuss the steps involved in design activity. [4]

OR

- Q2)** a) What do you mean by stress concentration? What are the causes of stress concentration? How it can be reduced? [8]
- b) Discuss the role of Equipment design in Process design of any process. [8]

- Q3)** a) An **open** belt 100 mm wide connects two pulleys mounted on parallel shafts with their centers 2.4 m apart. The diameter of the larger pulley is 450 mm and that of the smaller pulley 300 mm. The coefficient of friction between the belt and the pulley is 0.3 and the maximum stress in the belt is limited to 14 N/mm width. If the larger pulley rotates at 120 r.p.m., find the maximum power that can be transmitted. [14]

P.T.O.

- b) Discuss the different types of belt drives along with their applications and capacity for different purpose. [2]

OR

- Q4)** a) Design a cast-iron protective type flange coupling to connect shafts in order to transmit 15 hp at 500 rpm. The following permissible stresses may be used. [12]

Shear stress for shaft, bolt & key material = 400 KgF /Cm²

Crushing stress for bolt and key = 800 KgF/cm²

Shear stress for cast iron = 80 KgF/cm²

- b) What are the different factors on which selection of belt is depends?[4]

- Q5)** a) A Pressure vessel having outer diameter 1.3m and height 3.8m 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 different conditions and find out how much is the % material saving by welding a strip along the longitudinal joint. [10]

Allowable stress of the material = 1020 kg/cm². Corrosion allowance mm.

- b) Discuss the function of Pressure relief valve and rupture disc along with neat sketch. [8]

SECTION - II

- Q6)** a) Discuss different types of fouling in heat exchangers? What precautions can be taken to minimize the fouling? [8]

- b) Discuss the detailed classification of heat exchangers and the techniques for performance evaluation. [4]

- c) Why baffles and tie rods plays a important role in Shell & Tube heat exchangers? [4]

OR

Q7) Calculate the shell diameter and Nozzle thickness of shell and tube heat exchanger: Data:

Permissible stress = 95 N/mm^2

No. of Passes = 2

No. of Tubes = 54 (With 2 pass U-Bundle)

Spacing between tubes = 2.5 cm (Square pitch)

$B = 0.7$

Joint Efficiency = 85 %

Pressure = 0.5 N/mm^2

Nozzle inlet and outlet diameter = 75 mm **[16]**

- Q8)** a) Discuss and draw various types of roofs used in storage vessel along with conditions in which it is used. What is importance of changes in structure of these different roofs? **[4]**
- b) Discuss the types of losses in to storage tanks of volatile materials.**[12]**

OR

- Q9)** a) Draw the top view and cross section view of Bottom plate used for storage tanks. Why shell thickness is different along the height of tank? **[6]**
- b) A cylindrical storage tank has diameter 30m and the tank height is 15m. Liquid stored in the tank has a density 810 kg/m^3 . Material of construction is carbon steel having permissible stress 1300 kg/cm^2 . Density of material used for fabrication is 7700 kg/m^3 . The plates of size $3\text{m} \times 1.2\text{m}$ in varying thickness are available for fabrication. Welded joints efficiency is 85% and corrosion allowance is not necessary. Calculate the cylindrical shell thickness of the tank at different height. Also estimate the total number of plates required.**[10]**

Q10) Write Short Notes on (Any four) :

[18]

- a) IS Code for design of equipment.
- b) ASME & TEMA CODES.
- c) Piping for crude oil, natural gas and Sea water.
- d) Pipeline color codes for different pipe lines.
- e) Factor of Safety.
- f) Classification of Pipe supports.



Total No. of Questions : 12]

P900

SEAT No. :

[Total No. of Pages : 3

[4263] - 358

T.E. (Information Technology)

DESIGN AND ANALYSIS OF ALGORITHMS

(2008 Pattern) (Semester - II)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) *Answer three questions from each section.*
- 2) *Answers to the two sections should be written in separate 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 we mean by time and space complexity of an algorithm? How do we measure the time and space complexity of an algorithm? Explain with suitable example. [8]
- b) Discuss the recursive and non-recursive version of Quick sort algorithm and compare the time space complexity requirement in the same. [10]

OR

- Q2)** a) What do we mean by Worst case, Average case and Best case complexity of an algorithm? Explain with suitable example. [8]
- b) Suppose you have an array of 1000 records in which only a few are of order and they are not very far from their positions which sorting algorithm would you use to put the whole array in order? Justify your answer with time complexity of your algorithm. [10]
- Q3)** a) Design and analyze a divide and conquer algorithm for finding minimum and maximum number in the array of n-numbers that uses $(3n/2)-2$ comparison for any n. [10]
- b) Write Dijkstra's algorithm for a directed graph and determine the time complexity of the algorithm. [6]

P.T.O.

OR

- Q4)** a) Given a sequence of n-elements $A[1].....A[n]$, assume that they are split into 2 sets $A[1].....A[n/2]$ and $A[n/2 + 1].....A[n]$, each set is individually sorted and the resulting sequence is merged to produce a single sorted sequence of n elements. Using the divide and conquer strategy, write a Merge sort algorithm to sort the sequence in non-decreasing order. [10]
- b) Compare Prim's algorithm and Kruskals's algorithm for finding the minimum spanning tree. Analyze the time complexity of these algorithms. [6]
- Q5)** a) Compute and Construct the OBST for the given values using dynamic programming. [10]
n = 4 and (a1, a2, a3, a4) = (do, if, int, while)
Let p(1:4) = (3, 3, 1, 1)
and q(0:4) = (2, 3, 1, 1, 1)
- b) Distinguish between multistage graphs and Dijkstra's algorithm in terms of algorithm, strategy used, time complexity and application. [6]

OR

- Q6)** a) Consider 0/1 knapsack problem $N = 3$, $W = (4, 6, 8)$, $P = (10, 12, 15)$ using dynamic programming devise the recurrence relations for the problem and solve the same. Determine the optimal profit for the knapsack of capacity 10. [10]
- b) What is principle of optimality? Give suitable example. What is the significance of the same in dynamic programming? [6]

SECTION - II

- Q7)** In the backtracking strategy for 8-queen problem, what is the state space tree and with respect to state space tree explain the following terms. [18]
- | | |
|-----------------------|------------------|
| a) Solution space. | b) State space. |
| c) Answer state. | d) Static trees. |
| e) Dynamic trees. | f) Live nodes. |
| g) Bounding function. | |

OR

- Q8)** a) What is backtracking method for algorithmic design? Solve the sum of subset problem using backtracking algorithmic strategy for the following data $N = 4$ (w_1, w_2, w_3, w_4) = (11, 13, 24, 7) and $M = 31$ [12]
- b) Discuss and analyze the problem of Graph Coloring using backtracking. [6]

- Q9)** a) Explain the branch and bound algorithmic strategy for solving the problem, take an example of traveling salesman problem using branch and bound. [10]
- b) Differentiate between backtracking and branch and bound. Illustrate with example of Knapsack problem. [6]

OR

- Q10)** Explain the term : [16]
- Branch and bound
 - Bounding function.
 - Various searching techniques in branch and bound.
 - Heuristic function.
 - How 0/1 Knapsack problem can be solved using branch and bound?

- Q11)**a) Show that both P and NP are closed under the operation union, intersection, concatenation and Kleen closure (*). [10]
- b) Show that an infinite recursively enumerable set has an infinite recursive subset. [6]

OR

- Q12)**a) Explain the following : [8]
- computational complexity.
 - decision problems.
 - deterministic and non-deterministic algorithms.
 - complexity classes.
- b) What is cook theorem? How can it be used to establish whether $P = NP$ or $P \neq NP$. [8]



Total No. of Questions : 12]

P928

SEAT No. :

[Total No. of Pages : 3

[4263] - 238

T.E. (Production)

INDUSTRIAL ENGINEERING AND QUALITY ASSURANCE

(2008 Pattern) (Semester - II)

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 right indicate full marks.*
- 4) *Assume suitable data wherever necessary.*

SECTION - I

- Q1)** a) Discuss how ineffective time gets added due to short comings of management. [8]
- b) In what way bad design of product increases work content. [8]

OR

- Q2)** a) Discuss the contribution of F.W. Taylor and Gilbreth to Industrial Engineering. [8]
- b) Explain in detail tools and techniques of Industrial Engineering. [8]
- Q3)** a) Explain basic steps in method study to improve existing method. [8]
- b) Explain how the two handed process chart can be used in printing press. Construct the chart. [8]

OR

- Q4)** a) Explain in detail cyclegraph and chronocyclegraph with their applications. [8]
- b) Explain in detail Multiple activity chart and SIMO chart. [8]

P.T.O.

- Q5) a)** What are the different allowances in work study? Explain in detail.[10]
b) The elemental times in minutes for 5 cycles of an operation using a stop watch are [8]

Elements	Cycle time in minutes				
	1	2	3	4	5
1	1.6	1.7	1.4	1.3	1.5
2	3.2	3.3	3.4	3.5	3.3
3	2.5	2.4	2.6	2.5	2.4
4	1.3	1.2	1.4	1.3	1.2
5	0.52	0.53	0.51	0.52	0.51

Calculate standard time for the operation if

- Element 2, 3 and 4 are machine elements.
- For other elements, the operator is rated at 120%
- Total allowances are 10% of the normal time.

OR

- Q6) Write short notes on following :** [18]
- MTM
 - MOST
 - Westing house method of performance rating

SECTION - II

- Q7) a)** Define quality. Explain quality of design and quality of conformance. [8]
b) While conducting a study on the capability of a particular machine, it was found that the samples of 5 pieces each were taken for consecutive days and got the following data. (The shaft dia. required as per the drawing specifications was 26.2 ± 0.03)

Day	1	2	3	4	5	6
\bar{X}	26.23	26.20	26.22	26.21	26.15	26.20
R	0.080	0.044	0.082	0.044	0.030	0.028

Construct \bar{X} and R chart and state whether the process is in control. Comment on the process. For subgroup size of 5, $A_2 = 0.58$, $D_4 = 2.11$, $D_3 = 0$, $d_2 = 2.326$. [10]

OR

Q8) a) Discuss the following w.r.t. OC Curve in acceptance sampling. [10]

- i) Producers's risk
- ii) Consumer's risk
- iii) LTPD
- iv) AOQ

b) For the following data, calculate sample size and AOQ for a single sampling plan. [8]

Data given as :

- i) Probability of acceptance for 0.5% is 0.558.
- ii) Lot size is 10,000 units.
- iii) Acceptance no. $C = 1$.
- iv) Total no of defectives are 1.5

Q9) a) Explain in detail Fish bone diagram and Pareto analysis. [8]

b) Discuss in detail Concept and structure of Quality Circle. [8]

OR

Q10)a) Discuss Deming's fourteen points in Quality control? [8]

b) What is six sigma? Explain in DMAIC in six-sigma. [8]

Q11)a) Explain steps in implementation of ISO9000. [8]

b) What are the types of ISO 9000? Describe in short. [8]

OR

Q12)a) What are essential requirements of ISO14000? [8]

b) What is Malcom balbridge national quality award? Explain in detail.[8]



Total No. of Questions : 12]

P929

SEAT No. :

[Total No. of Pages : 4

[4263] - 266
T.E. (Electronics)
DRIVES AND CONTROL
(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 & Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12 from Section - II.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of logarithmic tables, and non programmable electronic pocket calculator is allowed.*
- 6) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Sketch a Single Phase Semiconverter Fed Separately excited DC shunt Motor as Drive. The field current is also controlled by a Semiconverter. Explain in short how this circuit can be used for the speed control of DC shunt motor below the rated speed with necessary waveforms.[10]
- b) Sketch Three Phase Dual Converter as DC drive. [6]

OR

- Q2)** a) Sketch and explain the Open-loop block diagram of separately excited dc motor drive. [10]
- b) Sketch the equivalent circuit of dc series motor and explain why it is not advisable to run a series motor without a load. [6]

- Q3)** The speed of a 25-hp, 330-V, 1000-rpm separately excited dc motor is controlled by a three-phase converter. The field circuit is also controlled by a three-phase full converter. The ac input to the armature and field converter is three-phase, (star) Y-connected, 220V, 50Hz. The armature resistance is $R_a = 0.30\Omega$, the field circuit resistance is $R_f = 150 \Omega$ and the motor voltage constant is $K_v = 1.2V/A \text{ rad/S}$. the viscous friction and no-load losses can be considered negligible. The armature and field currents are continuous and ripple free. [16]

P.T.O.

- If the field converter is operated at the maximum field current and the developed torque is $T_d = 116 \text{ N.m}$ at 1000 rpm, determine the delay angle of the armature converter α_a .
- If the field circuit converter is set for the maximum field current, the developed torque is $T_d = 116 \text{ N.m}$ and the delay angle of the armature converter is $\alpha_a = 0^\circ$, determine the speed of the motor.
- For the same load demand as in (b), determine the delay angle of the field converter if the speed has to be increased to 1800 rpm.

OR

Q4) a) A 15-hp, 220V, 2000 rpm separately excited dc motor controls a load requiring a torque $T_L = 45 \text{ N.m}$ at a speed of 1200 rpm. The field circuit resistance is $R_f = 147\Omega$, the armature circuit resistance is $R_a = 0.25\Omega$ and the voltage constant of the motor is $K_v = 0.7032 \text{ V/A rad/S}$. The field voltage is $V_f = 220 \text{ V}$. the viscous friction and no-load losses are negligible. The armature current may be assumed continuous and ripple free. Determine [10]

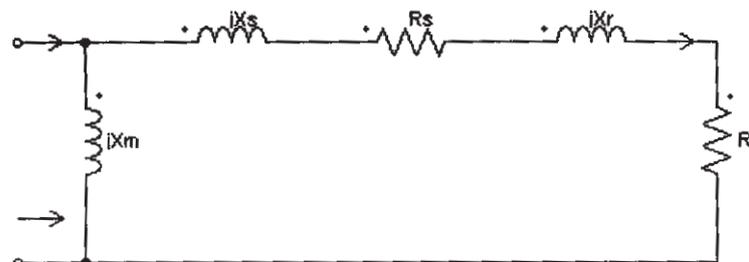
- The back emf E_g .
- The required armature voltage V_a , and
- The rated armature current of the motor.

b) Explain microcontroller/processor based dc motor drive for PMDC motor. [6]

Q5) a) Sketch and Explain the Torque Speed characteristics of A.C. Motor Drives. [8]

b) A three phase, 460 V, 60 Hz, four-pole star connected induction motor has the following equivalent circuit parameters : $R_s = 0.42 \Omega$, $R'_r = 0.23\Omega$, $X_s = X'_r = 0.82 \Omega$, and $X_m = 22 \Omega$. The no load loss, which is $P_{\text{no load}} = 60\text{W}$, may be assumed constant. The rotor speed is 1750 rpm. Use the approximate equivalent circuit as shown in figure 1 to determine

- the synchronous speed ω_s ; (ii) the slip s ; (iii) the input current I_i ;
- the input power P_i ; (v) the input Power Factor of the supply, PF_s . [10]



OR

- Q6)** Write short notes on the following (any three) : **[18]**
- a) Closed loop Control of DC Motor drives.
 - b) Stepper Motor Control.
 - c) Basic Principle of Vector Control.
 - d) Operating Modes of DC Drives.
 - e) Performance parameters of drives.
 - f) Power factor.

SECTION - II

- Q7)** a) Draw the circuit diagram and explain the working of separate control and self control of Synchronous motor. **[10]**
- b) A three-phase 230 V, 60 Hz, four-pole star connected reluctance motor has $X_d = 22.5\Omega$ and $X_q = 3.5\Omega$. The armature resistance is negligible. The load torque is $T_L = 12.5$ N-m. The voltage-to-frequency ratio is maintained constant at the rated value. If the supply frequency is 60 Hz Determine (i) the torque angle δ (ii) the line current I_a and (iii) the input Power factor. **[6]**

OR

- Q8)** a) Explain reluctance synchronous motor drive and derive expression for
- i) The reluctance torque
 - ii) The torque angle
 - iii) The pull out torque **[10]**
- b) What are the differences between salient pole motors and permanent motor? **[6]**
- Q9)** a) What is stepper Motor? Explain with principle of operation the working of a chopper drive (unipolar for stepper motor). **[8]**
- b) Draw and explain various power converter configurations for one phase of a Switched Reluctance Motor. **[8]**

OR

- Q10)** a) With the help of a neat circuit diagram and waveforms explain the operation of 3 phase half wave brushless dc motor drive. **[8]**
- b) With the help of construction and circuit diagram working of a stepper motor driver circuit. **[8]**

- Q11)** a) Explain traction drive with an application of road railway. [8]
b) Explain the operation of fuzzy logic based wind generation system. [10]

OR

- Q12)** Write short notes on the following (any three) : [18]
- a) Three phase brushless DC Motor.
 - b) Neuro fuzzy system.
 - c) Breaking of DC Motor.
 - d) Traction drives.
 - e) Vector control.



Total No. of Questions : 12]

SEAT No. :

P957

[Total No. of Pages : 4

[4263] - 308
T.E. (Chemical)
CHEMICAL ENGINEERING DESIGN - I
(2008 Patter) (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) *Draw neat sketches wherever necessary.*
- 3) *Use of logarithmic tables, calculator and steam table is permitted.*
- 4) *Assume suitable data, if necessary and mention it.*

SECTION - I

- Q1)** a) Discuss various factors to be considered for selection of material of construction for handling corrosive fluids. **[8]**
- b) Why post weld heat treatment is necessary for equipments? Explain radiography test and ultrasonic test. **[8]**

OR

- Q2)** a) What is optimization? Discuss in detail optimization techniques. **[10]**
- b) Explain in brief non destructive tests for vessels and joints. **[6]**
- Q3)** a) What is proportioning of vessels? What are the types of pressure vessels? Explain codes and standards for pressure vessels. **[10]**
- b) Explain different types of flanges and bolt design and selection consideration in chemical process industry. **[8]**

OR

- Q4)** a) A vessel is to have one end closed by a blind flange. Calculate the minimum thickness of blind flange for the design data given : **[12]**
- Design pressure = 7kg/cm^2
 - Design temperature = 121°C
 - Allowable bolt stress at gasket seating and operating Conditions = 1306kg/cm^2
 - Allowable flange stress at gasket seating and operating conditions = 1190kg/cm^2
 - Inside diameter of gasket = 34.4cm

P.T.O.

- Width of gasket = 2.5cm, $m = 3$, $Y_a = 680.3\text{kg/cm}^2$
 - Bolt circle diameter = 56.2cm
 - 16 bolts of 50mm diameter are used.
- b) Explain the method for calculating the thickness of torispherical head subjected to internal pressure. [6]

Q5) a) A cylindrical storage tank with conical roof has the following data : [12]

- Tank diameter = 15m
- Tank height = 12m
- Permissible stress for material of construction = 120N/mm^2
- Density of steel = 7700kg/m^3
- Density of liquid stored = 1050kg/m^3
- Modulus of elasticity = $2 \times 10^5\text{N/mm}^2$
- Corrosion allowance = 1.5mm

Use standard plate size of 6500mm X 1500mm superimposed load per unit area = 1225N/mm^2 .

Design :

- i) Shell plate thickness at various heights.
 - ii) Conical roof.
- b) What are the types of losses during storage of volatile liquids? [4]

OR

Q6) A multilayer vessel having an inside diameter 30cm and an outside diameter 59cm has been formed by shrink fitting. The vessel is to operate under an internal pressure of 1200kg/cm^2 and is constructed in three shells. The interface diameters are 37.5cm and 46.8cm respectively.

Determine the :

- a) Maximum combined stresses at the interfaces of the concentric shells.
- b) The hoop stress variation in each of the three shells. [16]

SECTION - II

Q7) a) Write a design procedure for skirt support with relevant sketches and equation. It should include

- i) Thickness of skirt.
- ii) Period of vibration.
- iii) Base bearing plate and
- iv) Anchor bolt. [10]

- b) Explain saddle support with neat sketch and show the various proportions for saddle support. [6]

OR

- Q8)** a) What are the various stresses developed in the tall vessels? [8]
b) Draw and explain various types of bearing plates for skirt support. [8]

Q9) 13000kg/hr of water available at 95° is to be cooled to 48°C in a shell and tube heat exchanger. This heat is to be utilized for preheating of water from 16° to 46° Cold water is to be circulated through the tubes while hot water on shell side. Tubes of 20mm ID are to be used and the maximum velocity through the tubes should not be more than 0.55m/sec. Due to space limitations the tube length is to be restricted to 3.2m. Overall heat transfer coefficient is 1460W/m²K. Fouling resistance and metal wall resistance may be neglected. Suggest a suitable design of the shell and tube heat exchanger. [18]

OR

- Q10)** a) Why are baffles used in shell and tube heat exchangers? Explain with neat sketch various types of baffles. [6]
b) Water is heated in a double pipe heat exchanger using dry saturated steam supplied on the annulus side. Steam condenses at 320°K and there is no subcooling. Water flows at 2m/s through the tube of 25mm outside diameter and 2500mm length. Calculate the overall heat transfer coefficient based on outside diameter, if the water inlet and outlet temperatures are 293 and 295°K respectively. How would the outlet temperature change if the water velocity is increased by 50%?

Data for water :

Density = 1000Kg/m³,

Specific heat = 4.18KJ/Kg°K

Inside film heat transfer coefficient may be estimated by following equation applicable for water.

$$h_i = 4280 (0.00488 T - 1) (V)^{0.8} (d)^{-0.2}, \text{ W/m}^2 \text{ } ^\circ\text{K}$$

Where T = mean water temperature, °K

V = Water velocity m/s,

d = may be taken as pipe OD in m.

[12]

Q11) 15000kg/hr of liquid with 10% solids available at 21°C is to be concentrated to 50% solids. The vacuum can be used at 13.3kN/m². BPR of the solution can be neglected. Design the evaporator as triple effect with backward feed arrangement.

- The heat capacity of solution = 4180J/kg K
- Temperature of steam at 205kN/m² = 121°C
- Temperature of vapor at 13.3kN/m² = 52°C
- Latent heat of steam at 121°C = 2200kJ/kg
- Latent heat of steam at 52°C = 2377kJ/kg
- OD of the tube = 75mm
- Length of the tube = 2.0m
- Down-comer area = 70 % of the total cross – sectional area.
- Overall heat transfer coefficient are $U_1 = 2500 \text{ W/m}^2\text{K}$, $U_2 = 2000 \text{ W/m}^2\text{K}$ and $U_3 = 1600 \text{ W/m}^2\text{K}$.

Arrangement of the tubes is square pitch with centre to centre distance equal to 1.25 times the OD of the tube. **[16]**

OR

- Q12)** a) With neat sketch, explain the working of plate heat exchanger. Mention the advantages and disadvantages of PHE. **[8]**
- b) Explain the design procedure of forced recirculation reboiler. **[8]**

☒☒☒☒

Total No. of Questions : 12]

SEAT No. :

P959

[Total No. of Pages : 4

[4263] - 306
T.E. (Chemical)
CHEMICAL REACTION ENGINEERING - I
(2008 Pattern) (Semester - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates :

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

SECTION - I

- Q1)** a) Explain temperature dependency from Arrhenius Law of rate expression. What is Activation Energy E? How does it affects the temperature sensitivity of reaction? [8]
- b) For a first order reaction the following data is available. Estimate activation energy for the reaction. [8]

Temperature°C	310	330
K (sec)⁻¹	0.000886	0.0139

Assume $R = 8.314 \text{ J/mol K}$

OR

- Q2)** a) How kinetic model is tested, explain rules for matching the predicted rate expression and found experimentally. [4]
- b) On doubling the concentration of the reactant the rate of reaction triples. Find the reaction order. [4]
- c) The rate constant of certain reaction are 1.6×10^{-3} and $1.625 \times 10^{-2} \text{ sec}^{-1}$ at 10°C and 30°C calculate the activation energy. [4]
- d) Differentiate elementary and non-elementary reaction. [4]
- Q3)** a) The first order reversible liquid reaction $A \rightarrow R$, $C_{A0} = 0.5 \text{ mol/lit}$, $C_{R0} = 0$ takes place in a batch reactor. After 8 min, conversion of A is 33% while equilibrium is 66%. Find rate equation for this reaction. [10]

P.T.O.

- b) At certain temperature, the half life period and initial concentration for a reaction are

$$t^{1/2} = 420 \text{ sec}, C_{A0} = 0.405 \text{ mol/lit}$$

$$t^{1/2} = 275 \text{ sec}, C_{A0} = 0.64 \text{ mol/lit}$$

Find the rate constant of reaction.

[6]

OR

- Q4)** a) Show that the decomposition of N_2O_5 at a $70^\circ C$ is first order reaction, calculate the value of rate constant, reaction is $N_2O_5 \rightarrow N_2O_4 + \frac{1}{2} O_2$. [10]

- b) At certain temperature, the half life period and initial concentration for a reaction are

$$t^{1/2} = 420 \text{ sec}, C_{A0} = 0.405 \text{ mol/lit}$$

$$t^{1/2} = 275 \text{ sec}, C_{A0} = 0.64 \text{ mol/lit}$$

Find the rate constant of reaction.

[6]

- Q5)** a) Derive performance equation of Mixed Flow Reactor. [9]

- b) In train of CSTR of equal volume, an irreversible constant density first order reaction is carried out show that if number of CSTR is very large, the total volume of all reactors in series tends to that of PFR for some extent of conversion and show that [9]

$$\tau_N = \frac{N}{K} [(C_0 - C)^{1/N - 1}]$$

$$\tau_p = \frac{1}{K} \ln(C_0 - C)$$

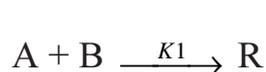
OR

- Q6)** a) Deduce the performance equation for recycle reactor. [12]

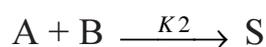
- b) Derive performance equation of Mixed Flow Reactor. [6]

SECTION - II

- Q7)** a) Define instantaneous fractional yield and overall fraction yield. Find out instantaneous fractional yield of reaction (Ψ). [6]



$$\frac{dC_R}{dt} = 1.0 C_A^{1.2} C_B^{1.4}$$

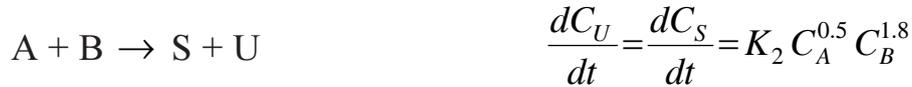


$$\frac{dC_S}{dt} = 1.0 C_A^{0.5} C_B^{2.0}$$

b) The desired liquid phase reaction



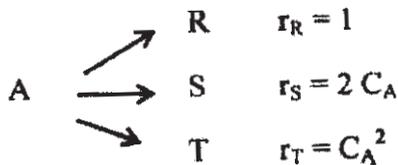
Is accompanied with undesirable side reaction.



What contacting scheme (reactor type) would you use to carry above reaction to minimize concentration of undesired product? [10]

OR

Q8) Often a desired reaction is accompanied by a variety of undesired side reactions, some of higher order some of lower order. To see which type of operation gives the best product distribution. Consider the parallel decomposition of A, $C_{A0} = 2$. [16]



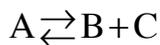
Find the maximum expected C_S for isothermal operations.

- In a mixed reactor.
- In a plug flow reactor.

Q9) a) Explain effect of temperature, pressure and inerts on equilibrium conversions (X_{AC}) for exothermic and endothermic reactions. [6]
 b) Explain optimum temperature progression for exothermic reversible reaction. [6]
 c) Draw and explain energy balance equation line for adiabatic operations. [4]

OR

Q10) Calculate the heat or reaction at 600°C of the reaction [16]



Heat capacities of the reacting species may be expressed as

$$C_p = \alpha + \beta T + \gamma T^2 + \delta T^3$$

Component	α	$\beta \times 10^2$	$\gamma \times 10^5$	$\delta \times 10^9$
A	-0.24	8.65	-5.12	12.05
B	-1.30	8.40	-5.55	14.25
C	6.45	0.104	-0.008	0

The heat of reaction at the standard state (25°C) of the reaction is 27.23 k cal/g mol.

Q11) A sample of the tracer hytane at 320 K was injected as a pulse to a reactor and the effluent concentration measured as a function of time resulting in the following data : **[18]**

t (min)	0	1	2	3	4	5	6	7	8	9	10	12	14
C (g/m ³)	0	1	5	8	10	8	6	4	3	2.2	1.5	0.6	0

- a) Construct figures showing C (t) and E (t) as function of time.
- b) Determine fraction of material leaving the reactor that has spent between 3 and 6 min in the reactor.
- c) Determine fraction of material that has spent 3 min or less in the reactor.

OR

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

- a) Tank in series model.
- b) C and E curve.
- c) Micro and macro mixing of fluids.
- d) Seggregation model.
- e) Dispersion flow model.

