

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
THIRD SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2017

Course Code: CS207

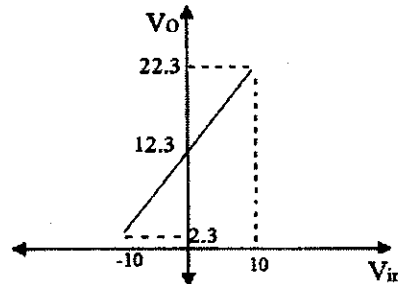
Course Name: ELECTRONIC DEVICES AND CIRCUITS (CS)

Max. Marks: 100

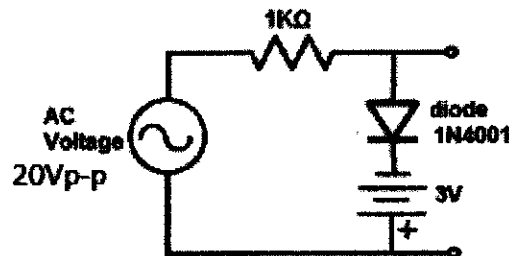
Duration: 3 Hours

PART A*Answer all questions, each carries 3 marks.*

- 1 Design a clamper circuit to get the following transfer characteristics, assuming voltage drop across the diode is 0.7V. (3) Marks



- 2 Draw the output waveform of the following circuit, assuming voltage drop across the diode is 0.7V. (3)



- 3 Compare linear regulator with switching regulator. (3)
 4 Compare FET with BJT (3)

PART B*Answer any two full questions, each carries 9 marks.*

- 5 a) With neat sketches explain the principle and working of RC integrator circuit. (5)
 b) Explain the response of an RC integrator circuit for a square wave input. (4)
 6 a) With neat sketches explain the working of n-channel JFET. (5)
 b) Draw the characteristics of n-channel JFET (4)
 7 a) Draw and explain a circuit whose output voltage is three times as that of input voltage. (5)
 b) Discuss about simple zener shunt voltage regulator with the help of circuit diagram. (4)

PART C*Answer all questions, each carries 3 marks.*

- 8 Define stability factor. Write down the expression for stability factor S. (3)
 9 Compare positive feedback with negative feedback. (3)

- 10 What is meant by sustained oscillation? What are the criteria's for obtaining sustained oscillations? (3)
- 11 An astable multivibrator having $R_1=2K\Omega$, $R_2=20K\Omega$ and $C_1=0.01\mu F$, $C_2=0.05\mu F$. Determine the period and frequency of oscillation. (3)

PART D

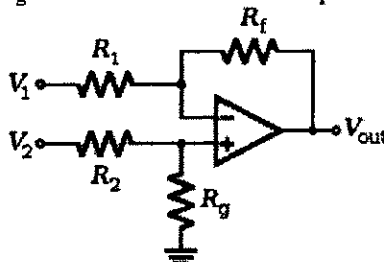
Answer any two full questions, each carries 9 marks.

- 12 a) With the help of circuit diagram explain the working of RC coupled amplifier. (5)
 b) Draw and explain the frequency response of RC coupled amplifier. (4)
- 13 a) With neat diagram explain the working of Hartley oscillator using BJT. (4)
 b) Derive the expression for frequency of oscillation and loop gain of a Hartley oscillator using BJT. (5)
- 14 a) Explain the effect of negative feedback on amplifiers. (5)
 b) With neat diagram explain the working of monostable multivibrator using BJT (4)

PART E

Answer any four full questions, each carries 10 marks.

- 15 a) With neat diagram explain the working and hysteresis curve of a non inverting Schmitt trigger using op amp. (6)
 b) The difference amplifier shown in the figure having $R_1=R_2=5K\Omega$, $R_f=10K\Omega$, $R_g=1k\Omega$. Calculate the output voltage. (4)



- 16 a) Explain RC differentiator circuit using op amp. (4)
 b) With the help of diagram explain a three input inverting summing amplifier. (4)
 c) Realize a circuit to obtain $V_o = -2V_1 + 3V_2 + 4V_3$ using operational amplifier. Use minimum value of resistance as $10K\Omega$. (2)
- 17 a) With neat diagram explain the working of Wien bridge oscillator using op-amp. (5)
 b) Derive the expression for frequency of oscillation of Wien bridge oscillator using op-amp. (5)
- 18 a) Explain the working principle of a successive approximation type ADC. (5)
 b) A 4-bit R-2R ladder type DAC having $R=10K\Omega$ and $V_R=10V$. Find its resolution and output voltage for an input 1101. (5)
- 19 a) Draw the circuit diagram and frequency response of a second order high pass Butterworth filter using OP-AMP and explain its working. (5)
 b) Design a first order Butterworth LPF using OP-AMP for a high cut off frequency of 1KHz and passband gain is 2. Give the design steps and draw the frequency response. (Assume $C=0.01\mu F$) (5)
- 20 a) With neat diagram explain the working of IC555 timer. (5)
 b) Design an astable multivibrator using IC 555 timer for a frequency of 1KHz and a duty cycle of 70%. Assume $C=0.1\mu F$. (5)

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
THIRD SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2017

Course Code: CS205

Course Name: DATA STRUCTURES (CS, IT)

Max. Marks: 100

Duration: 3 Hours

PART A

Answer all questions, each carries 3 marks.

- | | | Marks |
|---|---|-------|
| 1 | Differentiate between abstract and concrete data structure. | (3) |
| 2 | $N^2 + N = O(N^3)$ Justify your answer. | (3) |
| 3 | What is frequency count? Explain with an example. | (3) |
| 4 | How can we represent a linked list in memory using arrays? | (3) |

PART B

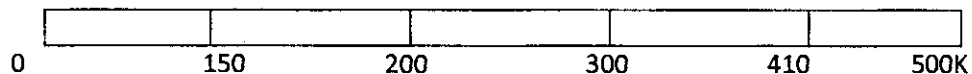
Answer any two full questions, each carries 9 marks.

- | | | |
|---|--|-----|
| 5 | Describe Big O notation used to represent asymptotic running time of algorithms. Give the asymptotic analysis of any one iterative algorithm. | (9) |
| 6 | a) Consider a singly linked list having n nodes. The data items d_1, d_2, \dots, d_n are stored in the n nodes. Let X be a pointer to the jth node ($1 \leq j \leq n$) in which d_j is stored. A new data item d stored in a node with address Y is to be inserted in the list. Give an algorithm to insert d into the list after d_j to obtain a list having items $d_1, d_2, \dots, d_j, d, d_{j+1}, \dots, d_n$ in that order without using the header. | (5) |
| | b) Explain about the use and representation of header node in linked list | (4) |
| 7 | a) What are the application of vectors. | (3) |
| | b) Write an algorithm for deleting a node from a specified position in a circular queue | (6) |

PART C

Answer all questions, each carries 3 marks.

- | | | |
|---|---|-----|
| 8 | How will you check the validity of an arithmetic expression using stack | (3) |
| 9 | Let take initial memory as - | (3) |



Do the following things with first fit approach and show the memory status:

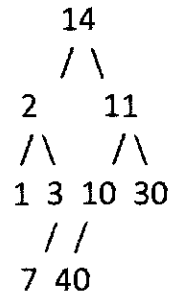
1. Allocate process C of size 90K
 2. Allocate process D of size 70K
- | | | |
|----|---|-----|
| 10 | Write a program in C to concatenate two strings using string function. | (3) |
| 11 | If a full binary tree is of height 5, give the positions of left child and right child of the second node in level 2. | (3) |

PART D

Answer any two full questions, each carries 9 marks.

- | | | |
|----|---|-----|
| 12 | Convert the following expression into its corresponding post fix form using the prescribed algorithm:
$(300+23)*(43-21)/(84+7)$. Do the evaluation of resultant postfix expression. | (9) |
|----|---|-----|

- 13 a) Here is a small binary tree: (4.5)



What is the output obtained after preorder, inorder and postorder traversal of the following tree.

- b) Write the non-recursive algorithm for post order traversal of tree. (4.5)
- 14 a) Write a function(C/ pseudo code) to insert an element into BST. (4)
- b) Write a program in C to check a particular sub string is present in a given string or not? If found print its location. (5)

PART E

Answer any four full questions, each carries 10 marks.

- 15 a) Draw the directed graph that corresponds to this adjacency matrix: (5)
- | | | | | | | |
|---|---|-------|-------|-------|-------|--|
| | 0 | 1 | 2 | 3 | | |
| 0 | | true | false | true | false | |
| 1 | | true | false | false | false | |
| 2 | | false | false | false | true | |
| 3 | | true | false | true | false | |
- b) Give the algorithm for BFS graph traversal. (5)
- 16 a) Show all the passes using insertion sort for the following list (5)
54,26,93,17,77,31,44,55,20
- b) Write a function (C/ pseudo code) of heap sort using min heap. (5)
- 17 Write a program to do the partition of a list using quick sort and then use insertion sort for sorting sub lists. Explain it with example. (10)
- 18 a) Write a program of binary search which tells how many comparisons it did to search an element given as user input. (7)
- b) Do the performance comparisons of Linear search and Binary search. (3)
- 19 Consider a hash table of size 7 and hash function $h(k) = k \bmod 7$. Draw the table that results after inserting in the given order, the following values. 19,26,13,48,17 for each of the three scenarios. (3)
- a) When collisions are handled by separate chaining. (3)
- b) When collisions are handled by linear probing. (3)
- c) When collisions are handled by double hashing using second hash function $h' = 5 - (5 \bmod k)$. (4)
- 20 a) Get the hash index in table of size 7 for the following list. 56,43,27,32,3. (3)
- b) Do the rehashing when the inserted elements are more than 4. (3)
- c) Briefly explain any 2 hashing functions. (4)

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
THIRD SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2017

Course Code: CS203

Course Name: SWITCHING THEORY AND LOGIC DESIGN (CS)

Max. Marks: 100

Duration: 3 Hours

PART A

Answer all questions, each carries 3 marks.

- | | | Marks |
|---|--|-------|
| 1 | a) Represent +51 and -51 in 1's complement and 2's complement form. | (2) |
| | b) Convert decimal $(378.93)_{10}$ to octal. | (1) |
| 2 | Perform the following decimal operations in the 8421 BCD code | (3) |
| | a) $(518)_{10} + (488)_{10}$ b) $(518)_{10} - (488)_{10}$ | |
| 3 | Express the following function as sum of minterms and product of maxterms: | (3) |
| | a) $F(A,B,C) = \bar{B} + A\bar{C} + A\bar{B}\bar{C}$ b) $F(A,B,C) = C(A + \bar{B})(\bar{A} + \bar{B} + \bar{C})$ | |
| 4 | a) Find complement of function. | (2) |
| | $F = A\bar{B} + B\bar{C} + \bar{A}C$ | |
| | b) Prove $AB + \bar{A}C = (A + C)(\bar{A} + B)$ | (1) |

PART B

Answer any two full questions, each carries 9 marks.

- | | | |
|---|---|-----|
| 5 | a) Write the format of single precision floating point binary numbers. Convert the decimal number 3.248×10^4 to a single-precision floating-point binary number. | (5) |
| | b) Perform the following hexadecimal operations | (4) |
| | 1) $A5C4_{16} + 39A5_{16}$ 2) $A96B_{16} - 9F2C_{16}$ | |
| 6 | Reduce the following expressions using K-map and implement the real minimal expression in universal logic. | (9) |
| | 1) $F(A, B, C, D) = \sum m(0, 1, 2, 3, 5, 7, 8, 9, 10, 12, 13)$ | |
| | 2) $F(A, B, C, D) = \prod M(2, 8, 9, 10, 11, 12, 14)$ | |
| 7 | a) Simplify the Boolean function $F(A, B, C, D) = \sum m(1, 3, 4, 5, 10, 12, 13, 15)$ using Quine-McCluskey method. | (9) |

PART C

Answer all questions, each carries 3 marks.

- | | | |
|----|--|-----|
| 8 | Differentiate between combinational and sequential circuits. | (3) |
| 9 | Draw the logic diagram of 4×1 MUX and list down the applications of MUX. | (3) |
| 10 | Give the truth table, characteristics table, excitation table and characteristic equation of SR flip-flop. | (3) |
| 11 | Compare Synchronous and Asynchronous sequential circuits. | (3) |

PART D*Answer any two full questions, each carries 9 marks.*

- 12 a) Design a 4-bit Binary to Gray code converter. (7)
 b) Implement the logic function $F = A \oplus B \oplus C$ using a 8:1 multiplexer. (2)
- 13 a) Explain race around condition in JK flip-flop. Explain how a master slave flip-flop avoids race around condition. (6)
 b) Convert JK Flip-Flop to T Flip-Flop. (3)
- 14 a) Design and implement full subtractor by using only NAND gates. (5)
 b) Explain 2 bit magnitude comparator using logic diagram. (4)

PART E*Answer any four full questions, each carries 10 marks.*

- 15 Design a synchronous counter using JK flip-flop which counts through the states 0,1,3,4,5,6,0..... Is the counter self starting? (10)
- 16 Draw and explain 4 bit Johnson counter. Also draw its timing sequence. (10)
- 17 a) Draw and explain the different types of shift registers. (8)
 b) List down the applications of shift registers. (2)
- 18 a) Write short notes on PLA. (3)
 b) Give any 2 applications of ROM. (3)
 c) Compare Static RAM and Dynamic RAM. (4)
- 19 Find the minimum size of PLA required to implement the following functions? (10)
 Hence implement the following function using PLA.

$$F_1(A, B, C) = \sum m(0,2,4,7) \quad F_2(A, B, C) = \sum m(3,5,6,7)$$
- 20 Explain the algorithm for floating point addition and subtraction. (10)

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
THIRD SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2017

Course Code: CS201

Course Name: DISCRETE COMPUTATIONAL STRUCTURES (CS, IT)

Max. Marks: 100

Duration: 3 Hours

PART A

Answer all questions, each carries 3 marks.

Marks

- | | | |
|---|--|-----|
| 1 | Assume $A = \{1, 2, 3\}$ and $\rho(A)$ be its power set. Let \subseteq be the subset relation on the power set. Draw the Hasse diagram of $(\rho(A), \subseteq)$ | (3) |
| 2 | Let R denote a relation on the set of ordered pairs of positive integers such that $(x, y)R(u, v)$ iff $xv = yu$. Show that R is an equivalence relation | (3) |
| 3 | Prove that in any group of six people, at least three must be mutual friends or at least three must be mutual strangers. | (3) |
| 4 | Define GLB and LUB for a partially ordered set. Give an example | (3) |

PART B

Answer any two full questions, each carries 9 marks.

- | | | |
|---|--|-----|
| 5 | a) Suppose $f(x) = x + 2, g(x) = x - 2$ and $h(x) = 3x$ for $x \in \mathbb{R}$, where \mathbb{R} is the set of real numbers. Find $g \circ f, f \circ g, f \circ f, g \circ g, f \circ h, h \circ g, h \circ h$ and $(f \circ h) \circ g$ | (4) |
| | b) Prove that every equivalence relation on a set generates a unique partition of the set with the blocks as R -equivalence classes | (5) |
| 6 | a) Show that the set \mathbb{N} of natural numbers is a semigroup under the operation $x * y = \max(x, y)$. Is it a monoid? | (3) |
| | b) Solve the recurrence relation $a_r + 5a_{r-1} + 6a_{r-2} = 3r^2 - 2r + 1$ | (6) |
| 7 | a) Show that for any commutative monoid $\langle M, * \rangle$, the set of idempotent elements of M forms a submonoid. | (5) |
| | b) Define subsemigroups and submonoids. | (4) |

PART C

Answer all questions, each carries 3 marks.

- | | | |
|----|--|-----|
| 8 | Show that, for an abelian group, $(a * b)^{-1} = a^{-1} * b^{-1}$ | (3) |
| 9 | Show that every chain is a distributive lattice. | (3) |
| 10 | Simplify the Boolean expression $a'b'c + ab'c + a'b'c'$ | (3) |
| 11 | Let $G = \{1, a, a^2, a^3\}$ ($a^4 = 1$) be a group and $H = \{1, a^2\}$ is a subgroup of G under multiplication. Find all cosets of H . | (3) |

PART D

Answer any two full questions, each carries 9 marks.

- 12 a) Show that the order of a subgroup of a finite group divides the order of the group. (6)
 b) Define ring homomorphism. (3)
- 13 Show that (I, \oplus, \odot) is a commutative ring with identity, where the operations \oplus and \odot are defined, for any $a, b \in I$, as $a \oplus b = a + b - 1$ and $a \odot b = a + b - ab$. (9)
- 14 a) Let (L, \leq) be a lattice and $a, b, c, d \in L$. Prove that if $a \leq c$ and $b \leq d$, then (5)
 (i) $a \vee b \leq c \vee d$
 (ii) $a \wedge b \leq c \wedge d$
- b) Show that in a Boolean algebra, for any a, b, c (4)
 $(a \wedge b \wedge c) \vee (b \wedge c) = b \wedge c$

PART E

Answer any four full questions, each carries 10 marks.

- 15 a) a) Construct truth table for $(\sim p \wedge (\sim q \wedge r)) \vee ((q \wedge r) \vee (p \wedge r))$ (6)
 b) Explain proof by Contrapositive with example. (4)
- 16 Prove the following implication (10)
 $(\forall x)(P(x) \vee Q(x)) \implies (\forall x) P(x) \wedge (\exists x) Q(x)$
- 17 a) Represent the following sentences in predicate logic using quantifiers (6)
 (i) "x is the father of the mother of y"
 (ii) "Everybody loves a lover"
- b) Determine whether the conclusion C follows logically from the premises (4)
 $H_1: \sim p \vee q, H_2: \sim(q \wedge \sim r), H_3: \sim r$ C: $\sim p$
- 18 a) Without using truth table prove $p \rightarrow (q \rightarrow p) \iff \sim p \rightarrow (p \rightarrow q)$ (4)
 b) Determine the validity of the following statements using rule CP. (6)
 "my father praises me only if I can be proud of myself. Either I do well in sports or I can't be proud of myself. If I study hard, then I can't do well in sports. Therefore if my father praises me then I do not study well"
- 19 a) Show that $r \rightarrow s$ can be derived from the premises $p \rightarrow (q \rightarrow s), \sim r \vee p, q$ (4)
 b) Prove, by Mathematical Induction, that $n(n+1)(n+2)(n+3)$ is divisible by 24, for all natural numbers n (6)
- 20 a) "If there are meeting, then travelling was difficult. If they arrived on time, then travelling was not difficult. They arrived on time. There was no meeting". Show that these statements constitute a valid argument. (6)
 b) Show that $2^n < n!$ For $n \geq 4$ (4)

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
THIRD SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2017

Course Code: HS200

Course Name: BUSINESS ECONOMICS

Max. Marks: 100

Duration: 3 Hours

PART A

Answer any three questions, each carries 10 marks.

- 1 a) What is a PPC? Explain opportunity cost concept using Production Possibility Curve. (6)
- b) What is Price Elasticity of demand? (4)
- 2 a) Explain the market equilibrium concept using a schedule and diagram. (6)
- b) Calculate marginal utility from the following data. (4)

X	1	2	3	4	5	6	7	8
TU	10	18	25	30	33	35	35	30

- 3 a) Give examples of any three business decisions which can be taken effectively using the concepts in business economics. (6)
- b) Comment on the nature of elasticity from the following data (4)
- i) $E_p = 1$ ii) $E_p = 0$ iii) $E_p = 2$ iv) $E_p = .85$
- 4 a) Given below are the production function of Firm A (4)
- $Q = 100 K^{0.3} L^{0.7}$,
- The firm use 20 units of Labour (L) and 10 units of Capital (K).
 Calculate the output
- b) State and explain the Law of variable proportions (6)

PART B

Answer any three questions, each carries 10 marks.

- 5 a) Elucidate the features of a perfect market structure (6)
- b) What will happen if a firm cut price in an oligopoly market (4)
- 6 a) (i) Calculate Break Even Quantity from the following data (6)
- Fixed Cost:Rs. 25,000 ; Average Variable Cost : Rs. 12; Selling Price Rs. 17
- (ii) What will be the Break-Even Quantity, if selling price increases by Rs.3?
- b) What are the limitations of Break-even analysis? (4)
- 7 a) Describe the Circular Flow Concept using a three-sector model. (6)
- b) Differentiate between GDP and GNP. (4)
- 8 a) What is inflation? What adjustments can be made in CRR and SLR to bring down the level of inflation? (5)
- b) Describe the different phases of Trade Cycle (5)

PART C

Answer any four questions, each carries 10 marks.

- 9 a) What are the advantages of NPV method (4)
- b) Mr. Keynes, an investor is evaluating two projects with an objective of selecting (6)

one among these for making an investment. From the following data, recommend which project to be selected using Pay Back Period Method

Project	Initial Outlay	Year1	Year 2	Year3	Year4
A	90,000	20,000	30,000	50,000	50,000
B	90,000	30,000	40,000	50,000	20,000

- 10 a) What is GST? (5)
 b) Distinguish between a money market and capital market. (5)
- 11 a) Elucidate the four main cannons of taxation. (6)
 b) What are the uses of demand forecasting? (4)
- 12 a) Prepare a balance sheet and arrange the following items in it (6)
 Cash, Interest Payable, Machinery, Wages Payable, Goodwill, Sundry Creditors, Inventories
 b) Why is it important to prepare a balance sheet? (4)
- 13 a) What is Cost Benefit Analysis? (6)
 b) Discuss Delphi Technique of demand forecasting? (4)
- 14 a) "Business always operate in an environment of uncertainty". Do you agree? (5)
 Give three reasons.
 b) What are the benefits of FDI? (5)

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
THIRD SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2017

Course Code: MA201

Course Name: LINEAR ALGEBRA AND COMPLEX ANALYSIS

Max. Marks: 100

Duration: 3 Hours

PART A

Answer any two full questions, each carries 15 marks.

Marks

- 1 a) Find the points where Cauchy-Riemann equations are satisfied for the function $f(z) = xy^2 + i x^2 y$. Where does $f'(z)$ exist? Is the function $f(z)$ analytic at those points? (7)
- b) If $v = e^x (x \sin y + y \cos y)$, find an analytic function $f(z) = u + iv$. (8)
- 2 a) Show that $u = x^2 - y^2 - y$ is harmonic. Also find the corresponding conjugate harmonic function. (7)
- b) (i) Find a bilinear transformation which maps $(-i, 0, i)$ onto $(0, -1, \infty)$. (8)
- (ii) Test the continuity at $z = 0$, if $f(z) = \frac{\text{Im } z}{|z|}, z \neq 0$
 $= 0, z = 0$
- 3 a) Find the image of the lines $x=1, y=2$ and $x>0, y<0$ under the mapping $W = z^2$ (8)
- b) Find the image of the semi-infinite strip $x > 0, 0 < y < 2$ under the transformation $w = iz + 1$. Draw the regions. (7)

PART B

Answer any two full questions, each carries 15 marks.

- 4 a) Evaluate $\oint \text{Re } z^2 dz$ over the boundary C of the square with vertices $0, i, 1 + i, 1$ clockwise (8)
- b) Evaluate $\int \frac{4-3z}{z(z-1)} dz$ over the circle $|z| = \frac{3}{2}$ (4)
- c) Evaluate $\int \frac{3z^2 + 7z + 1}{z+1} dz$ over the circle $|z+i|=1$ (3)
- 5 a) Expand $\frac{z}{(z-1)(z-2)}$ in (1) $0 < |z-2| < 1$, (2) $|z-1| > 1$ (8)
- b) Evaluate $\int_0^{2\pi} \frac{1}{2 + \cos \theta} d\theta$ (7)
- 6 a) Using Residue theorem evaluate $\int \frac{z^2}{(z-1)^2(z+2)} dz$ over the circle $|z|=3$ (7)
- b) Find the Taylor series of $\frac{\sin z}{z-\pi}$ about the point $z = \pi$ (4)

- c) Evaluate $\int \frac{\sin z}{z^6} dz$ over the circle $|z|=2$ using Cauchy's Residue theorem. (4)

PART C

Answer any two full questions, each carries 20 marks.

- 7 a) Solve by Gauss-Elimination method $x + y + z = 6$, $x + 2y - 3z = -4$, $-x - 4y + 9z = 18$. (7)
- b) Find the values of 'a' and 'b' for which the system of equations $x + y + 2z = 2$, $2x - y + 3z = 10$, $5x - y + az = b$ has: (7)
- (i) no solution (ii) unique solution (iii) infinite number of solutions.
- c) Verify whether the vectors $(1, 2, 1, 2)$, $(3, 1, -2, 1)$, $(4, -3, -1, 3)$ and $(2, 4, 2, 4)$ are linearly independent in \mathbb{R}^4 . (6)
- 8 a) Write down the matrix associated with the quadratic form $8x_1^2 + 7x_2^2 + 3x_3^2 - 12x_1x_2 - 8x_2x_3 + 4x_3x_1$. By finding eigen values, determine nature of the quadratic form. (7)
- b) Diagonalise the matrix $A = \begin{bmatrix} 1 & -2 & 0 \\ -2 & 0 & 2 \\ 0 & 2 & -1 \end{bmatrix}$ (7)
- c) If A is a symmetric matrix, verify whether AA^T and $A^T A$ are symmetric? (6)
- 9 a) Find the eigen vectors of $A = \begin{bmatrix} 3 & 0 & 0 \\ 5 & 4 & 0 \\ 3 & 6 & 1 \end{bmatrix}$ (8)
- b) Find the null space of $AX=0$ if $A = \begin{bmatrix} 1 & 1 & 0 & 2 \\ -2 & -2 & 1 & -5 \\ 1 & 1 & -1 & 3 \\ 4 & 4 & -1 & 9 \end{bmatrix}$ (6)
- c) Verify whether $A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & \cos \theta & -\sin \theta \\ 0 & \sin \theta & \cos \theta \end{bmatrix}$ is orthogonal. (6)

What can you say about determinant of an orthogonal matrix? Prove or disprove the result.
