



SMT. INDIRA GANDHI COLLEGE OF ENGINEERING

An Autonomous Institute with NAAC 'A' Grade
Approved by AICTE, Affiliated to the University of Mumbai.



END SEMESTER EXAMINATION (SIGCE R-19 C SCHEME)

QP Code: 2332133

Subject Name: Analysis of Algorithm

Subject Code: 2113113

Branch: Computer Engineering

Duration: 2.5 Hours

Date: 26/12/2025

Sem: III

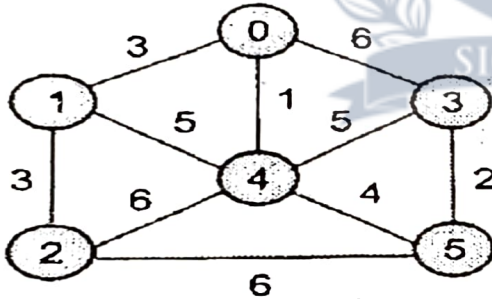
Max Marks: 60

Note:

- 1) Attempt all questions
- 2) Assume suitable data wherever necessary.
- 3) Figures to the right indicate full marks

CO Marks

- Q.1 Answer the following (any two)
- a. Explain O , Ω and Θ notations with appropriate equations and graphs. 8
 - b. Explain Selection sort algorithm with example. CO1 4
 - c. Write definition and give relationship of P, NP, NP-hard, NP-complete problem CO1 4
- Q.2 Answer the following (any two)
- a. Explain quick sort with algorithm and example. 10
 - b. Apply Merge sort algorithm to sort the following numbers. 10, 5, 7, 6, 1, 4, 8, 3, 2, 9. CO2 5
 - c. Explain binary search using divide and conquer approach. CO2 5
- Q.3 Answer the following (any One)
- a. Find MST of following graph using prim's and Kruskal's Algorithm. 10



CO3 10

- b. Explain Job Sequencing with deadline for the given instance $n=5, \{p_1, p_2, p_3, p_4, p_5\} = \{20, 15, 10, 5, 3\}$ and $\{d_1, d_2, d_3, d_4, d_5\} = \{2, 2, 1, 3, 3\}$. CO3 10

- Q.4 Answer the following (any Two)
- a. Find the LCS for following strings 14
String 1- AGGTAB CO4 7
String 2- GXTXAYB
 - b. Obtain the solution to following 0/1 knapsack problem using dynamic programming where: CO4 7
 $n = 4$, Knapsack Capacity $M = 5$, Weights $(W_1, W_2, W_3, W_4) = (2, 3, 4, 5)$ and profits $(P_1, P_2, P_3, P_4) = (3, 4, 5, 6)$.
 - c. Explain and differentiate between greedy knapsack and 0/1 knapsack. CO4 7





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Q.5 Answer the following (any Two)

- Write and explain sum of subset algorithm for $n = 5$, $W = \{2, 7, 8, 9, 15\}$ $M = 17$.
- Explain Backtracking with n-queen problem.
- Explain 15-puzzle problem using branch and bound strategy.

12

CO5 6

CO5 6

CO5 6

Q.6 Answer the following (any One)

- Explain Knuth Morris Pratt Method of Pattern Matching?
- Explain naïve string matching algorithm with example.

6

CO6 6

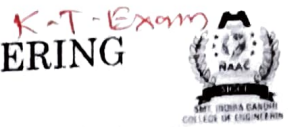
CO6 6





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QPCode:2332111

END SEMESTER EXAMINATION (SIGCE NEP 2020)

Subject Name: Mathematics for Computer Engineering

Subject Code: 2113111

Branch: COMP

Duration: 02:30 Hours

Date: 20/12/25

Sem: III

Max Marks: 60

Note:

- 1) Attempt all questions.
- 2) Statistical table will be provided.
- 3) Figures to the right indicate full marks.

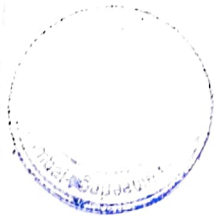
	CO	Marks
Q.1 Answer the following (any two)	1	10
a. State Cayley Hamilton theorem and verify it for $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$, Also find its inverse.		05
b. Show that the matrix $A = \begin{bmatrix} 4 & 1 \\ 0 & 2 \end{bmatrix}$ is diagonalisable and hence find diagonal matrix D & transforming matrix P.		05
c. Find the eigen values of $A + A^2 + adj(A) + A^{-1}$ if $A = \begin{bmatrix} 1 & 3 & 4 \\ 0 & -1 & 2 \\ 0 & 0 & -1 \end{bmatrix}$		05
Q.2 Answer the following (any two)	2	10
a. Find all possible basic solutions to following LPP and classify them in feasible, degenerate & optimal solution. $\text{Minimise } z = x_1 + 2x_2 + 3x_3$ $\text{Subject to } x_1 + x_2 + x_3 = 6$ $2x_1 + x_2 + 3x_3 = 10$		05
b. Solve following LPP by Simplex method. $\text{Maximise } z = 6x_1 + 5x_2$ $\text{Subject to } x_1 + x_2 \leq 5$ $3x_1 + 2x_2 \leq 12$ $x_1, x_2 \geq 0$		05
c. Solve following NLPP by Lagrange's multiplier method. $\text{Optimise } z = 12x_1 + 8x_2 + 6x_3 - x_1^2 - x_2^2 - x_3^2 - 23$ $\text{subject to } x_1 + x_2 + x_3 = 10$ $x_1, x_2, x_3 \geq 0$		05
Q.3 Answer the following (any two)	3	10
a. State Chinese-Remainder theorem and hence solve $x \equiv 2 \pmod{3}$ $x \equiv 3 \pmod{4}$ $x \equiv 2 \pmod{5}$		05
b. State Euler's theorem and hence prove that $9^{121} \equiv 9 \pmod{40}$		05
c. State Fermat's little theorem and hence prove that $5^{2003} \equiv 5 \pmod{23}$		05



P.T.O



- Q.4 Answer the following (**any two**) 4 **10**
- a. Find Fourier series expansion of 05
- $$f(x) = \begin{cases} x & 0 < x \leq \pi \\ 2\pi - x & \pi \leq x < 2\pi \end{cases}$$
- b. Find the Fourier expansion of $f(x) = x^2$ in $(-1, +1)$ and hence deduce that 05
- $$\frac{\pi^2}{6} = \frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \dots$$
- c. Find Fourier expansion of $f(x) = x$ in $(-\pi, +\pi)$ and hence deduce that 05
- $$\frac{\pi}{4} = \frac{1}{1} - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \dots$$
- Q.5 Answer the following (**any two**) 5 **10**
- a. Calculate Karl Pearson's correlation coefficient for the following bivariate data. 05
- | | | | | | |
|---|---|---|---|----|----|
| X | 2 | 4 | 6 | 8 | 10 |
| Y | 5 | 7 | 9 | 11 | 13 |
- b. Calculate Spearman's rank correlation coefficient for the following bivariate data. 05
- | | | | | | | |
|---|----|----|----|----|----|----|
| X | 75 | 85 | 75 | 65 | 65 | 55 |
| Y | 85 | 85 | 80 | 70 | 70 | 60 |
- c. Fit a straight line to the following bivariate data. 05
- | | | | | | | |
|---|---|---|---|---|---|---|
| x | 1 | 2 | 3 | 4 | 5 | 6 |
| y | 2 | 3 | 5 | 4 | 6 | 7 |
- Q.6 Answer the following (**any two**) 6 **10**
- a. A continuous random variable X has p.d.f. 05
- $$f(x) = \begin{cases} 2e^{-2x} & x > 0 \\ 0 & x \leq 0 \end{cases}$$
- Find m.g.f and hence find it's mean & standard deviation.
- b. A manufacturer of electric bulbs sells out 500 lots each consisting of 100 bulbs. If 5% bulbs are defective. In how many lots can we expect i) 97 or more good bulbs. ii) less than 97 good bulbs 05
- c. The life of army shoes is normally distributed with mean 8 months and standard deviation 2 months. If 5000 pairs are issued, how many pairs would be expected to need replacement after 12 months? 05





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END SEMESTER EXAMINATION (SIGCE NEP 2020 SCHEME)

QP Code: 2332131

Subject Name: Analysis of Algorithm

Subject Code: 2113113

Branch: Computer Engineering

Duration: 2.5 Hours

Date: 03/11/2025

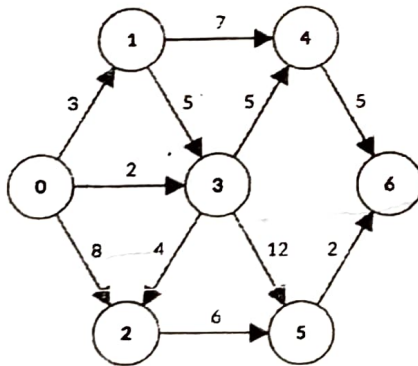
Sem: Iii

Max Marks: 60

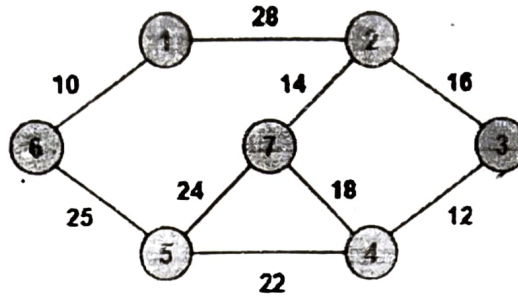
Note:

- 1) Attempt all questions
- 2) Assume suitable data wherever necessary.
- 3) Figures to the right indicate full marks

	CO	Marks
Q.1 Answer the following (any two)		8
a. Evaluate the time complexity for following recurrence relations using Master's method $T(n) = 4T(n/2) + n^3$	CO1	4
b. Write detailed notes on NP-Hard and NP-Complete class of problems	CO1	4
c. Evaluate the asymptotic performance of the given function by finding their upper bound, lower bound, and tight bound. Function is $f(n) = 3n+2$	CO1	4
Q.2 Answer the following (any Two)		10
a. Apply Strassen's Algorithm to multiply two 2×2 matrices.	CO2	5
b. Explain binary search algorithm with an example.	CO2	5
c. Explain general method steps of Divide and Conquer Approach with an example	CO2	5
Q.3 Answer the following (any One)		10
a. Find the Single source shortest path using Dijkstra Algorithm for the following-graph	CO3	10



- b. Compare Kruskal's and Prim's algorithm. Construct Minimum Spanning Tree using Prim's algorithm for the following Graph. CO3 10

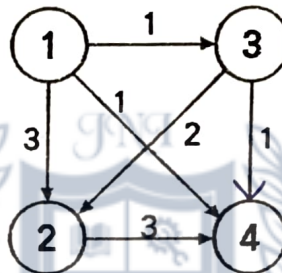


Q.4 Answer the following (any Two)

14

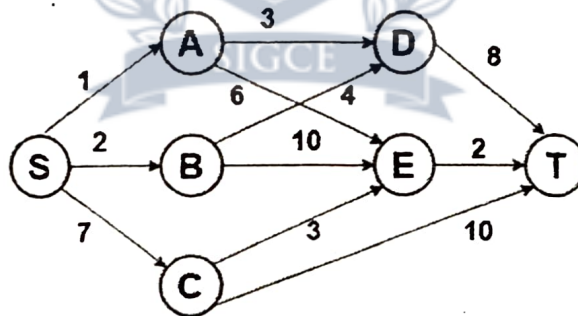
- a. Construct the final shortest path matrix for all vertices by applying Floyd Warshall algorithm for the following graph.

CO4 7



- b. Find a minimum cost path from 'S' to 'T' for the following directed graph in multistage graph using dynamic programming

CO4 7



- c. Explain Bellman Ford Algorithm with an example and show all iteration steps clearly.

CO4 7

Q.5 Answer the following (any Two)

12

- a. Explain with an example how n-queen Problem can be solved using backtracking
- b. What is Backtracking? Explain general method of backtracking technique
- c. Explain with an example how Travelling Salesperson Problem can be solved using Branch and Bound technique

CO5 6

CO5 6

CO5 6

Q.6 Answer the following (any One)

6

- a. Show the steps and find number of shifts to find pattern in the text string for the following using Naive String Matching Method.

CO6 6

Text : BADBABABABADA

Pattern : ABABADA

- b. Explain KMP string matching algorithm with an example

CO6 6





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END SEMESTER EXAMINATION (SIGCE NEP 2020)

QP Code: 2332153

Date: 10/11/2025

Subject Name: - Fintech Start-up

Subject Code: 2113311

Branch: Computer Engg.

Sem: III

Duration: 2.5 Hours

Max Marks: 60

	CO	Marks
Q.1 Answer the following (any three)	CO1	(15)
a. Discuss the evolution of Fintech in the investment sector.		5
b. Explain the role of Fintech in transforming traditional investment methods.		5
c. Summarise the benefits and limitations of automated investing platforms.		5
d. Describe the concept of Algorithmic Trading.		5
Q.2 Answer the following (any three)	CO2	(15)
a. Define Fintech. Explain its scope in investment management.		5
b. How Machine Learning used in investment decision-making.		5
c. What are the functions of algorithmic trading platforms in financial markets.		5
d. Justify the importance of data-driven investment tools.		5
Q.3 Answer the following (any three)	CO3	(15)
a. What is Blockchain Technology? Explain its application in finance.		5
b. What are Digital Assets? Explain with examples.		5
c. How blockchain enhances transparency and security in transactions.		5
d. State the importance of Ethics in Fintech and investment practices.		5
Q.4 Write a short note on: (any three)	CO4	(15)
a. Cryptocurrencies as investment assets.		5
b. Key challenges in cryptocurrency investment?		5
c. Impact of RBI and SEBI regulations on Fintech operations.		5
d. Fintech innovations in financial markets.		5





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END SEMESTER EXAMINATION OCT / NOV (SIGCE NEP 2020)

QP Code:
2332143

Subject Name COA

Subject Code: 2113114

Duration: 2.30 Hrs

Branch: Computer

07/11/2025

Sem:III

Max Marks: 60

Note:

- 1) Attempt all questions
- 2) Assume suitable data wherever necessary.
- 3) Figures to the right indicate full marks

CO Marks

Q.1 Answer the following (any one)	1	05
a. Compare Computer Organization and computer Architecture		5
b. Realize AND gate using only one universal gate.		5
Q.2 Answer the following	2	15
a. Draw the flow chart of Restoring Division algorithm and perform (13)/(3)		10
b. Answer the following (any one)		5
i) Convert Hex To Binary (2F) ₁₆		
ii) Explain IEEE 754 Floating point representation		
Q.3 Answer the following (any three)	3	15
a. Explain Register organization of 8086 in detail		5
b. Compare RISC and CISC architectures.		5
c. List out the various methods to design a Hardwired control unit. Explain any one.		5
d. Explain the importance of Bus Interface unit in 8086 architecture.		5
Q.4 Answer the following (any two)	4	10
a. Compare RAM and ROM.		5
b. Write note on: i) Paging		5
c. Explain memory hierarchy.		5
Q.5 Answer the following (any one)	5	5
a. What are the types of buses? Explain their importance.		5
b. List out different types of data transfer techniques and explain any one.		5
Q.6 Answer the following (any One)	6	10
a. Explain Flynn's classification		10
b. List and explain various Pipeline Hazards		10





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END SEMESTER EXAMINATION (SIGCE NEP 2020 SCHEME)

QP Code:
2332121

Subject Name: Discrete Structures and Graph Theory

Subject Code:2113112

Branch: Computer Engineering

Duration:2.5 Hrs

Date: 23/12/25

Sem:III

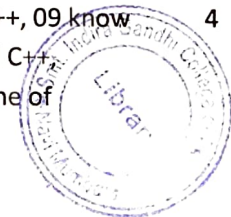
Max Marks: 60

Note:

- 1) Attempt all questions
- 2) Assume suitable data wherever necessary.
- 3) Figures to the right indicate full marks

CO Marks

- Q.1 Answer the following (any two)
- a. Define Universal and Existential quantifiers. Explain with examples. 1 5
 - b. Using laws of logic determine the following expression as tautology or contradiction:
 $[p \wedge (p \rightarrow q)] \rightarrow q$ 1 5
 - c. Prove that $8^n - 3^n$ is a multiple of 5 by mathematical induction, $n > 1$ 1 5
- Q.2 Answer the following (any two)
- a. Let $A = \{1,2,3,4\}$ and let $R = \{(1,2), (2,3), (3,4), (4,1)\}$ find transitive closure of R by using Warshall's algorithm 2 6
 - b. R be a relation on set of integers Z defined by $R = \{(x, y) \mid x-y \text{ is divisible by } 3\}$. Show that R is an equivalence relation. 2 6
 - c. Find the complement of D_{42} 2 6
- Q.3 Answer the following (any one)
- a. Functions f, g, h are defined on a set $X = \{1,2,3\}$ as $f = \{(1,2), (2,3), (3,1)\}$
 $g = \{(1,2), (2,1), (3,3)\}$ $h = \{(1,1), (2,2), (3,3)\}$. Find fogoh and fohog 3 6
 - b. Given $f(x) = (3x+4)/(4x-2)$. Find $f^{-1}(x)$ 3 6
- Q.4 Answer the following (any two)
- a. Define Extended Pigeon hole principle. If 8 colors are used to paint 65 bicycles then how many cycles will be of same color. 4 5
 - b. Solve the following recurrence relation: $a_n - 7a_{n-1} + 10a_{n-2} = 0$
with initial condition $a_0 = 1, a_2 = 6$ 4 5
 - c. Out of total 50 students in a class, 30 know Java, 18 know Python, 26 know C++, 09 know both Java and Python, 16 know both Java and C++, 08 know both Python and C++, 47 know at least one of the three languages. A) How many students know none of these languages B) How many students know all three languages? 4 5
- Q.5 Answer the following (any one)
- a. Consider an algebraic system $(G, *)$ where G is the set of all nonzero real non and * is a binary operation defined by $a*b = ab/4$. Show that $(G, *)$ is an abelian group. 5 10
 - b. Define the following algebraic structures with example - Semigroup, Monoid, Group, Abelian group and Ring 5 10





Q.6 Answer the following (any two)

a. Determine if the given graph has Euler path and Euler circuit. Justify.

6 6

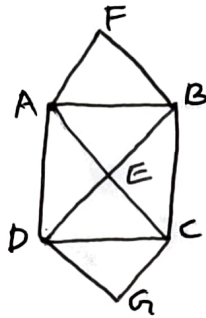
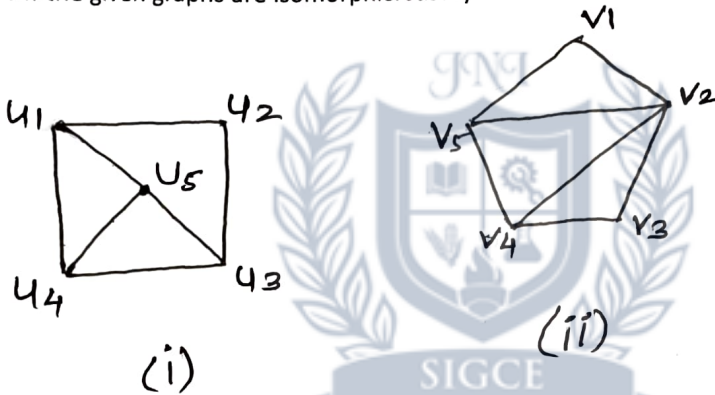


fig (a)

b. Determine if the given graphs are isomorphic. Justify.

6 6



(i)

(ii)

c. Define Planar graph with example. What are the properties of a planar graph?
Is $K_{3,5}$ planar graph?

6 6



SE sem II Computer R-19 C scheme

Time: 3 Hours

Total Marks 80

- N.B:** 1) Question **number 1** is compulsory.
 2) Attempt **any three** out of the remaining.
 3) Assume suitable data if **necessary** and justify the assumptions.
 4) Figures to the **right** indicate full marks.

1. Attempt any **FOUR**.
- What is rasterization? Explain with neat diagram [05]
 - Describe what is Homogeneous coordinates [05]
 - Give properties of Bezier Curve. [05]
 - Derive initial value for mid-point ellipse [05]
 - Define Aliasing, what is anti-aliasing? Give different antialiasing techniques [05]
- 2 a) Given a line AB where A(0,0) and B(5,2) calculate all the points on the line using BRESENHAM line algorithm [10]
 b) Derive formulas for Mid-point Circle algorithm [10]
- 3 a) What is Composite transformation? Derive a composite matrix for rotation at fix point P. [10]
 b) Explain shear transformation. Given a rectangle ABCD where A(0,0), B(0,10), C(10,10) and D(10,0) apply X-shear of 1 unit and compute new coordinate of rectangle ABCD. Apply Y-shear of 1 unit and compute new coordinate of rectangle ABCD. [10]
- 4 a) Give Liang Barsky Line clipping algorithm. [10]
 b) Explain Sutherland Hodgman polygon clipping algorithm [10]
- 5 a) With neat diagram explain Planer projection geometry. [10]
 b) Explain different traditional animation techniques. [10]
- 6 a) Describe with neat diagram Area Subdivision method [10]
 b) Describe with neat diagram Depth Buffer Method [10]

SE sem III computer R-19 e scheme

Time: 3 hours

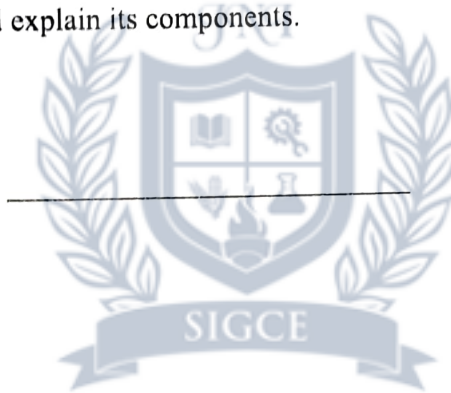
Max. Marks: 80

Instructions:

- 1) **Question Number 1 is compulsory.**
- 2) Solve any **three questions** out of **remaining five** questions.
- 3) Each Question carries 20 marks.
- 4) Illustrate your answers with neat sketches wherever necessary.
- 5) Figures to the right indicate full marks.
- 6) Assume suitable additional data, if necessary and clearly state it.
- 7) All sub-questions of the same question should be grouped together.

- Q.1 (a) What are the advantages and disadvantages of the Von Neumann architecture? **05**
- (b) Represent 4.5 in IEEE 754 Single precision Format. **05**
- (c) Explain the difference between a MUX and a DMUX with suitable parameters. **05**
- (d) Write a microprogram for the instruction ADD R₃, R₄. **05**
- Q.2 (a) A block-set associative cache memory consists of 128 blocks divided into four **10**
 block sets. The main memory consists of 16,384 blocks and each block contains
 256 eight bit words.
- a) How many bits are required for addressing the main memory?
- b) How many bits are needed to represent the TAG, SET and WORD fields?
- (b) Explain the different methods of Centralized BUS Arbitration. **10**
- Q.3 (a) Compare with suitable parameters a microprogrammed control unit and **10**
 hardwired control unit.
- (b) Explain the various addressing modes. **10**
- Q.4 (a) Explain how the NAND gate can be used as a universal logic gate. Provide **10**
 examples of how it can be used to implement other logic gates.
- (b) Multiply 13×-6 using Booth's Multiplication Algorithm. **10**
- Q.5 (a) With the help of algorithm for non-restoring division perform the division **10**
 operation on $(46)_{10}$ and $(23)_{10}$. Show the intermediate steps involved in the
 division process and explain how the final result is obtained.

- (b) List and describe the typical stages of a classic instruction pipeline in a CPU. **10**
What is Pipeline Hazard? Explain the types of pipeline hazards.
- Q.6** (a) Draw instruction cycle state diagram with interrupt. **03**
- (b) Give the methods used for design of Hardwired Control unit? **03**
- (c) What is Cache Memory? A 32-bit computer has a 32 bit memory address. It has 8kB of cache memory. The computer follows four-way set associative mapping. Each line size is 16 bytes. Show the memory address format and cache memory organization. **05**
- (d) List the different levels of the memory hierarchy, from the fastest to the slowest. **04**
- (e) Draw the block diagram for the MIMD architecture under Flynn's Classification and explain its components. **05**



SE sem III Computer R-19 C scheme

(3 Hours)

Total Marks: 80

- N.B:** (1) Question No. 1 is compulsory
 (2) Attempt any three questions out of the remaining five questions
 (3) Figures to the right indicate full marks
 (4) Make suitable assumptions wherever necessary with proper justifications

- Q1 A State the advantages of linked lists over arrays. [05]
 B Create a binary search tree by inserting node values in sequence- 56,32,12,90,-9,78,66,110,44,95. [05]
 C Write a program in C to check balanced parentheses using stack. [05]
 D Explain double ended queue. [05]
- Q2 A Write a program to perform following operations on the Singly linked list [10]
 a) Create the list
 b) Delete first element
 c) Insert element at end
 d) Search an element with value=66 in the list
 B Explain the concept of B-tree. Crate a B-tree of order-4 by inserting keys- 5, 3, 21, 9, 13, 22, 7, 10, 11, 14, 8, 16. [10]
- Q3 A Write a program in C to evaluate a postfix expression. [10]
 B Explain the concept of Huffman coding and describe the steps for constructing a Huffman tree. Given the following characters with frequencies, construct the Huffman tree and generate the Huffman codes for the given characters: A:20, B:15, C:5, D:15, E:45 [10]
- Q4 A Construct an AVL tree by inserting the following elements in sequence, showing the tree after each insertion and rotation: 21, 26, 30, 9, 4, 14, 28, 18,10, 7. [10]
 B Write a program in C to implement stack ADT using an linked list. [10]
- Q5 A Explain the different types of linked list with diagram. Also state the advantages of circular and doubly linked list over singly linked list. [10]
 B Write a program in C to implement linear queue using array. [10]
- Q6 A Explain graph representation techniques with suitable example. [10]
 B A hash table has 11 slots, and the following keys are inserted in this order: 43, 36, 92, 87, 11, 47, 12, 13, 14. Using linear probing as the collision resolution technique, show the final arrangement of keys in the hash table. Use the hash function $h(x) = x \% 11$. Also count number of collisions. [10]

SE sem III Computer R-19 E scheme

Time: 3 Hrs

Max. Marks: 80

- N.B. : 1) Question Number 1 is compulsory
 2) Solve any three questions from the remaining questions
 3) Make suitable assumptions if needed
 4) Assume appropriate data whenever required. State all assumptions clearly.

1.
 - a. Define the following with suitable example 5
 - a) Power Set b) Monoid c) Bipartite Graph d) Existential Quantifier
 - b. Find the number of positive integer's n where $1 \leq n \leq 100$ and n is not divisible by 2, 3 or 5. 5
 - c. Prove that the set $A = \{0, 1, 2, 3, 4, 5\}$ is a finite Abelian group under Addition modulo 6 5
 - d. State the Pigeonhole principle and show that if any five numbers form 1 to 8 are chosen, then two of them will add to 9. 5

2.
 - a. Define Equivalence Relation. Let $A = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$ and define R by aRb if both a and b leave the same remainder when divided by 4. 10
 - (a) Prove that R is an equivalence relation.
 - (b) List all equivalence classes.
 - b. Let $A = \{0, 1, 2, 3, 4, 5\}$ 10
 - i) Explain the term group.
 - ii) Prepare the composition table for the above set w.r.t the operation of addition modulo 6
 - iii) Determine whether it is a group
 - iv) Whether elements of set A are invertible? If yes, then find the inverses of these elements.
 - v) Determine whether it is a cyclic group.

3.
 - a. Let $f: R \rightarrow R$ be a function defined by $f(x) = 2x - 3$. Prove that it is bijective & find inverse. 4
 - b. Let $A = \{1, 2, 3, 4\}$ and $R = \{(1, 2), (2, 3), (3, 4), (2, 1)\}$ Find the Transitive Closure of R by using Warshall's algorithm 8
 - c. For the set $A = \{2, 3, 6, 12, 24, 36\}$, a relation R defined by divisibility Answer the following 8
 - a) Draw the Hasse Diagram
 - b) What are the maximal and Minimal elements
 - c) Is the poset Lattice?

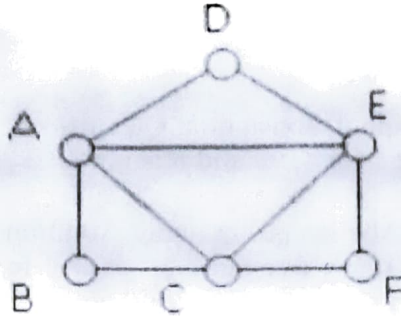
Give one example of chain and antichain

4.
 - a. If $f: R \rightarrow R$ and $g: R \rightarrow R$ are defined by $f(x) = x + 2$ and $g(x) = x^2$ find (i) $f \circ g \circ f$ (ii) $g \circ f \circ g$ 8
 - b. Consider (3,6) encoding function given below is a group code 8

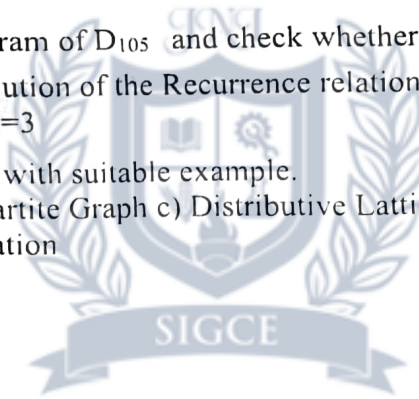
$e(000) = 000000, e(001) = 000110, e(010) = 010010, e(011) = 010100$
 $e(011) = 010100, e(100) = 100101, e(101) = 100011, e(110) = 110111,$
 $e(111) = 110001.$
 - c. Prove by mathematical induction that 4

$1 + 5 + 9 + \dots + (4n - 3) = n(2n - 1)$

- 5 a Define Euler Path, Euler Circuit, Hamiltonian Path and Hamiltonian Circuit. Determine if the following diagram has Euler Path, Euler Circuit, Hamiltonian Path and Hamiltonian Circuit and state the path /circuit. 8



- b Consider the Set $A = \{1, 2, 3, 4, 5, 6\}$ under multiplication Modulo 7. 8
1. Is it a Cyclic group?
 2. Find the orders and the Subgroups generated by $\{2, 3\}$ and $\{3, 4\}$
- c Find the complement of each element in D_{72} . 4
6. a Draw the Hasse Diagram of D_{105} and check whether it is a Lattice. 8
- b Find the complete solution of the Recurrence relation $a_n + 2a_{n-1} = n + 3$ for $n \geq 1$ and $a_0 = 3$. 8
- c Define the following with suitable example. 4
- a) Semigroup
 - b) Bipartite Graph
 - c) Distributive Lattice
 - d) Partial Order Relation



SE Sem III Computer R-19 C scheme

Duration: 3 hours

Max. Marks: 80

- N.B. (1) Question No. 1 is compulsory.
 (2) Answer any three questions from Q.2 to Q.6.
 (3) Use of Statistical Tables permitted.
 (4) Figures to the right indicate full marks

Q1 A If $f(t) = (\cos 2t + \sin t)^2$, find $L[f(t)]$ and hence find $L\{e^{-2t}f(t)\}$ 5

B Find $L^{-1}\left\{\frac{1}{(s-2)(s^2+4)}\right\}$ 5

C Obtain half-range sine series for $f(x) = x$ in $0 < x < 2$ 5

D Find k and moment generating function of the following distribution. Hence find mean and variance. 5

X	1	3	4	5
P(X)	0.4k	0.1k	0.2k	0.3k

Q2 A Find the orthogonal trajectories of the family of curves $3x^2y - y^3 = c$ 6

B Find $L\left\{t\left(\frac{\cos 2t}{e^t}\right)^2\right\}$ 6

C Find the Fourier series expansion for $f(x) = 1, 0 < x < 1,$
 $=x, 1 < x < 2$ 8

Hence deduce that $\frac{\pi^2}{8} = \frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \dots$

Q3 A Find $L^{-1}\left\{\log\left(\frac{s^2+9}{\sqrt{s+8}}\right)\right\}$ 6

B Find the analytic function $f(z) = u + iv$ where $u + v = \frac{\sin 2x}{\cosh 2y - \cos 2x}$, using Milne-Thompson's Method. 6

C Fit a parabola $y = a + bx + cx^2$ for the following data: 8

X:	1	2	3	4	5	6	7	8	9
Y:	2	6	7	8	10	11	11	10	9

- Q4 A The first 3 moments of a distribution about 2 of the random variable X are 1, 22 and 10. Compute Mean, variance and third central moment μ_3 . 6
 B Consider the equations of regression lines $4x-5y= -33$ and $20x-9y - 107=0$. Find \bar{x} , \bar{y} and correlation coefficient r. 6

C Find $L^{-1} \left\{ \frac{(s+3)^2}{(s^2+6s+5)^2} \right\}$ 8

- Q5 A Show that the Laplace transform of $\frac{\sin 2t + \sin 3t}{t} = \pi - \tan^{-1} \left(\frac{5s}{6-s^2} \right)$. 6

- B Find Spearman's rank correlation coefficient for the data below: 6

X :	85	74	85	50	65	78	74	60	74	90
Y :	78	91	78	58	60	72	80	55	68	70

- C Obtain Fourier Series for $f(x) = \begin{cases} \cos x, & -\pi < x < 0 \\ \sin x, & 0 < x < \pi \end{cases}$ 8

- Q6 A If $f(x)$ is probability density function of a continuous random variable X. find mean and variance. 6

$$f(x) = 6(x-x^2), \quad 0 < x < 1$$

- B Check if there exists an analytic function whose real part is $u = e^x(x \cos 2y - y \sin 2y)$. If so, find $f(z)$. Justify your answer. 6

- C Evaluate the following integral by using Laplace transforms 8

$$\int_0^\infty e^{-t} \left[\int_0^t u^2 \sinh u \cosh u \, du \right] dt$$
