

END TERM EXAMINATION

THIRD SEMESTER [B.TECH] DECEMBER 2025-JANUARY 2026

Paper Code: CIC-209

Subject: Data Structures

Time: 3 Hours

Maximum Marks:60

Note: Attempt all questions as directed. Internal choice is indicated.

Q1 Attempt any five of the following questions: (4x5=20)

- a) What is data structure? Explain different classification of data structures.
- b) Write a function/algorithm to implement two stacks using single array.
- c) What is sparse matrix? Explain its types and memory representations.
- d) The pre-order and in-order traversal of a binary tree are given below. Draw corresponding binary tree. Write a recursive algorithm for post-order traversal. Write its equivalent post-order traversal.
Pre-order: A,B,D, E, G,H,C,I,F In-order: D, B, G, E, H, A, I, C, F
- e) Explain the following External sorting with the help of example (i) Natural merge (ii) balanced merge and (iii) Polyphase merge.
- f) What is hashing? Explain any 4 hash function with example.
- g) Consider the following specification of the directed graph G
 $V(G) = \{A, B, C, D, E\}$ $E(G) = \{(A, B), (A, C), (B, C), (C, D), (E, A), (E, B)\}$
Draw its Adjacency matrix, Incidence matrix and Adjacency list.
- h) Explain Union Find Algorithm.

- Q2
- a) Write an algorithm to convert infix expression to prefix expression using stack. Convert the following infix expression to prefix using a stack. $(A-B)/C*((D^E)^F)$ (5)
 - b) What is a DEQUE? What is its type? Write an algorithm/function for deletion from the rear end of a DEQUE. (5)

OR

- Q3
- a) What is an array? What are the advantages and disadvantages of an array? How is a multidimensional array represented in memory? (5)
 - b) Write a function/ algorithm to reverse a singly linked list. (5)

- Q4
- a) Construct an AVL search tree by inserting the following elements in the order of their occurrence. (5)
74, 1, 34, 16, 3, 100, 90
 - b) Explain the insertion of a new value in the max binary heap with the help of example. (5)

OR

- Q5
- a) What is Binary Search tree? Construct a Binary Search tree for the following data in sequence A, D, E, L,M, K, C, P, Z, Q, X (5)
 - b) What is B-tree? What are the properties of B-tree? Construct B-tree of order 3 by inserting the following elements in the order of their occurrence. 110,120,130,140,150,15,255,200,600. (5)

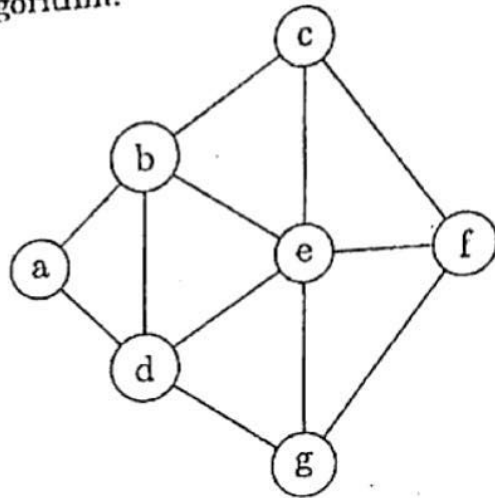
- Q6
- a) Write an algorithm/function for Quicksort? (5)
 - b) Given list of numbers 110,120,124,133,145,167,178, 199,210,220,230. Search the position of 220 using Binary Search algorithm. (5)

Q7

- OR**
- a) What is collision resolution? Explain different techniques of collision resolution with the help of example. (5)
 - b) Write an algorithm/function for Insertion sort. Perform insertion sort on the following values: 34, 54, 24, 84, 4, 64, 74, 14 (5)

Q8

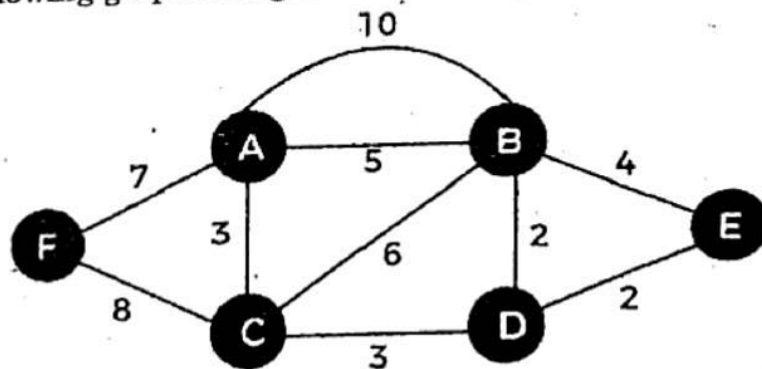
- a) Traverse the following graph using Breadth First Search (BFS) algorithm. (5)



- b) Explain the following terms used in graph with the help of example: (i) isolated vertex (ii) Transitive closure (iii) Minimum Spanning Tree (iv) Complete graph (v) Connected graph (5)

Q9

- OR**
- a) What is Minimum Cost Spanning Tree? Generate MST for the following graph using for Kruskal Algorithm. (5)



- b) Explain Dijkstra's Algorithm with the help of example. (5)
