

(2½ hours)

[Total Marks: 75]

- N. B.: (1) **All** questions are **compulsory**.  
 (2) Make **suitable assumptions** wherever necessary and **state the assumptions** made.  
 (3) Answers to the **same question** must be **written together**.  
 (4) Numbers to the **right** indicate **marks**.  
 (5) Draw **neat labeled diagrams** wherever **necessary**.  
 (6) Use of **Non-programmable** calculators is **allowed**.

**1. Attempt any three of the following:**

15

- List and explain the different asymptotic notations used in data structures.
- What are the different ways in which data structures are classified? Explain in detail.
- What do you mean by complexity of an algorithm? Explain its types.
- Write an algorithm for binary search in an array.
- What is sparse matrix? Explain different types of sparse matrix.
- Explain with the help of an example how to merge two sorted arrays.

**2. Attempt any three of the following:**

15

- Explain the structure and types of linked list.
- Write the algorithm for insertion of a node at the given position and deletion at the end in linked list.
- Write an algorithm to copy one linked list into another linked list.
- Write an algorithm to insert an element at the beginning and end of circular linked list.
- Write and explain an algorithm for inserting at the beginning in two way linked list.
- Explain the different categories of header linked list.

**3. Attempt any three of the following:**

15

- Write the algorithm for push and pop operation of the stack.
- Write the algorithm for converting infix to postfix and convert the following expression to postfix notation using stack.  
 $I=(6+2)*5-8/4$
- Write the algorithm for evaluating a postfix expression using stack and give an example.
- How insertion and deletion operations take place in a queue?
- Explain how queue can be represented using linked list and give the algorithm for insertion in it.
- How priority queues are represented in memory.

**4. Attempt any three of the following:**

15

- Write an algorithm to find the minimum and maximum element in binary search tree.
- Create a heap for the given elements 15 7 10 2 20 15 18.
- Construct a binary tree from its inorder and postorder traversals.  
 In-order: 5 10 12 15 18 20 25 30 35 40 50  
 Post-order: 5 12 18 15 10 25 35 50 40 30 20
- Sort the following elements using selection sort.  
 22 35 17 8 13 44 5 28

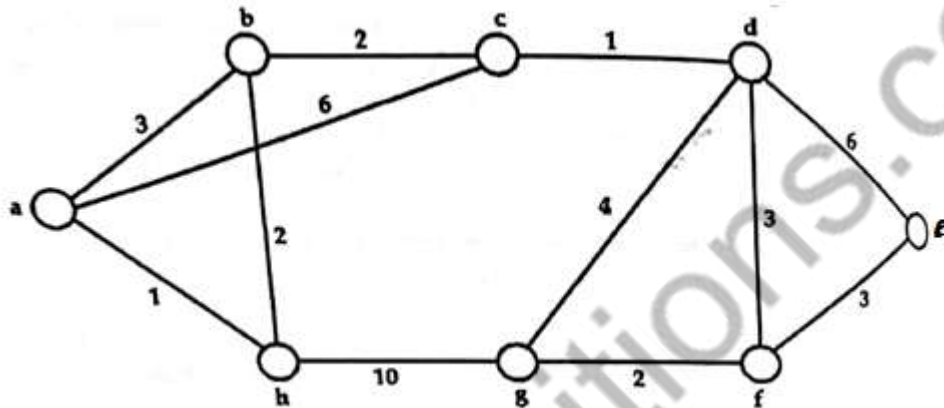
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- e. Write and explain the algorithm for finding a position of a given element and its parent in a binary search tree.
- f. Write the algorithm for inserting in a node in Red-Black tree.

5. Attempt any three of the following:

15

- a. What are the different ways to represent graphs in memory? Explain.
- b. Write and explain the algorithm for best first search in a graph.
- c. Using Prim's algorithm find the minimum spanning tree.



- d. Define the following terms.
  1. Graph.
  2. Weighted graph.
  3. Multi graph.
  4. Directed graph.
  5. Hamiltonian path.
- e. Explain any two collision resolution techniques.
- f. What are hash table and hash functions? Explain folding method and mid square method for constructing hash functions.