Paper / Subject Code: 80702 / Data Structures

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

2.   Attempt *any three* of the following: 15
a.   Explain the structure and types of linked list.
b.   Write the algorithm for insertion of a node at the given position and deletion at the end in linked list.
c.   Write an algorithm to copy one linked list into another linked list.
d.   Write an algorithm to insert an element at the beginning and end of circular linked list.
e.   Write and explain an algorithm for inserting at the beginning in two way linked list.
f.   Explain the different categories of header linked list.

3.   Attempt *any three* of the following: 15
a.   Write the algorithm for push and pop operation of the stack.
b.   Write the algorithm for converting infix to postfix and convert the following expression to postfix notation using stack.
   I=(6+2)*5-8/4
c.   Write the algorithm for evaluating a postfix expression using stack and give an example.
d.   How insertion and deletion operations take place in a queue?
e.   Explain how queue can be represented using linked list and give the algorithm for insertion in it.
f.   How priority queues are represented in memory.

4.   Attempt *any three* of the following: 15
a.   Write an algorithm to find the minimum and maximum element in binary search tree.
b.   Create a heap for the given elements 15 7 10 2 20 15 18.
c.   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
d.   Sort the following elements using selection sort.
    22 35 17 8 13 44 5 28

[TURN OVER]

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.

15

5. **Attempt _any three_ of the following:**

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.
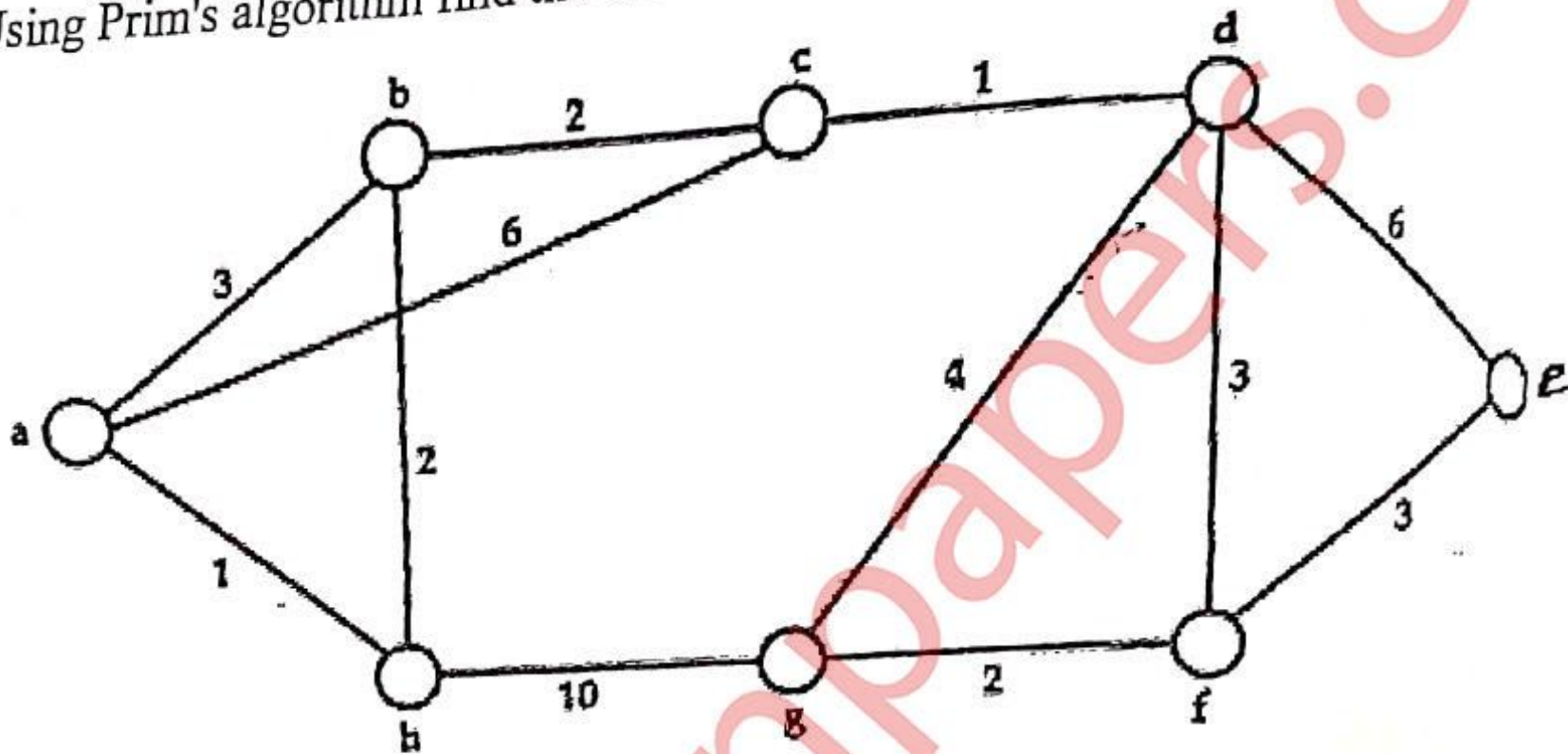
d. Define the following terms.
   1. Graph.
   2. Weighted graph.
   3. Multi graph.
   4. Directed graph.
   5. Hamiltonian path.

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.

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