



Time Allotted : 3 Hours

Full Marks : 70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

**Group-A (Very Short Answer Type Question)**

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (I) The number of elements in the adjacency matrix of a graph having 7 vertices is \_\_\_\_
- (II) What is the average time complexity of selection sort?
- (III) If several elements are competing for the same bucket in the hash table, what is it called?
- (IV) What is the best case time complexity of linear search?
- (V) Write the prefix form of the expression:  $(A + B) * (C - D)$ .
- (VI) In the worst case, what is the number of comparisons needed to search a singly linked list of length  $n$  for a given element
- (VII) What is the average case time complexity for finding the height of the binary tree?
- (VIII) What is direct addressing?
- (IX) What do you mean by divide and conquer algorithm for sorting?
- (X) Write the advantages of array over linked list.
- (XI) Which searching algorithm is better considering the time complexity among linear search and binary search?
- (XII) Write the time complexity of inserting an element in a queue.

**Group-B (Short Answer Type Question)**

Answer any three of the following :

[ 5 x 3 = 15 ]

2. What is threaded binary tree? Explain with example. [5]
3. What is minimum spanning tree? Discuss Krushkal's algorithm in short. [5]
4. What is selection sort? Explain with example. [5]
5. Convert the following Infix Expression to Postfix using stack.  $(A + B) * C - (D - E) * (F + G \wedge H)$  [5]
6. Write a Python program to implement the "Insert at End" and "Delete from End" operation of a doubly Linked List using Class "Node". [5]

**Group-C (Long Answer Type Question)**

Answer any three of the following :

[ 15 x 3 = 45 ]

7. (a) Explain the advantages of doubly linked list and circular linked list over singly linked list. [ 6 ]  
(b) Write a python program for a singly linked list which can perform following operations [ 9 ]
  - i) create the linked list.
  - ii) insert element in any position.
  - iii) delete the element from any position.
8. (a) Define binary search tree. Write algorithm to implement insertion and deletion operation in BST. [ 8 ]  
(b) What is AVL tree? Explain the advantages of AVL tree over general binary search tree. [ 7 ]
9. (a) What is Double Hashing? [ 5 ]  
(b) Discuss the ways of calculating the hash function. [ 7 ]  
(c) Consider a hash table with 100 slots. Collisions are resolved using chaining. Assuming simple uniform hashing, what is the probability that the first 3 slots are unfilled after the first 3 insertions? [ 3 ]
10. (a) Write a Python program to implement Prim's algorithm. [ 10 ]  
(b) Differentiate between BFS and DFS. [ 5 ]
11. (a) Write a Python program for Merge Sort. [ 8 ]  
(b) Write an algorithm with an example for Insertion Sort [ 7 ]