

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

**Q1. Attempt any three of the following:**

[15]

1. Define data structure. State and explain classification of data structures.
2. Explain the operations on data structures.
3. Write a short note on Big O Notation and Big Theta Notation.
4. Explain how sequential search will be used to search for value 19 from the following list of values : 1,3,5,7,11,12,17,19,21,22,24.
5. Write an algorithm for sorting an array in using bubble sort algorithm.
6. What is sparse matrix? Explain it with example.

**Q2. Attempt any three of the following:**

[15]

1. Explain the concept of deletion of a node at the beginning of the linked list.
2. Explain the concept of insertion of an element in a sorted linked list. Also state the algorithm.
3. Explain circular linked list with the application.
4. State and explain the algorithm for traversing and searching operations performed in two-way linked list.
5. Explain the applications of the linked list.
6. Explain the categories of header linked list.

**Q3. Attempt any three of the following:**

[15]

1. Consider the following arithmetic infix expression Q:  
 $Q: 1 + (2 * 3 - (4 / 5 * 6) * 7) * 8$   
Convert Q in to postfix expression P.
2. Discuss the concept of matching parenthesis of stack with suitable example.
3. What is recursion? What are its drawbacks?
4. What is circular queue? Explain with an example, how it is implemented?
5. What is deque? List its different types of deque.
6. Explain the applications of priority queue.

**Q4. Attempt any three of the following:**

[15]

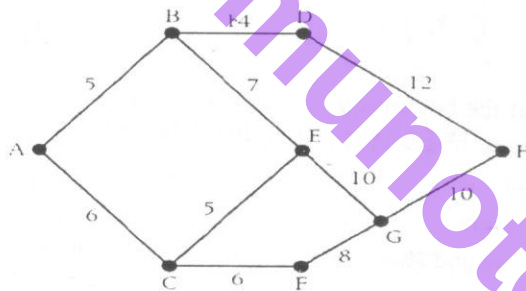
1. What is Heap? Explain the heap sort algorithm.
2. State and explain the algorithm to find the smallest element in of a binary search tree.

3. Explain the different tree traversal techniques.
4. What is complete binary tree? State the properties of binary tree.
5. Explain AVL tree with example.
6. Binary tree T has 9 nodes. The Inorder and preorder traversal of traversal of T yield the following sequence of nodes.  
 Inorder: 5,1,3,11,6,8,4,2,7  
 Preorder: 6,1,5,11,3,4,8,7,2  
 Draw the complete binary tree.

**Q5. Attempt any three of the following:**

[15]

1. Define the following:
  - a. Path matrix
  - b. Strongly connected graph
  - c. Adjacent Vertices
  - d. Multigraph
  - e. Hamiltonian path
2. Use Dijkstra's algorithm to find the shortest distance from A to H.



3. What is an adjacency matrix?
4. What is Rehashing? When to Rehash? State the advantages of rehashing.
5. Differentiate between DFS and BFS graph traversal algorithms.
6. List the algorithm for finding the MST. Explain any one with suitable example.