

333453(22)

**B. E. (Fourth Semester) Examination,
April-May 2021**

(New Scheme)

(IT Engg. Branch)

DATA STRUCTURES and ALGORITHM ANALYSIS

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : Attempt all questions. Part (a) from each question is compulsory and carries 2 marks. Attempt any two parts from (b), (c) and (d) which are of 7 marks each.

Unit-I

1. (a) Differentiate between linear and non-linear data structures.

- (b) Discuss the different steps in the development of an algorithm? What is analysis of an algorithm? Explain time and space complexity of an algorithm.
- (c) What do you mean by sparse matrix? How matrix is represented using Array? Write a menu-driven 'C' program to input a matrix and display corresponding matrices :
- (i) Identity matrix
 - (ii) Lower-Triangular matrix
- (d) Write an algorithm to input two matrices and output the product of the two matrices.

Unit-II

2. (a) Define Header Linked List. Specify the use of Header Node.
- (b) Write an algorithm to evaluate a postfix expression and evaluate the following postfix expression using stack :

6, 2, 3, +, -, 3, 8, 2, /, +, *, 2

Note : Stands for power and all operands are single digit.

[3]

- (c) What is Deque? What are the advantages of Deque? Explain different types of Deque and different operations that can be done in a Deque.
- (d) Write an algorithm for the following in a singly linked list :
- (i) Inserting a node in between any two nodes
 - (ii) Deleting a node from the end of the list

Unit-III

3. (a) Which sorting algorithm is best if the list is already sorted? Why?
- (b) Explain the working of selection sort by writing an algorithm? Sort the sequence 3, 1, 4, 1, 5, 9, 2, 6, 5 using selection sort.
- (c) Sort the elements 50, 23, 9, 18, 61, 32 using :
- (i) Merge sort
 - (ii) Quick sort
- (d) Write an algorithm for binary search and discuss its speed compared with linear search.

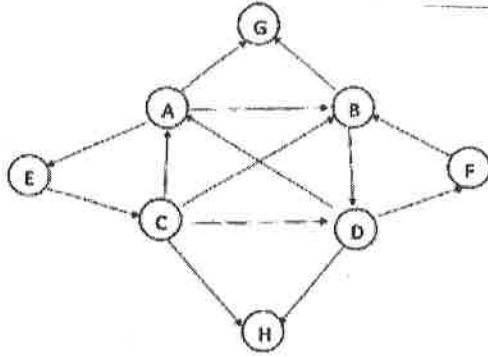
Unit-IV

4. (a) Define threaded binary tree. What are the types of threaded binary tree?
- (b) Draw a Binary search tree for the following input list 60, 25, 75, 15, 50, 66, 33, 44. Trace the algorithm to delete the nodes 25, 75, 44 from the tree.
- (c) What is height balanced tree? What do you mean by balance factor of a node in an AVL tree? Describe the different rotations defined for AVL tree.
- (d) Explain heap as a data structure. Build a Max Heap by investing the following data arriving as a sequential set 23, 7, 92, 6, 12, 14, 40, 44, 20, 21. Show the heap after deleting 2 elements.

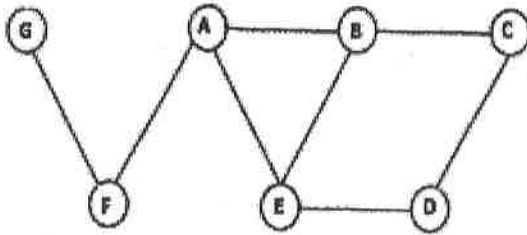
Unit-V

5. (a) What is a graph?
- (b) Create the Adjacency matrix and Adjacency List of the graph given below :

[5]



- (c) What is the difference between DFS and BFS?
When is DFS and BFS used perform BFS on the following graph, starting at vertex A :



- (d) What is a minimum spanning tree? Write Kruskal's algorithm to find a minimum spanning tree. Determine the minimum spanning tree of the following graph :

[6]

