

Roll No.

Total No. of Pages : 02

Total No. of Questions : 09

MCA (2012 & Onward) (Sem.-2)

DATA STRUCTURES

Subject Code : MCA-203

Paper ID : [B0135]

Time : 3 Hrs.

Max. Marks : 100

INSTRUCTIONS TO CANDIDATES :

- 1. SECTIONS-A, B, C & D contains TWO questions each carrying TWENTY marks each and students has to attempt any ONE question from each SECTION.**
- 2. SECTION-E is COMPULSORY consisting of TEN questions carrying TWENTY marks in all.**
- 3. Use of non-programmable scientific calculator is allowed.**

SECTION-A

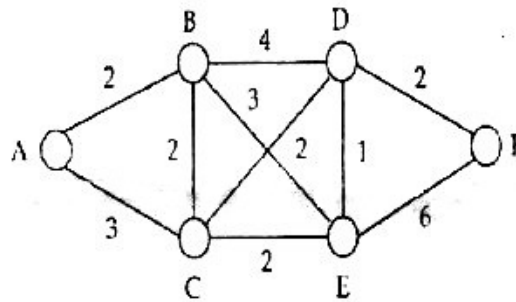
1.
 - a) What is a data structure? What are the various operations that can be performed on it? Explain with examples. Explain Big-O asymptotic notation with suitable example.
 - b) How are one-dimensional, two-dimensional and three-dimensional arrays initialized and represented in main memory? Explain with example program.
2.
 - a) What is a 'stack' data structure? Write an algorithm which reverses the order of elements on stack using one additional stack and some additional variables.
 - b) Explain the advantages of a linked list over arrays. Write an algorithm to insert and delete an element in a singly-linked list.

SECTION-B

3.
 - a) What is a binary search tree? Explain with the help of an example. What are its advantages?
 - b) Implement recursive versions of pre-order, in-order and post-order traversal algorithms of a binary tree.
4.
 - a) Define height of a tree. Give an algorithm to determine the height of a tree.
 - b) Write a short note on 'Tree representation using Arrays and operations'.

SECTION-C

5. a) Write an algorithm to represent different operations on graphs using the adjacency lists.
b) Write an algorithm/C++-program to traverse the graph using the Depth First Search (DFS) traversal method.
6. Name and define various types of graphs. Using Dijkstra's algorithm, find the shortest path between A and F for the following graph. Show the intermediate steps also.



SECTION-D

7. a) Write an algorithm for the implementation of Binary Search. What are its Space and Time complexities?
b) Describe an algorithm for Heap sort. Give step-by-step working of the algorithm for the following set of data : 23, 16, 19, 3, 53, 9, 17, 1, and 89.
8. a) What are the different methods for collision resolution in hashing? Explain Linear Probing.
b) Write an algorithm for 2-way merge sort. Sort the following numbers and show all intermediate steps : 7, 19, 39, 5, 72, 115, 13, 44, and 56.

SECTION-E

9. **Write briefly :**
 - a) What are features of an algorithm?
 - b) What do you mean by garbage collection?
 - c) Define Dequeue.
 - d) What are the differences between B-trees and B+ trees?
 - e) The postfix equivalent of the prefix $* + a b - c d$ is_____.
 - f) Is recursive algorithm always efficient than non-recursive? Explain.
 - g) What is stable sorting algorithm?
 - h) Give applications of hashing.
 - i) Define max-heap property in data structures.
 - j) Give average case and worst case time complexity of insertion sort.