2022

1st Semester Examination

MCA

Paper : MCA 103

(Data Structure and Algorithm)

Full Marks : 70 Time : Three Hours

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

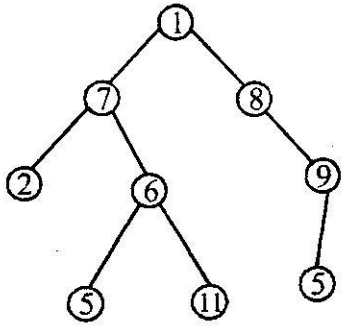
Group - A

Answer any ***five*** questions : 2×5=10

1. (i) Define complete binary tree with an example.

   (ii) What are the important features of an algorithm?

   (iii) Show the level order traversal of the following tree



P.T.O.

(iv) What do you mean by asymptotic analysis of an algorithm?

(v) How is a problem solved using branch and bound technique?

(vi) What is the necessity of approximation algorithm?

(vii) What do you mean by peep operation in a stack?

(viii) What are the advantages of linked list over array?

Group - B

Answer any ***four*** questions : 15×4=60

2. Convert the following infix expression into postfix expression. Show each step in detail.

$$(A+(B*C-(D/E\wedge F)+G)*H)$$

Write down the algorithm of quicksort. Explain why worst case time complexity of quicksort is more than the average case. 5+8+2

3. Explain operations on doubly linked list in detail with function for add and delete from doubly linked list. Why a tail recursive function is preferred to its non-tail recursive equivalent? What is threaded binary tree? Explain how a binary tree is transform into a threaded binary tree with an example. 7+3+2+3

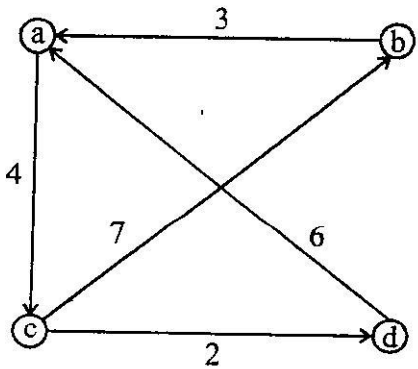
4. Write an algorithm to check wheather a given list is palindrome or not using stack. Explain dynamic programming approach using a suitable example. 8+7

5. Implement radix sort on the following numbers :

   23, 55, 29, 41, 36, 90 12 7+8

   Briefly explain how Kruskal's algorithm is used to find out the minimum spanning tree of a graph using a suitable example.

6. Derive the all-pair shortest path from the following graph by Floyd-Warshall algorithm using dynamic programming approach.



   Write short notes on : polynomial addition using array. 8+7

7. Derive the longest common subsequence from the string "BCDABC" and "CBADCA" using dynamic programming approach. What do you mean by sparse matrix? Why do we need different representation for sparse matrix. 10+3+2

P.T.O.

8. Explain greedy approach with a suitable example. What is the difference between performance analysis and performance measurement? How can we achieve performance analysis? 9+3+3

9. What do you mean by tractable problems? Define class P and class NP problems. What do you mean by reduction? When a problem is called a NP-complete problem? Define row-major and column-major representation of a matrix. 2+5+2+3+3

2. Answer any ***four*** questions : 15×4=60

(a) What do you mean by the term "Software process model"? With the help of a diagram explain the activities carried out in the Prototyping model of software development. 3+12

(b) (i) Discuss the principle aim of Software Project Management.

(ii) Explain the major responsibilities of a software project manager.

(iii) Explain the term Project Planning. 8+4+3

(c) What are the popular metrics to measure project size? Explain any two of them. 3+12

(d) What are the different categories of software development projects according to the COCOMO estimation model? Explain in detail the basic COCOMO estimation technique. 5+10

(e) What do you understand by the term "Risk" and "Risk management"? Discuss briefly the activities of risk management. 3+12

(f) Define the term Cohesion and Coupling. Explain the different types of Cohesion and Coupling. 3+12

(g) What do you mean by Software Configuration and Software Configuration management? Explain the different activities of Software Configuration management. 3+12

(h) Write short notes : (i) SPMP document (ii) Types of Testing. (iii) Cyclomatic complexity. 5+5+5