Roll No. .... Total Pages : 4

MCA/D-15 **10616**

DESIGN AND ANALYSIS OF ALGORITHMS

Paper–MCA-14-33

Opt.–(01)

Time Allowed : 3 Hours] [Maximum Marks : 80

Note : Attempt **five** questions in all, selecting at least **one** question from each Unit. Question No. **1** is compulsory. All questions carry equal marks.

Compulsory Question

1. (a) What do you understand by the term Complexity? What are various types of complexities?

   (b) Differentiate between Binary and Depth first Searching.

   (c) What do you understand by "Recurrence"?

   (d) Differentiate between NP-hard and NP-complete.

   (e) What do you understand by Hash function?

   (f) Write down the algorithm for counting Sort.

   (g) What is a Graph?

   (h) Give the Imitation of Dijkstra's algorithm.

   2×8=16

UNIT–I

2. (a) Derive the time complexity of "Quick Sort" in Best, Worst and Average cases with explanation.

    8

   (b) Use Master method to give tight asymptotic bounds for the following :   8

       (i) $T(n) = 4T(n/2) + n^2$

       (ii) $T(n) = T(n/2) + \Theta(1)$.

3. What is Bucket sort? Explain the algorithm for Bucket sort. Sort the following list using the same algorithm:

    2   14   30   18   12   8

    Also give its time complexity.   16

UNIT–II

4. (a) What is Matrix Chain Multiplication? Explain with example.   8

   (b) Write an algorithm to insert an element X from a binary tree T. What is the complexity of your algorithm?   8

5. Write down the algorithm for finding out the Longest Common Subsequence (LCS). Find the LCS of :

    $S_1 = $ a a b c d a c f

    $S_2 = $ d e a b f.

UNIT–III

6. (a) Describe Huffman codes in brief. 8

   (b) What are Flow networks? Explain their use in brief. 8

7. Discuss Bellman-Ford's algorithm to solve single pair shortest path problem. Also, find the shortest path in the given problem : 16
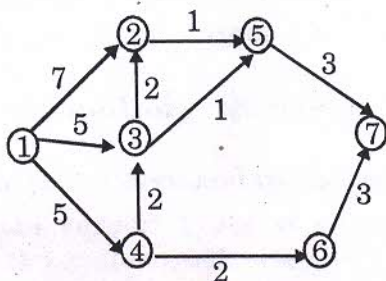
UNIT–IV

8. (a) What is Travelling Salesman Problem? Explain with example. 8

   (b) Explain Rabin-Karp string matching algorithm with example. 8

9. (a) Consider five items along with their respective weights and profits : 8

   Wi = (8, 16, 24, 18, 42)

   Pi = (37, 42, 115, 80, 123).

   The Knapsack has capacity m = 60. Find out the solution to the 0/1 knapsack problem.

(b) Explain the following terms :   2×4

    (i) Satisfiability

    (ii) Vertex cover

    (iii) Clique

    (iv) Independent set.