Total No. of Questions: 6 *Total No. of Printed Pages:3*

Enrollment No.....

Faculty of Engineering

End Sem Examination Dec-2023

IT3CO34 Design & Analysis of Algorithms

Programme: B.Tech. Branch/Specialisation: IT

Duration: 3 Hrs. **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d. Assume suitable data if necessary. Notations and symbols have their usual meaning.

Q.1 i. An algorithm is _____. **1**

(a) A problem
(b) A procedure for solving a problem
(c) A real-life mathematical problem
(d) None of these

ii. Which of the following data structure is used to perform recursion? **1**

(a) Linked list (b) Array (c) Queue (d) Stack

iii. Which of the following sorting algorithms provide the best time complexity in the worst-case scenario? **1**

(a) Merge sort (b) Quick sort
(c) Bubble sort (d) Selection sort

iv. In what time complexity can we find the diameter of a binary tree optimally? **1**

(a) O(V+E) (b) O(V) (c) O(E) (d) O (V * log E)

v. Dijkstra's algorithm is used to solve _____ problems? **1**

(a) Network lock (b) Single source shortest path
(c) All pair shortest path (d) Sorting

vi. Which of the following algorithms are used to find the shortest path from a source node to all other nodes in a weighted graph? **1**

(a) BFS (b) Djikstra's algorithm
(c) Prims algorithm (d) Kruskal's algorithm

vii. Identify the approach followed in Floyd Warshall's algorithm? **1**

(a) Linear programming (b) Dynamic programming
(c) Greedy technique (d) Backtracking

P.T.O.

viii. You are given a knapsack that can carry a maximum weight of 60. There are 4 items with weights {20, 30, 40, 70} and values {70, 80, 90, 200}. What is the maximum value of the items you can carry using the knapsack? **1**

(a) 160 (b) 200 (c) 170 (d) 90

ix. Which of the following is used for solving the N Queens Problem? **1**

(a) Greedy algorithm (b) Dynamic programming

(c) Backtracking (d) Sorting

x. Which of the following is known to be not an NP-Hard Problem? **1**

(a) Vertex cover problem

(b) 0/1 Knapsack problem

(c) Maximal independent set problem

(d) Travelling salesman problem

Q.2 i. Why greedy algorithms may not always produce optimal solutions? **2**

ii. Explain asymptotic notations. **3**

iii. Solve the recurrence $T(n) = 7T(n/2) + n^3$. **5**

OR iv. Sort the following list using Insertion and Selection sort algorithms, displaying each step. 66, 44, 30, 15, 20, 35, 75, 20, 50, 48, 70, 110, 30 **5**

Q.3 i. Write any four differences between heap sort & merge sort. **2**

ii. Explain Strassen's algorithm for matrix multiplication. **8**

OR iii. Explain how quicksort works? Solve using quicksort algorithm- 9, -3, 5, 2, 6, 8, -6, 1, 3 **8**

Q.4 i. Define job sequencing with deadline problem. **3**

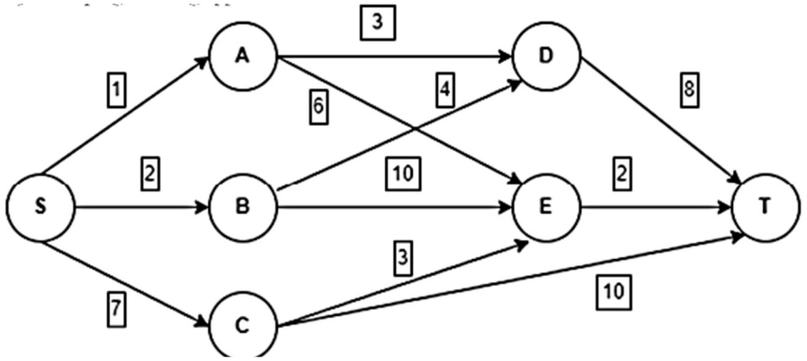
ii. Write the Kruskal's algorithm for minimum spanning tree. Analyse its complexity. **7**

OR iii. Encode "aacdeaab" using Huffman code. Derive output string, codes and final tree. **7**

Q.5 i. What problem does the Warshall algorithm solve? How does it work? **4**

ii. Consider the problem having weights and profits are: **6**
Weights: {3, 4, 6, 5}, Profits: {2, 3, 1, 4}. The weight of the knapsack is 8 kg. To maximize the profit apply Dynamic programming to solve the problem.

OR iii. Solve the below graph for the shortest path using multistage graph method with dynamic programming approach. **6**

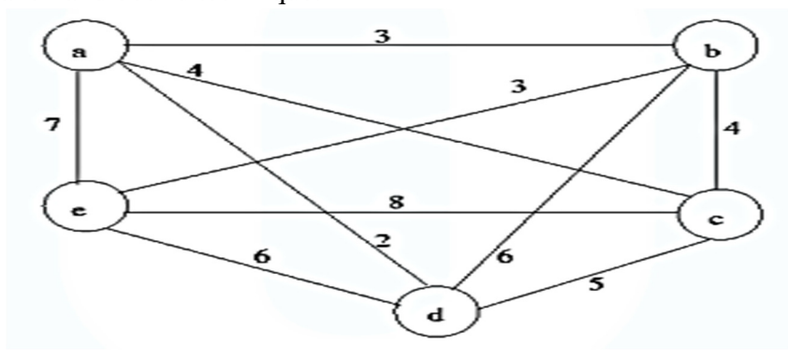


Q.6 Attempt any two:

i. Define NP- Hard and NP – complete problems. What are the steps used to show a given problem is NP-Complete? **5**

ii. How backtracking can be used to solve N-queens problem. **5**

iii. Solve travelling salesman problem for the following graph using branch and bound technique. **5**



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