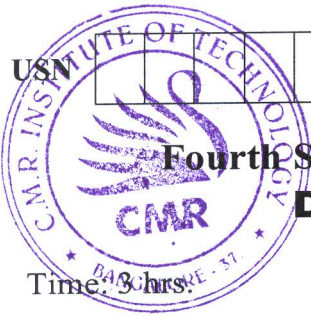USN | | | | | | | | | | |

17CS43

Fourth Semester B.E. Degree Examination, June/July 2023
Design and Analysis of Algorithms

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1   a. Explain the fundamentals of algorithmic problem solving with neat diagram. Mention different problem types. **(12 Marks)**

    b. Explain the basic asymptotic notations used to check the algorithms time efficiencies with diagram. **(08 Marks)**

OR

2   a. Describe the general steps used to obtain time complexity for non-recursive algorithms. **(12 Marks)**

    b. Write an algorithm to compute n! recursively. Set up a recurrence relation for the algorithms basic operation count and solve it. **(08 Marks)**

Module-2

3   a. Write an algorithm to find minimum and maximum element of given array. Prove that algorithm in efficient. **(10 Marks)**

    b. Explain the Strassen's matrix multiplication with suitable example and analyse it using master theorem. **(10 Marks)**

OR

4   a. Write an algorithm to sort the given array elements using divide and conquer design strategy where partition is based on index value. Sort the given array elements: 25, 38, 15, 34, 18 **(12 Marks)**

    b. Explain the topological sorting with suitable example. **(08 Marks)**

Module-3

5   a. What is greedy method? Write an algorithm to find minimum cost spanning tree using Kruskal's algorithm. Explain with suitable example. **(10 Marks)**

    b. Consider the items n = 4 and profits = {10, 30, 25, 55} and weights = {2, 3, 5, 1} with capacity m = 5. Find the optimal solution for this using Knapsack problem under greedy method. **(10 Marks)**

OR

6   a. Explain the heap construction. Sort the given elements {30, 13, 57, 24, 10, 6, 19} using heap sort. **(10 Marks)**

    b. Construct a Huffman tree for the following data and obtain its Huffman code:

Character	A	B	C	D	E	-
Probability	0.5	0.35	0.5	0.1	0.4	0.2

Encode the given data: DAD

(10 Marks)

Module-4

7 a. What is transitive closure? Write an algorithm to find the transitive closure of the given graph and mention the time complexity. **(08 Marks)**

   b. Write an algorithm to find shortest path from every vertex to remaining all vertices. Apply the algorithm to find all pair shortest path for the given graph. [Fig.Q7(a)]
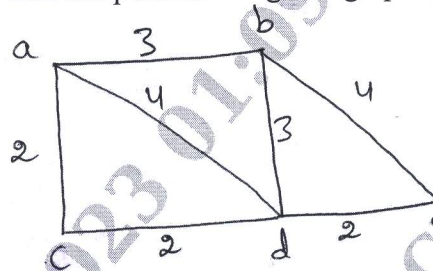

Fig.Q7(a) **(12 Marks)**

OR

8 a. Write the Bellman ford algorithm to find shortest path. Find the single source shortest path for the given graph. Use ① as source vertex.
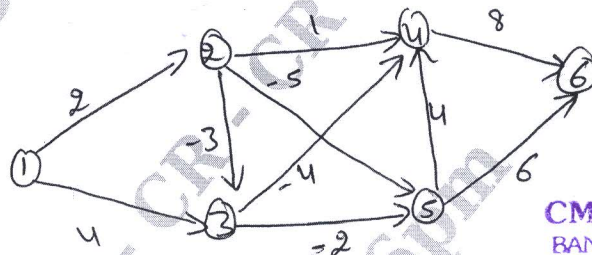

Fig.Q8(a) **(14 Marks)**

   b. Explain the reliability design problem under dynamic programming approach with suitable example. **(06 Marks)**

Module-5

9 a. Explain the backtracking method. Find the solution for u-queens problem with the help of state-space tree. **(10 Marks)**

   b. Write an algorithm to find solution for the graph coloring problem. Explain it with suitable example. **(10 Marks)**

OR

10 a. What is branch and bound technique? Apply the branch and bound design strategy for assignment of jobs to the given matrix.

$$\begin{array}{c} \\ a \\ b \\ c \\ d \end{array} \begin{array}{cccc} J_1 & J_2 & J_3 & J_4 \\ \begin{bmatrix} 4 & 2 & 6 & 5 \\ 9 & 3 & 4 & 8 \\ 3 & 1 & 7 & 2 \\ 6 & 4 & 7 & 8 \end{bmatrix} \end{array}$$

(12 Marks)

   b. Write short notes on:
   (i)   NP complete problem
   (ii) NP hard problem
   (iii) Travelling salesman problem
   (iv) Subset sum problem
   Provide sufficient examples for each. **(08 Marks)**

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