H Roll No. .....

# TMC–301

## M. C. A. (THIRD SEMESTER)

## END SEMESTER

## EXAMINATION, Dec., 2023

DESIGN AND ANALYSIS OF ALGORITHM

**Time : Three Hours**

**Maximum Marks : 100**

**Note :** (i) All questions are compulsory.

(ii) Answer any *two* sub-questions among (a), (b) and (c) in each main question.

(iii) Total marks in each main question are **twenty**.

(iv) Each sub-question carries 10 marks.

1. (a) Define an Algorithm. Write a recursive Algorithm to find the Factorial of a function and find its complexity. (CO1)





(c) Explain Bellman Ford Algorithm with proper example. (CO4)

5. (a) Compare between NP-hard and NP-complete. (CO5)

(b) Explain Robin-Karp Algorithm for Pattern Searching with the help of an example. (CO5)

(c) Construct an optimal travelling sales person tour using Dynamic Programming. (CO5)

$$\begin{pmatrix} 0 & 10 & 9 & 3 \\ 5 & 0 & 6 & 2 \\ 9 & 6 & 0 & 7 \\ 7 & 3 & 5 & 0 \end{pmatrix}$$

630

(b) Explain the following notation for growth rate of function : (CO1)

(i) O(big-Oh)

(ii) θ(theta)

(iii) Ω(omega)

(c) Write Divide–And–Conquer recursive Quick sort algorithm and analyse the algorithm for average time complexity. (CO1)

2. (a) Discuss the various cases of insertion of key in red-black tree for given sequence of key in an empty red-black tree : (CO2)

{15, 13, 12, 16, 19, 23, 5, 8}

(b) Write an algorithm for In-order and Pre-order traversal. Also analyse its time and space complexity. (CO2)

(c) Show the results of inserting the keys : (CO2)

F, S, Q, K, C, L, H, T, V, W, M, R, N, P, A, B, X, Y, D, Z, E

in order into an empty B-tree. Use $t = 3$, where $t$ is the minimum degree of B-tree. (CO2)



3. (a) Explain Backtracking Method. What is N-Queens Problem ? Give solution of 4-Queens Problem using Bactracking Method. (CO3)

(b) Explain Matrix Chain Multiplication with an example. (CO3)

(c) Find an optimal solution to the knapsack instance $n = 4$ objects and the capacity of knapsack $m = 15$, profits (10, 5, 7, 11) and weight are (3, 4, 3, 5). (CO3)

4. (a) Explain Breadth First Traversal Method for Graph with example. (CO4)

(b) What is Minimum Spanning Tree (MST) ? Explain Kruskal's algorithm to create the MST for the following graph : (CO4)