R18 Regulation *Subject code:2P5ED*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A+' Grade)

B.Tech V Semester Supplementary Examinations, May 2025

DESIGN AND ANALYSIS OF ALGORITHMS

(CSE)

Maximum Marks: 70 Date: 24.06.2025 Duration: 3 hours

Note: **1.This question paper contains two parts A and B.**
2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
3. Part B consists of 5 Units. Answer any one full question from each unit.
4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks (10X2M=20 Marks)		Marks	CO	BTL
1	Define Space and Time Complexities?	2M	1	L1
2	Mention the criteria to be satisfied by an algorithm.	2M	1	L1
3	What is an articulation point in a graph? Give two examples.	2M	2	L1
4	Write the algorithms for Collapsing Find and Weighted Union.	2M	2	L1
5	What is an optimization Problem? Describe it with an Example.	2M	3	L1
6	Define Spanning tree	2M	3	L1
7	Write the general procedure of dynamic programming.	2M	4	L1
8	What is the difference between 0/1 Knapsack and fractional Knapsack	2M	4	L1
9	What are the differences between backtracking and branch & bound algorithm design Techniques?	2M	5	L1
10	Define P and NP class of problems.	2M	5	L1

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	BTL
11	a) Use Back Substitution Method to show the time complexity taken for the above Recurrence Relation $T(n) = \begin{cases} 1 & n=0 \\ 2T(n-1)+1 & n>0 \end{cases}$ b) Write a Short note on Properties of Asymptotic Notations.	5M 5M	1	L2
	OR			
12	a) Explain various asymptotic notations used in algorithm design in detail. b) Discuss the working strategy of merge sort and illustrate the process of merge sort algorithm for the given data: 43, 32, 22, 78, 63, 57, 91 and 13.	5M 5M	1	L2
13	What is Graph coloring? Write an algorithm and explain with an example	10M	2	L2
	OR			
14	Write an algorithm to implement 8-Queens Problem. Analyze the algorithm for its space & time complexity.	10M	2	L2

15	Find the feasible solutions and optimal solution for the following knapsack instance n=7, m=15, (p1, p2,…,p7) = (10,5,15,7,6,18,3) and (w1,w2,…,w3) = (2,3,5,7,1,4,1).	10M	3	L2
	OR			
16	a) Discuss about All pairs shortest path problem with suitable example. b) Discuss briefly about the minimum cost spanning tree.	5M 5M	3	L2
17	a) State Chained Matrix Multiplication Problem and explain it considering the following matrices Matrix size A1 5X4 A2 4X7 A3 7X6 A4 6X2. b) Device an algorithm for the above problem	5M 5M	4	L2
	OR			
18	Explain Travelling salesman problem. Give and analyze the algorithm with suitable example.	10M	4	L2
19	a) State and prove Cook's theorem. b) Give and explain the relationship between P, NP, NP Complete and NP Hard.	5M 5M	5	L2
	OR			
20	State travelling salesperson problem. Apply Branch and Bound algorithm to solve the TSP instantiated by the following cost matrix. $\begin{bmatrix} \infty & 20 & 30 & 10 & 11 \\ 15 & \infty & 16 & 4 & 2 \\ 3 & 5 & \infty & 2 & 4 \\ 19 & 6 & 18 & \infty & 3 \\ 16 & 4 & 7 & 16 & \infty \end{bmatrix}$	10M	5	L2