



R22 Regulation **Subject code: 4E4EB**
TKR COLLEGE OF ENGINEERING AND TECHNOLOGY
 (Autonomous, Accredited by NAAC with 'A+' Grade)

B.Tech IV Semester Supplementary Examinations, December 2024

DESIGN AND ANALYSIS OF ALGORITHMS
(Common to CSE, CSE(AI&ML) & CSE(DS))

Maximum Marks: 60

Date: 05.12.2024

Duration: 3 hours

- Note:
1. This question paper contains two parts A and B.
 2. Part A is compulsory which carries 10 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		CO	Bloom Tx
All the following questions carry equal marks (10X1M=10 Marks)			
1.a)	What are the three main steps in the divide and conquer method?	1	L1
b)	What does algorithm specification refer to?	1	L1
c)	What does the graph coloring problem aim to achieve in backtracking?	2	L1
d)	What distinguishes an AND/OR graph from a standard graph?	2	L1
e)	What is the goal of the job sequencing with deadlines problem?	3	L1
f)	What does the single source shortest path problem aim to find?	3	L1
g)	List the applications of dynamic programming.	4	L1
h)	What does the all pairs shortest path problem aim to find?	4	L1
i)	What is the significance of Cook's Theorem in computational complexity theory?	5	L1
j)	What does NP stand for in computational complexity theory?	5	L1
Part-B			Bloom Tx level
Answer All the following questions. (5X10M=50Marks)			
2	A) Explain the concept of randomized algorithms and discuss the benefits and drawbacks of using randomized algorithms with specific examples such as randomized quicksort. [5M] B) What is merge sort. Explain with an example. [5M]	1	L2
OR			
3	A) Describe the divide and conquer strategy and provide detailed explanations of its application in binary search, merge sort, quicksort, and Strassen's matrix multiplication. [5M] B) Compare performance analysis between space complexity and time complexity? [5M]	1	L2
4	A) Define connected components and spanning trees in graph theory. Illustrate their importance with examples and describe an algorithm to find a minimum cost spanning tree. [5M] B) Explain the application in solving sum of subsets problem? [5M]	2	L2
OR			

5	A) What are bi-connected components in a graph? Describe an algorithm to find bi-connected components and discuss its applications. [5M] B) Describe the graph coloring problem and how backtracking can be used to solve it. Discuss its applications and provide an example. [5M]	2	L2																									
6	A) Explain job sequencing with deadlines. [5M] B) Discuss how greedy method can be applied to the knapsack problem. [5M]	3	L2																									
OR																												
7	Using Dijkstra's algorithm, create a solution for finding the shortest path from a source vertex to all other vertices in the following graph: [10M] <ul style="list-style-type: none"> • Vertices: A, B, C, D, E, F • Edges and weights: <ul style="list-style-type: none"> ○ A-B: 4 ○ A-C: 2 ○ B-C: 5 ○ B-D: 10 ○ C-E: 3 ○ D-F: 11 ○ E-D: 4 ○ E-F: 6 	3	L3																									
8	A) Apply the dynamic programming approach to solve a small instance of the Travelling Salesperson Problem (TSP). Given four cities with the following distances: [5M] <table style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <tr> <td></td> <td style="border-right: 1px solid black; padding: 5px;"><i>A</i></td> <td style="padding: 5px;"><i>B</i></td> <td style="padding: 5px;"><i>C</i></td> <td style="padding: 5px;"><i>D</i></td> </tr> <tr> <td style="padding: 5px;"><i>A</i></td> <td style="border-right: 1px solid black; padding: 5px;">0</td> <td style="padding: 5px;">10</td> <td style="padding: 5px;">15</td> <td style="padding: 5px;">20</td> </tr> <tr> <td style="padding: 5px;"><i>B</i></td> <td style="border-right: 1px solid black; padding: 5px;">10</td> <td style="padding: 5px;">0</td> <td style="padding: 5px;">35</td> <td style="padding: 5px;">25</td> </tr> <tr> <td style="padding: 5px;"><i>C</i></td> <td style="border-right: 1px solid black; padding: 5px;">15</td> <td style="padding: 5px;">35</td> <td style="padding: 5px;">0</td> <td style="padding: 5px;">30</td> </tr> <tr> <td style="padding: 5px;"><i>D</i></td> <td style="border-right: 1px solid black; padding: 5px;">20</td> <td style="padding: 5px;">25</td> <td style="padding: 5px;">30</td> <td style="padding: 5px;">0</td> </tr> </table> B) Find the minimum cost tour that visits each city exactly once and returns to the starting city. Show the steps involved in your solution. [5M]		<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>A</i>	0	10	15	20	<i>B</i>	10	0	35	25	<i>C</i>	15	35	0	30	<i>D</i>	20	25	30	0	4	L3
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<i>D</i>	20	25	30	0																								
OR																												
9	A) Describe how dynamic programming can be used to optimize the reliability of a system composed of multiple components. [5M] B) Explain all pairs shortest path problem with an example. [5M]	4	L2																									
10	A) Definition and significance of NP-Hard and NP-Complete classes. [5M] B) Describe the Branching and Bounding techniques in detail? [5M]	5	L2																									
OR																												
11	Explain its application to the 0/1 Knapsack Problem using the LC Branch and Bound solution. [10M]	5	L2																									