



**B.Tech IV Semester Supplementary Examinations, December 2024**

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

**Maximum Marks: 70**

Date:10.12.2024

Duration: 3 hours

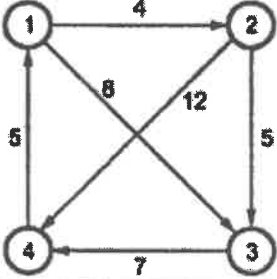
- Note:
1. This question paper contains two parts A and B.
  2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
  3. Part B consists of 5 Units. Answer any one full question from each unit which carries 10M.
  4. Each question carries 10 marks and may have a, b, c, d as sub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

**Part-A**

All the following questions carry equal marks (10X2M=20) Marks)		CO	Bloom Tx
1	In what way a time complexity differs from space complexity	1	L1
2	Give the general plan of divide and conquer algorithms.	1	L1
3	Write an algorithm for find and union.	2	L1
4	List the applications of backtracking	2	L1
5	What is an optimization Problem? Describe it with an Example.	3	L1
6	Define Spanning tree	3	L1
7	What is the essential difference between Greedy Method and Dynamic Programming?	4	L1
8	Construct the possible binary search trees with the numbers 1, 2, 3, 4, 5, 6 such that the height of the tree must be 6.	4	L1
9	What are the searching techniques that are commonly used in branch & bound method.	5	L1
10	Define NP-Hard problems.	5	L1

**Part-B**

Answer All the following questions. (5X10M=50Marks)		CO	Bloom Tx
11	A) What are the different mathematical notations used for algorithm analysis. [5M] B) Write Divide – and – Conquer recursive Quick sort algorithm and analyze the algorithm for average time complexity. [5M]	1	L2
OR			
12	A) Explain recursive binary search algorithm for the given data:2,4,8,9,11,13,15,16,24,30,33,42,48 and key=16 with time complexity analysis. [5M] 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]	1	L2
13	Explain in detail Sum of Subsets algorithm and discuss the possible solution strategies using backtracking for below weights W[1:6]={5,10,12,13,15,18},m=30 [10M]	2	L2

	OR		
14	Briefly explain n-queen problem using backtracking with a suitable example. [10M]	2	L2
15	Find the feasible solutions and optimal solution for the following knapsack instance $n=7, m=15, (p_1, p_2, \dots, p_7) = (10, 5, 15, 7, 6, 18, 3)$ and $(w_1, w_2, \dots, w_7) = (2, 3, 5, 7, 1, 4, 1)$ . [10M]	3	L2
	OR		
16	Define and explain Prim's Algorithm, give pseudo-code and trace it with a suitable example [10M]	3	L2
17	A) Design an algorithm for All Pairs Shortest Path Algorithm. Mention its complexity. [5M] B) Calculate the shortest paths between all pairs of vertices using dynamic programming strategy for the following graph. [5M]	4	L2
			
	OR		
18	A) Define Reliability Design Problem [2M] B) Design a reliable three state system with three device types D1, D2 and D3. The costs are \$30, \$15 and \$20 respectively. The cost of system is to no more than \$105. The reliability if each device type is 0.9, 0.8 and 0.5 respectively. [8M]	4	L2
19	A) State 0/1 Knapsack problem and design an algorithm of LC Branch and Bound. [5M] B) Find the solution for the 0/1 knapsack instance of $n = 4, (p_1, p_2, p_3, p_4) = (10, 10, 12, 18), (w_1, w_2, w_3, w_4) = (2, 4, 6, 9)$ and $M = 15$ . [5M]	5	L2
	OR		
20	State and prove 3-satisfiability problem is NP-Complete. [10M]	5	L2