



SCHOOL OF COMPUTER SCIENCE AND ENGINEERING
CONTINUOUS ASSESSMENT TEST - I
WINTER SEMESTER 2024-2025

SLOT: E1

Programme Name & Branch : B.Tech CSE and Business Systems
Course Code and Course Name : CBS3003, Design and Analysis of Algorithms
Faculty Name(s) : Dr. Mukku Nisanth Kartheek
Class Number(s) : VL2024250505157
Date of Examination : 31st January 2025 (9:30 AM-11:00 AM)
Exam Duration : 90 minutes Maximum Marks: 50

General instruction(s):

- Answer All the Questions.
- M - Max mark; CO - Course Outcome; BL - Blooms Taxonomy Level (1 - Remember, 2 - Understand, 3 - Apply, 4 - Analyse, 5 - Evaluate, 6 - Create)
- Course Outcomes
 1. Analyse worst-case running times of algorithms using asymptotic analysis.
 2. Identify suitable algorithmic paradigm for solving the given problem.
 6. Describe various algorithmic strategies, analysis and their implementation.

Q. No	Question	M	CO	BL
1.	Suppose you are choosing between the following two algorithms. • Algorithm A solves problems by dividing them into five subproblems of half the size, recursively solving each subproblem, and then combining the solutions in linear time. • Algorithm B solves problems of size n by recursively solving two subproblems of size $(n-1)$ and then combining the solutions in constant time. Write the recurrence relations and derive the time complexity for each of these algorithms and between them, which one would you choose? Explain.	10	1	2
2.	(a) Compare the given functions, $f(n) = n^{\log n}$ and $g(n) = 2^{\sqrt{n}}$ and analyze their time complexity. (b) Analyze the time complexity for the following iterative algorithm. <pre> A() { int i, j, k, n; for (i=1; i<=n; i++) { for (j=1; j<=i²; j++) { for (k=1; k<=(n/2); k++) { printf("DAA"); } } } } </pre>	3	1	4
	(c) Consider the following functions from positives integers to real numbers. $10, \sqrt{n}, n, \log_2 n, 100/n$. Write the given functions in increasing order of asymptotic complexity.	4		



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3.	(a) Given a set of weights, $w = \{10, 20, 30, 40\}$ and a target weight, $m=50$, find all subsets of w whose sum equals m. Use backtracking approach to generate the state space tree and identify the valid subsets. (b) Identify at least four differences between brute force and backtracking in solving combinatorial problems like the Sum of Subsets problem.	6	6	3																				
4.	Solve the Job Sequencing with deadlines problem for the following problem using Branch and Bound method. Apply least cost method and use variable size solution approach. Provide at least one solution using the state space tree. <table><tr><td>Jobs</td><td>1</td><td>2</td><td>3</td><td>4</td></tr><tr><td>Penalty</td><td>15</td><td>30</td><td>18</td><td>9</td></tr><tr><td>Deadline</td><td>3</td><td>9</td><td>6</td><td>3</td></tr><tr><td>Time</td><td>3</td><td>6</td><td>3</td><td>3</td></tr></table>	Jobs	1	2	3	4	Penalty	15	30	18	9	Deadline	3	9	6	3	Time	3	6	3	3	10	6	3
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Time	3	6	3	3																				
5.	State the fractional knapsack problem. Write the algorithm for fractional knapsack problem using Greedy method and analyze the time complexity. Find an optimal solution for an instance with number of items $n=7$, capacity of the sack $W=15$, profit associated with the items $(p_1, p_2, p_3, p_4, p_5, p_6, p_7) = (10, 5, 15, 7, 6, 18, 3)$ and weight associated with each item $(w_1, w_2, w_3, w_4, w_5, w_6, w_7) = (2, 3, 5, 7, 1, 4, 1)$.	10	2	3																				
