

INDIRA UNIVERSITY, PUNE

SCHOOL OF INFORMATION TECHNOLOGY- MSC CS

Backlog Examination (2025 Pattern) April/ May – 2026 - Semester – I

Subject Name: Design and Analysis of Algorithms
Subject Code: 25PSC102T

Max. Marks: 50
Time: 2:30 Hrs.

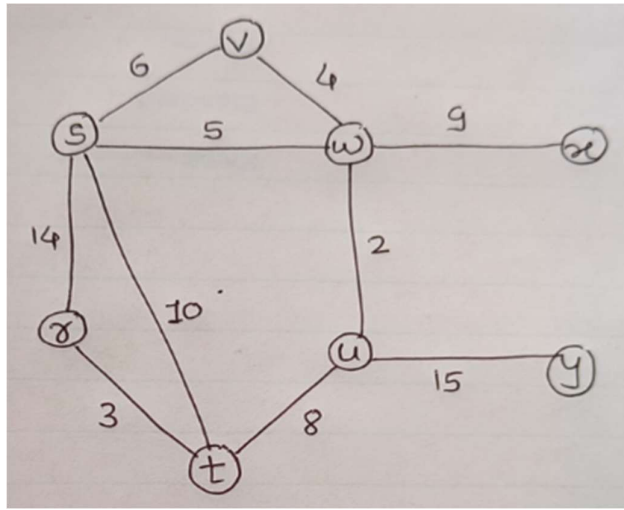
Instructions

- All Questions are Compulsory.

CO #	Cognitive Ability	Course Outcome
CO1	Remember	Identify fundamental algorithm definitions, characteristics, and basic classifications by searching and retrieving relevant algorithm concepts
CO2	Understand	Explain and interpret the role of data structures in algorithm efficiency by comparing and categorizing various algorithm design strategies
CO3	Apply	Implement and execute classical algorithms by choosing appropriate algorithmic techniques and experimenting with problem-solving approaches.
CO4	Analyze	Differentiate and deconstruct various algorithm design methods such as divide and conquer, greedy, and dynamic programming by estimating, questioning, and structuring their time and space complexities.

Q1.	Attempt any 5 out of 7. (2 mark each) (10 Marks) 1. What is the complexity of following fragment of code? <pre>for(int i=0;i<n;) i = i +1</pre> 2. Define the control abstraction of Divide and Conquer Strategy. 3. What are the application of a Greedy strategy? 4. What is Articulation Point and Bridge edge? 5. What do you mean by implicit and explicit constraints? 6. Define the term Brach and Bound. 7. Give at least two differences between deterministic and non-deterministic algorithms	CO1
Q2.	Attempt any 4 out of 6 (5 marks each) (20 Marks) 1. State the concept of merge sort and Sort the following numbers using Merge Sort 66, 22, 89, 10, 43, 78, 32, 15, 50, 70 2. Write down the recurrence relation of quick sort and solve the recurrence relation of quick sort to find out the time complexity.	CO2

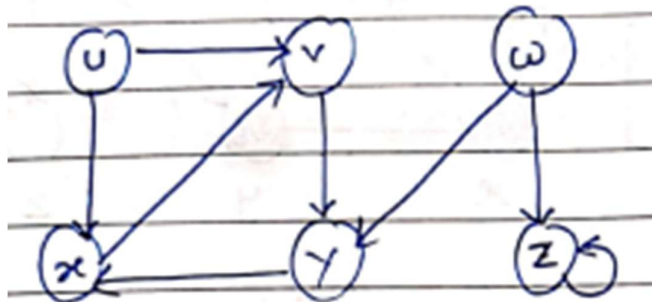
3. Using Prim's Algorithm to find the minimum spanning tree of following Graph G



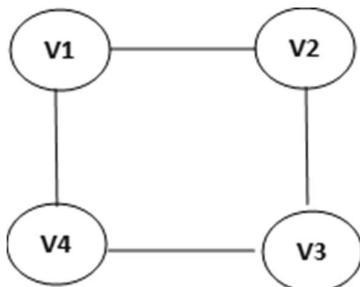
4. Write down the recursive algorithm for the following –

1. To calculate the sum of n user defined numbers
2. To find out the GCD of two numbers

5. What do you mean by Depth First Search(DFS). Find BFS for the following graph



6. What is m-colorability of graph problem? Find all possible solution for 3-coloring of a following graph



Q.3.	Attempt any 2 out of 3 questions. (5 marks each) (10 Marks) 1. Solve the following 0/1 knapsack problem using Least Cost Branch and Bound Strategy. $n = 4$, $(p_1, p_2, p_3, p_4) = (10, 10, 12, 18)$, $(w_1, w_2, w_3, w_4) = (2, 4, 6, 9)$ and capacity of knapsack $(m) = 15$ 2. Let $A[i]$, $1 \leq i < n$ be an unsorted array of positive integers. Write a non-deterministic algorithm to sort the elements of A into non-decreasing order. 3. Find longest common sub - sequence of X and Y. Where $X = \langle A, B, C, B, D, A, B \rangle$ and $Y = \langle B, D, C, A, B, A \rangle$	CO3
Q.4	Attempt all. (10 Marks) 1. Suppose you have a knapsack with a weight capacity of 10 units and the following items: • Item 1: weight = 2, value = 20 • Item 2: weight = 3, value = 30 • Item 3: weight = 5, value = 50 • Item 4: weight = 7, value = 60 Determine the maximum value that can be obtained by selecting items without exceeding the weight capacity. [use both the methods - functional method and Merge and Purge method)]	CO4
