SET-1

INDIRA UNIVERSITY, PUNE

SCHOOL OF INFORMATION TECHNOLOGY-M.SC (CS)

Term End Examination (2025 Pattern) December – 2025 - Semester – I

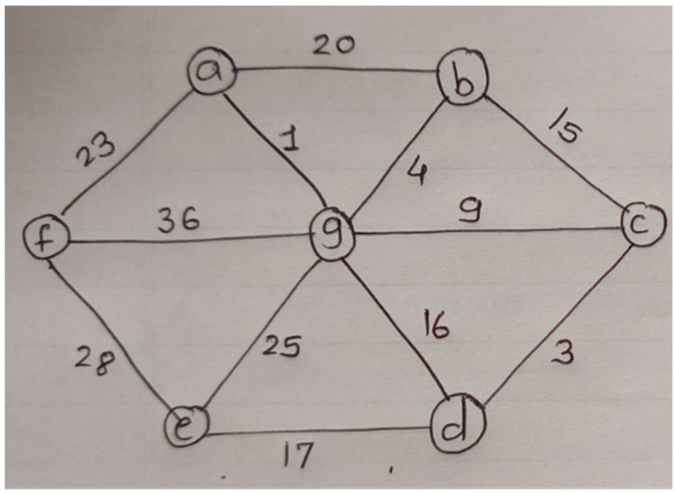
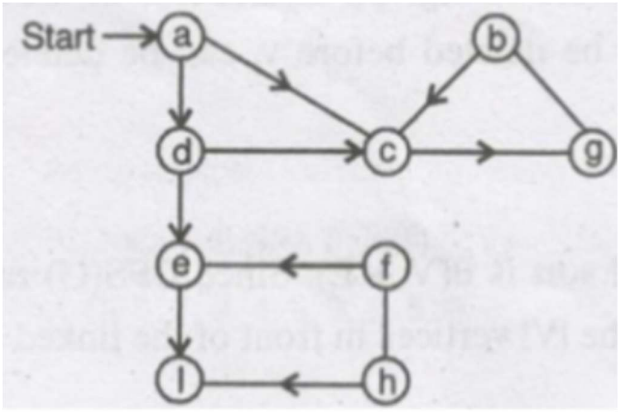
Subject Name: Design and Analysis of Algorithm **Max. Marks: 50**
Subject Code: 25PSC102T **Time: 2:30 Hrs.**

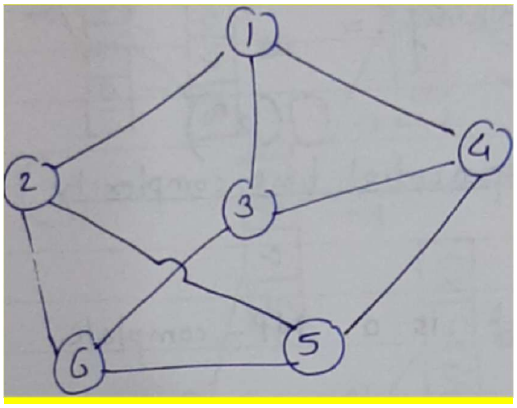
Instructions

- 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)**	
a)	Define Time complexity and Space complexity.	CO1
b)	List any four algorithms(applications) that use divide and conquer strategy.	CO1
c)	Define the term Spanning Tree and Minimum-cost spanning tree	CO1
d)	Define the term Graph and list down representation form of graph.	CO1
e)	What do you mean by fixed tuple and variable tuple formulations.	CO1
f)	Define the term live node and E node in Branch and Bound approach?	CO1
g)	What do you mean by deterministic algorithm?	CO1

Q2.	**Attempt any 4 out of 6 (5 marks each) (20 Marks)**	
a)	Sort the following numbers using heap sort . 82, 90, 10, 12, 15, 77, 55, 23	CO2
b)	Write down the recurrence relation of Merge sort and solve the recurrence relation of merge sort to find out the time complexity.	CO2
c)	Using Kruskal's Algorithm to find the minimum spanning tree of following Graph G 	CO2
d)	Write down the recursive algorithm for the following – 1. To the given number is prime or not. 2. To find out the GCD of two numbers	CO2
e)	Explain in detail topological Sort. Find the topological sort of the following graph. 	CO2

f)	What is Hamiltonian cycle? Find out all possible Hamiltonian cycle for the following graph.  	CO2
Q.3.	**Attempt any 2 out of 3 questions. (5 marks each) (10 Marks)**	
a)	Solve the given of TSP by using reduced cost matrix method (LCBB) $\begin{bmatrix} \infty & 20 & 30 & 10 & 11 \\ 15 & \infty & 16 & 4 & 2 \\ 3 & 5 & \infty & 2 & 4 \\ 19 & 6 & 18 & \infty & 3 \\ 16 & 4 & 7 & 16 & \infty \end{bmatrix}$	CO3
b)	Write a non-deterministic algorithm for max clique decision problem	CO3
c)	Find the best way to multiply a chain of matrices with dimensions that are 4 X 10, 10 X 3, 3 X 12, 12 X 20 and 20 X 7 using dynamic programming.	CO3
Q.4	**Attempt all. (10 marks)**	
a)	Given two strings as Str1 = < A, B, C, D, G, H> and Str2 =< A, E, D, F, H, R> 1. Find longest common sub - sequence of Str1 and Str2 using dynamic programming approach. 2. Calculate the minimum number of operations required to convert the string Str1 into Str2 using dynamic programming. Allowed operations are insertion, deletion, and substitution. Show the dynamic programming table and the sequence of operations.	CO4

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