SHRI VAISHNAV VIDYAPEETH VISHWAVIDYALAYA, INDORE

Shri Vaishnav Institute of Information Technology

Department of Computer Science and Engineering

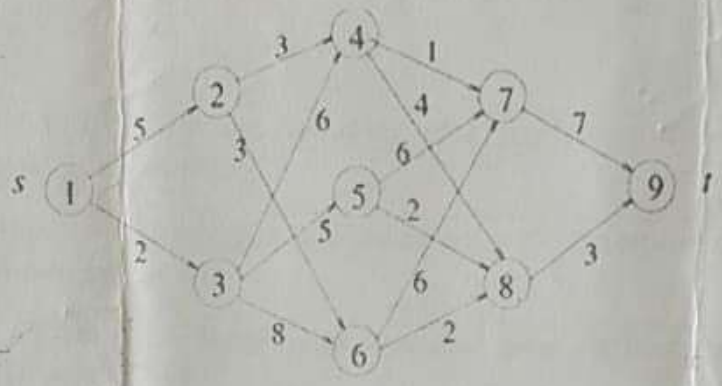
MST II

Subject Code: BTCS302N **Subject Name:** Analysis & Design of Algorithms **Semester:** IV

Time: I Hour **Total Marks:** 20

Note: All questions are compulsory. Assume suitable missing data.

Question No.		Marks	Related CO
1	a) Write an algorithm for All Pair Shortest Path problem.	3	CO3
	b) Find a minimum-cost path from s to t in following multistage graph.	3	CO3



	c) Consider knapsack instance n=3, (w1, w2, w3) = (2,3,4), (p1, p2, p3) = (1,2,5), and m=6. Find optimal solution using dynamic programming.	4	CO3
	OR		
	d) Consider the following travelling salesman on instance defined by cost matrix. Solve travelling salesman problem using dynamic programming.	4	CO3

	1	2	3	4
1	0	10	15	20
2	5	0	9	10
3	6	13	0	12
4	8	8	9	0

2	a) Explain the 4 Queen's problem and apply the backtracking to solve the 4 Queen's problem.	3	CO4
	b) Let w = {5,7, 10,12,15,18,20}, and m=35. Find all possible subsets of w that sum to m. Draw portion of the state space tree that is generated.	3	CO4
	c) Write an algorithm for Graph Coloring Problem.	4	CO4
	OR		
	d) Write an algorithm to find all Hamiltonian Cycle in graph.	4	CO4

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MST I

Subject Code: BTCS302N **Subject Name: ADA** **Semester: I**

Time: 1 Hour **Total Marks:** 20

Note: All questions are compulsory. Assume suitable missing data

Q. No.	Questions	Marks	Related CO
1	a) Define an algorithm and list its characteristics	3	CO1
	b) Solve the Recurrence Relation $T(n)=2T(n/2)+\sqrt{n}$, $T(1)=1$	3	CO1
	c) Explain Quick Sort algorithm with an example. Discuss its best case, average case, and worst case time complexity.. OR d) Explain Merge Sort using the Divide and Conquer method. Write the algorithm and analyze its time complexity.	4	CO2
2	a) Find the optimal solution for the fractional Knapsack problem making use of greedy approach. Consider- n = 5, W = 60 kg (w1, w2, w3, w4, w5) = (5, 10, 15, 22, 25) (P1, P2, P3, P4, P5) = (30, 40, 45, 77, 90)	3	CO3
	b) Analyze the Time Complexity of Job Scheduling With Deadline?	3	CO2
	c) Discuss briefly about the minimum spanning tree OR d) Write an algorithm for single source shortest path and explain with an example.	4	CO3

CO1 - Understand algorithm design principles and asymptotic analysis
CO2- Understand basic concepts of algorithms and analyze their time and space complexity.
CO3 - Apply greedy method to solve optimization problems

MST II

Subject Code: BTCS302N **Subject Name: ADA** **Semester: IV**

Time: 1 Hour **Total Marks: 20**

		M	CO
Q 1 a	Solve the following 0/1 Knapsack Problem using Dynamic Programming. Inputs are given as: Knapsack Capacity = 5 Item 1: Weight = 2, Profit = 12 Item 2: Weight = 1, Profit = 10 Item 3: Weight = 3, Profit = 20 Item 4: Weight = 2, Profit = 15	3	1
b	Apply Dynamic Programming to construct the Optimal Binary Search Tree for the following keys and successful search probabilities: Keys: {10, 20, 30, 40} Frequency: {1, 2, 4, 1} Find the minimum expected search cost.	3	1
c	Solve the following Multistage Graph problem using Dynamic Programming and find the minimum cost path from source to destination. Stages and edge costs are: $(1\to2)=2, (1\to3)=1, (2\to4)=3, (2\to5)=6, (3\to4)=6, (3\to5)=7, (4\to6)=1, (5\to6)=2$	4	2
	OR		
d	Solve the following All Pairs Shortest Path Problem using Floyd Warshall Algorithm. Adjacency Matrix:	4	2

0	3	∞	7
8	0	2	∞
5	∞	0	1
2	∞	∞	0

Q 2 a	Using Backtracking, determine whether the subset {3, 5, 6, 7, 8} contains a subset whose sum is equal to 15. Show the solution state space.	3	2
b	Solve the 4-Queens Problem using Backtracking technique and show all possible valid arrangements of queens on the chessboard.	3	2
c	Determine whether the following graph contains a Hamiltonian Cycle. Vertices = {A, B, C, D, E} Edges = {(A,B), (B,C), (C,D), (D,E), (E,A), (A,C), (B,D)}. Also find atleast 4 Hamiltonian Cycle.	4	2
	OR		
d	Solve the Traveling Salesperson Problem using Branch and Bound for the following cost matrix:		

∞	10	15	20
10	∞	35	25
15	35	∞	30
20	25	30	∞