Seat No.: _____ Enrolment No.

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– V EXAMINATION – SUMMER 2020

Subject Code: 2150703 **Date:26/10/2020**

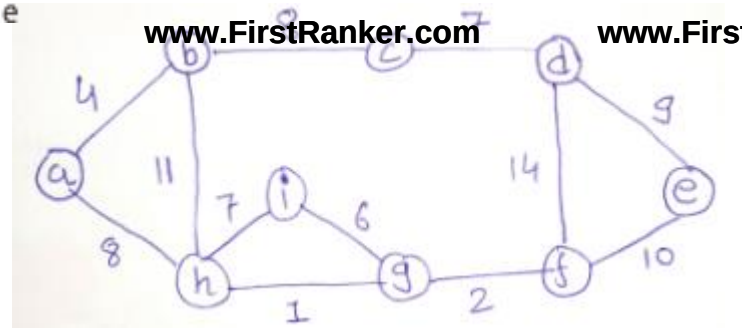
Subject Name: ANALYSIS AND DESIGN OF ALGORITHMS

Time: 02:30 PM TO 05:00 PM **Total Marks: 70**

Instructions:

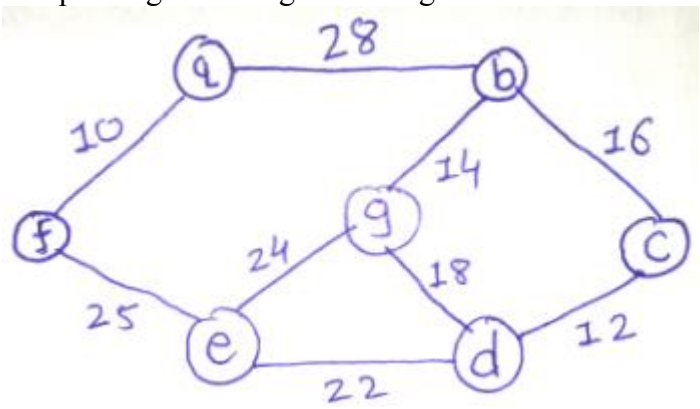
1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

			MARKS
Q.1	**(a)**	Define the terms: 1) Principal of Optimality 2) Feasible solution 3) Quantifier	**03**
	(b)	Analyze Binary search algorithm in best and worst case.	**04**
	(c)	Define Asymptotic notation. Arrange the following functions in increasing order of growth. 2^n, n^2, 1, log n, n log n, 3^n and n.	**07**
Q.2	**(a)**	Define the function types: 1) One-to-One 2) Into (Injective) and 3) Onto (Surjective)	**03**
	(b)	What is the smallest value of **n** such that an algorithm whose running time is $100n^2$ runs faster than an algorithm whose running time is 2^n on the same machine?	**04**
	(c)	Analyze Quick sort algorithm in best and worst case.	**07**
		OR	
	(c)	Analyze insertion sort algorithm in best and worst case.	**07**
Q.3	**(a)**	Differentiate divide and conquer approach with dynamic programming approach.	**03**
	(b)	Solve the following recurrence using Master Theorem. T(n)=9T(n/3) + n.	**04**
	(c)	Write equation for Matrix Chain Multiplication using Dynamic programming. Find out optimal sequence for multiplication: A1 [5 × 4], A2 [4 × 6], A3 [6 × 2], and A4 [2 × 7]. Also give the optimal solution.	**07**
		OR	
Q.3	**(a)**	Differentiate greedy programming approach with dynamic programming approach.	**03**
	(b)	Solve the following recurrence using Master Theorem. T(n) = T(2n/3) + 1.	**04**
	(c)	Using greedy algorithm find an optimal schedule for following jobs with n=6. Profits: (P1, P2, P3, P4, P5, P6) = (20, 15, 10, 7, 5, 3) Deadline: (d1, d2, d3, d4, d5, d6) =(3, 1, 1, 3, 1, 3).	**07**
Q.4	**(a)**	Define and explain P and NP problems with suitable example.	**03**
	(b)	Solve the following Knapsack Problem using greedy method. Number of items = 7, knapsack capacity W = 15, weight vector = {2, 3, 5, 7, 1, 4, 1} and profit vector = {10, 5, 15, 7, 6, 18, 3}.	**04**
	(c)	Find minimum spanning tree using Krushkal's algorithm of the following graph.	**07**



OR

Q.4	**(a)**	Define and explain NP-complete and NP-hard problems with suitable example.	**03**
	(b)	Explain Dijkstra's algorithm to find the shortest path.	**04**
	(c)	Find minimum spanning tree using Prim's algorithm of the following graph.	**07**



Q.5	**(a)**	Explain the naive string matching algorithm	**03**
	(b)	Differentiate between depth first search and breadth first search.	**04**
	(c)	Working modulo q = 11. How many spurious hits does the Rabin-Karp matcher encounter in the text T = 3141592653589793 when looking for the pattern P =26?	**07**

OR

Q.5	**(a)**	Explain polynomial-time reduction algorithm.	**03**
	(b)	Prove that if G is an undirected bipartite graph with an odd number of vertices, then G is non-Hamiltonian.	**04**
	(c)	Explain Backtracking Method. What is N-Queens Problem? Give solution of 4 Queens Problem using Backtracking Method.	**07**

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