Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V (NEW) EXAMINATION – WINTER 2021

Subject Code:3150703 Date:17/12/2021

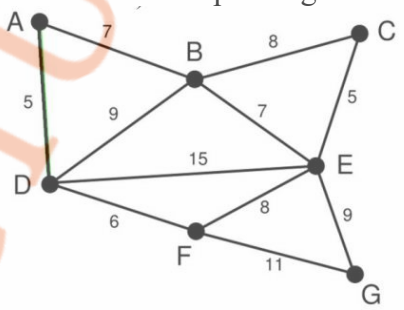
Subject Name:Analysis and Design of Algorithms

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.**
4. **Simple and non-programmable scientific calculators are allowed.**

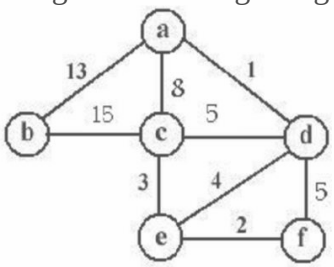
			MARKS
Q.1	**(a)**	Define algorithm. Discuss key characteristics of algorithms.	**03**
	(b)	Explain why analysis of algorithms is important? Explain: Worst Case, Best Case and Average Case Complexity with suitable example.	**04**
	(c)	Write and analyze an insertion sort algorithm to arrange n items into ascending order.	**07**
Q.2	**(a)**	Write an algorithm of Selection Sort Method.	**03**
	(b)	Sort the following numbers using heap sort. 20, 10, 50, 40, 30	**04**
	(c)	Sort the following list using quick sort algorithm: <50, 40, 20, 60, 80, 100, 45, 70, 105, 30, 90, 75> Also discuss worst and best case of quick sort algorithm.	**07**
		OR	
	(c)	Apply merge sort algorithm on array A = {2,7,3,5,1,9,4,8}. What is time complexity of merge sort in worst case?	**07**
Q.3	**(a)**	What is Principle of Optimality? Explain its use in Dynamic Programming Method	**03**
	(b)	Explain Binomial Coefficient algorithm using dynamic programming.	**04**
	(c)	Solve the following 0/1 Knapsack Problem using Dynamic Programming. There are five items whose weights and values are given in following arrays. Weight w [] = {1,2,5,6,7} Value v [] = {1, 6, 18, 22, 28} Show your equation and find out the optimal knapsack items for weight capacity of 11 units.	**07**
		OR	
Q.3	**(a)**	Compare Dynamic Programming Technique with Greedy Algorithms	**03**
	(b)	Give the characteristics of Greedy Algorithms.	**04**
	(c)	Obtain longest common subsequence using dynamic programming. Given A = “acabaca” and B = “bacac”.	**07**
Q.4	**(a)**	Using greedy algorithm find an optimal schedule for following jobs with n=7 profits: (P1, P2, P3, P4, P5, P6, P7) = (3, 5, 18, 20, 6, 1, 38) and deadline (d1, d2, d3, d4, d5, d6, d7) = (1, 3, 3, 4, 1, 2, 1)	**03**
	(b)	Find Minimum Spanning Tree for the given graph using Prim’s Algo.	**04**



	(c)	Explain in brief Breadth First Search and Depth First Search Traversal techniques of a Graph with Example.	**07**

OR

Q.4	**(a)**	Find an optimal Huffman code for the following set of frequency. A : 50, b: 20, c: 15, d: 30	**03**
	(b)	Find Minimum Spanning Tree for the given graph using Kruskal Algo.	**04**



	(c)	Explain Backtracking Method. What is N-Queens Problem? Give solution of 4- Queens Problem using Backtracking Method	**07**
Q.5	**(a)**	Define Articulation point, Acyclic Directed Graph, Back Edge	**03**
	(b)	Show the comparisons that naïve string matcher makes for the pattern p=0001 in the text T=000010001010001	**04**
	(c)	Explain spurious hits in Rabin-Karp string matching algorithm with example. Working modulo q=13, how many spurious hits does the Rabin-Karp matcher encounter in the text T = 2359023141526739921 when looking for the pattern P = 31415?	**07**

OR

Q.5	**(a)**	Explain polynomial reduction.	**03**
	(b)	Differentiate branch and bound and back tracking algorithm.	**04**
	(c)	Explain P, NP, NP complete and NP-Hard problems. Give examples of each	**07**

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