GUJARAT TECHNOLOGICAL UNIVERSITY
## BE – SEMESTER- V EXAMINATION-SUMMER 2023

Subject Code: 3150703   **Date: 03/07/2023**

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 following terms: (i) Big O Notation, (ii) Big Theta Notation, (iii) Big Omega Notation.	**03**
	(b)	Perform Bucket sort for following sequence: 30, 12, 22, 66, 48, 27, 35, 43, 47, 41.	**04**
	(c)	Explain the bubble sort algorithm and derive its best case, worst case, and average case time complexity.	**07**
Q.2	**(a)**	Define Algorithms and characteristics of algorithms.	**03**
	(b)	What is a recurrence? Solve recurrence equation for $T(n) = T(n-1) + 1$ using substitution method.	**04**
	(c)	Discuss Binary search algorithm, also write and solve its recurrence relation.	**07**
		OR	
	(c)	Explain Merge Sort algorithm with suitable example.	**07**
Q.3	**(a)**	Explain principle of optimality with suitable example.	**03**
	(b)	Explain advantages and disadvantages of dynamic programming.	**04**
	(c)	Given the denominations: d1=1, d2=4, d3=6. Calculate for making change of Rs. 8 using dynamic programming.	**07**
		OR	
Q.3	**(a)**	Explain Weighted Graph, Undirected Graph, Directed Graph.	**03**
	(b)	Discuss advantages and disadvantages of greedy algorithm.	**04**
	(c)	Consider weights w=(3,4,6,5) and profit v=(2,3,1,4) and Knapsack capacity W=8. Find the maximum profit using dynamic approach.	**07**
Q.4	**(a)**	Find an optimal Huffman code for the following set of frequency. a : 40, b: 20, c: 15, d: 30, e: 10.	**03**
	(b)	Explain depth first traversal using suitable example.	**04**
	(c)	Draw the minimum spanning tree correspond to following graph using Prim's algorithm and find the MST weight:	**07**
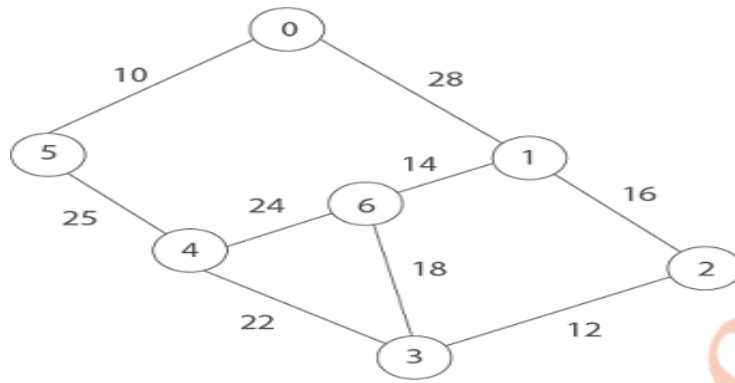
OR

Q.4	(a)	Differentiate between Kruskal's algorithm and Prim's algorithm for finding MST.	**03**
	(b)	Explain the need of topological Sort with example.	**04**
	(c)	Draw the minimum spanning tree correspond to following graph using Kruskal's algorithm and find weight of MST:	**07**
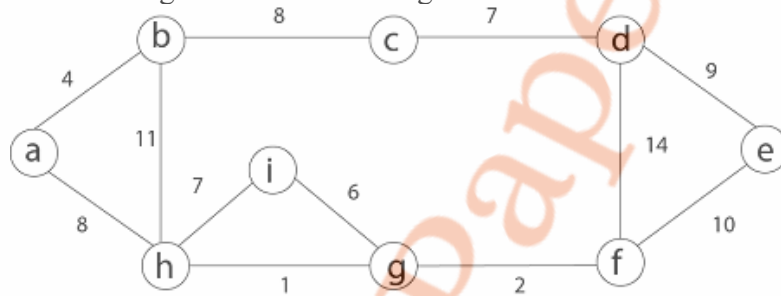
Q.5	(a)	Explain Spurious hits with an example.	**03**
	(b)	Write the pseudocode for Naïve String-Matching Algorithm.	**04**
	(c)	What is state space tree. How do you solve the Eight queens problem using backtracking with the help of state space tree.	**07**

OR

Q.5	(a)	Explain polynomial time reduction.	**03**
	(b)	Differentiate between Backtracking and Branch-and-Bound algorithms.	**04**
	(c)	Define P, NP, NP complete and NP-Hard problems. Give examples of each.	**07**

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