GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–V (NEW) EXAMINATION – SUMMER 2024

Subject Code:3150703 **Date:31-05-2024**
**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)**	Find Omega (Ω) notation of function $f(n)=2n^2 + n * \lg n + 6n$	**03**
	(b)	Define Big-oh and Theta notations with graph	**04**
	(c)	Write and analyze an insertion sort algorithm to sort n items into ascending order.	**07**
Q.2	**(a)**	Explain: Articulation Point, Graph, Tree	**03**
	(b)	Solve following recurrence using Master Theorem: $T(n) = 3T(n/3) + n^3$.	**04**
	(c)	Illustrate the working of the quick sort on input instance: 25, 29, 30, 35, 42, 47, 50, 52, 60. Comment on the nature of input i.e. best case, average case or worst case.	**07**

OR

	(c)	What is recurrence? Explain recursion-tree method with suitable example.	**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)	Obtain longest common subsequence using dynamic programming. Given A = "acabaca" and B = "bacac".	**07**

OR

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Q.3	**(a)**	Explain the steps of greedy strategy for solving a problem	**03**
	(b)	Demonstrate Binary Search method to search Key = 14, form the array A=<2,4,7,8,9,10,12,14,18>	**04**
	(c)	What is a minimum spanning tree? Draw the minimum spanning tree correspond to following graph using Prim's algorithm.	**07**
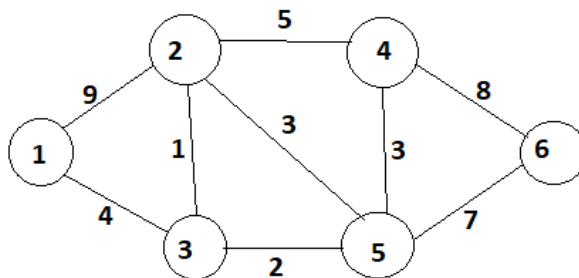
Q.4	**(a)**	Explain Tower of Hanoi Problem, Derive its recursion equation and computer it's time complexity.	**03**
	(b)	Using greedy algorithm find an optimal schedule for following jobs with n=7 profits: (P1, P2, P3, P4, P5, P6, P7) = (3, 5, 18, 20, 6, 1, 38) and deadline (d1, d2, d3, d4, d5, d6, d7) = (1, 3, 3, 4, 1, 2, 1)	**04**

	(c)	Solve the following Knapsack Problem using greedy method. Number of items = 5, knapsack capacity W = 100, weight vector = {50, 40, 30, 20, 10} and profit vector = {1, 2, 3, 4, 5}.	**07**

OR

Q.4	**(a)**	What are the disadvantages of greedy method over dynamic programming method?	**03**
	(b)	Find an optimal Huffman code for the following set of frequency. A : 50, b: 20, c: 15, d: 30	**04**
	(c)	Consider a Knapsack with the maximum weight capacity M is 7, for the objects with value [12,10,20,15] with weights [2,1,3,2] solve using dynamic programming the maximum value the knapsack can have.	**07**

Q.5	**(a)**	Define NP-Complete and NP-Hard problems.	**03**
	(b)	Draw the state space tree Diagram for 4 Queens problem.	**04**
	(c)	Find all pair of shortest path using Floyd's Algorithm for following graph.	**07**
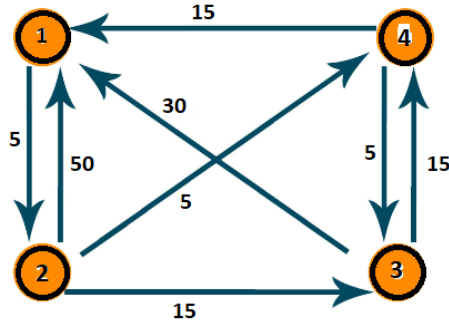
OR

Q.5	**(a)**	Define BFS. How it is differ from DFS.	**03**
	(b)	Explain the naive string matching algorithm.	**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**

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