Enrolment No./Seat No_____

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

Subject Code:3150703 **Date:17-12-2024**
Subject Name:Analysis and Design of Algorithms
Time:10:30 AM TO 01:00 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 the following terms: i) Function in mathematics ii) Linear inequalities	**03**
	(b)	Explain the need of amortized notation. Explain with suitable example.	**04**
	(c)	Write an algorithm for insertion sort. Calculate the best, average and worst case complexity of it.	**07**
Q.2	**(a)**	Sort the following elements using counting sort. 2, 5, 3, 0, 2, 3, 0, 3	**03**
	(b)	Sort the following elements using bucket sort. 10, 21, 29, 41, 52	**04**
	(c)	Write the Master theorem. Solve following recurrence using it. (i)$T(n)= 3T(n/2) + n^2$ (ii) $T(n)=2T(n/2) + n \log n$	**07**

<div align="center">OR</div>

	(c)	Write binary search algorithm using recursion. Derive its recurrence relation. Calculate its complexity using master theorem.	**07**
Q.3	**(a)**	Explain the steps of greedy strategy for solving a problem.	**03**
	(b)	Write an algorithm for Max-Min problem using divide and conquer approach. Calculate its complexity.	**04**
	(c)	The matrices A(5X10), B(10X15), C(15X20), and D(20X25) are given. Solve the matrix chain multiplication problem using dynamic programming.	**07**

<div align="center">OR</div>

Q.3	**(a)**	Enlist the general characteristics of greedy algorithms.	**03**
	(b)	Write an algorithm for matrix multiplication using divide and conquer approach. Calculate its complexity.	**04**
	(c)	For the given set of items and knapsack capacity = 5 kg, find the optimal solution for the 0/1 knapsack problem using dynamic programming.	**07**

Item	Weight	Value
I1	2	3
I2	3	4
I3	4	5
I4	5	6

Q.4	**(a)**	Explain DFS with suitable example.	**03**
	(b)	Enlist the advantages and disadvantages of dynamic programming.	**04**

	(c)	Define minimum spanning tree. Explain Prim's algorithm with suitable example.	**07**

OR

Q.4	**(a)**	Explain BFS with suitable example.	**03**
	(b)	Define principal of optimality. Explain its use in Dynamic Programming Method.	**04**
	(c)	"A greedy strategy will work for fractional Knapsack problem but not for 0/1", is this true or false? Explain with suitable example.	**07**

Q.5	**(a)**	Define string matching problem. Define valid shift and invalid shift.	**03**
	(b)	Define the followings: i) Articulation point ii) Acyclic Directed Graph iii) Back Edge iv) Tree	**04**
	(c)	Explain P, NP, NP complete and NP-Hard problems. Give examples of each.	**07**

OR

Q.5	**(a)**	Explain Backtracking Method. Give solutions for 4-queens problem using backtracking method.	**03**
	(b)	Explain in-order, pre-order and post-order traversals of the graph.	**04**
	(c)	Write short note on the followings: i) Approximation algorithms ii) Randomized algorithms	**07**

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