Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–III (NEW) EXAMINATION – SUMMER 2024

Subject Code:3134201 **Date:19-07-2024**

Subject Name: Data Structures and 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.**

Q.1 **(a)** What is an algorithm? Why analysis of algorithm is required? **3**

(b) What is asymptotic notation? **4**
Find out big-oh notation of the function: $f(n) = 3\,n^2 + 5n + 10$

(c) Sort the following list using quick sort algorithm: < 5, 3, 8, 1, 4, 6, 2, 7> **7**
Also write Best case, Worst case and Average case of the quick sort algorithm.

Q.2 **(a)** What is the difference between linear search and binary search? **3**

(b) Explain open hashing-separate chaining with example. **4**

(c) Write an algorithm to convert and infix expression to postfix expression. **7**
Give appropriate example to show the execution.

OR

(c) Write an algorithm to evaluate an infix expression. **7**
Give appropriate example to show the execution.

Q.3 **(a)** What is the difference between selection sort and bubble sort? **3**

(b) Explain quadratic probing with example. **4**

(c) Explain recursive tree method and solve following recurrence relation using recursive tree method. **7**

$$T(n) = \sqrt{n}T(\sqrt{n}) + n$$

OR

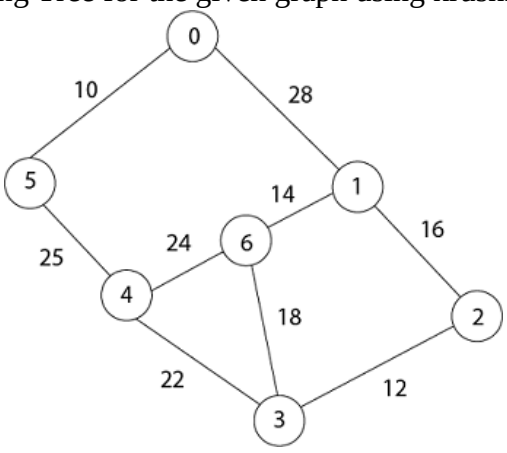
Q.3 **(a)** How divide and conquer approach work? **3**

(b) Write list of stack applications. Give any two with corresponding examples. **4**

(c) Explain master theorem and solve the following recurrence with master method. **7**

$$T(n) = 9\,T\left(\frac{n}{3}\right) + n$$

Q.4 **(a)** Find Minimum Spanning Tree for the given graph using krushkal's algorithm. **3**



	(b)	Find the Huffman code for each symbol in following text ABCCDEBABFFBACBEBDFAAAABCDEEDCCBFEBFCAE	**4**
	(c)	Write an algorithm of finding the kth minimum element in a BST. Also show the time complexicity of your algorithm.	**7**
		OR	
Q.4	**(a)**	Find Minimum Spanning Tree for the graph given in Q4(a) using Prim's Algorithm.	**3**
	(b)	Consider Knapsack capacity W=15, w = (4, 5, 6, 3) and v=(10, 15,12, 8) find the maximum profit using greedy method.	**4**
	(c)	Explain Backtracking Method. What is N-Queens Problem? Give solution of 4-Queens Problem using Backtracking Method.	**7**
Q.5	**(a)**	Write the characteristics of greedy algorithm.	**3**
	(b)	Give difference between greedy approach and dynamic programming	**4**
	(c)	Write an algorithm of finding Longest Common Subsequence (LCS) with example	**7**
		OR	
Q.5	**(a)**	Explain the Minimax principle and show its working for simple tic-tac-toe game playing.	**3**
	(b)	Find out minimum number of multiplications required for multiplying: A[1 × 5], B[5 × 4], C[4 × 3], D[3 × 2], and E[2 × 1].	**4**
	(c)	Explain travelling salesman problem with example.	**7**

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