Seat No.: _____ Enrolment No.

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–V (NEW) EXAMINATION – WINTER 2020

Subject Code:2150703 **Date:22/01/2021**

Subject Name:Analysis and Design of Algorithms

Time:10:30 AM TO 12:30 PM **Total Marks: 56**

Instructions:

1. **Attempt any FOUR questions out of EIGHT questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** Define O, Ω, θ notations with example. **03**

(b) Sort following functions in increasing order of running time for large values of n: **n, $\log_2 n$, 2^n ,$n^2 \log n$, n^3** **04**

(c) (i) What are the different parameters to analyze any algorithm? **03**

(ii) Solve the following using Master's theorem:

A. $T(n) = 2T(n/4) + 1$ **04**

B. $T(n) = 3T(n/3) + n$

Q.2 **(a)** Explain Master Theorem for all three cases. **03**

(b) (i) What is the smallest value of n such that an algorithm whose running time is $100n^2$ is runs faster than an algorithm whose running time is 2^n on the same machine? **04**

(ii) What is meaning of T (n) =O(1). Explain with suitable example.

(c) Given the four matrices P_{5x4}, Q_{4x6}, R_{6x2}, T_{2x7}. Find the optimal sequence for the computation of multiplication operation. **07**

Q.3 **(a)** Mention the parameters for finding suitable algorithm among many candidate algorithms. Justify parameter with suitable example. **03**

(b) i. Which version of algorithm is preferred when memory resources are limited, Iterative or recursive? Justify your answer. **04**

ii. An asymptotically fast algorithm running on Slow computer is better than asymptotically slow algorithm is running on fast computer for larger input size. (**True/False**) Justify your answer with supporting arguments.

(c) Analyze Selection sort and Insertion Sort algorithms in best case and worst case scenarios. **07**

Q.4 **(a)** Merge sort algorithm have similar time complexity in best, average and worst case. (**True/False**). Justify your answer. **03**

(b) Differentiate between greedy approach and Dynamic approach.. **04**

(c) How the selection of pivot affects the performance of Quick Sort? Discuss all possible scenarios. **07**

Q.5 **(a)** How to solve knapsack problem using dynamic programming? **03**

(b) Given two strings from 26 symbols set, X="BITTER", Y = "BUTTER" obtain the longest common subsequence. **04**

(c) Compare and contrast Branch and Bound and Backtracking Methods with suitable example. **07**

Q.6 **(a)** Generate Huffman Code for symbols with probability as $A_1(0.5), A_2(0.25), A_3(0.125), A_4(0.0625), A_5(0.0625)$. **03**

(b) Find the all pair shortest path using Floyd-Warshall Algorithm for directed graph shown below: **04**

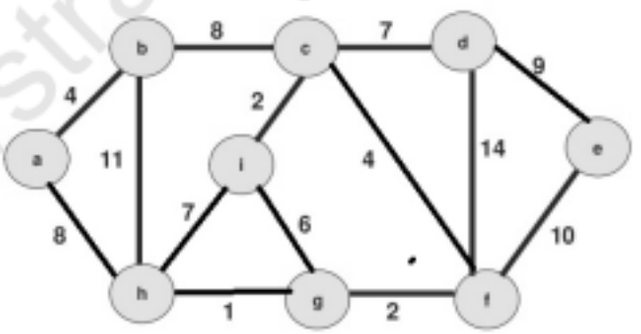
(c) How to solve 0-1 knapsack problem using dynamic programming? Consider Items having Value(Rs.)={60,100,120} , Weight(KG)={10,20,30} respectively, Weight Capacity =50 KG. **07**

Q.7 **(a)** Define terms: Articulation Point, Isolated , Adjacency **03**

(b) Solve the following Task Assignment problem for minimization using following cost matrix.(Cost matrix represents cost of Task T performed by Person P. **04**

	T1	**T2**	**T3**
P1	10	20	25
P2	20	23	26
P3	12	16	25

(c) Find minimum spanning tree for the following undirected weighted graph using Kruskal's algorithm. **07**



Q.8 **(a)** What is the significance of Hashing in Rabin-Karp Pattern matching algorithm? **03**

(b) Draw the Finite automata which accepts String over 26 letter alphabet of {A...Z} : **ACACAGA** **04**

(c) Explain the concept of P, NP and NP-complete problem **07**

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