

GUJARAT TECHNOLOGICAL UNIVERSITY**BE – SEMESTER- V EXAMINATION-SUMMER 2023****Subject Code: 2150703****Date: 23/06/2023****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) Why analysis of algorithm is important? What is time and space complexity?	03
	(b) Explain asymptotic notation and arrange $O(n^3)$, $O(n)$, $O(3n)$, $O(n!)$, $O(\sqrt{n})$ in increasing order.	04
	(c) Write insertion sort algorithm and find out its best case and worst case time complexity.	07
Q.2	(a) Find the Θ -notation for the function $f(n) = 31n^2 + 18n$.	03
	(b) Discuss amortized analysis.	04
	(c) What is recurrence? Write master theorem and explain.	07
	OR	
	(c) Differentiate divide-and-conquer and dynamic programming.	07
Q.3	(a) Discuss Huffman codes.	03
	(b) Solve $T(n) = 2T(n/2) + n$ using substitution method.	04
	(c) Find the longest common subsequence for $S1 = [A B C B D A B]$ and $S2 = [B D C A B A]$.	07
	OR	
Q.3	(a) Differentiate 0/1 knapsack and fractional knapsack problem.	03
	(b) What is principal of optimality? Write the four steps of development of dynamic programming algorithm.	04
	(c) For given matrices of 4×10 , 10×3 , 3×12 , 12×20 and 20×7 , find out the most optimal solution for matrix chain multiplication.	07
Q.4	(a) Differentiate greedy method and dynamic programming.	03
	(b) Discuss the difference of DFS and BFS graph traversing technique.	04
	(c) For the capacity of knapsack $W=60$, find the solution of the fractional knapsack problem for given 5 items with weights $w = \{5, 10, 20, 30, 40\}$ and benefit $b = \{30, 20, 100, 90, 160\}$.	07
	OR	
Q.4	(a) What is spurious hit? Describe it using example.	03
	(b) What is minimum spanning tree? Differentiate Prim's and Kruskal's algorithm.	04
	(c) Define directed graph, undirected graph, connected graph, articulation point, topological sort, class NP and class NPC.	07
Q.5	(a) Describe class P problem and polynomial time reduction.	03
	(b) Discuss the n-queens problem for $n=4$.	04
	(c) Explain Rabin-Karp algorithm.	07
	OR	
Q.5	(a) Describe NP-hard problem.	03
	(b) What is approximation algorithm? Give its advantages and disadvantages.	04
	(c) Show that the travelling salesman problem is NP-complete problem.	07