

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-V (NEW) - EXAMINATION – SUMMER 2018

Subject Code:2150703

Date:04/05/2018

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.

- Q.1**
- (a) Define Algorithm. Discuss key characteristics of algorithm. **03**
- (b) Prove or disprove that $f(n) = 1 + 2 + 3 + \dots + n \in \Theta(n^2)$. **04**
- (c) Which are the basic steps of counting sort? Write counting sort algorithm. Derive its time complexity in worst case. **07**

- Q.2**
- (a) What are the advantages of dynamic programming method over divide-&-conquer method? **03**
- (b) Solve following recurrence using recursion tree method: $T(n) = 3T(n/3) + n^3$. **04**
- (c) Write standard(conventional) algorithm and Strassen's algorithm for matrix multiplication problem. What is the recurrence for Strassen's algorithm? Solve it using master method to derive time complexity of Strassen's algorithm. **07**

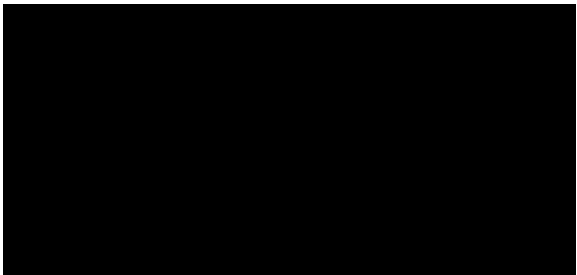
OR

- (c) Discuss best case, average case and worst case time complexity of quick sort. **07**
- Q.3**
- (a) Justify with example that shortest path problem satisfies the principle of optimality. **03**
- (b) Which are the three basic steps of the development of the dynamic programming algorithm? Mention any two examples of dynamic programming that we are using in real life. **04**
- (c) Solve the following making change problem using dynamic programming method: Amount = Rs. 7 and Denominations: (Rs. 1, Rs. 2 and Rs. 4) **07**

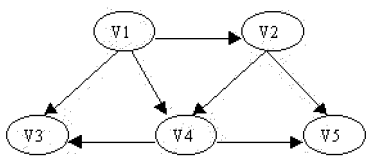
OR

- Q.3**
- (a) Justify with example that longest path problem does not satisfy the principle of optimality. **03**
- (b) Discuss general characteristics of greedy method. Mention any two examples of greedy method that we are using in real life. **04**

- (c) Solve all pair shortest path problem for the following graph using Floyd's algorithm. 07



- Q.4 (a) What are the disadvantages of greedy method over dynamic programming method? 03
- (b) What is DFS? Explain with example. Show the ordering of vertices produced by Topological-sort for the following graph. 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) Write an algorithm for Huffman code. 03
- (b) What is an approximation algorithm? Explain performance ratio for approximation algorithm. 04
- (c) Explain use of branch and bound technique for solving assignment problem. 07
- Q.5 (a) Write Naive string-matching algorithm. Explain notations used in the algorithm. 03
- (b) Explain polynomial-time reduction algorithm. 04
- (c) Working modulo $q = 11$. How many spurious hits does the Rabin-Karp matcher encounter in the text $T = 3141592653589793$ when looking for the pattern $P = 26$? 07

OR

- Q.5

(a)

Which are the three major concepts used to show that a problem is an NP-Complete problem?

03

(b)

Explain breadth first search with example.

04

(c)

Find minimum spanning tree for the following undirected weighted graph using Kruskal's algorithm.

07

