Nirma University

Institute of Technology

Semester End Examination (RPR), December-2017

B.Tech. in Computer Engineering/Information Technology, Semester -VI

CE601 – Design and Analysis of Algorithms

Roll / Exam No. _____ Supervisor's Initial with Date _____

Time: 3 Hours Max Marks: 100

Instructions:
1. Attempt all the questions.
2. Figures to right indicate full marks.
3. Draw neat sketches wherever necessary.

Q-1 Do as directed **[18]**

a) Prove the correctness of "INSERTION SORT" algorithm. [6]

b) Illustrate the working of Bubble sort algorithm by applying it on the sequence of elements :- <70, 30, 40, 10, 80, 20, 60, 50> [6]

c) Prove the correctness of "PARTITION" procedure in Quick sort. [6]

Q-2 Do as directed **[16]**

a) Apply Recursion Tree method on the following recurrence relation :- $T(n) = 3T(n/3) + n^2$ [6]

OR

a) Apply Recursion Tree method on the following recurrence relation :- $T(n) = 4T(n/3) + n$ [6]

b) Solve the following recurrence relation using "Change of variable" method :- $T(n) = 2T(\sqrt{n}) + \log n$ [6]

c) Solve the following recurrence relation using Master method :- $T(n) = 3T(n/2) + 3n/4 + 1$ [4]

Q-3 Do as directed **[16]**

a) The weight of the Minimum Spanning Tree (MST) of the graph G = (V, E), containing 200 vertices and 320 edges, is 150. If the weight of each of the edge of the MST is increased by 5 units, then what would be the weight of the updated MST? [6]

OR

a) How many spanning trees will a complete undirected graph on 4 vertices contain? Draw all such spanning trees. [6]

b) Write "Heap sort" algorithm and analyse its time complexity. [6]

c) Prove the correctness of MERGE SORT algorithm. [4]

Q-4 Do as directed **[18]**

a) Explain the operations of "Disjoint Set Structures" in detail. [6]

b) Describe the operations of "Binomial Heap" in detail. [6]

c) Differentiate between the following terms:- [6]
   i) Prim's algorithm vs. Kruskal's algorithm.
   ii) Djikstra's algorithm vs. Floyd's algorithm

Q-5 Do as directed **[16]**

a) Write an algorithm to compute "Longest Common Subsequence". [6]

OR

a) Write an algorithm to perform "Matrix Chain Multiplication". [6]

b) Explain "0/1 Knapsack problem" with a suitable example. [6]

c) Which important properties must be possessed by the problems that are solved using "Dynamic Programming"? [4]

Q-6 Do as directed **[16]**

a) Given a set S of n activities with start time, S_i, and finish time, F_i ,of an i^{th} activity. Design a greedy algorithm which computes the maximum size of mutually compatible activities. [6]

OR

a) Given an array A of size n and containing integer values (Z). Design an algorithm to compute the maximum sum of the subarray. [6]

b) What is the primary requirement to perform search operation using "binary search"? Can we use linked list to implement "binary search"? Give suitable reasons for your answer. [6]

c) Differentiate :- Greedy approach and Dynamic Programming [4]