ROLL NO. _____

Code: CT42 Subject: DESIGN AND ANALYSIS OF ALGORITHMS

ALCCS – NEW SCHEME

Time: 3 Hours **FEBRUARY 2012** **Max. Marks: 100**

PLEASE WRITE YOUR ROLL NO. AT THE SPACE PROVIDED ON EACH PAGE IMMEDIATELY AFTER RECEIVING THE QUESTION PAPER.

NOTE:

- **Question 1 is compulsory and carries 28 marks. Answer any FOUR questions from the rest. Marks are indicated against each question.**
- **Parts of a question should be answered at the same place.**

Q.1 **(7 × 4)**

a. Define Big Omega notation with example.

b. Define External sorting with example.

c. Define acyclic graph with example.

d. Explain various tree traversal methods.

e. Explain Divide and Conquer strategy. Why recursion is most suited for divide and conquers?

f. Explain Greedy method in detail with example.

g. Define NP complete and NP hard problems with example.

Q.2 a. Show the Red-Black tree that results after the successive insertions of the keys 51, 48, 45, 23, 30 into an initially empty tree. Delete 51 from the resultant tree. **(9)**

b. Give a topological sort for the following relation:
(a < b, a < c, d < b, e < c, a < e, a < d) **(9)**

Q.3 a. Demonstrate the execution of the dynamic programming algorithm for longest common subsequences on the following example:
X = <A B C D A B E>
Y = <C A B E>
What is the final LCS and its length? **(9)**

b. Explain Quick sort and find out its running time (average case, best case and worst case). **(9)**

Q.4 a. Illustrate the operation of BUCKET SORT on the array
A = <0.79, 0.29, 0.1, 0.35, 0.49, 0.45, 0.13, 0.38> **(9)**

b. Give a linear time in-place algorithm to rearrange an array of n keys so that all the even-valued keys precede all the odd-valued keys. Show that your algorithm runs in linear time. **(9)**

Q.5 a. Using disjoint-sets find the connected components in the undirected graph G = (V, E), where the vertices V = {a, b, c, d, e, f, g, h, i, j} and edges E = {(a, c), (a ,b), (e, f), (h, i), (e, g), (a, d), (e, d) (b, d), (c, a), (h, j)}. The edges are processed in the order given. List the vertices in each connected component after each step. **(9)**

b. Explain the BFS along with example. Also discuss the running time of the algorithm. **(9)**

Q.6 a. Determine the cost and structure of an optimal binary search tree for a set of n = 7 keys with the following probabilities **(9)**

i	0	1	2	3	4	5	6	7
p_i		.04	.06	.08	.02	.10	.12	.14
q_i	.06	.06	.06	.06	.05	.05	.05	.05

b. What is an optimal Huffman code for the following set of frequencies based on first 8 Fibonacci numbers:
1,1,2,3,5,8,13,21 **(9)**

Q.7 Write short notes on any **THREE** of the following:

(i) B+ trees
(ii) Heap sort
(iii) Knapsack problem
(iv) Knuth Morris Pratt algorithm **(6×3)**