CSE/T/323/85/2013

3rd Year Computer Science & Engg. Examination 2013

(2nd Semester)

DESIGN AND ANALYSIS OF ALGORITHMS

Time: Three hours

Full Marks: 100

Answer Question# 1 and any four from the rest

1. Find the best possible time for sorting algorithms based on comparisons. What is the minimum number of comparisons required to sort four elements? Which sorting technique does it? Make a comparison matrix for Bubble sort, Insertion sort and Quick sort. 8+2+2+8

2. Write a BST algorithm using sentinel to improve on the search time. How does a sentinel improve insertion sort? 12+8

3. Draw the game tree for Nim with 5 sticks stating clearly your rule set. 20

4. a) There is a straight line with numbered positions from 0 to N. A walker starts at one of these positions and steps forward or backward one position at a time. The probability of a forward step is P and of a backward step, therefore, is 1 – P. (For example, P = 1 / 4 means only a quarter of the steps are forward.) A walk ends when position 0 or N is reached. Simulate such walks to determine how often each of these end positions is reached. This is a random walk problem. Write the program for it.
b) Write a program for the following problem. It merely does some bookkeeping for you. You will be asked to choose from the numbers 1, 2, 3. Sometimes your choice will be called "RIGHT" and sometimes your choice will be "WRONG". If you get 10 RIGHTs in succession you will be proclaimed a "T-H-I-N-K-E-R". 10+10

5. a) Write a program to find the smallest and the largest in an array by repeatedly taking two consecutive numbers and comparing them. What is its advantage over the common *if…then…else if…* logic?
b) Write a program to compute x^n where n is a +ve integer, taking advantage of the fact that the product is repeatable by nature. 10+10

6. a) The gcd of two numbers can be found by taking each prime factor common to their representations according to the smaller number of its appearances. Thus, the gcd of 12 and 30 is 2 * 3. Write a program to find the gcd in this way.
b) Write a program to get Huffman codes of a set of 7 characters. Also, draw the corresponding trees. 10+10