CSE/T/323/85/2014

B.C.S.E 3rd Year 2nd Semester Examination 2014

DESIGN AND ANALYSIS OF ALGORITHMS

Time: **Three hours** Full Marks: **100**

Answer Question# 1 and any four from the rest

1. Write the top-down and bottom-up algorithms of merge sort, explain with trees of call and provide a timing analysis. 4+4+4+8

2. a) Devise an algorithm for adding two natural numbers and provide a proof of correctness.
   b) Devise an algorithm for swapping the values of two variables and provide a proof of correctness. 10+10

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

4. Provide analysis for the following algorithms i) heap sort ii) selection sort iii) average case of quick sort and iv) average case of insertion sort. 4+4+6+6

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) Find the minimum time any comparison-based sorting algorithm can take. If there are four data then what is the minimum number of comparisons that would sort them and by which algorithm? b) provide a schematic algorithm for sorting disk files. 8+12