No. of Printed Pages : 3

MCS-031

10829

MCA (Revised)

Term-End Examination

June, 2014

MCS-031 : DESIGN AND ANALYSIS OF ALGORITHMS

Time : 3 hours *Maximum Marks : 100*

Note : *Question **No. 1** is **compulsory**. Attempt **any three** from the remaining questions.*

1. (a) What is big O notation ? How is it different from Ω notation ? 4

   (b) Give an analysis of merge-sort. For simplicity, assume that the number of elements i.e. n is an exact power of two. 6

   (c) Explain limitations of Strassen's Algorithm for matrix multiplication. 5

   (d) Use Master's method to find tight asymptotic bounds for the following recurrence : 5

   $$T(n) = T\left(n/2\right) + n$$

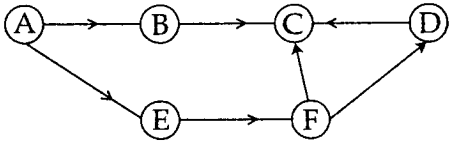
   (e) Give a divide and conquer based algorithm to find i^{th} largest element in an array of size n. 4

   (f) What is regular expression ? Write a regular expression over $\sum = \{a, b\}$ to generate all string that start with a and end with two b's. 6

(g) Write binary search algorithm and evaluate its time complexity in the best, average and worst cases. 6

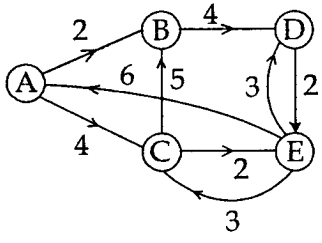
(h) Explain NP- complete problem with the help of an example. 4

2. (a) Find the topological ordering of the following graph : 6



(b) Write Kruskal's algorithm and determine its time complexity. 8

(c) Represent the following graph using 6
(i) Array ; and (ii) Adjancy List



3. (a) Sort the given list using bubble sort and show the steps involved in the process : 6
2, 7, 5, 10, 21, 3

(b) Write Euclid's algorithm for finding Greatest Common Divisor (G.C.D) of two natural numbers m and n. 4

(c) What is the benefit of preconditioning a problem space ? Explain using an example. 5

(d) Consider the CFG : 5

$S \rightarrow SS \mid X\,a\,X\,a\,X \mid \wedge$

$X \rightarrow bX \mid \wedge$

Explain the language generated by this CFG

4. (a) What is Push Down Automata ? How is it different from Finite Automata. 5

(b) What is MinMax Algorithm ? Explain how Alpha-Beta pruning helps in improving MinMax algorithm. 10

(c) What is best case analysis ? Perform the best case analysis for Quick Sort. 5

5. (a) Explain each of the following, with an appropriate example : 12

(i) NIM/Marienbad Game

(ii) Principle of Mathematical Induction

(iii) Halting Problem

(b) Trace how Depth First Search Traverses the following tree, when starting at node A. 8