

Roll No.

23068

**M.E./M. Tech. 1st Sem.
Examination – June, 2013**

ANALYSIS AND DESIGN OF ALGORITHMS

Paper : MTCE-605-A

Time : Three hours]

[Maximum Marks : 100

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt any *five* questions.

1. Write and explain different types of asymptotic notations with suitable example. Which of among transitivity, reflectivity, symmetry are followed by asymptotic notations O , θ , ω , Ω . 20

2. (a) What is Recurrence Relation ? Where recurrence relation used ? Solve the following recurrence relation by recurrence tree method : 10

$$T(n) = T(n/3) + T(2n/3) + \log n$$

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- (b) The rank of an element in a sequence is the number of smaller elements in the sequence plus the number of equal elements that appear to its left. For example if the sequence is given array $x = [4, 3, 10, 4, 7]$ then rank $r = [2, 0, 4, 1, 3]$. Give a sorting algorithm using Rank. Also explain time complexity. 10
3. (a) Explain Convex Hull. Write Graham Scan Algorithm used in sorting points. Also drive its time complexity. 10
- (b) Define and explain P and NP problem algorithms. Also explain decision and optimal problem. 10
4. (a) Define and explain Cook's theorem. What is satisfiability and CNF? 10
- (b) Consider Knapsack instance : Number of elements $N = 3$ with corresponding weights and profit as $W_i = \{2, 3, 5\}$, $P_i = \{1, 3, 7\}$ capacity $m = 6$ using Dynamic Approach. Find the solution for this instance of 0/1 Knapsack problem. 10

5. (a) Write and explain all pair shortest path algorithm with suitable examples and drive its time complexity. 10
- (b) Discuss algorithm for least common subsequence problem and find its time complexity. 10
6. (a) Consider N jobs to be processed on two M/C A and B. If a job is processed on M/C A takes time t_A and if processed on B than takes time t_B to process. Due to nature of jobs. It is possible that $t_A \geq t_B$. Obtain a dynamic formulation to determine minimum time needed to process all jobs. 10
- (b) Explain Kruskal algorithm to find minimum spanning tree for a graph with example and drive its time complexity. 10
7. (a) What is divide and conquer strategy ? Describe strassen matrix multiplication method with example. 10
- (b) Differentiate between Backtracking and Branch and Bound method. 10

8. (a) Give an algorithm for Hamiltonian Cycle detection problem using backtracking and derive its time complexity. 12
- (b) Discuss N-Queens problem in detail. 8
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