

Roll No. ....

Total Pages : 3

MCA(6/7)/D-12

**10428**

DESIGN AND ANALYSIS OF ALGORITHMS

Paper : MCA-303

Time : Three Hours]

[Maximum Marks : 80

**Note :** Attempt five questions in all. Question No. 1 is compulsory.  
Attempt four more questions selecting one question from each unit.

**Compulsory Question**

1. (i) What do you mean by satisfiable (STA) ?  
(ii)  $S(n) = 1^2 + 2^2 + 3^2 + \dots + n^2$ . What is the order of  $S(n)$  ?  
(iii) How to discover fast algorithms ?  
(iv) Suppose  $f = \Theta(g)$  and  $g = O(h)$ , then show that  $f = O(h)$ .  
(v) Prove that independent set is NP-complete ?  
(vi) What does Lower bound theory prove about comparison based sorting problem ?  
(vii) Write an algorithm to find the median of a given array using Greedy approach.  
(viii) What is Recurrence Equation ? 3×8=24

**UNIT-I**

2. (a) What do you understand by Data structure ? Write a brief note on Linked list and Tree data structures. 7  
(b) What do you understand by Module ? Discuss the Structured design methodology to identify the modules in a problem. Use suitable example. 7

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3. (a) What is Big O notation ? How the space and time complexities are computed under this notation ? Discuss. 7  
(b) Give the proof of Euclid's algorithm correctness. 7

**UNIT-II**

4. (a) What do you understand by Divide and Conquer algorithm ? Analyze the time taken by Quick sort. Explain various possibilities in selection of pivot element. 7  
(b) With an example, explain how the Branch-and-bound technique is used to solve 0/1 knapsack problem. 7
5. (a) Design a Linear time algorithm for maximal matching. 7  
(b) What is Dynamic programming ? How to design a dynamic programming algorithm ? Write dynamic programming algorithm for knapsack problem. 7

**UNIT-III**

6. (a) Lower bound theory says when to stop searching for better algorithms. Explain with examples. 7  
(b) Suppose C is the longest subsequence in S. Show that  $LCS(A(2.....M), B(1.....N))$  could be longer than C. 7
7. (a) What is the space bound for  $d$  dimensional range trees ? <http://www.kuonline.in> 7  
(b) Suppose you have  $k$  sorted sequences each of length  $n/k$ . Show that the time required for merging them into a single length  $n$  sequence in the decision tree model is  $\Omega(n \log n)$ . 7

**UNIT-IV**

8. (a) What do you understand by NP hard problem ? Show that TSP is an NP hard problem. 7  
(b) What is Cook's theorem ? Discuss. 7
9. (a) What do you understand by state space representation of a problem ? Explain using suitable example. 7  
(b) What is Approximation algorithm ? Discuss its relevance in random access machine. 7
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