



Printed Pages : 4

TCS-503

(Following Paper ID and Roll No. to be filled in your Answer Book)

**PAPER ID : 1075**

Roll No.

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**B. Tech.****(SEM. V) EXAMINATION, 2008-09****DESIGN & ANALYSIS OF ALGORITHMS***Time : 3 Hours]**[Total Marks : 100*

- Note :*
- (i) Attempt all questions.*
  - (ii) All parts of a question should be attempted at one contiguous place.*

**I Attempt any four parts of the following :      5×4=20**

- (a) Solve the recurrence relation by iteration :**

$$T(n) = T(n-1) + n^4.$$

- (b) What is the smallest value of  $n$  such that an algorithm whose running time is  $100n^2$  runs faster than an algorithm whose running time is  $2^n$  on the same machine ?**

- (c) Prove that any comparison sort algorithm require  $\Omega(n \log n)$  comparisons in worst case.**

- (d) Illustrate the operation of counting sort on the following array :**

$$A = \langle 6, 0, 2, 0, 1, 3, 4, 6, 1, 3, 2 \rangle.$$

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[Contd...

- (e) How, both the minimum and the maximum of a set of  $n$  elements can be computed in atmost  $3\lfloor n/2 \rfloor$  comparisons ?
- (f) Solve the recurrence relation for binary search algorithm using tree method.

2 Attempt any **four** of the following : **5×4=20**

- (a) Prove that a red-black tree with  $n$  internal nodes has height at most  $2 \log(n+1)$ .

- (b) Construct binary expression tree from the following traversals :

**Inorder :**  $4 + 3 + 2 * 1$

**Preorder :**  $+4 * +3 2 1$

- (c) Write an algorithm **HEAP-DELETE**( $A, i$ ), which deletes the item in node  $i$  from heap  $A$ .
- (d) Write three operations and their implementation on dynamic sets.
- (e) Give an algorithm to count the number of leaf nodes in a binary tree  $t$ . What is it's computing time ?
- (f) Explain the process of augmenting a data structure with an example.

3 Attempt any **two** of the following : **10×2=20**

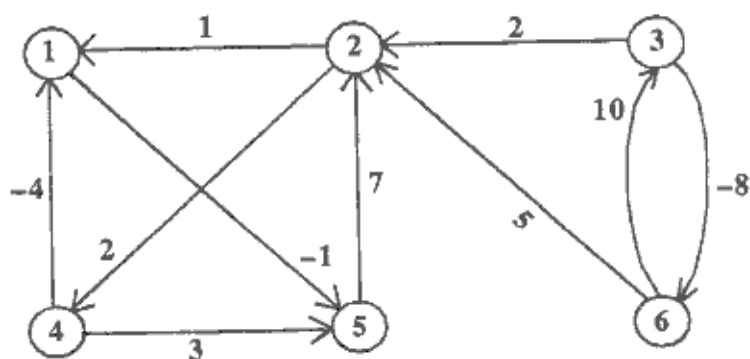
- (a) What steps are used in Dynamic Programming Approach ? Discuss the 0/1 Knapsack problem with respect to Dynamic Programming. Is Greedy method equally applicable for the above problem ?



- (b) Apply greedy approach to an activity-selection problem of scheduling several competing activities that require exclusive use of common resources, with a goal of selecting a maximum size set of mutually compatible activities.
- (c) What do you understand by amortized analysis? What are different methods for it? Explain with an example.

4 Attempt any **two** of the following : **10×2=20**

- (a) Prove that if the weights on the edge of the connected undirected graph are distinct then there is a unique Minimum Spanning Tree. Give an example in this context. Also, discuss Kruskal's minimum spanning tree in detail.
- (b) Explain Floyd Warshall algorithm with suitable example.
- (c) For the graph (Weighted, directed)



apply Floyd-Warshall algorithm for constructing shortest path. Show the matrix  $D^{(k)}$  that results each iteration.



5 Attempt any **two** of the following : 10×2=20

(a) (i) Discuss the decision problems of class **P** and **NP**.

(ii) Discuss **NP** complete problems.

(b) Explain Boyer-Moore algorithm for string matching for text :

**"a b c a a b c c a a b b a b c a"**

Pattern **a b c**.

Compute worst time complexity of this algorithm.

(c) What are approximation algorithms ? What is meant by a  **$P(n)$**  - approximation algorithm ? Give an approximation algorithm for travelling salesman problem.

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