

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

PAPER ID : 1075

Roll No.

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B. Tech.

FIFTH SEMESTER EXAMINATION, 2006-07

DESIGN AND ANALYSIS OF ALGORITHMS

Time : 3 Hours

Total Marks : 100

- Note :** (i) Attempt *ALL* questions.
(ii) All questions carry equal marks.
(iii) In case of numerical problems assume data wherever not provided.
(iv) Be precise in your answer.

1. Attempt *any four* parts of the following : (5x4=20)

- (a) Find big oh (O) and big theta (
- θ
-) notations for the following function

$$f(n) = 27n^2 + 16n + 25$$

- (b) Consider the following "for" loop, obtain the time complexity (worst case) for the following :

for i = 2 to m - 1

{

for j = 3 to i

}

set sum = sum + A [i][j]

}

}

- (c) Consider the following recurrence

$$T(n) = 4T(n/2) + n^2$$

Find its asymptotic bound using Master Method.

- (d) Explain the concept of partitioning of the given set to be sorted using quick-sort algorithm.
- (e) Prove that the running time of Redix-sort is represented as $O(n \log n)$.
- (f) Explain selection in expected linear time. You are also required to give the desired algorithm.

2. Attempt *any four* parts of the following : (5x4=20)

- (a) What is a binomial tree ? Explain with suitable example. You are also required to give its properties.
- (b) What are the three different cases, when insert a node into a Red Black Tree (RBT) ? Explain with example.
- (c) Explain the different conditions of getting union of two existing binomial Heaps.
- (d) What are the various differences in Binomial and Fibonacci Heap ? Explain.
- (e) Write an algorithm of Insertion in B-tree. You are also required to give comments on its running time.
- (f) Augment a Binary Tree, where now each node maintains the size of node (number of internal nodes including itself) with suitable diagram.

3. Attempt *any two* parts of the following : (10x2=20)

- (a) Explain what do you understand by "assembly line scheduling". Describe a method of solving the problem using Dynamic Programming Technique.
- (b) What are the different Greedy Criterion ? Explain.

Consider the five items along with their respective weights and values :

$$I = \{I_1, I_2, I_3, I_4, I_5\}$$

$$W = \{5, 10, 20, 30, 40\}$$

$$V = \{30, 20, 100, 90, 160\}$$

The knapsack has capacity $W = 60$, Find the solution of the problem using the concept of fractional knapsack.

- (c) Find the amortized cost for Enqueue (Insertion) and Dequeue (Deletion) operations in a queue using accounting method.

4. Attempt *any two* parts of the following : (10x2=20)

- (a) Explain linked Adjacency Lists representation of a graph with suitable example/diagram.
- (b) What is a minimum spanning tree(MST) of a graph ? Describe PRIM's algorithm to find MST alongwith its running time.
- (c) Explain and write the Bellman-Ford algorithm. You are also required to find the running time of the algorithm.

5. Attempt *any two* parts of the following : (10x2=20)

- (a) Explain and write the Naive-String string matching algorithm :

Suppose the given pattern $P = a a b$ and
given text $T = a c a a b c$

Apply Naive-String Matching algorithm on above Pattern (P) and Text (T) to find the number of occurrences of P in T.

- (b) Explain NP-Hard and NP-Complete with suitable example.
- (c) What do you mean by Randomized algorithms ? Explain with suitable example.

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