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CA401

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

PAPER ID : 214401

Roll No. □□□□□□□□□□

M. C. A.

(SEM. IV) THEORY EXAMINATION, 2014-15

DESIGN & ANALYSIS OF ALGORITHMS

Time : **3** Hours] [Total Marks : **100**

Note:(1) Attempt all questions.

(2) All question carry equal marks.

1 Attempt any four parts of the following : [5x4=20]

(a) Define the asymptotic notations used for best case, average case and worst case analysis of algorithm.

(b) Using Radix sort the given list of elements:

L=599, 875, 344, 375, 399, 489, 498

(c) Write an algorithm for finding maximum element of an array; perform and average case complexity with appropriate order notations.

(d) lllustrate the algorithm of BUILD MAX-HEAP and devise its complesxity;

(e) Sort the following list in increasing order using quick sort technique and argue its running time: 38, 57, 62,3, 38, 57, 62, 3, 31, 65, 72, 46, 16, 92

(f) Find the time complexity of recurrence relation $T(n) = 2T\left(\sqrt{n}\right) + 1$.

2 Attempt any four parts of the following. [5×4=20]

(a) Define B-Tree. Discuss the deletion of a key from B-Tree.

(b) Create a B-Tree for the following list of elements L=80, 60, 40, 20, 10, 30, 50, 70, 90, 100; given minimization factor t=3.

Prove that for $n \geq 1$, then for any n-key B-tree T of height h and minimum degree $t \geq 2$

$$h \leq \log_t \frac{n+1}{2}.$$

(c) Explain Binomial Heap an binomial Trees Property . How Binomial heaps are represented ? Write algorithm to find the minimum key in a binomial heap.

(d) Write an algorithm for inserting a node into Fibonacci Heap.

(e) Prove that a red black tree with n internal nodes has height at most 2 log (n+1); show the red black trees that result that result after successively inserting the keys 41, 38, 31, 12, 19, 8 into an initially empty red black tree.

(f) List and explain the properties of a Red Black tree.

3 Attempt an four parts of the following. [5×4=20]

(a) What are the four feasible solutions for

n=3, m=20, (p1, p2, p3) = (25, 24, 15),(w1, w2, w3) = 18, 15, 10)

(b) Which is a more efficient way to determine the optimal number of multiplications in a matrix chain multiplication problem enumerating all the ways of parenthesizing the product and computing the number of multiplication for each or running MATRIX- XHAIN-ORDER? Justify your answer, Find an optimal parenthesization of a matrix-chain product whose sequence of dimensions is (5, 10, 3, 12, 5, 50, 6)

(c) Compare Backtracking and Branch and Bound techniques with an example.

(d) Find the longest common subsequence from the two sequence of characters :

(a) P = <A, B, C, D, B, C, D, C, D, D>

Q = <B, C, D, C, D>

(b) P = <1, 0, 0, 1, 0, 1, 1, 0, 1, 1, 0, 1>

Q = <0, 1, 1, 0>

(e) Define a knapsack problem and describe its formulation. Point the optimal solution to the knapsack instance.

n=5 w = 20, 30, 40, 107

P = 7, 8, 9, 1, 6 C=80, using Greedy method

(f) When and how dynamic programming approach is applicable ? Discuss matrix chain multiplication with reference to dynamic programming technique and also apply it on the following array :

30	1	40	10	25
r0	rl	r2	r3	r4

4 Attempt any two parts of the following. [10×2=20]

(a) Define Depth First Search. Write an algorithm for DFS, discussing its time complexity. Also illustrate with some example.

(b) Write and explain Dijkstra' s algorithm with the help of suitable example.

(c) Explain the Floyd Warshall algorithm with example. Which design strategy the algorithm uses ?

5 Attempt any two parts of the following. [10x2=20]

(a) Using Knuth-Marries Pratt algorithm find whether the pattern P = <0010> is in text T=<1100011010001010>or not ? Compute complexity of this algorithm

(b) Explain NP-hard and NP complete problems with problems with example.

(c) 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 abc, Compute worst time complexity of this algorithm.