Printed Pages: 677 ECS-502

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

Paper ID : 110512 Roll No. | | | | | | | | | | |

B.Tech.

(SEM. V) THEORY EXAM. 2015-16

DESIGN AND ANALYSIS OF ALGORITHMS

[Time:3 hours] **[MaximumMarks:100]**

Section-A

1. Attempt **all** parts. All parts carry equal marks. Write answer of each part in short. (10x2=20)

   (a) Why should we do asymptotic analysis of algorithms? Explain.

   (b) Order the following expressions by their asymptotic growth and justify your answer

   $2^n, n!, (\log n)!, n^3, 2^{\log^2 n}, 2^{2^n}, n^{\log \log n}, e^n$

(c) How can youy modify Quick sort algorithm to serch an item in a list?

(d) What are all pairs shortest path?

(e) Define Convex Hull.

(f) Discuss various properties of Binomial Tree

(g) What are the steps to design an algorithm?

(h) Prove that red-black tree with **n** internal nodes has height at most $\mathbf{2\log^2(n+1)}$

(i) Prove that the maximum degree of **n**- node in a binomial tree is $\mathbf{\log_2 n}$.

(j) What do you understand by **'stable'** sort? Name two stable sort algorithms.

(k) Define Greedy Approach.

Section-B

Attempt **any five** questions from this section. (5x10=50)

2. Explain insertion in Red Black Tree. Show steps for inserting 9,8,7,6,5,4,3,2, & 1 into empty RB tree.

3. Show all the steps of Strassen's matrix Multiplication algorithm to multiply the following matrices

$$x = \begin{bmatrix} 3 & 2 \\ 4 & 8 \end{bmatrix} and = y = \begin{bmatrix} 1 & 5 \\ 9 & 6 \end{bmatrix}$$

4. Define Dynamic programming. How Dynamic Programming approach is used to find the shortest path? Illustrate with an example.

5. Find optimal solution to the Fractional Knapasck instances n= 7 and Knapsack capacity M = 15 Where profits and weights are as follows $(p_1, p_2 \ldots\ldots p_7)$ = (10,5,15,7,6,18,3) & $(w_1, w_2 \ldots\ldots w_7)$ = (2,3,5,7,1,4,1) respectively

6. Construct the string- matching automaton for the pattern **P=a a b a b** and illustrae its operation on the text string **T = a a a b a b a a b a a b a a b.**

7. Illustrate the operation of heap sort on the array A=(6,1,2,4,3,5,7,9,8,0)

8. Find an LCS for the sequences. X={x1, x2 .....Xm,} and Y={y1 ,y2.....y_n}. Also show that it requires O (m+n) time.

9. Write short note on Fast Fourier Transform (FFT).

Section-C

Attempt **any two** questions from this section. (2x15=30)

10. Attempt both :

    (a) Why the statement "The running time of algorithm A is at least O (n^2) is meaningless"? Explain .

    (b) What is the procedure of partition (A, p, r) in Quick Sort and also define the complexity of Quick Sort.

11. What do you mean by Branch & Bound? How TSP can be solve using this approach.

12. Attempt both :

    (a) Discuss the relationship between the class P, NP, NP- complete and NP- hard with suitable example of each class.

    (b) Define Approximation algorithms. What is Approximation ratio? Give an Approximation algorithm for the Travelling Salesman

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