2017

CSIT

Paper : 407 (Old)

ALGORITHM AND COMPLEXITY THEORY

Full Marks: 80

Time: 3 hours

The figures in the margin indicate full marks for the questions '

1. (a) Define the following notations 3

θ, O, Ω

(b) Find a solution to the following recurrence relation using the substitution method. (anytwo). 2*3=6

(i) $T(n) = T(n-1) + n$ (ii) $T(n) = T(n-1) * n$

$T(n) = 1$ $T(n) = 1$

(iii) $T(n) = T(n-1) + 1/n$

$T(n) = 1$

(c) Use the master theorem to give asymptotic bounds for the following recurrences (any two) : 2*3=6

(i) $T(n) = 4T(\frac{n}{2}) + n$

(ii) $T(n) = 4T(\frac{n}{2}) + n^2$

(iii) $T(n) = 4T(\frac{n}{2}) + n^3$

2. Write down the steps followed in discovering optimal substructure of a problem. Given a chain of matrices A1, A2, A3 and A4 in the dimension 15

A1=5*4

A2=4*6

A3=6*2

A4=2*7

respectively, find the order of matrix multiplications minimizing the scalar multiplications to compute the product.

3. What is the running time of an algorithm? Explain the best-case and worst-case time complexity of insertion sort. 10

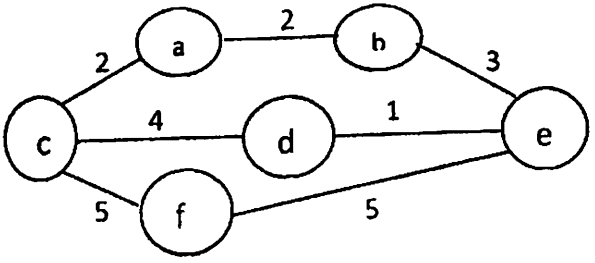
4. Explain the greedy technique with knapsack problem as an example. 5

5. Find out the maximum mutually compatible activities from the following jobs. 5

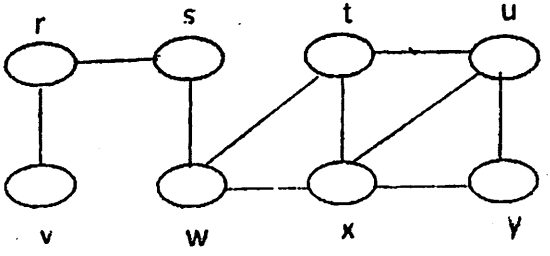
Sl. No.	Starting Time	Finishing Time
1	1	4
2	3	5
3	4	6
4	5	7
5	3	8
6	7	9
7	10	11
8	8	12
9	8	13
10	2	14
11	13	15

6. Describe two ways of representing graphs in computer. 6

7. What is the minimum spanning tree of a graph? Using Kruskal algorithm, find a minimum spanning tree for the following graph. 2+6=8



8. Apply BFS on the following graph 10



9. Find a solution to the following recurrence relation using the recursion tree method 6

$T(n) = 2T(\frac{n}{2}) + cn$

$T(1) = C,$ Where $c > 0$ is a constant.

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