2018

COMPUTER SCIENCE & TECHNOLOGY

MCA 3.2

DESIGN AND ANALYSIS OF ALGORITHM

Full Marks: 75

Time: 3 Hours

The figures in the margin indicates full marks for the questions

1.(a)Arrange the following functions by order of growth in the ascending order. If two (or more) functions have the same order, indicate which : 3

2^{2n}, 2^n, lgn, n^2, $2n^3-7a^2$, e^n, n!,n^3+7n^2+n, 4,

(b) Find a solution to the following recurrence relation using the substitution method (any two). $3 \times 2 = 6$

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

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

(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): $3 \times 2 = 6$

(iT(n) = $T(\frac{2n}{3}) + 1$

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

(iii)$T(n) = 9T(\frac{n}{3}) + n$

(d) Find a solution to the following recurrence relation using the recursion tree method 6

$T(n) = 2T(\frac{n}{2}) + cn \qquad T(1) = c$

Where $c > 0$ is a constant.

2. What is the running time of an algorithm? Explain the best-case and worst- case time complexity of insertion sort? 2+8=10

Or,

Analyze merge sort algorithm using divide and conquer method. Given an array 2,4,5,7,1,2,3,6 sort it on paper using merge sort. Write down explicitly each step. 10

3. For a chain (A_1, A_2, A_3) of three matrices that are in the dimensions 10 x 100, 100 x 5 and 5 x 50 respectively. Show that computing the product according to parenthesization $((A_1, A_2)\ A_3)$ is 10 times faster than the parenthesization $((A_1\ (A_2 A_3))$ in terms of scalar multiplications. 6

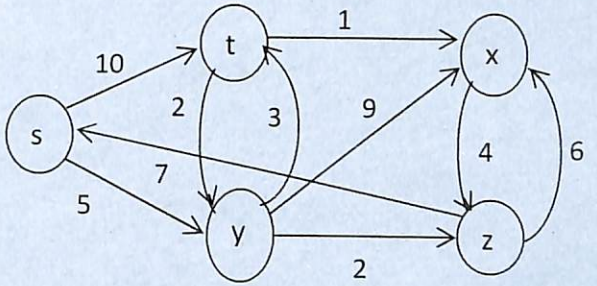
4. How does dynamic programming differ from divide and conquer method. Write the four steps followed when developing a dynamic programming algorithm? 6

5. Explain the greedy technique with knapsack problem as an example. 6

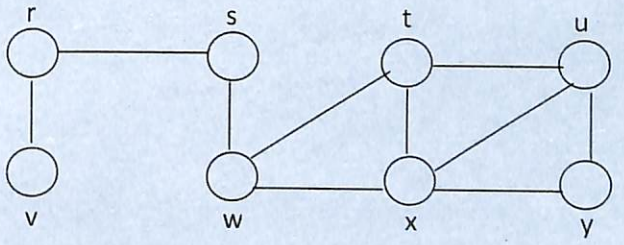
6. Find out the maximum mutually compatible activities from the following jobs 5

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

7. What is Dijkstra's algorithm? Using Dijkstra's algorithm, find the shortest path from vertex s to every other vertex from the following graph. 2+6=8



8. What is Breadth-first Search? Apply Breadth-first search on the following graph. 10



9. (a) Define the following notations : 3

θ, O, Ω

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