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B.E/B.Tech. (Full Time)DEGREE END SEMESTER EXAMINATIONS, NOV/DEC 2011

COMPUTER SCIENCE & ENGINEERING / INFORMATION TECHNOLOGY BRANCH

THIRD SEMESTER-(REGULATIONS 2008)

CS9201- DESIGN & ANALYSIS OF ALGORITHMS

Time: 3 hours Max. Mark: 100

Answer ALL Questions

Part-A (10 x 2= 20 Marks)

1. Calculate the time complexity for the following algorithm. Specify its upper and lower bounds.

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Algorithm add(a,b,c,n)
//Input : a,b,c –matrices of size nXn (n-positive integer)
    for i=1 to n do
        for j=1 to n do
            c[i,j]=a[i,j]+b[i,j]
```

2. List out the difference between Dynamic Programming and greedy approach.

3. Define optimal substructure.

4. Find the longest common subsequence for the following sequence W (a,a,c,b,d,a,c) and X(d,a,b,d,c).

5. Mention the characteristics of Deterministic and Randomized Algorithm.

6. Find the optimal Huffman code for the following :
(Character, frequency) ➔(a, 5) ; (b,2) ;(d,4) ; (e,3); (f,3);(g,1)

7. What is basic solution? When can you say that a basic solution is an optimal solution?

8. Formulate a dual Linear program for the following Linear Program

Maximize 2X+Y+Z

Subject to

X+Y+2Z<=30
2X+2Y+4Z<=24
3X+Y+Z<=36
X,Y ,Z >=0

9. Define P and NP problem.

10. List out the properties of NP-Complete (NPC) problem.

Part-B (5 x 16= 80 Marks)

11.a.(i) Write a randomized algorithm for hiring problem and perform an analysis of hiring problem using indicator random variable to compute the expected number of times we hire a new office assistant. (12)

(ii) Solve the following recursive equation using recursive tree method and verify it by using Masters method. (4)

$$T(n)= \begin{cases} b & \text{if } n<3 \\ 3T(n/3)+bn & \text{if } n>=3 \end{cases}$$

12.a.(i) Write the randomized Quicksort Algorithm and analyse its expected running time. (8)

(ii) Demonstrate the operation of counting sort on the array A= (2,0,0,5,4,2) (4)

(iii) Give a brief justification for the lower bounds for comparison sort in worst case. (4)

(OR)

12.b.(i) Find an optimal parenthesization of a matrix-chain product for the following matrices of given order (8)

A1 (10x3), B (3 x 5), C (5 x 2), D (2 x4)

(ii) Write an algorithm that computes an optimal order for multiplying the chain of matrix using Dynamic Programming strategy. Specify its time complexity. (8)

13.a. Write an iterative algorithm to solve the Activity selection problem using Greedy approach. Apply the algorithm to the following table and compute the result. (16)

Activity(i)	1	2	3	4	5	6	7
Start time (s_i)	1	2	4	3	3	5	8
Finish time (f_i)	4	3	7	6	5	8	11

(OR)

13.b.(i) Solve the following Linear Equations using LUP decomposition (10)

X+5Y+4Z=12
2X+3Z=9
5X+8Y+2Z=5

(ii) How many Scalar multiplications are required to multiply two 2 x 2 matrices using Strassen's algorithm? Explain the steps included in Strassen's approach to perform Scalar multiplications. (6)

14.a.(i) Solve the following linear program using SIMPLEX algorithm: (8)

Maximize 10X+12Y
Subject to
X+Y<=40
X+2Y<=75
X, Y>= 0

(ii) Explain the steps involved in SIMPLEX algorithm. (8)

(OR)

14.b.(i) Write the KMP string matching algorithm and compare the running time efficiency of KMP with Naïve string matching algorithm in worst case. (8)

(ii) Perform the String Matching process for the following Text and Pattern using KMP algorithm. (8)

Text (T) => AABAABDABAABD

Pattern(P)=> AABD

15.a. Prove that Vertex Cover Problem is NP-Complete and explain the three key concepts involved in showing a problem to be NP-Complete. (16)

(OR)

15.b.(i) Write an approximation algorithm for any one NP-Complete problem and calculate its approximation ratio. (8)

(ii) Discuss on how to use a polynomial –time reduction algorithm to solve a decision problem "X" in polynomial time given a polynomial time decision algorithm for another problem "Y". (8)