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 the upper and lower bounds.

    Algorithm add(a,b,c,n)

    for i=1 to n do

    for j=1 to n do

    c[i,j]=a[i,j]+b[i,j]

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

3. Mention the elements in Dynamic programming approach?

4. List out the difference between Deterministic and Randomized Algorithm?

5. What is optimal substructure?

6. What is duality in Linear Programming?

7. Give the format for Slack form.

8. How many Scalar multiplications are required to multiply two 2 x 2 matrices using Strassen's algorithm? Specify its time complexity.

9. Define NP and NP-Complete (NPC) problem.

10. Mention the characteristics of an Approximation algorithm.

Part-B (5 x 16= 80 Marks)

11.a.i Write a randomized algorithm for hiring problem and prove that the probability of   (10)
        obtaining identity permutation is 1/n!.

   ii   Give a brief description about the three cases in Masters method and its condition   (3)

   iii Solve the following recursive equation using recursive tree method.   (3)

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

12.a.i Explain the Counting Sort with Algorithm .Demonstrate the operation of counting (8)
sort on the array A= (2,0,0,5,4,2) .

ii Identify the lower bounds for comparison sort in worst case and justify. (8)

(OR)

12.b.i Find the optimal way of multiplying the following matrices of given order. (16)
A1 (5 x3), B (3 x 2), C (2 x 4), D (4 x1)
Write an algorithm that computes an optimal order for multiplying this chain of matrix.

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

i	1	2	3	4	5	6	7
s_i	1	3	0	5	3	5	8
f_i	4	5	6	7	8	9	11

(OR)

13.b.i Find the optimal Huffman code for the following data (8)

(Character, frequency) ➔(a, 5) ; (b,2) ;(d,4) ; (e,7); (f,3);(g,7); (h,1) .Mention the
time complexity of its algorithm.

ii Explain the steps included in strassen's approach to perform Scalar multiplications. (8)

14.a.i Discuss the various steps involved in solving a linear program using SIMPLEX (16)
method with algorithm.

(OR)

14.b.i Explain KMP algorithm. Perform pattern matching and compute the prefix function (10)
for the given text (T)="abaaacabaa" and pattern Pattern (P)= "aba"
using KMP.

ii Discuss the steps involved in Converting any linear program into standard form (6)

15.a Discuss the characteristics of NP-Complete problem.Identify any one NP-Complete (16)
problem and prove that it is NP-Complete.

(OR)

15.b Write an approximation algorithm for any one NPC problem and calculate its (16)
approximation ratio.