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5E1355

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B.Tech. V-Sem. (Back) Examination, January/February - 2024

Computer Sc. & Engg

5CS4-05 Analysis of Algorithms

CS,IT

Time : 3 Hours **Maximum Marks : 120**

Mm. Passing Marks: 42

Instructions to Candidates:

Attempt all ten questions from Part A, five question out of seven from Part B and four questions out of five from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used! calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No.205)

Part - A

(Answer should be given up to 25 words only)

All questions are compulsory **(10×2=20)**

1. What are Asymptotic Notations? Define them.
2. Differentiate Kruskal's and Prim's Algorithm.
3. Define and explain the Cook's theorem.
4. Differentiate Branch & Bound and Backtracking problems with example.
5. Find out the time complexity of given algorithm.

```
int x = 0;
for (int i=1, i<n; +i++)
{for (j=1;j<n;++j)
{x++;
n--;}}
```

6. What is 0/1 Knapsack Problem?

7. Describe binary search algorithm with its complexity.
8. Explain Naive pattern matching algorithm.
9. Write the difference between feasible and optimal solution.
10. Discuss Quadratic Assignment problem with suitable example.

PART - B

(Analytical/Problem solving questions)

(5×8=40)

Attempt any Five questions

1. Solve the recurrence relation using Recurrence Tree for time complexity.

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

   $T(n)=T(n/3)+T(2n/3)+cn$ if $n>1$

2. Define the vertex cover and set cover problems.
3. Show all the steps of Strassen's Matrix Multiplication Algorithm. Apply it on given 2x2 matrices.

$$\begin{vmatrix} 1 & 3 \\ 2 & 5 \end{vmatrix} \quad \begin{vmatrix} 3 & 9 \\ 4 & 7 \end{vmatrix}$$

4. Define the term pattern-matching. Explain spurious hits in the Rabin- Karp string-matching algorithm with an example. How many spurious hits does the Rabin-Karp encounter in the text T=2359023141526739921 when looking for pattern P=31415 with q=13?
5. Explain Greedy approach with suitable example. Consider a Knapsack of capacity 60 and items with profits as (280, 110,120,120) and weight (40,10,20,24).What is the maximum Profit earned using greedy approach.
6. What is Dynamic programming? How it is used to find longest common subsequence?
7. Illustrate the randomized algorithm. Differentiate the Las Vegas and Monte-Carlo Algorithm with example.

PART - C

(Descriptive/Analytical/Problem Solving/Design question)

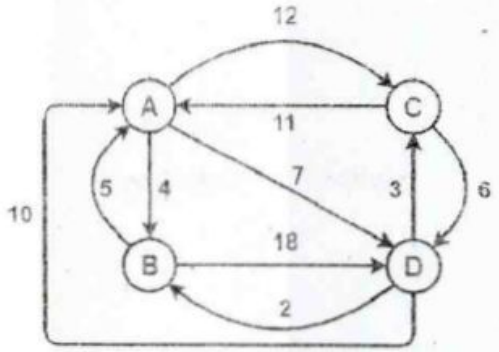
Attempt any Four questions **(4× 15 = 60)**

1. Write the algorithm of Merge Sort. Implement Merge Sort on the following data using divide and conquer technique. Also show tree of Recursive calls. Write the time and space complexity of merge sort.

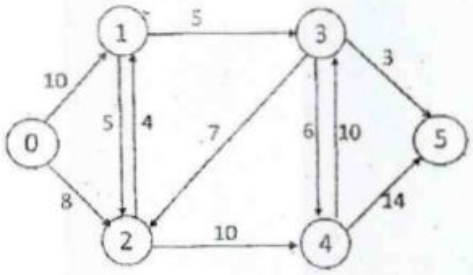
   32,14, 15, 27,31,7,23,26

2. What is the use of matrix chain multiplication method? Find the optimal parenthesizing for given matrices. A1 =2x3 A2=3x4 A3=4x2A4=2x5

3. Solve the Travelling and Salesman problem using branch and bound method for the given graph.



4. Discuss the terms Residual Network, residual capacity and Augmenting Path. Find the Maximum flow using Ford Fulkerson and the mm-cut for the given n/w.



5. Define terms P. NP, NP-Complete and NP-Hard problem with suitable examples. Show the relation between them.