5E1755

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B.Tech. V-Sem. (Main & Back) Examination, January/February - 2024
Artificial Intelligence and Data Science
5AID4-05 Analysis of Algorithm
CS, IT, AID, CAI, CIT, CDS, CSD, CCS

Time : 3 Hours   Maximum Marks : 70

Instructions to Candidates:

Attempt all **Ten** questions from Part A, **Five** questions out of **Seven** questions from Part **B** and **Three** questions out of **Five** questions 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 form No.205)

ersahilkagyan.com

PART - A

(Answer should be given up to 25 words only).
All questions are compulsory.   (10×2=20)

1. What is knapsack problem? Define two variants of Knapsack problem.

2. Difference between Dynamic Programming and Greedy Method.

3. What do you understand by Approximation Algorithm? Give two examples of Approximation Algorithm.

4. Give recurrence relation for Merge Sort and solve the reccurence to find its time complexity.

5. What do you mean by Pattern Matching? Name any two pattern matching Algorithms.

6. State Cook's Theorem.

7. What is Minimum Spanning Tree? Name any two algorithm used to find Minimum Spanning Tree.

8. Define Time complexity with its Notation

9. Order the following time complexities in increasing order

   n, 2^n, $\log_2^n$, 1, 3^n, $n\log_2^n$, n^3

10. Define lower Bound Theory.

PART - B
(Analytical/Problem solving questions)
Attempt any Five questions. $(5\times4=20)$

1. Solve the following recurrence relation and find complexity using Master's method.

   a) $T(n) = 4T(\sqrt{n}) + \lg^s n$ { lg means $\log_2$ }

   b) $T(n) = T\left(\dfrac{9n}{10}\right) + n$

2. $A = <a\,c\,b\,a\,e\,d>$, $B = <a\,b\,c\,a\,d\,f>$ If D is an LCS of A and B then find D using dynamic programming.

3. Explain Best case, Average case and worst case running time of Quick Sort.

4. Use Strassen's Matrix multiplication to compute matrix product.

   $$A = \begin{bmatrix} 1 & 2 \\ 6 & 3 \end{bmatrix} \qquad B = \begin{bmatrix} 5 & 7 \\ 3 & 1 \end{bmatrix}$$

5. What do you understand by Randomized Algorithm? explain Las Vegas and Monte Carlo Algorithm.

6. Why Huffman code is better than fixed length code? Find Huffman code corresponding to following character and its frequencies.

Character	a	b	c	d	e	f	g
Frequency	37	18	29	13	30	17	6

7. Explain use of prefix function in KMP string matching algorithm with an example

PART - C
## (Descriptive/Analytical/Problem Solving/Design question)

**Attempt any Three questions.** $(3\times10=30)$

1. Find the optimal paranthesization of matrix chain product whose sequence of dimension is (30, 1, 40, 10, 25).

2. What is backtracking? Write an algorithm for solving n-queen problem. trace it for N=6 using backtracking approach.

3. Solve Travelling Salesman Problem(TSP) having following cost matrix using branch and bound method.
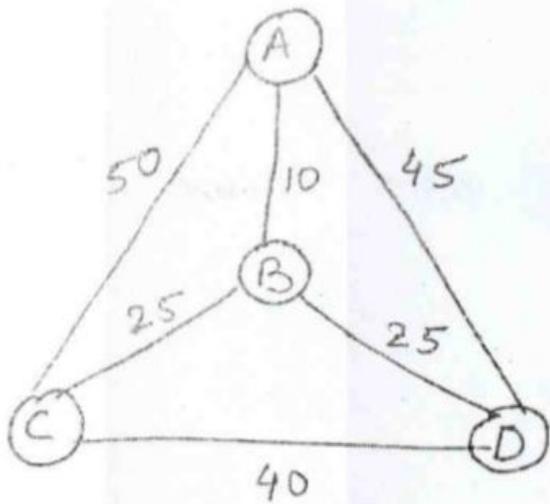
4. Explain multicommodity flow problem and solve the following flow network for finding maximum flow.
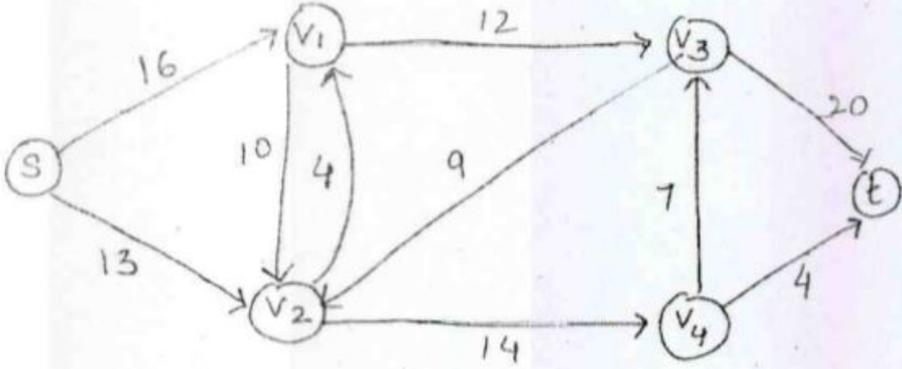
5. Define the terms P, NP, NP complete and NP-hard problems. Prove that 3-SAT is NP complete problem.

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