5E1355

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B. Tech. V - Sem. (Main / Back) Exam., Feb.-March - 2021
Computer Science & Engineering
5CS4 – 05 Analysis of Algorithms
Common for CS, IT

Time: 2 Hours

Maximum Marks: 82
Min. Passing Marks: 29

Instructions to Candidates:

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

Schematic diagrams must be shown wherever necessary. Any data you feel missing may 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)

1. NIL   2. NIL

PART – A

(Answer should be given up to 25 words only)   [10×2=20]

All questions are compulsory

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Q.1   What is Master Method?

Q.2   What is the difference between Dynamic Programming and Divide and Conquer Mechanism?

Q.3   What do you mean by Approximation Algorithms? Give two examples.

Q.4   What do you mean by Lower Bounds?

Q.5   What is Greedy Method?

Q.6   State Cook's theorem.

Q.7 Write down the algorithm of Binary Search.

Q.8 Give a recurrence for merger sort algorithm and solve it.

Q.9 What are the constraints required for a Backtracking method?

Q.10 Order the following time complexities in increasing order.

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

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

PART – B

(Analytical/Problem solving questions) [4×8=32]

Attempt any four questions

Q.1 X = < a, a, b, a, b >, Y = < b, a, b, b >. If Z is an LCS of X and Y, then find Z using dynamic programming.

Q.2 What is the use of prefix function in KMP string matching algorithm? Explain with example.

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Q.3 Explain vertex and set cover problem.

Q.4 Write short notes on the following:-

(a) Quadratic assignment problem

(b) Boyer-Moore Algorithm

Q.5 Explain the Las Vegas and Monte Carlo Algorithm with example.

Q.6 Solve the following recurrence relations and find their complexities using master method-

(a) $T(n) = 2T(\sqrt{n}) + \log_2 n$

(b) $T(n) = 4T\left(\frac{n}{2}\right) + n^2$

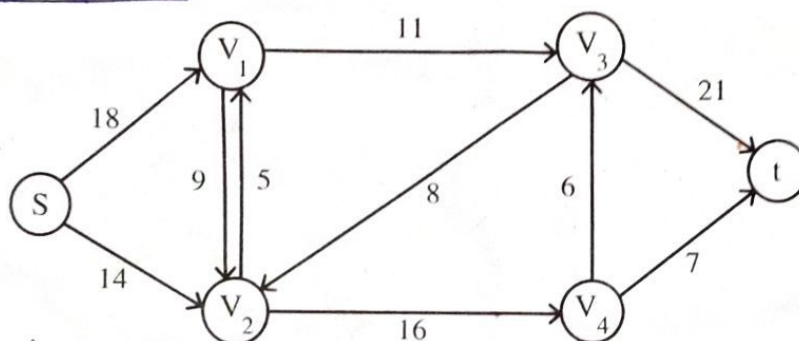Q.7 Define the terms P, NP, NP complete and NP-Hard problems.

PART – C

Attempt any two questions

Q.1 Find the optimal parenthesization of matrix-chain product whose sequence of dimensions is (4, 10, 6, 40, 5).

Q.2 What do you mean by Multi-commodity flow in the network? Find the max flow path by Ford-Fulkerson method for given network.

Q.3 Given the text –

T = < 2, 3, 5, 9, 0, 2, 3, 1, 4, 1, 5, 2, 6, 7, 3, 9, 9, 2, 1 >

P = < 3, 1, 4, 1, 5 >

And modulo q = 13, m = 5

Choose the pattern matching with average case complexity and explain the search process. Justify the answer for choosing such algorithm.

Q.4 Solve the TSP problem having the following cost matrix using branch and bound.

$$
\begin{array}{c|cccc}
 & A & B & C & D \\
\hline
A & X & 15 & 11 & 7 \\
B & 14 & X & 13 & 20 \\
C & 6 & 9 & X & 4 \\
D & 8 & 12 & 22 & X \\
\end{array}
$$

Q.5 Show all the steps of Strassen's Matrix Multiplication algorithm to multiply the following matrices –

$$X = \begin{bmatrix} 3 & 2 \\ 4 & 8 \end{bmatrix} \text{ and } Y = \begin{bmatrix} 4 & 5 \\ 9 & 6 \end{bmatrix}$$