5E1755

Roll No.

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B. Tech. V - Sem. (Main) Exam., February - 2023

Artificial Intelligence and Data Science

5AID4-05 Analysis of Algorithm

CS, IT, AID, CAI

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 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

Q.1 Find out the Time Complexity of given algorithm -

```
Sum(a, n)
{ if(n <= 0)
      return 0;
else
      return sum (a, n-1) + a [n];
}
```

Q.2 Discuss space complexity.

Q.3 Distinguish Greedy Method and Dynamic Programming.

Q.4 Define 0/1 knapsack problem.

Q.5 Recognize Lower Bound Theory.

Q.6 Identify Pattern Matching Algorithms.

Q.7 State about assignment problem.

Q.8 Describe Randomized Algorithms.

Q.9 Explain set cover problem.

Q.10 Define Cook's Theorem.

PART – B

(Analytical/Problem solving questions) **[5×4=20]**

Attempt any five questions

✓ Q.1 Contrast between 3 asymptotic notations & define the use & objective of asymptotic notations.

✓ Q.2 Sort the following sequence using Quick Sort Method. Consider first element as the Pivot element.

15, 56, 62, 2, 9, 16, 21, 17, 23, 3, 10

✓ Q.3 Find out the solution generated by the job sequencing. When n = 7 with following profit & deadline -

$$\begin{bmatrix} \text{Profit } (P_1, P_2 \ldots P_7) & = & (3,5,20,18,1,6,30) \\ \text{Deadline } (d_1, d_2 \ldots d_7) & = & (1,3,4,3,2,1,2) \end{bmatrix}$$

✓ Q.4 Solve the TSP problem for the following Cost Matrix -

	W	X	Y	Z
W	A	8	13	18
X	3	A	7	8
Y	4	11	A	10
Z	6	6	7	A

Q.5 Discuss Quadratic Assignment Problem using a suitable example.

Q.6 Differentiate between Las Vegas and Monte-Carlo Algorithm with example.

Q.7 Prove that the Hamilton Cycle Problem is NP-Complete.

PART – C

(Descriptive/Analytical/Problem Solving/Design Questions) **[3×10=30]**

Attempt any three questions

Q.1 Solve the recurrence using Master theorem -

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

(b) $T(n) = 8T(n/2) + n^2$

Q.2 Discuss matrix chain multiplication with reference to dynamic programming technique. Explain 0/1 Knapsack Problem with suitable example.

Q.3 (a) Find the pattern ABCBC in the test ACABABCABCBCA using KMP Matcher.

(b) Discuss Naive String Matching Algorithm in detail.

Q.4 (a) Define the terms flow networks and flow. Explain the essential properties of flow.

(b) Discuss the terms -

(i) Residual Network

(ii) Augmenting Path

Q.5 (a) Describe the terms P, NP, NP-Hard, NP-Complete with suitable example. Also, give relationship between them.

(b) Write algorithm for approximation for vertex cover problem with example.
