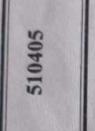
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510405

B.TECH. V SEM (OLD SCHEME) BACK EXAMINATION ACAD. SESSION 2023-24 (ARTIFICAL INTELLIGENCE AND DATA SCIENCE)-V AND OTHER BRANCHES

5AD4-05 - Analysis of Algorithms

Common with CSE, IT, MLC, DS

Time: 3 Hours]

[Max. Marks: 120

[Min. Passing Marks:

Instructions to Candidates:

Part-A: Short Answer Type Questions (up to 25 words) $10 \times 2 = 20$ marks. All 10 questions are compulsory.

Part-B: Analytical/Problem Solving questions $5 \times 8 = 40$ marks. Candidates have to answer 5 questions out of 7.

Part-C: Descriptive/Analytical/Problem Solving questions 4 × 15 marks = 60 marks.

Candidates have to answer 4 questions out of 5.

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 the following supporting materials is permitted during examination. (Mentioned in form no. 205).

1			
		2	

F-193

(1)

P.T.O.

- Q. 1. Given a graph G and a matching M of G. If there exists an augmenting path P in G w.r.t. M, then what is a matching of G with/for $M' = (M \setminus P)U(P \setminus M)$?
- Q. 2. Write the control abstraction for Divide and Conquer technique.
- Q. 3. Explain the important of order Big O.
- Q. 4. What is the in-place technique ?
- Q. 8. Consider the following function f:

```
int f(int n)
{
  int s = 0;
  while (n > 1)
  {
    n = n/2;
    s++;
  }
return s;
```

What is the asymptotic complexity in terms of n for above function f?

- Q. 6. What is meant by order of growth?
- Q. 7. Are all NP-complete problems NP-hard? Justify.
- Q. §. Define zero knowledge condition.
- Q. 9. Let G be a graph with 'n' nodes and let 'm' be the chromatic number of the graph. Then what is the time taken by the backtracking algorithm to color it.
- Q. 19. What is n-queen problem ?

Q. 1. Find the optimal schedule for the following task with given weights, w_i and deadlines, d_i .

	1	2	3	4	5	6	7
d_i	4	2	4	3	1	4	6
W_i	70	60	50	40	30	20	/ 10

- Q. 2. In the flow network, define the terms maximum cut, residual network, augmenting path, capacity and flow.
- Q. 3. Solve the below recurrence relations:

(i)
$$T(n) = 4T(n/2) + n^2 \sqrt{n}$$

(ii)
$$T(n) = T(n-2) + 2 \log n$$

- Q. 4. Give the steps of a non-deterministic graph coloring algorithm with example.
- Q. 5 Analyses the behavior of Quick sort algorithm for worst case and average case.
- Q. 6. Prove that edge contraction does not alter the min-cut size in a multigraph.
- Q. 7. Give an algorithm for graph traversal. Analyse the algorithm.

- Q. 1. Construct an instance of a knapsack problem that visits every leaf node, even if you use branch and bound with randomized. You can choose any well-defined estimation.
- Consider the string matching problem of finding all occurrences of pattern P = abcab in the text T = aaabcabad, where $\Sigma = \{a : b : c : d\}$. Give the prefix function π for the pattern P, bad character function λ for the pattern P and alphabet Σ and good suffix function γ for the pattern P. Using the Boyer-Moore algorithm how far is the pattern shifted after the first character mismatch?

- Q.3. Prove that CNF satisfiability problem reduces to directed Hamiltonian cycle problem.
- Q. 4. Suppose that all characters in the pattern P are different. Show how to accelerate NAIVE-STRING-MATCHER to run in time O(n) on n-character text T.
- Q. 5. Write the short notes of the following:
 - (i) Zero-one principal
 - (ii) Merging network
