

Roll No.

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510405

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**B.TECH. V SEM (OLD SCHEME) BACK
EXAMINATION ACAD. SESSION 2023-24
(ARTIFICIAL 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 $M' = (M \setminus P) \cup (P \setminus M)$?
- 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. 5. 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. 8. 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. 10. What is n -queen problem ?

Part-B

5×8=40

- 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.

Part-C

4×15=60

- 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.

- Q. 2. Consider the string matching problem of finding all occurrences of pattern $P = \text{abcb}$ in the text $T = \text{aaabcbad}$, 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
