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Total No. of Pages : 02

Total No. of Questions : 09

**B.Tech. (AI & ML / AI & DS / CSE / DS / IOT / Internet of Things and
Cyber Security including Block Chain Technology) (Sem.-4)**

DESIGN & ANALYSIS OF ALGORITHMS

Subject Code : BTCS-403-18

M.Code : 77629

Date of Examination : 10-01-2025

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY** consisting of **TEN** questions carrying **TWO** marks each.
2. **SECTION-B** contains **FIVE** questions carrying **FIVE** marks each and students have to attempt any **FOUR** questions.
3. **SECTION-C** contains **THREE** questions carrying **TEN** marks each and students have to attempt any **TWO** questions.

SECTION-A

1) Answer briefly :

- a) Why the concept of order (Big O) is important?
- b) What is time space trade-off?
- c) Name some methodologies for design of the algorithm.
- d) What are the features of dynamic programming?
- e) What are the applications of Spanning Tree?
- f) What is the average successful search time taken by binary search on a sorted array of 10 items?
- g) Differentiate P vs NP.
- h) What is Cook's algorithm?
- i) What will happen when you apply heuristics in an existing algorithm?
- j) What is the role of randomizer in a Randomized algorithm?

SECTION-B

- 2) Look at the following recurrence when n is a power of 2 :

$$T(n) = \begin{cases} T(1) & n = 1 \\ T\left(\frac{n}{2}\right) + c & n > 1 \end{cases}$$

Solve the above recurrence relation for the following choices of a , b and $f(n)$ (c being a constant) $a = 1$, $b = 2$ and $f(n) = cn$

- 3) Explain Backtracking with the help of n -queens problem.
- 4) Write the algorithm for depth first search : Take a suitable example to show its working.
- 5) **Write short notes on :**
- a) Computability classes
 - b) NP Complete Problems.
- 6) Explain randomized algorithms with example.

SECTION-C

- 7) Show that the following equalities are correct.
- a) $5n^2 - 6n = \theta(n)$
 - b) $n! = O(n^n)$
 - c) $2n^2 2^n + n \log n = \theta(n^2 2^n)$
- 8) What is Prim's algorithm? Explain its steps and Analyze its time complexity too.
- 9) **Write short notes on :**
- a) Travelling Salesperson Problem
 - b) Topological Sorting.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.