Roll No. | | | | | | | | | | | | | Total No. of Pages : 02

Total No. of Questions :9

B.Tech. (AI&DS/AI&ML/CSE/CS/DS/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 : 22-12-2025

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. What is asymptotic analysis?

b. Write a short note on time and space trade-off.

c. Explain the concept of Dynamic Programming.

d. Define transitive closure of a graph.

e. What is a spanning tree?

f. What is Cook's theorem? State its significance in NP-complete problems.

g. Explain briefly the role of reduction in proving NP-completeness.

h. Describe various heuristics characteristics.

i. Differentiate between randomized and deterministic algorithms.

j. Discuss briefly different ways of analyzing recursive algorithms.

SECTION - B

2. Define the best-case and worst-case complexities of an algorithm. How do these compare to the average-case complexity in terms of analysis?

3. Differentiate between Branch and Bound and Backtracking algorithms.

4. Explain the topological sorting algorithm and discuss its applications in real world scenarios.

5. Discuss in detail various standard NP complete problems with examples.

6. Discusstherole of randomized algorithms in optimization problems, providing a detailed example of their application and potential advantages.

SECTION - C

7. What is computability of an algorithm? Discuss various computability classes in detail.

8. Explain in detail the design, analysis and approximation ratio of an Approximation algorithm for the vertex cover problem.

9. Describe the working of Prim's and Kruskal's algorithms for finding a Minimum Spanning Tree.

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.