

Roll No.....
Total No. of Questions: [09]

Total No. of Printed Pages: [1]

B. Tech. (CSE) (Semester – 5th)
DESIGN & ANALYSIS OF ALGORITHMS
Subject Code: BCSES1504
Paper ID: [18111123]

Time: 03 Hours

Maximum Marks: 60

Instruction for candidates:

1. Section A is compulsory. It consists of 10 parts of two marks each.
2. Section B consist of 5 questions of 5 marks each. The student has to attempt any 4 questions out of it.
3. Section C consist of 3 questions of 10 marks each. The student has to attempt any 2 questions.

Section – A

(2 marks each)

Q1. Attempt the following:

- a. Define asymptotic notation and explain the significance of worst-case analysis.
- b. Describe the difference between recursive and iterative algorithms with an example.
- c. What is the Master's theorem? Give a scenario where it can be applied.
- d. Explain the concept of time-space trade-off in the context of algorithm design.
- e. Briefly describe the greedy paradigm and mention one problem suited for it.
- f. What is dynamic programming and how does it differ from the greedy approach?
- g. Explain the concept of backtracking with an example of its application.
- h. Describe what a depth-first search (DFS) accomplishes in graph traversal.
- i. What is meant by the term NP-complete? Give an example of an NP-complete problem.
- j. Define the term "recurrence relation" and its importance in analyzing recursive algorithms.

Section – B

(5 marks each)

- Q2. Describe how the QuickSort algorithm works and analyze its time complexity.
- Q3. Explain the concept of Branch and Bound using the Traveling Salesperson Problem (TSP) as an example.
- Q4. Derive the time complexity of the Merge Sort algorithm using the Master's theorem.
- Q5. Compare and contrast Depth First Search (DFS) and Breadth-First Search (BFS) in terms of their strategies and applications.
- Q6. Discuss the concept of backtracking with reference to the N-Queen problem.

Section – C

(10 marks each)

- Q7. Analyze the Dijkstra algorithm for shortest path finding. Include in your answer its algorithmic complexity and a comparison with Bellman-Ford's algorithm.
- Q8. Discuss the importance of graph traversal algorithms, specifically focusing on BFS and DFS, and their application in real-world scenarios.
- Q9. Explain the concept of NP-completeness and the Cook-Levin theorem. Discuss how this impacts the solvability of algorithmic problems and mention two NP-complete problems.