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SNS COLLEGE OF ENGINEERING

Kurumbapalayam (Po), Coimbatore – 641 107



AN AUTONOMOUS INSTITUTION

Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

INTERNAL ASSESSMENT – III

Fourth Semester

B.E.Computer Science and Technology

23TSB202- Analysis of Algorithm

Regulations 2023

Question Bank

Small Questions:

1. Define the Knuth-Morris-Pratt algorithm and mention one practical use-case in text editing tools.
2. What is the Ford-Fulkerson method, and what is it used for in network analysis?
3. Why is it difficult to solve NP-complete problems optimally?
4. Describe the Branch and Bound strategy in solving optimization problems.
5. What is an Approximation Algorithm, and why is it important in solving NP-hard problems?
6. Differentiate between Naïve and KMP string matching algorithms.
7. What is maximum matching in bipartite graphs used for?
8. Define the P, NP, and NP-Complete classes with one example each.
9. Explain Lower bound arguments in analyzing algorithms.
10. Write the condition for a Hamiltonian Circuit to exist in a graph.

Big Questions:

11. Explain Ford-Fulkerson algorithm step-by-step to determine the maximum flow from source to sink with its algorithm and analysis
12. Implement the Naïve String-Matching Algorithm to search for a keyword in a document. Evaluate its limitations in large-scale text search applications like in search engines.
13. Interpret Knuth-Morris-Pratt (KMP) algorithm with an example and provide its Analysis over Naïve String Algorithm
14. Explain Maximum Bipartite Matching problem and implement an efficient approach (e.g., using Ford-Fulkerson on a flow network). Analyze the time complexity and practical constraints.
15. Write a backtracking-based algorithm to solve the N-Queens problem for $N = 4$. Explain how the recursive call stack helps avoid placing queens in attacking positions.
16. Construct a backtracking algorithm to solve Subset Sum Problem with its algorithm and analysis.
17. Apply Branch and Bound to solve a 0/1 Knapsack problem using the best-bound strategy. Explain node evaluation and pruning steps clearly.
18. A Job scheduling system needs to minimize total task cost across machines. Formulate and solve this as an Assignment Problem using Branch and Bound. Provide the matrix form and explain each step.
19. A Cybersecurity system uses Rabin-Karp for pattern scanning in large logs. Demonstrate its working on a sample text and pattern, showing how hashing is used and what happens during a collision.
20. A drone delivery service faces the Travelling Salesman Problem with time-sensitive deliveries. Devise a Branch and Bound based strategy and discuss where approximation algorithms might outperform exact solutions.
21. A cybersecurity firm needs a fast and scalable method to detect malicious code signatures in network traffic. Design a solution using the KMP algorithm combined with preprocessing and pattern-indexing for real-time detection.
22. A company wants to deploy cleaning robots on an $N \times N$ grid such that no two interfere (same row, column, or diagonal). Solve this using the N-Queens backtracking algorithm.

- Write Algorithm and Analyze time complexity.
- Suggest one optimization for large N.