

Reg. No. : **Question Paper Code : 20012**

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2023.

Third Semester

Artificial Intelligence and Data Science

AD 3351 — DESIGN AND ANALYSIS OF ALGORITHMS

(Common to : Computer Science and Business Systems)

(Regulations 2021)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

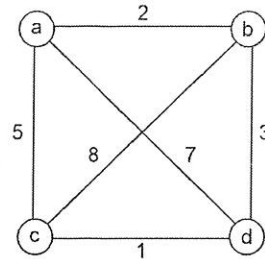
PART A — (10 × 2 = 20 marks)

1. Define algorithm.
2. Distinguish sequential and parallel algorithms.
3. What is brute force approach?
4. List the major variations of decrease-and-conquer technique.
5. Define principle of optimality.
6. Write the pseudo code of Floyd's algorithm.
7. List the requirements of standard form.
8. Infer when a pair (m, w) is said to be a blocking pair.
9. Write about information-theoretic lower bound.
10. State Heuristic with an example.

PART B — (5 × 13 = 65 marks)

11. (a) (i) Write the pseudocode for Euclid's algorithm. (5)
- (ii) Describe graph problems and combinatorial problems in detail. (8)
- Or
- (b) (i) Indicate the steps for analyzing the efficiency of the algorithm with examples. (8)
- (ii) Infer how asymptotic notations are used to express the complexity of an algorithm. (5)

12. (a) (i) Reproduce an algorithm to implement brute-force string matching problem with an example and specify its worst case, average-case complexity. (5)
- (ii) Describe Traveling sales person problem using exhaustive search technique and find the optimal tour for the following graph. (8)



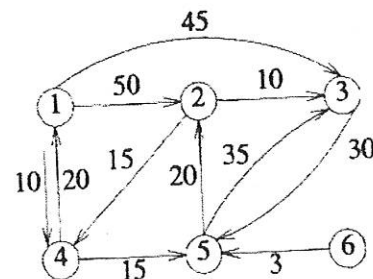
Or

- (b) (i) State the strategy of divide and conquer technique to compute the product of two $n \times n$ matrices using Strassen's method. (5)
- (ii) Draw step by step successive key insertions for the list 2, 9, 7, 6, 5, 8 by bottom-up heap. Construct an algorithm for the same and specify its complexity. (8)
13. (a) (i) Discuss how coin changing problem can be solved by dynamic programming with an example. (6)

- (ii) Indicate the algorithm to find the optimal feasible subset of first i entries by memory function for the knapsack problem. (7)

Or

- (b) (i) Write Dijkstra's algorithm to find the shortest path for the following graph using greedy technique. (7)



- (ii) Explain how Huffman trees are constructed for assigning shorter bit strings to high-frequency symbols and longer ones to low-frequency symbols. (6)

14. (a) (i) List the steps of the simplex method. (5)
- (ii) State the shortest-augmenting-path algorithm to find a maximum flow and a minimum cut in the networks. (8)

Or

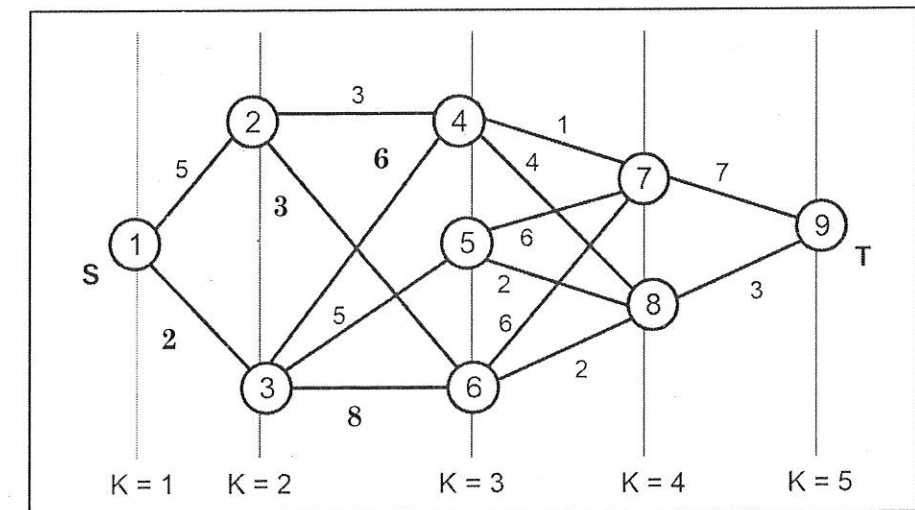
- (b) (i) Outline the pseudo code for Maximum Matching Bipartite graph. (8)
- (ii) Describe how you will find a stable marriage matching for men's and women's preferences. (5)
15. (a) (i) Summerize P, NP and NP-Complete problems. (6)
- (ii) Discuss how N-Queen's problem can be solved by back tracking technique. (7)

Or

- (b) (i) Describe Traveling sales person problem using Branch and Bound technique with an example. (7)
- (ii) Infer the steps of greedy algorithm for discrete and continuous knapsack problem with an example. (6)

PART C — (1 × 15 = 15 marks)

16. (a) (i) Devise an algorithm for the multistage graph problem using dynamic programming design technique. (10)
- (ii) Compute the minimum cost and path from s to t for the following multistage graph. (5)



Or

- (b) (i) Justify how backtracking technique is used to solve sum of subsets problem with its pseudo code and complexity. (10)
- (ii) Construct all possible subsets of weights that sum to M for the given instance $n = 6$, $M = 30$ and Weights (1:6) = (5, 10, 12, 13, 15, 18). (5)