

THE KAVERY ENGINEERING COLLEGE
(An Autonomous Institution)

B.E/B.TECH DEGREE END SEMESTER THEORY EXAMINATIONS, NOV /DEC 2024

Third Semester

Artificial Intelligence and Data Science

AD3351- Design and Analysis of Algorithms

Regulations – 2021

Duration: 3 Hrs.

Maximum: 100 Marks

PART – A (ANSWER ALL QUESTIONS) (Marks 10*2=20)

Q.No	Questions	BLT	CO	Marks
1.	What is empirical analysis of an algorithm? How it is done?	RE	1	2
2.	Compare sequential and parallel algorithms.	UN	1	2
3.	Construct an example problem that cannot be solved by brute-force algorithm. Justify your answer. List the strength and weakness of brute force algorithm.	AN	2	2
4.	Define exhaustive search.	RE	2	2
5.	Recall the general procedure of dynamic programming.	RE	3	2
6.	Develop the pseudo code of Floyd's algorithm.	AP	3	2
7.	What are the requirements to represent the simplex method to a linear programming problem in a standard form?	RE	4	2
8.	State the mathematical formulation of maximum flow problem.	RE	4	2
9.	Analyze the limitations of algorithm power.	AN	5	2
10.	Show how does a branch and bound algorithm work?	UN	5	2

PART – B (ANSWER ALL QUESTIONS) (Marks 5*13 = 65)

Q.No	Questions	BLT	CO	Marks
11.	a List the importance of asymptotic analysis for running time of an algorithm with an example. Or b Define the recursive algorithm to find the factorial of any given number n > = 0 and Find the time complexity.	RE	1	13
12.	a Explain in detail about Travelling Salesman Problem using exhaustive search. Or b Illustrate Strassen's matrix multiplication and show how it is solves the problem using divide and conquer technique.	UN	2	13
13.	a Compare and contrast dynamic programming and greedy method. Or b Construct the algorithm for optimal binary search tree and solve the following problem instance to construct the optimal binary search tree. Keys are a, b, c, d and the probabilities are 0.1, 0.2, 0.4 and 0.3	UN	3	13

14. a Explain in detail about Simplex method with example. UN 4 13
- Or
- b Summarize stable marriage problem with example. UN 4 13
15. a Explain in detail about 8-Queens problem & Discuss the possible solutions. UN 5 13
- Or
- b Prove that TSP problem is NP complete, assuming that Hamiltonian problem is NP complete. UN 5 13

*PART – C (Marks 1*15 = 15)*

<i>Q.No</i>	<i>Questions</i>	<i>BLT</i>	<i>CO</i>	<i>Marks</i>
16. a	Solve the following instance of the knapsack problem by the branch-and bound algorithm:	AP	4	15

Item	Weight	Value
1	10	Rs.100
2	7	Rs.63
3	8	Rs.56
4	4	Rs.12

W=16

Or

- b i Several coins are placed in cells of an $n \times m$ board, no more than one coin per cell. A robot, located in the upper left cell of the board, needs to collect as many of the coins as possible and bring them to the bottom right cell. On each step, the robot can move either one cell to the right or one cell down from its current location. When the robot visits a cell with a coin, it always picks up that coin. Design an algorithm to find the maximum number of coins the robot can collect and a path it needs to follow to do this. AP 3 8
- ii Apply Warshall's algorithm to find the transitive closure of the digraph defined by the following adjacency matrix. AP 3 7

$$\begin{pmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \end{pmatrix}$$