Register No : _____

THE KAVERY ENGINEERING COLLEGE

(An Autonomous Institution)

B.E/B.TECH DEGREE END SEMESTER THEORY EXAMINATIONS, NOV/DEC 2025

Third Semester

Artificial Intelligence and Data Science

UADTL24301 - Design and Analysis of Algorithms

Regulations - 2024

Duration : 3 Hrs *Maximum : 100 Marks*

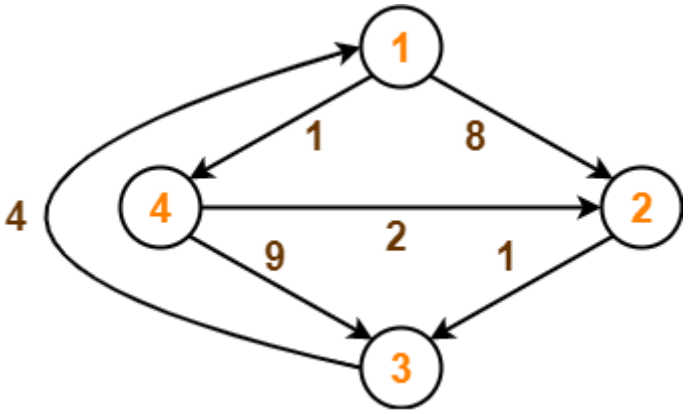
*PART – A (ANSWER ALL QUESTIONS) (Marks 10*2=20)*

Q.No	*Questions*	*BTL*	*CO*	*Marks*
1.	Define algorithm. List the desirable properties of an algorithm.	L1	1	2
2.	How do you measure and express the running time of an algorithm?	L2	1	2
3.	Give an example problem that cannot be solved by brute-force algorithm. Justify your answer.	L4	2	2
4.	State the convex hull problem.	L2	2	2
5.	Define principles of optimality with suitable example.	L1	3	2
6.	How dynamic programming is used to solve Knapsack problem?	L2	3	2
7.	Why the maximum flow is required for iteration process?	L3	4	2
8.	State stable marriage problem.	L2	4	2
9.	Give an example for sum-of-subset problem.	L1	5	2
10.	What is LC Search and how it is efficient from other search methods in branch and bound algorithms?	L2	5	2

*PART – B (ANSWER ALL QUESTIONS) (Marks 5*16 = 80)*

Q.No			*Questions*	*BLT*	*CO*	*Marks*
11.	a	i	Solve: $T(n) = 2T(n/2) + n^3$.	L3	1	6
		ii	Outline the mathematical analysis of recursive and non-recursive algorithm.	L3	1	10
			Or			
	b	i	Write the asymptotic notations used for best case, average case and worst-case analysis of algorithms. Write an algorithm for finding maximum element in an array.	L3	1	16
12.	a		Propose a divide and conquer strategy-based procedure to search a key in a set of n elements. Demonstrate the process to search 12 in 2, 5, 7, 32, 16, 48, 12, 10, 23, 14.	L3	2	16
			Or			
	b		Depict heapsort for the following elements 12, 45, 30, 10, 71, 17, 8, 23, 51, 3, 2 and discuss about the stability of heapsort with suitable example.	L3	2	16

13.	a		Analyze the Flyods – Warshall algorithm using dynamic programming. Trace the algorithm for the given example.	L4	3	16



Or

	b		Write a greedy algorithm to solve the 0/1 knapsack problem. Analyze its time complexity. Demonstrate (with an example) that the greedy algorithm is not optimal for the 0/1 Knapsack problem.	L4	3	16
14.	a	i	State and prove Max-Flow Min-Cut Theorem.	L3	4	8
		ii	Illustrate the steps of the simplex methods with an example.	L3	4	8

Or

	b		Find a stable marriage matching for the instance defined by the following ranking matrix:	L3	4	16

	A	B	C	D
α	1,3	2,3	3,2	4,3
β	1,4	4,1	3,4	2,2
γ	2,2	1,4	3,3	4,1
δ	4,1	2,2	3,1	1,4

15.	a		Illustrate the P, NP and NP-Complete problems and derive the relationship between them.	L3	5	16

Or

	b		Solve the Traveling Salesman Problem using branch and bound technique.	L3	5	16

	A	B	C	D
A	∞	12	5	7
B	11	∞	13	6
C	4	9	∞	18
D	10	3	2	∞