Reg.No.:												

VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN
[AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY, CHENNAI]
Elayampalayam – 637 205, Tiruchengode, Namakkal Dt., Tamil Nadu.

Question Paper Code: 60026

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – JAN. 2025
Fourth Semester
Information Technology
U19IT409 - DESIGN AND ANALYSIS OF ALGORITHMS
(Regulation 2019)

Time: Three Hours | Maximum: 100 Marks

Answer ALL the questions

Knowledge Levels (KL)	K1 – Remembering	K3 – Applying	K5 - Evaluating
	K2 – Understanding	K4 – Analyzing	K6 - Creating

PART – A

(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	How do you measure an algorithm's running time?	2	K2	CO1
2.	Solve the following recurrence relation T(n)=T(n-1)+1.	2	K2	CO1
3.	What is the time and space complexity of merge sort?	2	K2	CO2
4.	Give an example of a Greedy Algorithms used for Graphs.	2	K1	CO2
5.	What are Bipartite Graphs?	2	K1	CO3
6.	Apply 0/1 knapsack dynamic programming approach on the following items(weight,profit): item1(2,3); item2(3,2); item3(4,6); item4(5,5). What will be the result? (Capacity of knapsack is 7)	2	K3	CO3
7.	List out the reason for terminating search path at the current node in branch and bound algorithm.	2	K3	CO4
8.	Find the minimum number of colours required to color the nodes of a k-ary tree such that no adjacent vertices get the same colour?	2	K2	CO4
9.	When is a problem said to be NP-Hard?	2	K2	CO5
10.	Give an example of an NP-Complete problem.	2	K1	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.			Questions	Marks	KL	CO
11.	a)	i.	Discuss various the asymptotic notations used for best case average case and worst case analysis of algorithms.	6	K2	CO1
		ii.	Give the non-recursive algorithm for finding the value of the largest element in a list of n numbers.	7		
			(OR)			
	b)		Solve the following recurrence relation. $x(n)=x(n-1)+n$ for $n>0, x(0)=0$.	13	K2	CO1
12.	a)		Outline the following:		K3	CO2
			i. Strassen's Matrix Multiplication.	7		
			ii. Multiplication of largest integer.	6		
			(OR)			
	b)		Write the Huffman's tree Algorithm. Construct the Huffman's tree for the following data and obtain its Huffman's Code.	13	K3	CO2

Character	A	B	C	D	E	
probability	0.5	0.35	0.5	0.1	0.4	0.2

13.	a)		Construct the optimal binary search tree for the following table using dynamic programming.	13	K3	CO3

Key	A	B	C	D
Probability	0.1	0.2	0.4	0.3

(OR)

	b)		Develop a stable marriage algorithm and trace it with an instance. Analyze its running time complexity.	13	K3	CO3
14.	a)		Find the optimal solution using branch and bound for the following assignment problem.	13	K3	CO4

	Job 1	Job 2	Job 3	Job 4
A	9	2	7	8
B	6	4	3	7
C	5	8	1	8
D	7	6	9	4

(OR)

	b)	Describe N-Queens puzzle problem. Explain a solution to this problem with its complexity analysis.	13	K2	CO4
15.	a)	Compare and contrast P, NP-Hard and NP-Complete Problems with suitable examples.	13	K2	CO5
		(OR)			
	b)	Outline the steps to find an approximate solution to the NP Hard optimization problems using approximation algorithms with an example.	13	K2	CO5

PART – C

(1 x 15 = 15 Marks)

Q.No.		Questions	Marks	KL	CO
16.	a)	Consider a round-robin chess tournament with n players with 10 each player playing every other player exactly once. A win scores I point for the winner and 0 points for the loser, while a draw scores ½ points for each player. We are given a set of final scores (S1, ... Sn) for the players with Os Sn-1. We want to check whether these scores are feasible [for example, in a three - player tournament, a set of final scores is impossible.]. Write an algorithm for this checking.	15	K3	CO3
		(OR)			
	b)	Solve the all-pairs shortest path problem for the digraph with the following weight matrix, write an algorithm to solve this problem and analyze its time and space complexity of it.	15	K3	CO3

0	2	∞	1	8
6	0	3	2	∞
∞	∞	0	4	∞
∞	∞	2	0	3
3	∞	∞	∞	0