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: 50038

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – JAN. 2026
Fourth Semester
Computer Science and Engineering
U19CS411 - 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.	Define order of growth and compare the order of growth of $n(n-1)/2$ and n^2.	2	K2	CO1
2.	Differentiate Time Efficiency and Space Efficiency.	2	K2	CO1
3.	Derive the Complexity of Binary Search.	2	K1	CO2
4.	Show the recurrence relation of divide-and-conquer?	2	K2	CO2
5.	How Dynamic Programming is used to solve Knapsack Problem?	2	K1	CO3
6.	Describe the approach Floyd's Algorithm uses to determine shortest paths between all pairs of vertices.	2	K2	CO3
7.	List and explain the type of constraints used in backtracking problem.	2	K2	CO4
8.	Write the time complexity for Hamiltonian cycle.	2	K2	CO4
9.	Prove that vertex cover problem is NP-complete.	2	K2	CO5
10.	What is satisfiability problem?	2	K2	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.		Questions	Marks	KL	CO
11. a)	i.	Elucidate asymptotic notations used for best case, average case and worst case analysis of algorithm.	8	K2	CO1
	ii.	List out the various steps to solve the non recursive equations with few basic formulas.	5	K2	
		(OR)			
b)		Solve the following recurrence relation		K2	CO1
	i.	$x(n) = x(n-1)+5$ for $n>1$ $x(1) = 0$	3		
	ii.	$x(n) = 3x(n-1)$ for $n>1$ $x(1) = 4$	3		
	iii.	$x(n) = x(n-1)+n$ for $n>0$ $x(0) = 0$	3		
	iv.	$x(n) = x(n/2)+n$ for $n>1$ $x(1) = 1$ (solve for $n = 2^k$)	4		
12. a)		Find the binary search for the list containing following elements -15, -6, 0, 7, 9, 23, 54, 82, 101, 112, 125, 131, 142, 151. And search the following elements 151, -14, 9 in the given list.	13	K2	CO2
		(OR)			
b)		Find the maximum and minimum for the following set of elements using divide conquer technique. 22, 13, -5, -8,15,60,17,31,47.	13	K2	CO2
13. a)		Use function OBST to compute w(i,j), r (i,j) and c (i,j), $0<=i<j<=4$ for the identifier set (a_1,a_2,a_3,a_4) = (Cout, float, if, while) P(1) = 1/20, P(2) = 1/5, P(3) = 1/10, P(4) = 1/20, q(0) = 1/5, q(1) = 1/10, q(2) = 1/5, q(3) = 1/20 and q(4) = 1/20 to construct the optimal binary search tree.	13	K3	CO3
		(OR)			
b)	i.	Write an algorithm for Multistage graph using forward approach with time and space complexity.	7	K1	CO3
	ii.	Write a procedure & algorithm for All pair shortest path problem with its complexity.	6	K3	
14. a)	i.	Write the concept and procedure for Hamiltonian problem.	6	K2	CO4
	ii.	Solve the following instance of the 0/1, knapsack problem given the knapsack capacity is W = 5	7	K3	

ITEM	WEIGHT	VALUE
1	4	10
2	3	20
3	2	15
4	5	25

(OR)

b)	i.	Describe the backtracking solution to solve 8-queens' problem with proper solution.	6	K3	CO4
	ii.	Briefly explain the FIFO branch and bound solution with example.	7		
15. a)		Compare Deterministic and Non-Deterministic algorithms. Give the methods for establishing Lower Bounds.	13	K3	CO5
		(OR)			
b)		Describe in detail about Approximation Algorithms for NP hard problems. Give any five undecidable problems and explain the famous halting problem.	13	K2	CO5

PART – C

(1 x 15 = 15Marks)

Q.No.		Questions	Marks	KL	CO
16. a)	i.	Give the recursive algorithm for finding the number of binary digits is n's binary representation, where n is a positive decimal integer. Find the recurrence relation and complexity.	8	K2	CO1
	ii.	Show how to implement a stack using two queues. Analyze the running time of the stack operations.	7		
		(OR)			
b)	i.	Give separate answers for the following a. List represented as arrays b. List represented as linked lists Compare the time complexities involved in the analysis of both the algorithms.	8	K2	CO1
	ii.	Suppose W satisfies the following recurrence equation and base case (where c is constant): $W(n) = c.n+W(n/2)$ and $W(1) = 1$. What is the asymptotic order of w(n).	7		