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: 50040

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – JAN. 2025
Fourth Semester
Computer Science and Engineering
U19CS411 - DESIGN AND ANALYSIS OF ALGORITHMS
(Common to Computer Science and Technology)
(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

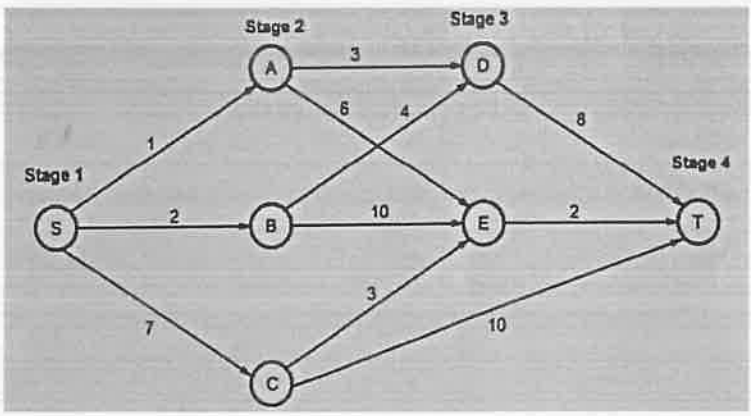
(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	Write the recurrence relation to state the time complexity for binary search algorithm.	2	K2	CO1
2.	Distinguish between time and space complexity.	2	K2	CO1
3.	Does the running time of quick sort depend on the values of the keys in the input file? Justify the answer.	2	K2	CO2
4.	Define container loading.	2	K2	CO2
5.	What are the basics characteristics of Dynamic Programming Method?	2	K1	CO3
6.	Define Traveling salesperson problem.	2	K2	CO3
7.	Distinguish Between LIFO and FIFO search.	2	K2	CO4
8.	Is Hamiltonian graph a Eulerian graph? Justify.	2	K2	CO4
9.	What does NP completeness property refer to?	2	K2	CO5
10.	Is P=NP? Justify your answer.	2	K2	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.		Questions	Marks	KL	CO
11.	a)	State the general plan for analyzing the time efficiency of non-recursive algorithms and explain with an example.	13	K4	CO1
		(OR)			
	b)	i. Use recursion tree method, to solve the following recurrence relation T(n)=3T(n/4) + n^2 where T(1)=1.	8	K4	CO1
		ii. Express the following function in terms of Big Oh (0) notation f(n)=7n^3+1000nlogn + 3n.	5		
12.	a)	Construct a Huffman tree for characters 'A', 'B', 'C', 'D' with frequencies [5, 3, 8, 12]. Use the tree to encode and decode the message "ABCD". Analyze the compression ratio achieved compared to a fixed-length encoding.	13	K5	CO2
		(OR)			
	b)	Solve the fractional knapsack problem using a greedy algorithm. Given items with weights [2, 5, 8, 3] and values [20, 30, 25, 14], determine the maximum value that can be obtained within a knapsack's weight capacity of 10.	13	K5	CO2
13.	a)	i. Using Dynamic programming, write an algorithm to calculate Fibonacci sequence. Analyze the complexity of the algorithm.	7	K5	CO3
		ii. Consider N=4, c=15, V=[ ]={10,10,12,18} W[ ]={2,4,6,9}. Select the item such that the sum of weight taken in knapsack is less then or equal to C and generate maximum profit. Solve using 0/1 knapsack using least cost branch and bound.	6		
		(OR)			
	b)	Discuss the procedure of multistage graph and analyze the time complexity. Consider the following multistage graph and analyze the cost at each step.	13	K4	CO3



14.	a)	i. Knapsack Problem with Knapsack Capacity C and n items, can be solved in time O(nC). Is it NP complete or Is there any contradiction? Explain.	7	K3	CO4
		ii. Show that the Hamiltonian cycle problem for undirected graphs, is NP complete.	6		
		(OR)			
	b)	Derive the time complexity of 8 Queen Problem using Backtracking.	13	K5	CO4
15.	a)	In what ways does polynomial-time verification contribute to the reliability and feasibility of checking solutions for various computational problems, and how does it differ from the general problem-solving process?	13	K4	CO5
		(OR)			
	b)	Investigate the significance of NP-complete problems in the field of computer science. How does identifying a problem as NP-complete impact our understanding of its computational difficulty and potential solutions?	13	K4	CO5

PART – C

(1 x 15 = 15Marks)

Q.No.		Questions	Marks	KL	CO
16.	a)	Sort the elements in non-decreasing order using quick sort algorithm 90,23,101,45,65,28,67,89,34,29. Analyze the best, average and worst care time-complexity.	15	K4	CO5
		(OR)			
	b)	i. If f(n) amn+ amin+.....+ainta, where am≠0 and a R, then show that f(n)=2 (n).	6	K5	CO3
		ii. Illustrate Big Oh, Omega and Theta asymptotic notations graphically and explain.	9		