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: 50046

M.E. / M.Tech. DEGREE END-SEMESTER EXAMINATIONS – JAN. / FEB. 2026
First Semester
Computer Science and Engineering
P23CS101 – ADVANCED ALGORITHMS
(Regulation 2023)

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.	State the role of algorithms in computing.	2	K1	CO1
2.	Express the function $7n+3n+4$ using Θ-notation.	2	K2	CO1
3.	List any two characteristics of dynamic programming with an one example.	2	K1	CO2
4.	Compute the optimal cost of multiplying three matrices of dimensions (10×20), (20×30), (30×40) using DP table entries only.	2	K2	CO2
5.	Name the steps involved in Prim's algorithm.	2	K1	CO3
6.	Define a sparse graph.	2	K1	CO3
7.	Define fork-join parallelism with an example.	2	K1	CO4
8.	Write the FFT of the polynomial $A(x)=1+2x+3x^2+4x^3$ at n=4 points (only list the output vector).	2	K2	CO4
9.	List two differences between Rabin–Karp and KMP string matching algorithms.	2	K2	CO5
10.	Classify the following problems as P or NP (Travelling Salesperson, Matrix Chain Multiplication).	2	K2	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.		Questions	Marks	KL	CO
11.	a)	Demonstrate the use of Divide-and-Conquer by deriving the recurrence and time complexity for Merge Sort.	13	K3	CO1
		(OR)			
	b)	Construct a randomized algorithm for selecting the i-th order statistic and evaluate its expected time complexity.	13	K3	CO1
12.	a)	Design a dynamic programming solution for the Optimal Binary Search Tree problem for 4 keys with given probabilities; compute the cost matrix and optimal root structure.	13	K2	CO2
		(OR)			
	b)	Apply the greedy strategy to construct Huffman codes for the characters {A,B,C,D,E} with frequencies {5,9,12,13,16}. Show the tree and code lengths.	13	K2	CO2
13.	a)	Compare Kruskal's and Prim's algorithms on a given sample weighted graph of your choice; execute trace both the algorithms and analyze the cost of the MST obtained.	13	K2	CO3
		(OR)			
	b)	Using Floyd–Warshall algorithm, compute all-pairs shortest paths for a given weighted directed graph of your choice (weights provided). Discuss time complexity.	13	K2	CO3
14.	a)	Develop a parallel algorithm for matrix multiplication using fork-join model. Analyze its work and span.	13	K4	CO4
		(OR)			
	b)	Evaluate the complexity of solving a system of linear equations using Gaussian elimination and propose how it can be parallelized.	13	K4	CO4
15.	a)	Design a finite automaton for string matching over the pattern "ababa" and analyze its running time.	13	K5	CO5
		(OR)			
	b)	Propose an approximation algorithm for the Vertex Cover problem. Derive and justify its approximation ratio.	13	K5	CO5

PART – C

(1 x 15 = 15 Marks)

Q.No.		Questions	Marks	KL	CO
16.	a)	A logistics company needs to find optimal delivery routes among 20 cities. Formulate this as an algorithmic problem, discuss its computational class (P, NP, NP-complete), and propose a suitable approximation or heuristic. Critically evaluate the effectiveness of your approach.	15	K5	CO5
		(OR)			
	b)	You are tasked with building a text-search engine that must handle huge data streams in parallel. Develop a high-level design, combining parallel FFT and efficient string-matching algorithms. Justify the choice of algorithms, and analyse expected performance.	15	K5	CO5