

THE KAVERY ENGINEERING COLLEGE
(An Autonomous Institution)

B.E/ B.TECH DEGREE END SEMESTER THEORY EXAMINATIONS, APRIL-MAY 2025

Third Semester

Artificial Intelligence and Data Science

AD3351- Design and Analysis of Algorithms

Regulations - 2021

Duration : 3 Hrs

Maximum : 100 Marks

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

Q.No	Questions	BLT	CO	Marks
1.	What are the asymptotic notations? List their properties.	L1	1	2
2.	Analyze the time complexity for the following algorithm and prove that it is Linear Time Complexity. <pre>int sum(int A[], int n) { int sum=,j; for(i=0;i<n,i++) sum=sum+A[i]; return sum; }</pre>	AP	1	2
3.	Give the mathematical notation to determine if a convex direction is towards left or right and write the algorithm.	L2	2	2
4.	State the concept divide and conquer method.	L1	2	2
5.	Define principles of optimality with a suitable example.	L1	3	2
6.	Distinguish greedy techniques from dynamic programming.	L2	3	2
7.	Infer maximum cardinality matching.	L1	4	2
8.	List out the properties of Bipartite graph.	L1	4	2
9.	Describe about Hamiltonian circuit.	L1	5	2
10.	State the reason for terminating search path at the current node in branch and bound algorithm.	L1	5	2

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

Q.No	Questions	BLT	CO	Marks
11.	a i Write the insertion sort algorithm and estimate its running time.	L3	1	8
	ii Show how to implement a stack using two queues. Analyze the running time of the stack operations.	L3	1	8
	Or			
	b List out the steps in mathematical analysis of non-recursive algorithms for finding the largest element in a given array.	L3	1	16

12.	a	Solve the following using Brute-Force algorithm : Find whether the given string follows the specified pattern and return 0 or 1 accordingly. Examples: i) Pattern : "abba", input : "redblueredblue" should return 1 ii) Pattern : "aaaa", input : "asdadasdasd" should return 1 iii) Pattern : "aabb" input : "xyzabcxzyabc" should return 0	L3	2	16
		Or			
	b	Depict heapsort for the following elements 4, 1, 7, 5, 3, 9 and discuss about the stability of heapsort with suitable example.	L3	2	16
13.	a	Outline the concepts of Floyd's algorithms for finding all-pairs shortest paths in a graph. Provide a step-by-step example of how the algorithm works on a graph.	L2	3	16
		Or			
	b	What is 0/1 Knapsack problem? Analyze how it can be solved using Branch and Bound method.	L2	3	16
14.	a	Justify the subset of bipartite graph is bipartite. Outline with an example.	L4	4	16
		Or			
	b	Analyze the algorithm of Stable marriage problem of MEN(A,B,C) and WOMEN(X,Y,Z)	L4	4	16
15.	a i	Explain how job assignment problem could be solved, given n tasks and n agents where each agent has a cost to complete each task, using Branch and Bound technique.	L2	5	8
	ii	Suggest an approximation algorithm for traveling salesperson problem. assume that the cost function satisfies the triangle inequality.	L2	5	8
		Or			
	b	Outline the steps to find approximate solution to NP-Hard optimization problems using approximation algorithms with an example.	L2	5	16