

THE KAVERY ENGINEERING COLLEGE*(An Autonomous Institution)***UG/PG DEGREE END SEMESTER THEORY EXAMINATIONS, APRIL-MAY 2026***First Semester**Master of Computer Applications***PMCT2401 – ADVANCED DATA STRUCTURES AND ALGORITHMS***Regulations - 2024***Duration : 3 Hrs****Maximum : 100 Marks****PART – A(ANSWER ALL QUESTIONS) (Marks 10*2=20)**

Q.No	Questions	BLT	CO	Marks
1.	Identify the essential criteria that all algorithms must meet.	L2	1	2
2.	Why is algorithmic efficiency important in problem-solving and software development?	L1	1	2
3.	Recall any two properties of Red-Black trees.	L1	2	2
4.	Summarize the main characteristics and advantages of Fibonacci heaps.	L2	2	2
5.	How graphs can be represented in data structures?	L1	3	2
6.	Infer how Prim's algorithm finds a minimum spanning tree.	L2	3	2
7.	Compare and contrast the Greedy algorithm and Dynamic Programming in terms of problem-solving approach.	L2	4	2
8.	List the steps involved in constructing a Huffman tree.	L1	4	2
9.	State the significance of the concept NP-completeness.	L2	5	2
10.	Name any four concepts that are essential for NP-completeness proofs.	L1	5	2

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

Q.No	Questions	BLT	CO	Marks
11.	a i Describe the role of time complexity and space complexity in solving a problem more optimally.	L2	1	8
	ii Explain the most commonly used asymptotic notations in complexity analysis to describe an algorithm's performance.	L2	1	8
	Or			
	b Enumerate the process of solving time complexity recurrence relations using the recursion tree method with an example and show each step of constructing the recursion tree.	L2	1	16
12.	a Construct the binary search tree for the following set of numbers: 50, 40, 60, 35, 45, 55, 65, 25, 70 Illustrate the process of building the tree through sequential insertions and perform deletion operations on selected nodes with suitable algorithm and step-by-step explanation.	L3	2	16
	Or			
	b Demonstrate how insertion, deletion and searching operations are performed in B-Trees. Give a step-by-step explanation of each operation and an example to highlight the structure and balancing properties of B-Trees.	L3	2	16
13.	a Apply Breadth-First Search and Depth-First Search algorithms to explore a graph with simple example and demonstrate how each algorithm operates step-by-step on the graph.	L3	3	16

Or

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| | b | Utilize Dijkstra's algorithm to find the shortest path between two nodes in a graph and explain the key steps and representation of the process with an example. | L3 | 3 | 16 |
| 14. | a | Make use of dynamic programming principles to perform matrix chain multiplication for a given sequence of matrix dimensions. | L3 | 4 | 16 |
| | | Or | | | |
| | b | Use the greedy algorithm technique to find the global optimum solution and illustrate its characteristics, importance and working strategy with suitable example. | L3 | 4 | 16 |
| 15. | a | Analyze the processes of Polynomial-Time Verification and Reduction with an example problem. | L4 | 5 | 16 |
| | | Or | | | |
| | b | Inspect various NP-Complete optimization problems and evaluate the solution methods for the Traveling Salesman Problem. | L4 | 5 | 16 |
