Course Code & Title	:	U21AM402	ALGORITHMICS	Dept.::	CSE (AIML)
Year	:	II	Semester: 04	Date: 21.05.2025 - FN	Ac.Yr.: 2024 – 2025
CIAT	:	II	Duration: 90 Minutes	Maximum Marks: 60	

Section – A (10X1=10 Marks)
Answer All Questions

Q. No			Marks	BT	CO
1		Which of the following algorithms is the best approach for solving Huffman codes?	1	U	CO3
	a.	Greedy algorithm			
	b.	Exhaustive search			
	c.	Divide and conquer algorithm			
	d.	Brute force algorithm			
2		In the Activity Selection Problem, what strategy does the greedy algorithm use to select activities?	1	U	CO3
	a.	Select activity with maximum duration			
	b.	Select activity with earliest start time			
	c.	Select activity with shortest duration			
	d.	Select activity with earliest finish time			
3		Matrix Chain Multiplication is typically solved using which technique?	1	R	CO4
	a.	Divide and conquer	b.	Greedy	
	c.	Dynamic Programming	d.	Backtracking	
4		In AVL trees, the balance factor of a node is given by ___	1	R	CO4
	a.	Left subtree height – Right subtree height	b.	Right subtree height – Left subtree height	
	c.	Maximum of both subtrees	d.	Sum of both subtree heights	
5		The objective of the knapsack problem is to get the ___	1	R	CO4
	a.	maximum total value in the knapsack	b.	minimum total value in the knapsack	
	c.	maximum weight in the knapsack	d.	minimum weight in the knapsack	
6		What is the main idea behind Branch and Bound technique?	1	R	CO4
	a.	Divide and combine solutions	b.	Explore all paths recursively	
	c.	Explore promising branches and prune others	d.	Match patterns using finite automata	
7		The N-Queens problem is a classic example of ___ algorithmic technique.	1	R	CO5
	a.	Greedy	b.	Divide and conquer	
	c.	Backtracking	d.	Dynamic Programming	
8		Which of the following is an NP-Complete problem?	1	R	CO5
	a.	Binary Search	b.	Hamiltonian Circuit	
	c.	Prim's Algorithm	d.	Linear Search	
9		In the context of NP-Complete problems, if one NP-Complete problem is solved in polynomial time, then ___	1	R	CO5
	a.	All NP problems can be solved in polynomial time	b.	No NP problems can be solved	
	c.	NP = EXP	d.	All problems become unsolvable	

Section – B (10X2=20 Marks)
Answer All Questions

Q.No			Marks	BT	CO
10		The Graph Coloring problem is used primarily to ___	1	R	CO5
	a.	Minimize the number of vertices in a graph	b.	Assign colors to edges of a graph	
	c.	Color adjacent vertices with different colors using minimum number of colors	d.	Color adjacent vertices with different colors using minimum number of colors	
11		Define the greedy technique.	2	R	CO3
12		State the purpose of Huffman Trees.	2	R	CO3
13		List the advantages of dynamic programming.	2	R	CO4
14		Identify the three primary components in the branch and bound method.	2	R	CO4
15		Define the term state-space tree.	2	R	CO4
16		State the principle of polynomial-time reduction.	2	R	CO5
17		Recall the concept of the N-Queens problem.	2	R	CO5
18		Differentiate between AVL tree and Red-Black tree.	2	U	CO5
19		Define the graph coloring problem.	2	R	CO5
20		Compare NP-Hard and NP-Complete problems.	2	U	CO5

Section – C (1X6=6 Marks & 2X12=24 Marks)
Answer All Questions

Q.No			Marks	BT	CO
21 a)		Apply the Quick Sort algorithm on the following dataset:	6	AP	CO3
		25, 36, 12, 4, 5, 16, 58, 54, 24, 16, 9, 65, 78.			

(Or)

21 b) Solve the following Knapsack Problem using Branch and Bound with knapsack capacity W=6

Items	Weight	Value
1	2	8
2	3	6
3	2	4

22 a) Consider the assignment problem to find the solution

	Job 1	Job 2	Job 3	Job 4
Person 1	9	2	7	8
Person 2	6	4	3	7
Person 3	5	8	1	8
Person 4	7	6	9	4

(Or)

22 b) Apply the Branch and Bound algorithm to solve the Travelling Salesperson Problem (TSP) for the given graph.

Marks for 22 a) and 22 b): 12, BT: AP, CO: CO4
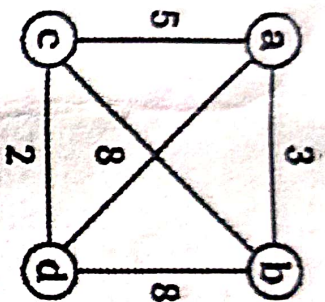
23 a)	Discuss in detail about the class P, NP, NP-hard and NP-complete problems. Give examples for each class?	12	U	CO
	(Or)			
23 b)	Devise a backtracking algorithm for 6 Queen problem and analyze the possible solution.	12	U	CO

Graph:

```
        3
   (a)-------(b)
    |\       /|
   5| \8   8/ |
    |  \   /  |
    |   \ /   |
    |    X    |
    |   / \   |
   (c)-------(d)
        2
```