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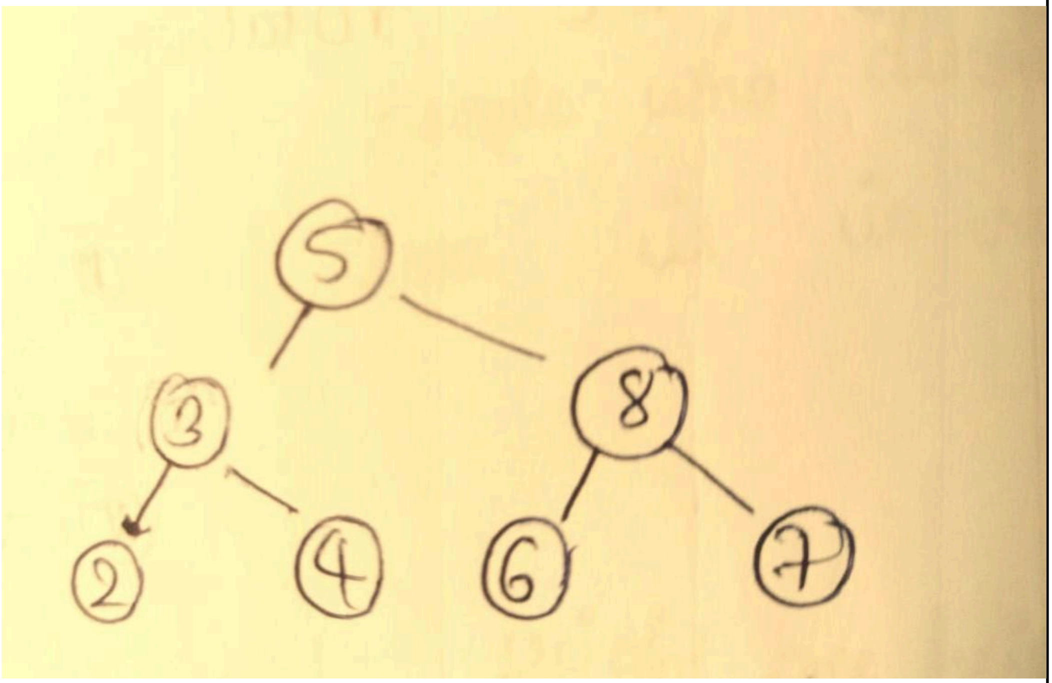
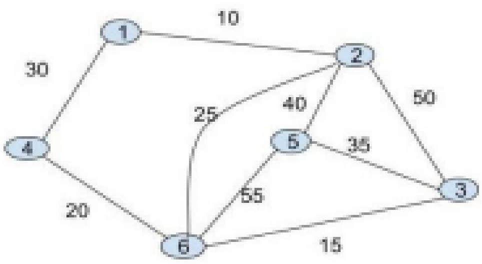
Internal Assessment Test 2 Solution– May 2025

Sub:	ANALYSIS & DESIGN OF ALGORITHMS					Sub Code:	BCS401	Branch:	AIML/CSE-AIML
Date:	24.05.25	Duration:	90 mins	Max Marks:	50	Sem/Sec:	IV - A, B & C		OBE

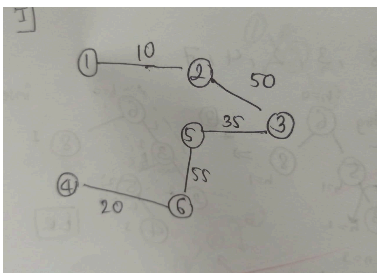
	Answer any FIVE FULL Questions	MARKS	CO	RBT
1.	Define AVL trees. Construct an AVL tree for the list of keys: 5, 6, 8, 3, 2, 4, 7 indicating each step of key insertion and rotation. Ans: The following tree can be drawn by inserting all the keys given above.	10	CO3	L3

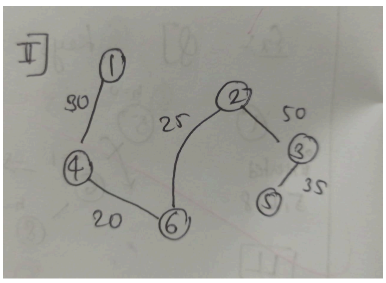


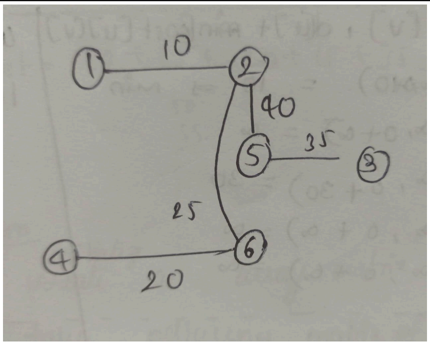
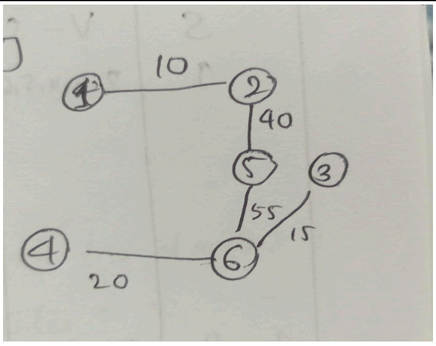
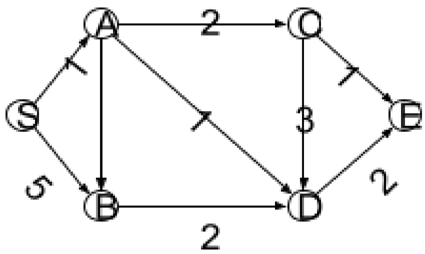
		MARKS	CO	RBT
2.	Write four spanning trees for the following graph. What is the cost of a Minimum Spanning Tree and obtain using Prim's algorithm?	10	CO3	L3

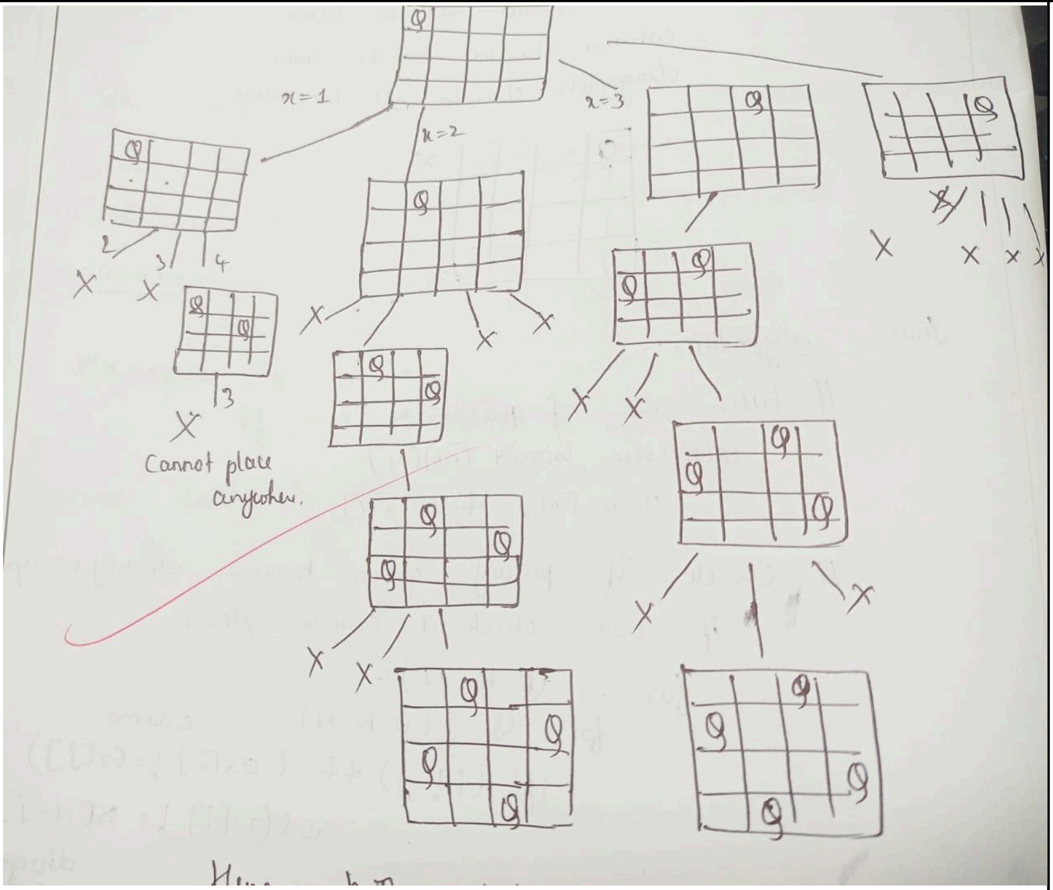


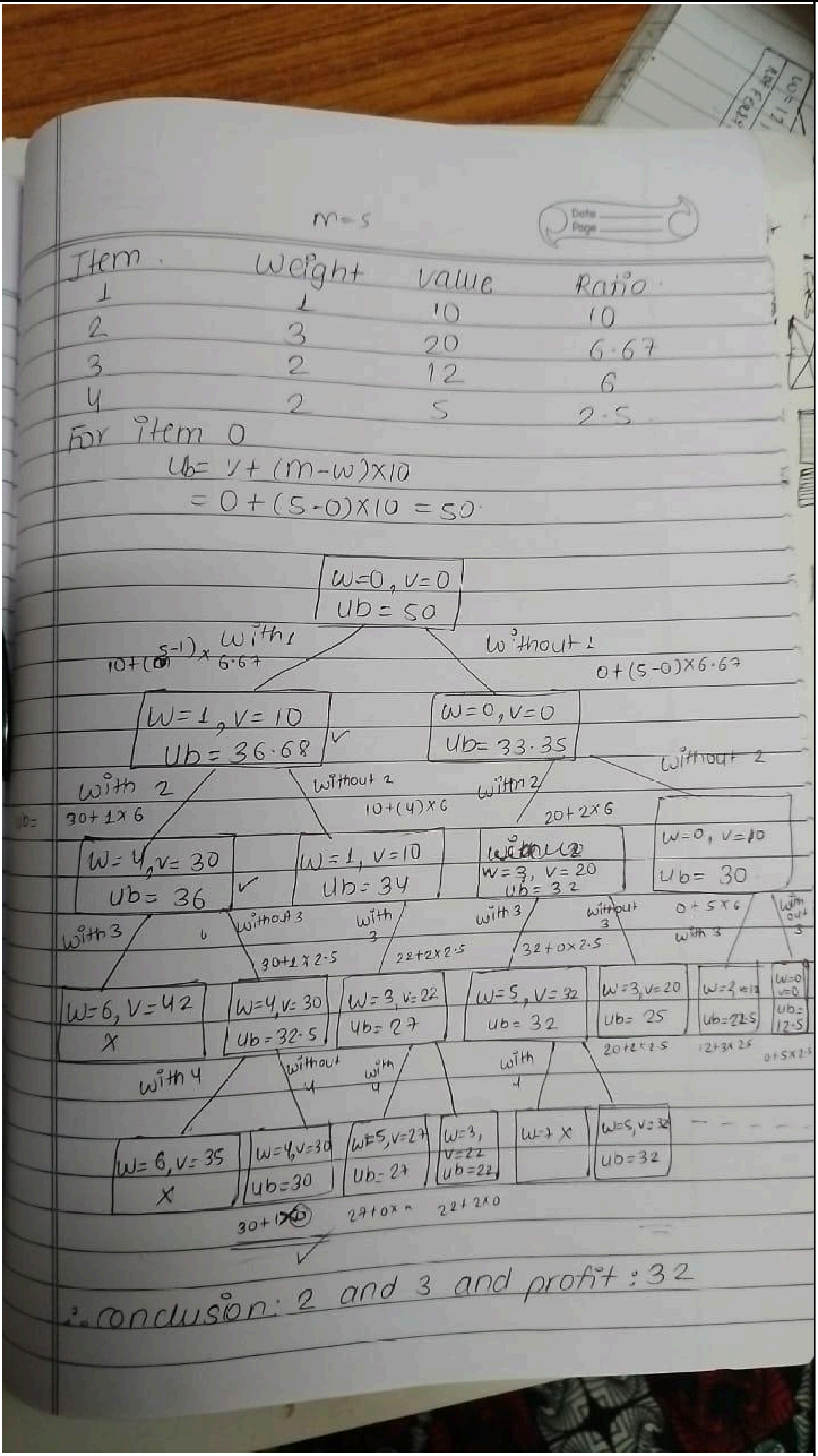
The following 4 minimum spanning trees can be formed with the mentioned weights.





		 			
3.	a)	Explain the design technique of Greedy with an example. Greedy algorithms are a class of algorithms that make locally optimal choices at each step with the hope of finding a global optimum solution. ● At every step of the algorithm, we make a choice that looks the best at the moment. To make the choice, we sometimes sort the array so that we can always get the next optimal choice quickly. We sometimes also use a priority queue to get the next optimal item. ● After making a choice, we check for constraints (if there are any) and keep picking until we find the solution. ● Greedy algorithms do not always give the best solution. For example, in coin change and 0/1 knapsack problems, we get the best solution using Dynamic Programming. ● Examples of popular algorithms where Greedy gives the best solution are Fractional Knapsack, Dijkstra's algorithm, Kruskal's algorithm, Huffman coding and Prim's Algorithm	5	CO4	L2
	b)	Formulate the Knapsack problem applying the Greedy method and find the optimal solution for n=3, m=40, (p1-p3)=(30, 40, 35); (w1-w3)=(20, 25, 10). Ans: **Solution is 82.5 is the profit.**	5	CO4	L3
4.		Apply Dijkstra's algorithm to find the single source shortest path for the given graph by considering S as the source vertex.  Ans: 1->2 = 10 2->5 =6 6->3=15 3->5=35 **Total Cost =105.**	10	CO4	L3
5.		Illustrate N queen's problem using backtracking to solve the 4-Queens problem. Ans:	10	CO5	L2

					
6.	a)	Explain Branch and Bound Algorithm design technique in detail with an example.	5	CO5	L2



m = 5

Item	Weight	value	Ratio
1	1	10	10
2	3	20	6.67
3	2	12	6
4	2	5	2.5

For item 0

$ub = v + (m-w) \times 10$

$= 0 + (5-0) \times 10 = 50$

∴ conclusion: 2 and 3 and profit : 32

b)	Explain the following: i. P problem ii. NP Problem P Class	5	CO5	L1

		The P in the P class stands for Polynomial Time. It is the collection of decision problems(problems with a "yes" or "no" answer) that can be solved by a deterministic machine (our computers) in polynomial time. Features: The solution to P problems is easy to find. P is often a class of computational problems that are solvable and tractable. Tractable means that the problems can be solved in theory as well as in practice. But the problems that can be solved in theory but not in practice are known as intractable. NP Class The NP in NP class stands for Non-deterministic Polynomial Time. It is the collection of decision problems that can be solved by a non-deterministic machine (note that our computers are deterministic) in polynomial time. Features: The solutions of the NP class might be hard to find since they are being solved by a non-deterministic machine but the solutions are easy to verify. Problems of NP can be verified by a deterministic machine in polynomial time.			

CI **CCI** **HOD**

---All the Best---