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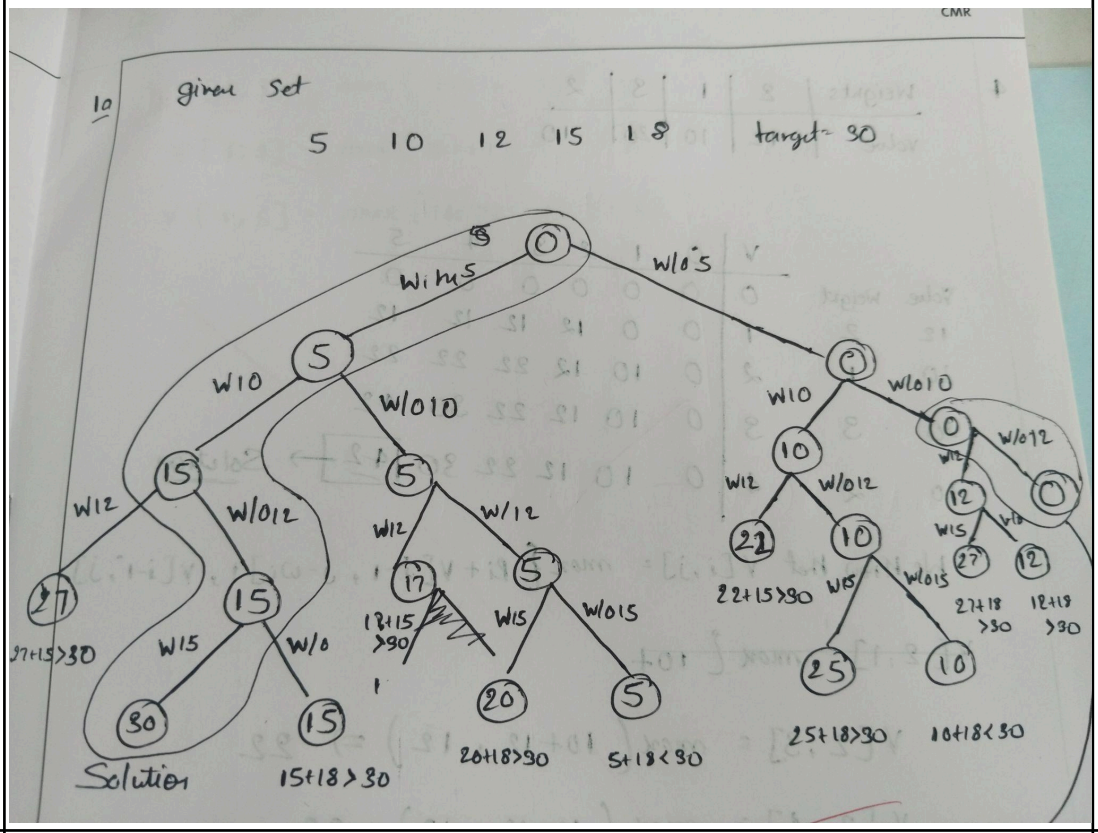
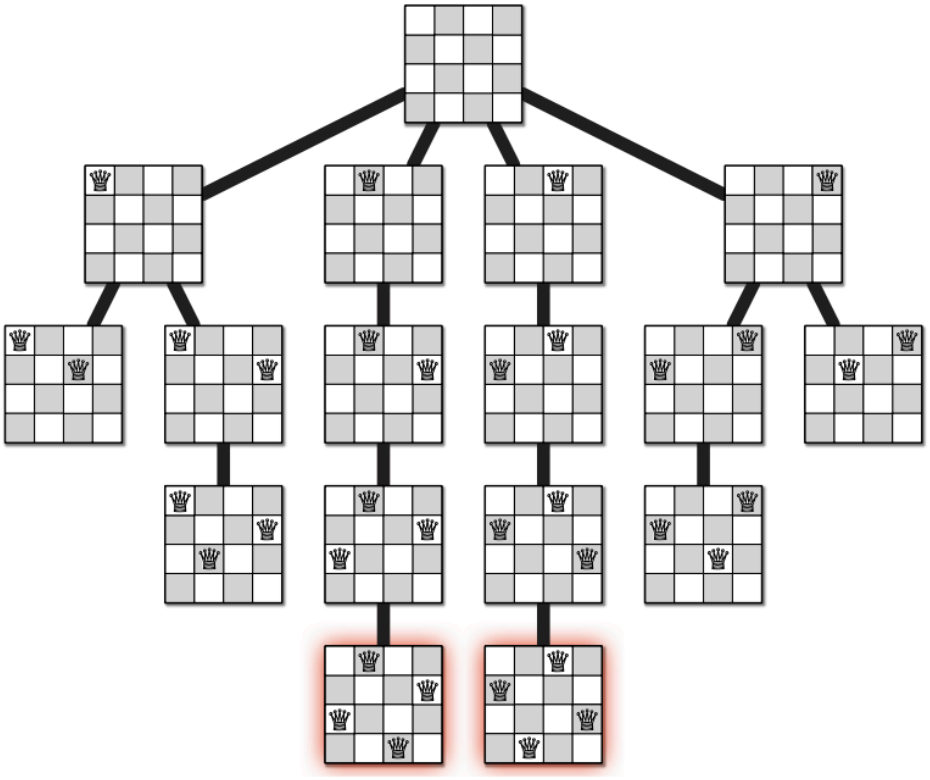
Internal Assessment Test 3 – AUG 2024

Sub:	Analysis and Design of Algorithms					Sub Code:	BCS401	Branch:	CSE
Date:	07-08-2024	Duration:	90 mins	Max Marks:	50	Sem / Sec:	IV (A, B & C)		OBE

Answer any FIVE FULL Questions

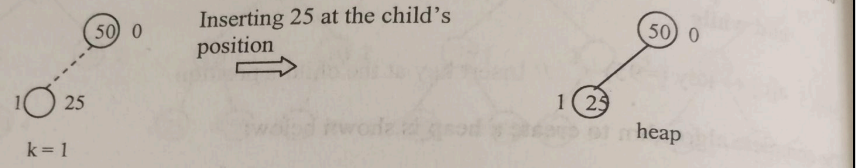
		MARKS	CO	RBT
1 (a)	Apply Backtracking method to solve sum of subset problem for the instance d=30, S={5,10,12,15,18}.Give all possible solution with state space tree construction 	10	CO5	L3
2 (a)	Draw the state space tree to generate solutions to 4-queen's problem	5	CO5	L2

				
2 (b)	Construct the heap for the list 50 25 30 75 100 45 80 using top down approach	5	CO3	L3

using top-down approach

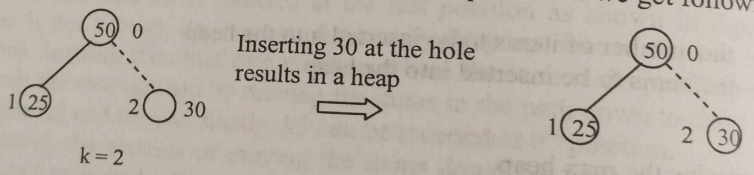
Step 1: Item = 50. Inserting the item into an empty tree, we get the tree as shown below:

Step 2: Item = 25. Inserting the item into above heap at position 1, following heap is obtained



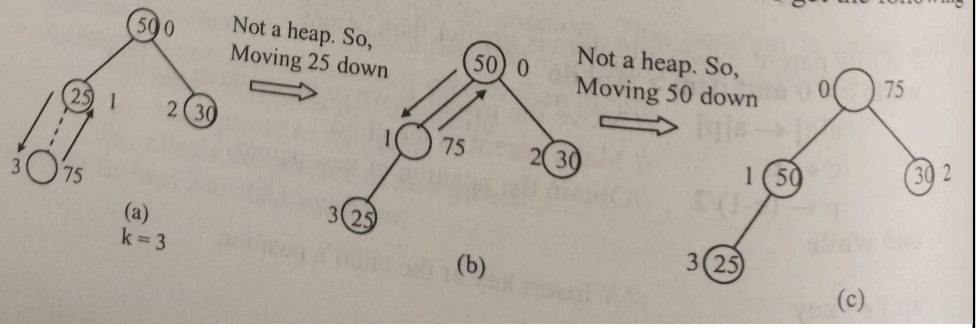
Observe that the parent 50 is greater than the child 25 and so, it can be inserted at the child's position and the resulting tree is a heap.

Step 3: Item = 30. After inserting into above heap at position 2 we get following heap

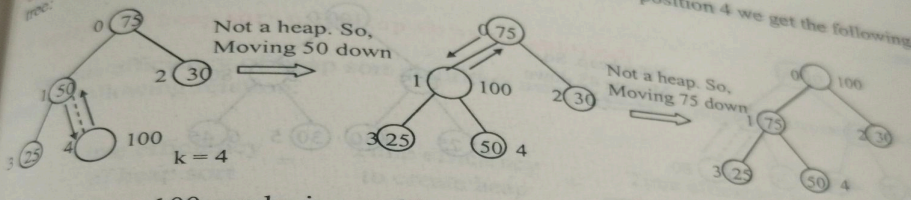


Observe that the parent 50 is greater than the child 30 and so, it can be inserted at the child's position and the resulting tree is a heap.

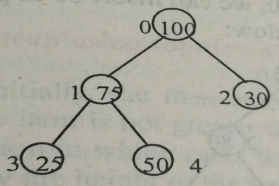
Step 4: Item = 75. Inserting the item into above heap at position 3 we get the following heap:



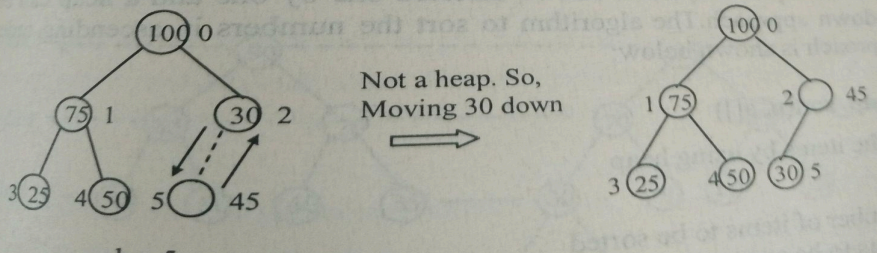
Step 5: Item = 100. Inserting the item into above heap at position 4 we get the following tree:



Finally, the key 100 can be inserted into the child's at root node and the resulting heap is shown below:



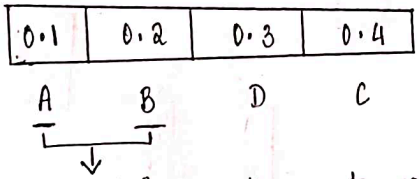
Step 6: Item = 45 Inserting the item into above heap at position 5 we get the followin tree:



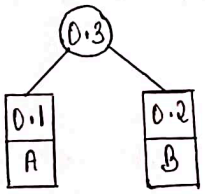
<table>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>3</td><td>A message consisting of the characters given in the table below has to be transmitted over a network in the secured manner

<table><tr><td>Character</td><td>A</td><td>M</td><td>R</td><td>-</td></tr><tr><td>Probability</td><td>0.4</td><td>0.2</td><td>0.3</td><td>0.1</td></tr></table>
a)Construct the Huffman Tree for the following characters (Branch Label:Left(0),Right(1)).
b)Derive the Huffman code for the given characters.
c)Decode the text whose encoding is 1000101
d)Encode the text RAMA_RAMAR</td><td>10</td><td>CO4</td><td>L3</td></tr>
</table>

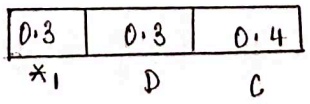
Step 1: Arrange the keys in ascending order of their probability/frequency

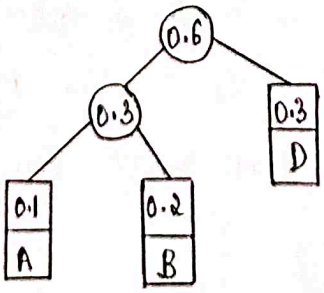


Select the first 2 minimum keys to construct the tree.



Step 2: Arrange in ascending order again





(ii)

Character	Code
A	0
M	101
R	11
_	100

(iii) 1000101

_ A M

∴ 1000101 ⇒ _AM

(iv) R A M A _ R A M A R

11 0 101 0 100 11 0 101 0 11

∴ RAMA_RAMAR ⇒ 11010100111010111

4	Apply the memory function method to solve the following instance of the Knapsack problem with capacity M=5 Item / Weight / Value 1 / 2 / 12 2 / 1 / 10 3 / 3 / 20 4 / 2 / 10	10	CO4	L3
5(a)	Apply the greedy method to obtain optimal solution to the knapsack problem given M=60.	5	CO3	L3

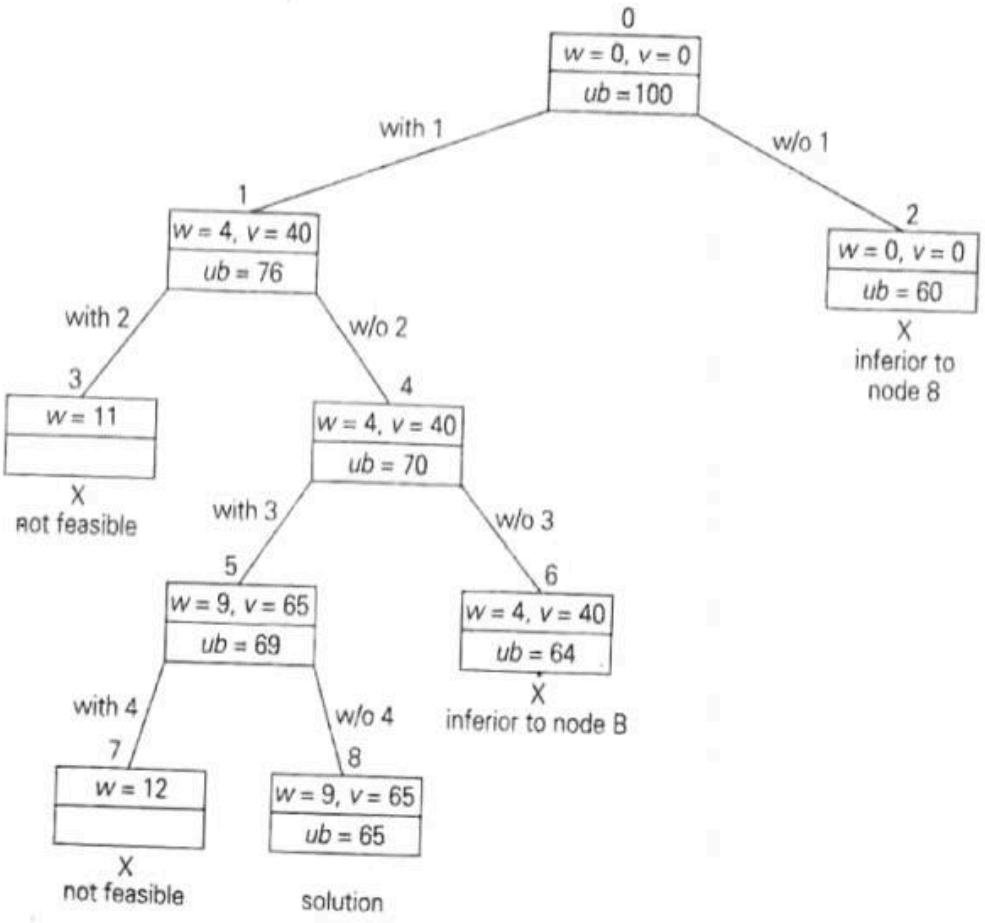
	W={5,10,20,30,40} P={30,20,100,90,60} Find the total profit earned. Ans:- Step 1: Calculate Profit/Weight ratio. Step 2: Arrange all items in non-ascending order of Profit/Weight ratio. Total profit = $\left(\frac{35}{40} \times 160\right) + 130 = 140 + 130 = 170$ ∴ Total profit = 170.			
(b)	Write the algorithm of Counting Sort.Sort the following numbers using the same. 10,1,0,2,5,6.	5	CO3	L2
6	Apply the branch and bound to solve the instance of 0/1 knapsack problem	10	CO5	L3

Item	1	2	3	4
Weight	4	7	5	3
Profit	$40	$42	$25	$12

Items	Profit	Weight	Profit/Weight	Remaining Weight	Total Profit
1	30	5	6	60-5 = 55kg	30
3	100	20	5	55-20 = 35kg	30+100
5	160	40	4	35-35 = 0kg	$\frac{35}{40} \times 160 + 130$
4	90	30	3	–	
2	20	10	2	–	

Items	Profit	Weight	Profit/Weight
1	30	5	6
2	20	10	2
3	100	20	5
4	90	30	3
5	160	40	4

knapsack capacity W=10



CI **CCI** **HOD**