

TUTORIAL 9 COST FUNCTION

1. Easter Toaster Co. is contemplating a modernization of its antiquated plant. It now sells its toasters for Rs 20 each. The profit contribution of the company is 60% of the price. Fixed cost is given as Rs 8,40,000.

(a) Calculate the break even quantity? **(Ans: 70,000)**

(b) If the proposed modernization is carried out, the new plant would have fixed cost of Rs 12,00,000 per year, but its variable cost would decrease to Rs 5 per unit. What will be the breakeven point now? **(Ans: 80,000)**

If the company wanted to breakeven at the same quantity as with the old point, what price would it have to charge for a toaster? **(Ans: 17.14)**

2. Tlite and Brite produce lamps which they sell for \$40. Tlite has fixed cost of \$8000 less than Brite and average variable cost of \$33, which is 10% more than Brite. Tlite has a break even output which is 15% less than Brite, and produces 25% less revenue than Brite. Tlite also makes \$12000 less profit than Brite. Calculate the outputs of both the firms. **($Q_B=4210.52$ & $Q_L=3157.89$)**

3. Complete the following Cost table:

Quantity	1	2	3	4
Total Cost	90	114	141	180
Average Variable Cost	30	27	27	30
Marginal Cost	30	24	27	39

Ans: **In bold given in table itself**

4. A biscuit producing firm has a production function given by $Q=2\sqrt{KL}$. In the short run, the firm's amount of capital equipment is fixed at $K=100$. The rental rate for K is Re 1 and the wage rate is Rs 4.

i. Calculate the firm's short run total and average costs. **$STC=(100+Q^2/100)$, $SAC=100/Q + Q/100$**

ii. What are STC, SAC and SMC for producing 25 sticks? **$STC 100 + \frac{625}{100}$,
 $SAC 4.25$, $SMC 0.5$**

5. Based on a consulting economist's report, the total and marginal cost functions for Bihar Electronics are

$$TC=200+5q-0.04Q^2+0.001Q^3$$

$$MC= 5-0.08Q+0.003Q^2$$

The president of the company determines that knowing only these equations is inadequate for decision making. You have been directed to do the following:

- Determine the level of fixed cost (if any) and equations for average total cost, average variable cost, and average fixed cost.
- Determine the rate of output that results in minimum average variable cost. **$Q=20$**
- If fixed costs increase to Rs 500, what output rate will result in minimum average variable cost? **unchanged**

TUTORIAL 11

MONOPOLY & MONOPOLISTIC

1. A Monopoly firm faces the following cost curve: $C(Q) = Q^2 + 12$, where Q is the output produced. The demand for its product is given by $P = 24 - Q$.

i) Find the equilibrium price and quantity (**$P=18$, $Q=6$**)

ii) Find the profit level and Consumer Surplus associated to the monopoly (**Profit=60, CS=18**)

2. Hawkins Micro Brewery has a monopoly on Oatmeal Stout in the local market. The demand is: $Q = 100 - 2P$. Hawkins marginal cost of producing Oatmeal Stout is $MC = 5 + 0.5Q$. Calculate Hawkins profit maximizing output. Calculate the social cost of Hawkins monopoly power. (**$Q=30$, Society Loss=112.50**)

3. Suppose perfectly competitive industry produce breads at a constant marginal cost of Rs 10 per bread. Once the industry is monopolized, the marginal cost rises to Rs 12 per bread. Suppose the market demand for breads is given by the following equation: $Q=1000-50P$. Calculate:

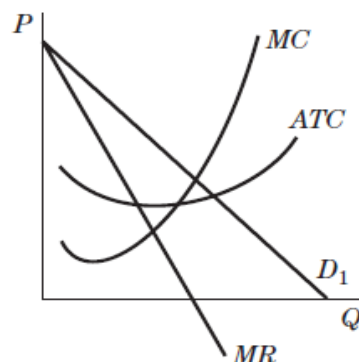
(a) Perfectly competitive and monopoly output and prices (**$P_{pc}=10$, $Q_{pc}=500$, $P_m=16$, $Q_m=200$**)

(b) The total loss of consumer surplus under monopolization of bread industry (**2100**)

(c) Dead Weight Loss (**1300**)

4. Suppose demand curve DD facing a firm working under monopolistic competition is given by $P=36-2Q$ and firm's Long run average cost $Q^2-18Q+100$. What is the long run equilibrium price & output of the individual firm? Would the firm earn any profit in long run? (**$Q=8$, $P=20$, Profit=0**)

5. The following graph shows a firm in a monopolistically competitive industry.



- Show the firm's short-run profit-maximizing quantity and price. Is the firm making a profit?
- Carefully explain what will happen in the industry over time, and draw a graph of a monopolistically competitive firm in long-run equilibrium.

TUTORIAL -11 (DSA)

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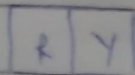
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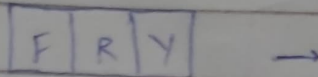
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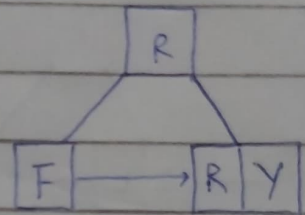
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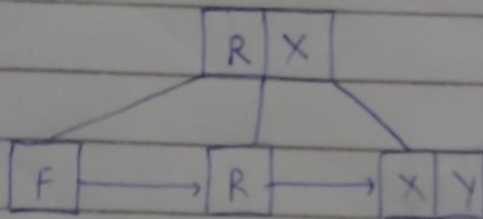
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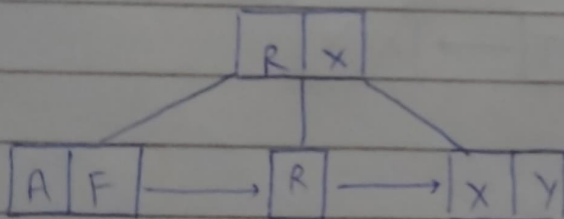
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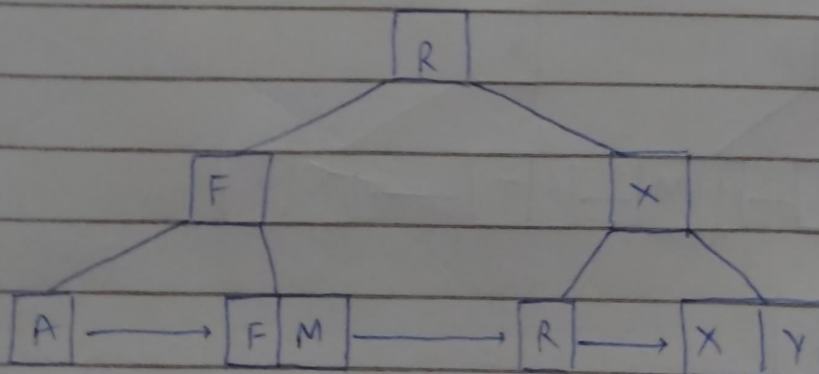
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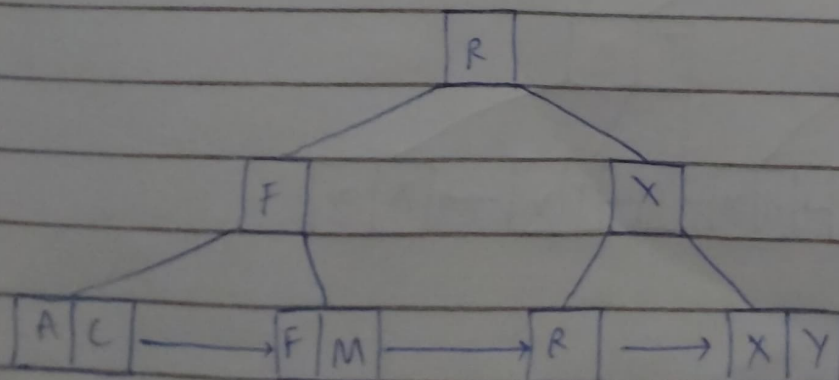
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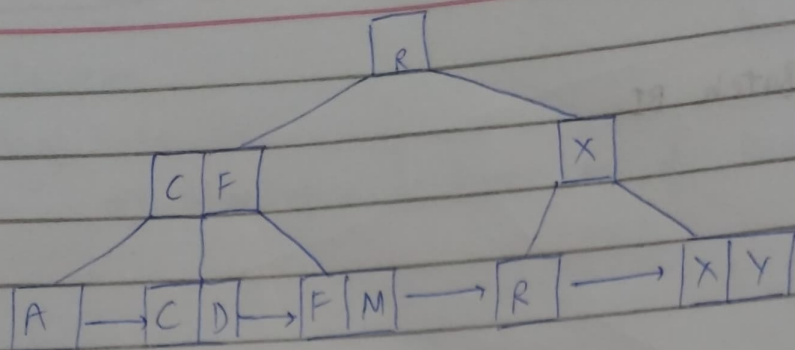
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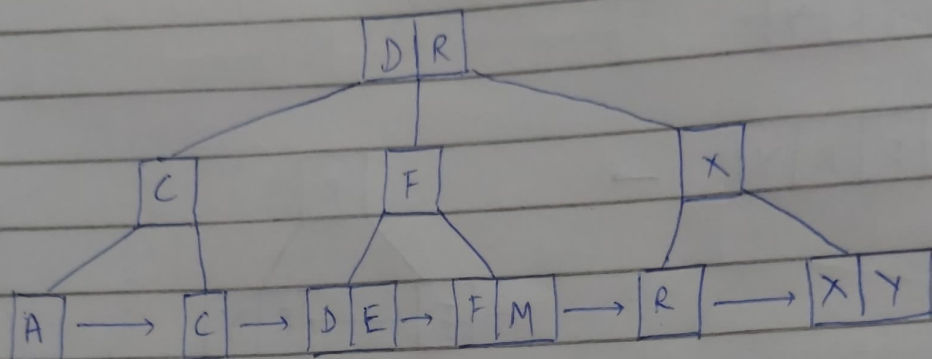
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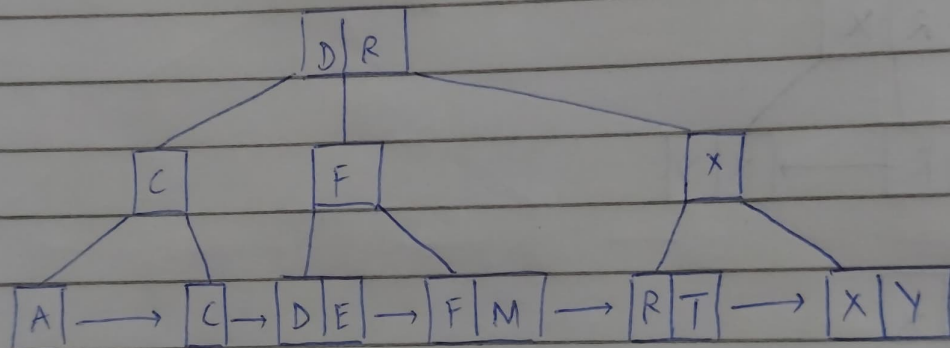
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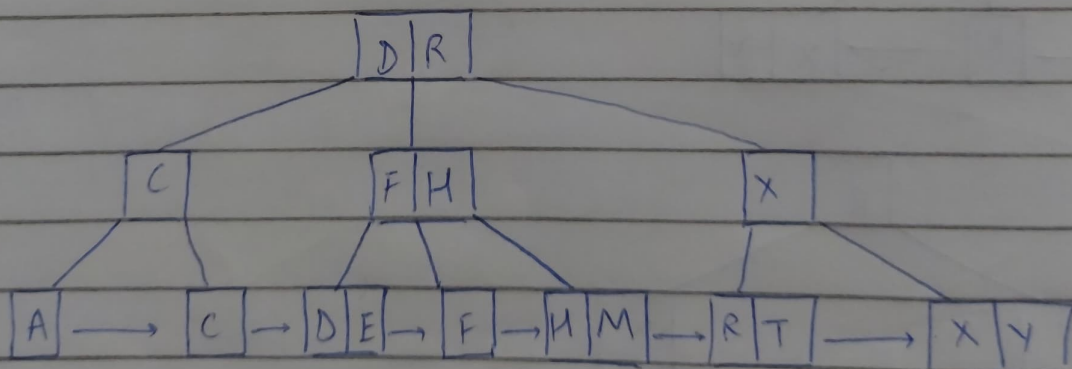
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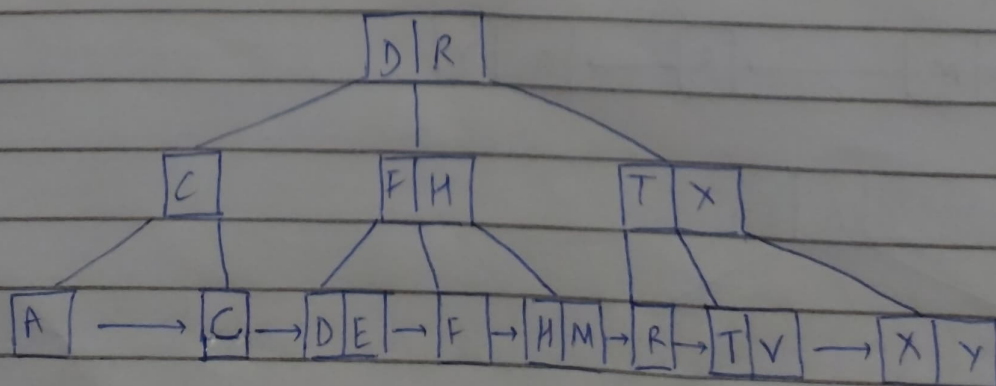
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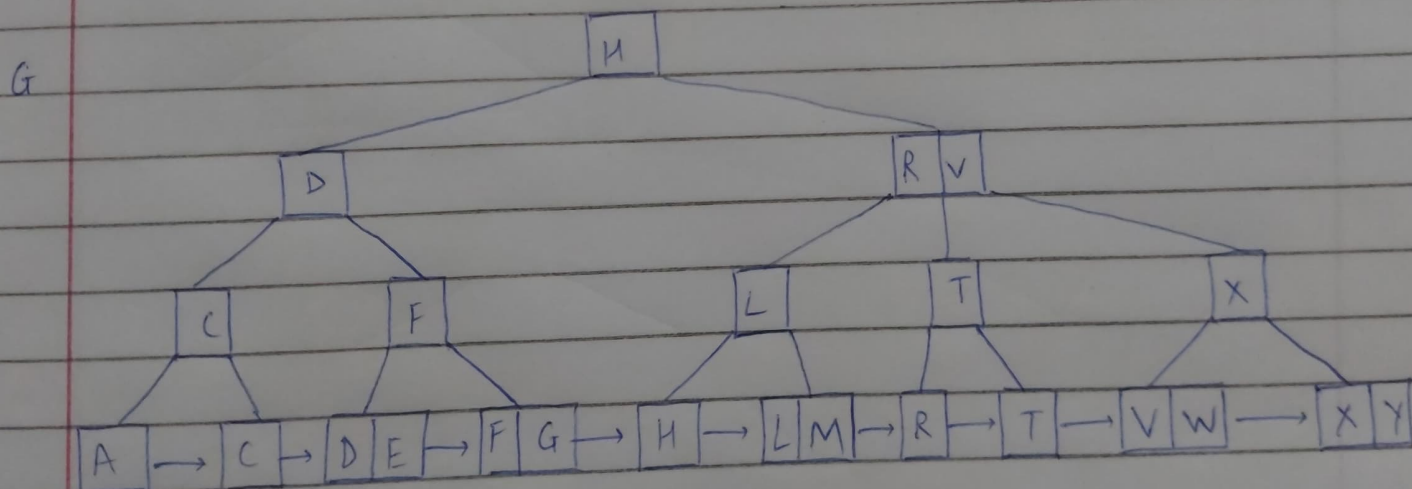
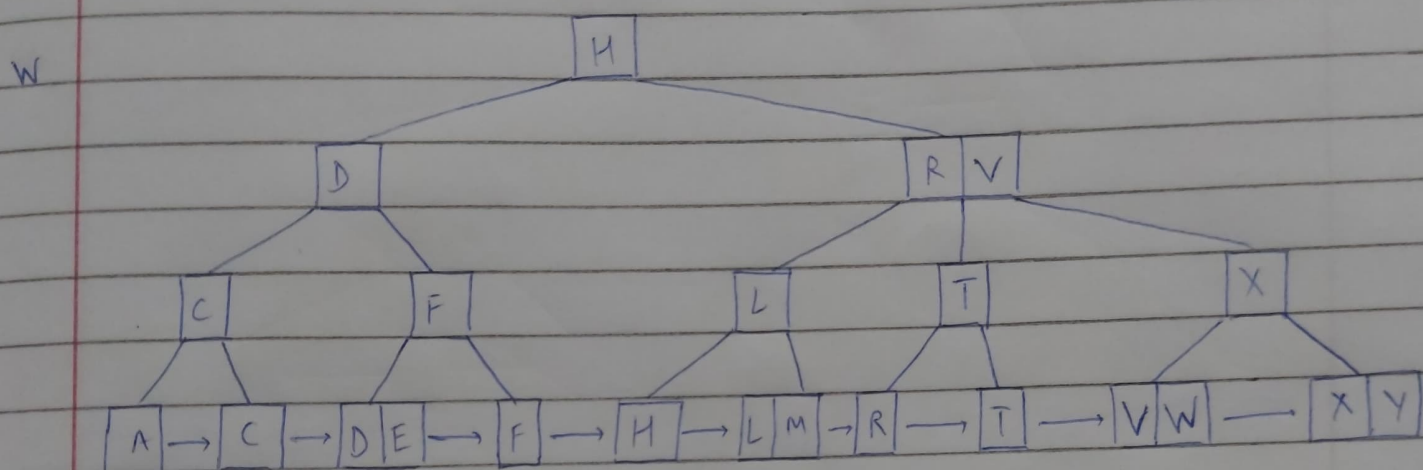
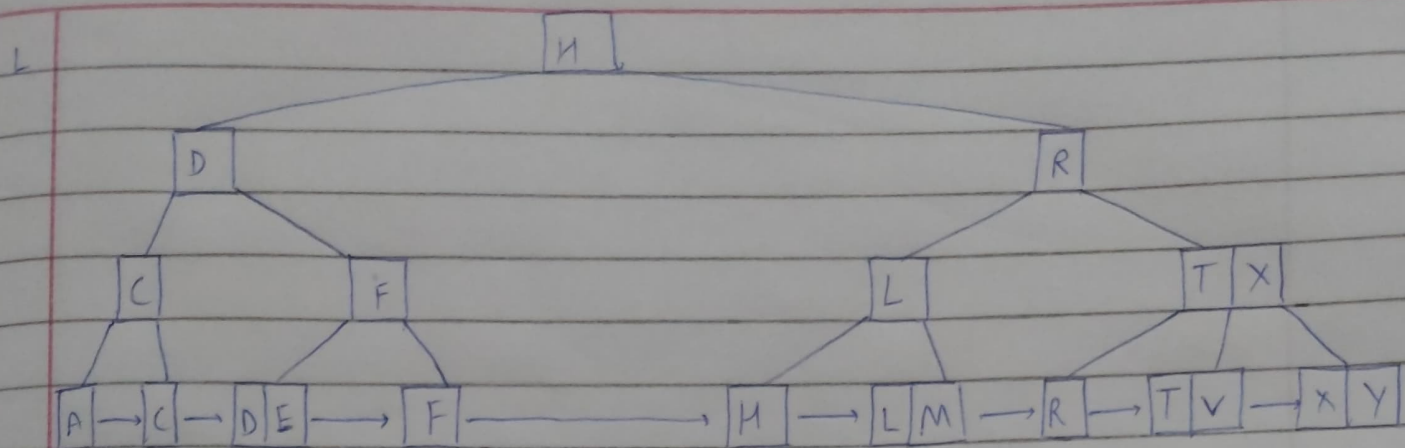


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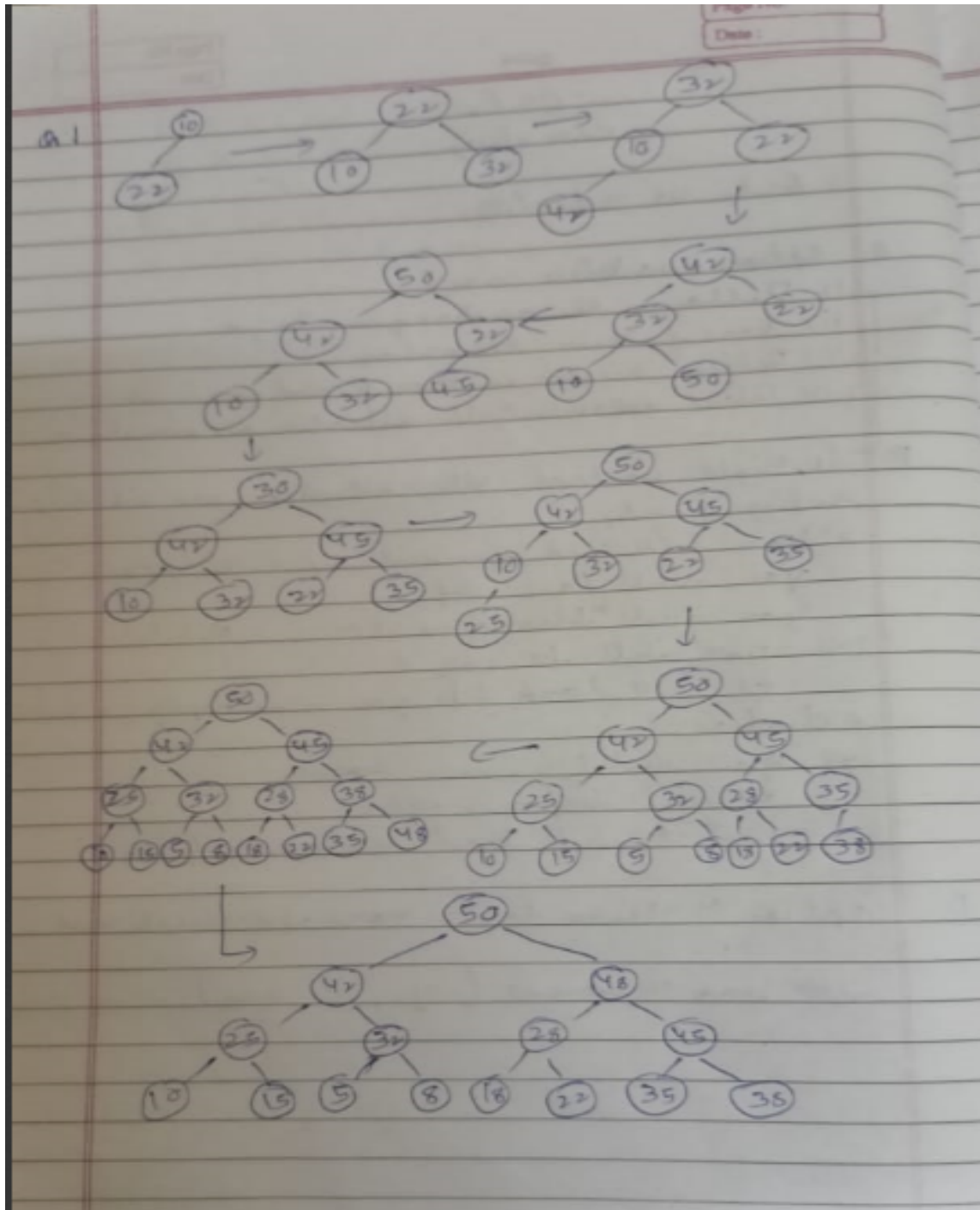
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- Q2-1. Separate indexing and key or sequence set
1. Traversal in leaf level is possible
 2. Time complexity of finding localised group $\approx O(\log_m n) + O(1) + O(1) + \dots$
 3. While merging or splitting the temporary space required is less in B+ tree as only the key value is stored in memory and not the records unlike B-tree

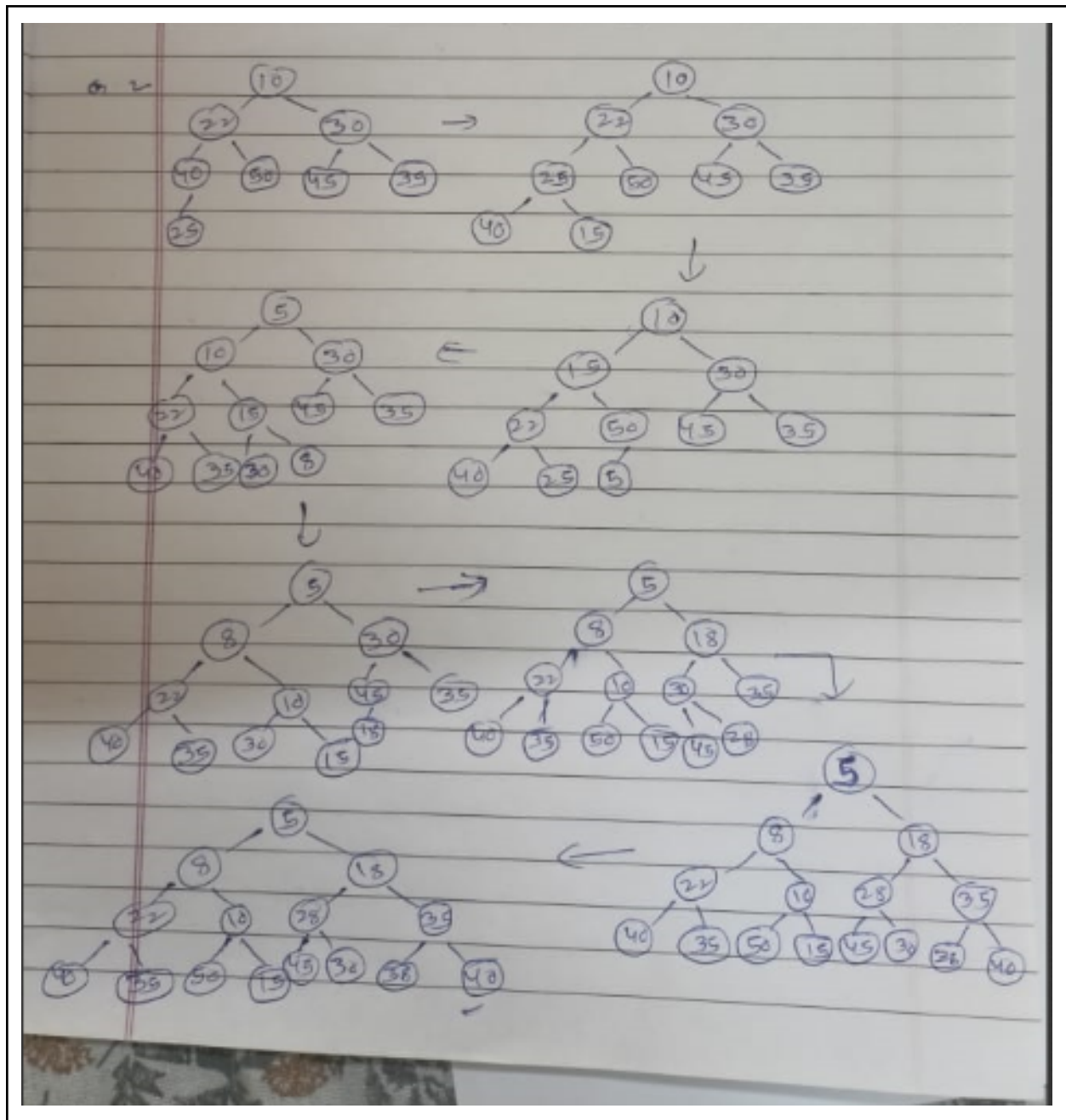
**Q.1 Construct a Max Binary Heap using following elements:
10, 22, 32, 42, 50, 45, 35, 25, 15, 5, 8, 18, 28, 38, and 48 and
sort them in ascending order using heap sort.**



Heap sort:

- ① Swap head node with last node (Bottom-right node)
- ② Delete last node (store the value in array)
- ③ Max-heapify the root binary tree
- ④ So on, we get array in descending order
- ⑤ To sort reverse the array and you get sorted array of: [5, 8, 10, 15, 18, 22, 25, 28, 32, 35, 38, 42, 45, 48, 50]

Q2. Construct a Min Binary Heap using following elements:
 10, 22, 30, 40, 50, 45, 35, 25, 15, 5, 8, 18, 28, 38, and 48



Q3. Analyse the performance of the Binary Heap, if it is created using (a) array and (b) binary tree

Binary heap creating with array is better than creating with binary tree. Because it takes less space as binary tree has pointers which takes more space.

Q4. You have been given a Max Binary Heap and it is desired to convert it into a Min Binary Heap. Write a program to perform the desired task.

```
#include <bits/stdc++.h>
using namespace std;
void MinHeapify(int arr[], int i, int N)
{
    int l = 2 * i + 1;
    int r = 2 * i + 2;
    int smallest = i;
    if (l < N && arr[l] < arr[i])
        smallest = l;
    if (r < N && arr[r] < arr[smallest])
        smallest = r;
    if (smallest != i)
    {
        swap(arr[i], arr[smallest]);
        MinHeapify(arr, smallest, N);
    }
}
void convertMinHeap(int arr[], int N)
{
    for (int i = (N - 2) / 2; i >= 0; --i)
        MinHeapify(arr, i, N);
}
void printArray(int *arr, int size)
{
    for (int i = 0; i < size; ++i)
```

```

cout << arr[i] << " ";
}
int main(){
int arr[] = {20, 18, 10, 12, 9, 9, 3, 5, 6, 8};
int N = sizeof(arr) / sizeof(arr[0]);
printf("Max Heap array : ");
printArray(arr, N);
convertMinHeap(arr, N);
printf("\nMin Heap array : ");
printArray(arr, N);
return 0;
}

```

Q5. You have been given two Max Binary Heaps and it is desired to merge both heaps into a single heap. Write a program to perform the desired task.

```

#include <bits/stdc++.h>
using namespace std;
void maxHeapify(int arr[], int N, int idx)
{
if (idx >= N)
return;
int l = 2 * idx + 1;
int r = 2 * idx + 2;
int max = idx;
if (l < N && arr[l] > arr[idx])
max = l;
if (r < N && arr[r] > arr[max])
max = r;
if (max != idx)
{
swap(arr[max], arr[idx]);maxHeapify(arr, N, max);
}
}
void buildMaxHeap(int arr[], int N)

```

```

{
for (int i = N / 2 - 1; i >= 0; i--)
maxHeapify(arr, N, i);
}
void mergeHeaps(int merged[], int a[], int b[], int N,
int M)
{
for (int i = 0; i < N; i++)
merged[i] = a[i];
for (int i = 0; i < M; i++)
merged[N + i] = b[i];
buildMaxHeap(merged, N + M);
}
int main()
{
int a[] = {10, 5, 6, 2};
int b[] = {12, 7, 9};
int N = sizeof(a) / sizeof(a[0]);
int M = sizeof(b) / sizeof(b[0]);
int merged[N + M];
mergeHeaps(merged, a, b, N, M);
for (int i = 0; i < N + M; i++)
cout << merged[i] << " ";
return 0;}

```