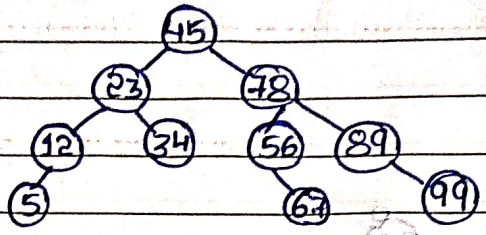
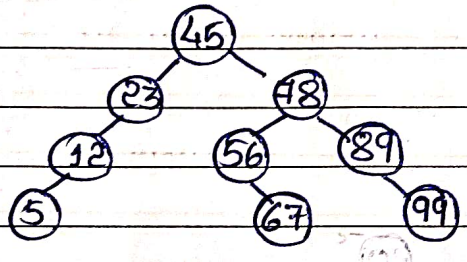
1. 45, 23, 78, 12, 34, 56, 89, 67, 05, 99

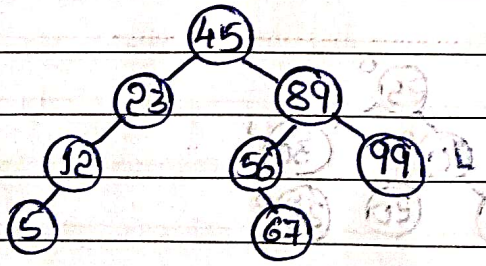
BST:



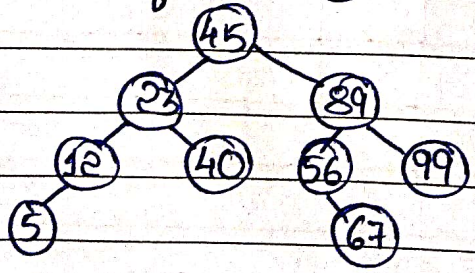
Deletion of Node (34):



Deletion of node (78):



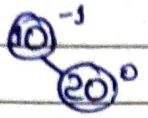
Insertion of node (40):



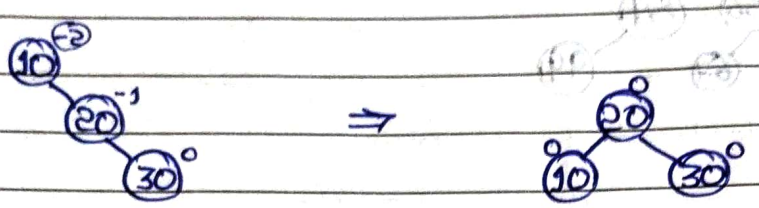
2. 10, 20, 30, 25, 28, 5, 8

i)

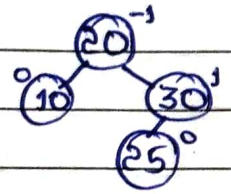
ii)



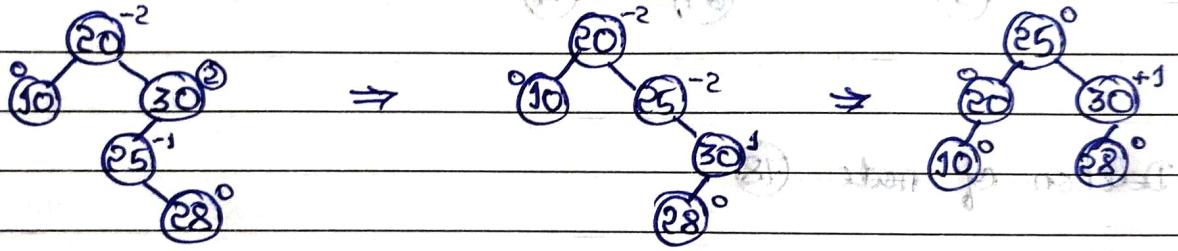
iii)



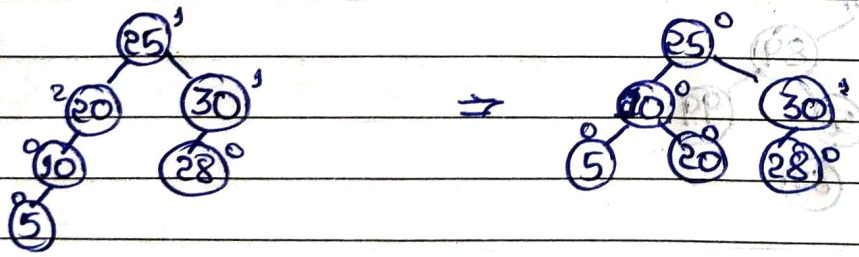
iv)



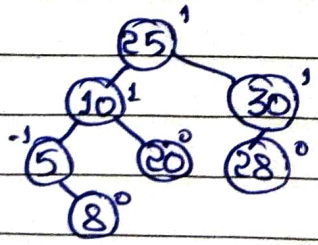
v)



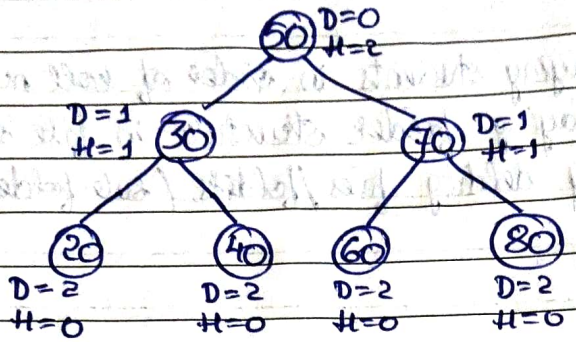
vi)



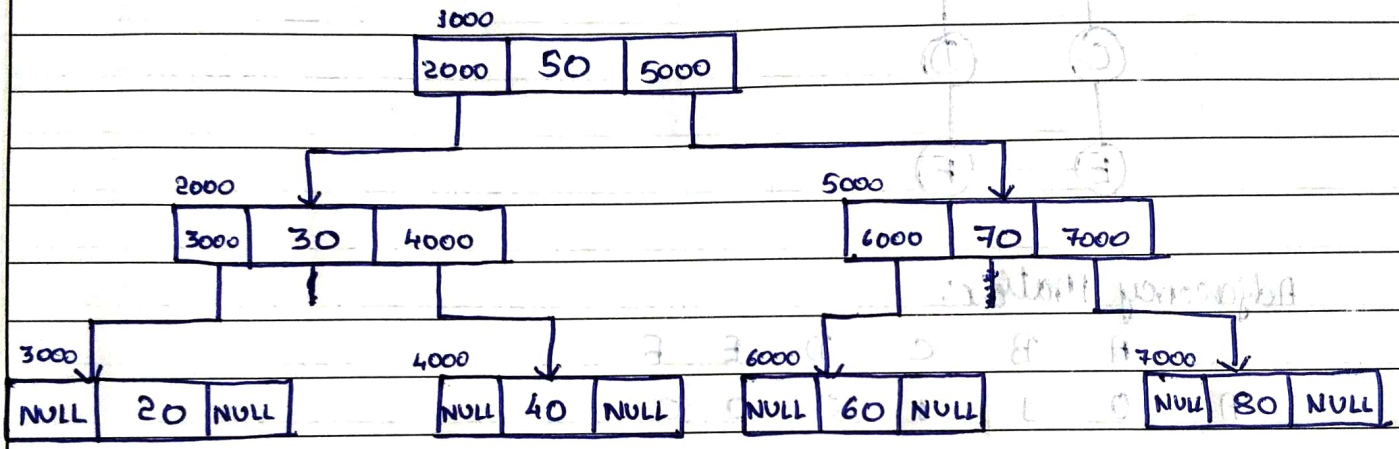
vii)



3.



Linked List Representation:



Inorder Traversal:

20, 30, 40, 50, 60, 70, 80

Preorder Traversal:

50, 30, 20, 40, 70, 60, 80

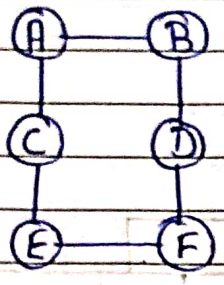
Postorder Traversal:

20, 40, 30, 60, 80, 70, 50

Real-Life Applications:

i) Inorder Traversal: Displaying students in order of, roll numbers
ii) Preorder Traversal: Displaying folder structure in file systems
iii) Postorder Traversal: Safely deleting files/folders (sub-folders before root folder)

4. Graph:



Adjacency Matrix:

	A	B	C	D	E	F
A	0	1	1	0	0	0
B	1	0	0	1	0	0
C	1	0	0	0	1	0
D	0	1	0	0	0	1
E	0	0	1	0	0	1
F	0	0	0	1	1	0

Adjacency List:

A → B → C
B → A → D
C → A → E
D → B → F
E → C → F
F → D → E

BFS:

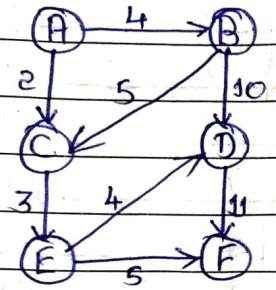
A, B, C, D, E, F

DFS:

A, B, D, F, E, C

5.

Dijkshatka's Algorithm



Starting from A

A → B 4

A → C 2

Visit C ⇒ Distance = 2

C → E 3

Visit B ⇒ Distance = 4

B → C 5

B → D 10

Visit E ⇒ Distance = 2+3 = 5

E → D 4

E → F 5

Visit D ⇒ Distance = 9

D → F 11

Visit F

⇒ Path A → B → D → F ⇒ Distance = 11

Path A → C → E → F ⇒ Distance = 10

6. 43, 22, 1, 31, 77, 99, 11, 55, 60

Chaining:

$h(k) = k \% 10$

$43 \% 10 = 3 \Rightarrow$ Index 3

$22 \% 10 = 2 \Rightarrow$ Index 2

$1 \% 10 = 1 \Rightarrow$ Index 1

$31 \% 10 = 1 \Rightarrow$ Index 1

$77 \% 10 = 7 \Rightarrow$ Index 7

$99 \% 10 = 9 \Rightarrow$ Index 9

$11 \% 10 = 1 \Rightarrow$ Index 1

$55 \% 10 = 5 \Rightarrow$ Index 5

$60 \% 10 = 0 \Rightarrow$ Index 0

Index	Value
0	[60]
1	[1 → 31 → 11]
2	[22]
3	[43]
4	[]
5	[55]
6	[]
7	[77]
8	[]
9	[99]

Linear Probing:

Key	h(k)	Insertion Index
43	3	3
22	2	2
1	1	1
31	1	4
77	7	7
99	9	9
11	1	5
55	5	6
60	0	0

Index	Value
0	60
1	1
2	22
3	43
4	31
5	11
6	55
7	77
8	-
9	99

Quadrating Probing:

Index = $(h(k) + i^2) \% 10$ for $i = 0, 1, 2, \ldots$

Key	h(k)	Index
43	3	3
22	2	2
1	1	1
31	1	i=1 $(1+1^2)\%10 = 2$
		i=2 $(1+4)\%10 = 5$ (free)
77	7	7
99	9	9
11	1	i=1 $(1+1^2)\%10 = 2$
		i=2 $(1+4)\%10 = 5$
		i=3 $(1+9)\%10 = 0$ (free)
55	5	i=1 $(5+1)\%10 = 6$ (free)
60	0	i=1 $(0+1)\%10 = 1$
		i=2 $(0+4)\%10 = 4$ (free)

Index	Value
0	11
1	1
2	22
3	43
4	60
5	31
6	55
7	77
8	-
9	99