DSA LAB Assignment

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Reg #   SP22-BCS-041

Section   A
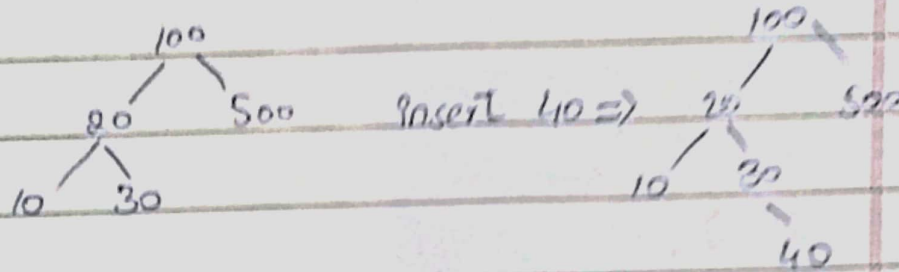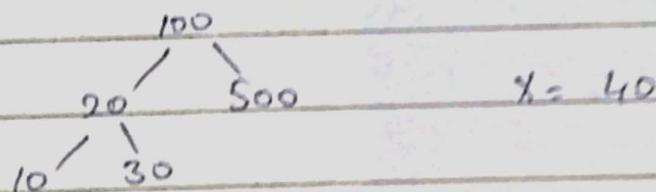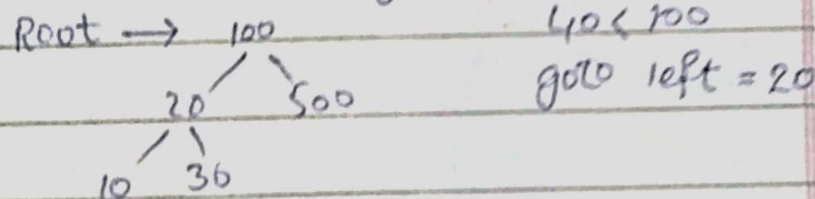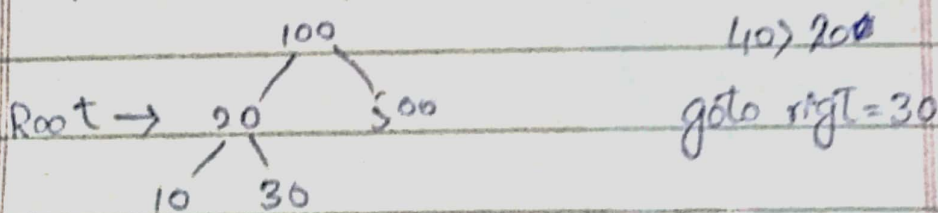
'—————'

i) Insertion in BST:

```
        100                            100
       /   \                          /   \
     20     500     Insert 40 =>    20     522
    /  \                           /  \
  10    30                       10    30
                                          \
                                           40
```

Illustration:

```
        100
       /   \                    X = 40
     20     500
    /  \
  10    30
```

step # 1   comparing with root node

Root ⟶ 100 $40 < 100$

```
       /   \                   goto left = 20
     20     500
    /  \
  10    36
```

Step # 2   compare with left child root

```
        100                    40 > 200
       /   \                   goto rigt = 30
Root ⟶ 20   500
    /  \
  10    30
```

step # 3   comparing with child root 30

```
        100
       /    \
     20      500
    / \
  10   30  ← right
```
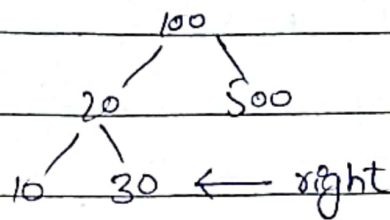
$40 > 30$

goto right

step # 4   insert item as it is leaf node

```
        100
       /    \
     20      500
    / \
  10   30
         \
          40  ← inserted node,
```
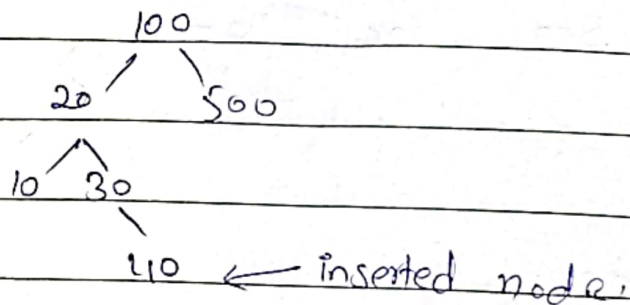
Deletion in BST:

case 1   Delete leaf node.

```
      50
     /  \
   30    70
   / \
  20  40
```
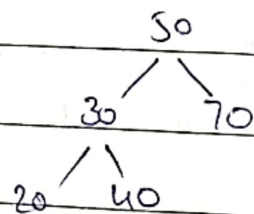
1 Delete 20

```
x = 20 ⌒→ 50
           /  \
         30    70
         / \
       20   40
```
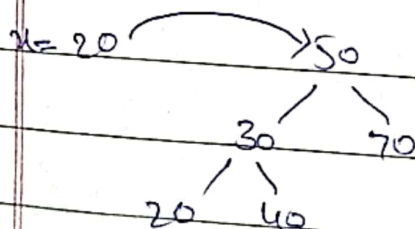
compare

$x < 50$ && $x \neq 50$

goto left

4

```
x=20
      50
     /  \
  →36    70
   / \
  20  40
```

$x < 30$ && $x \neq 30$

goto left

$x = 20$ && $x == 20$

iii) $x=20$

50
30   70
20   40

delete it.

iv Deleted.
→ 20

50
30   70
20   40
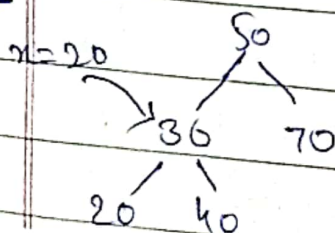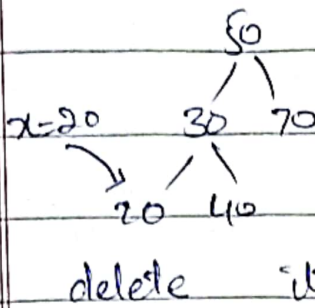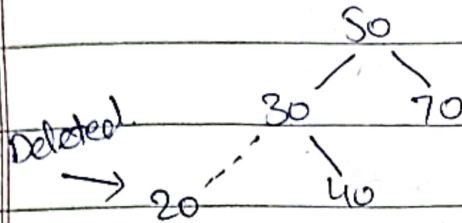
Case II Delete node with single child BST.

50
30   70
20 40   80
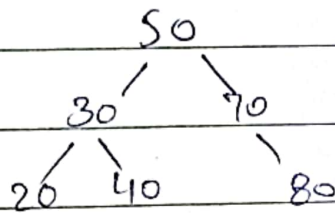
i Delete (70)

replacing 70 with 80.

50   50
30   70   ⟹   30   80
20 40 80   20 40 70
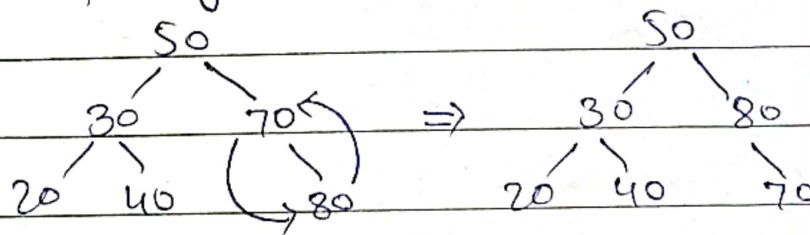
ii goto 70 node and delete it -

50
30   80
20 40   70 ← delete.
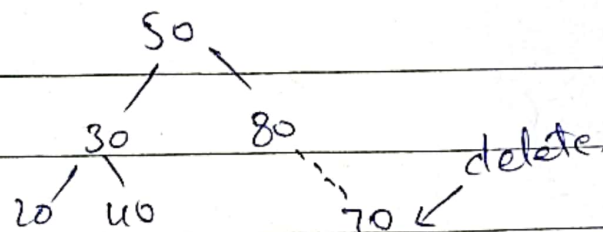
⓪ Case III delete node with both children.

```
        50
       /  \
     30    70
    / \   /  \
   20 40 60  80
```
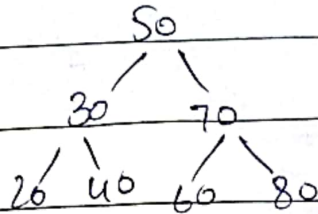
१ delete (50)

compare 50 goto right

```
        50 ↻
       /  \
     30    70
    / \   /  \
   20 40 60  80
```
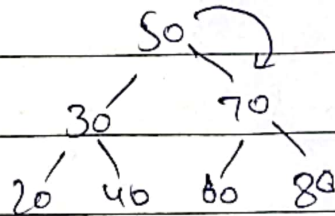
compare with 70   50 < 70

```
        50               goto left
       /  \
     30    70 ↻
    / \   / \
   20 40 60  80
```
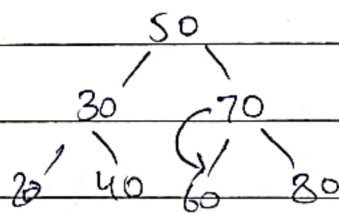
compare with 60

                          60 is leaf node

```
        60               swap 50 with 60
       /  \
     30    70
    / \   / \
   20 40 50  80
```

now delete 50

```
        60
       /  \
     30    70        deleted
    / \   / \
   20 40 50  80
```

Searching in BST

```
        60
       /  \
     30    80
    /  \
  20    40
```
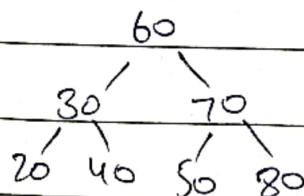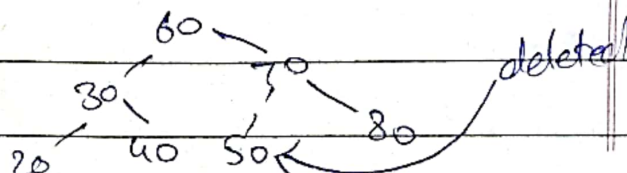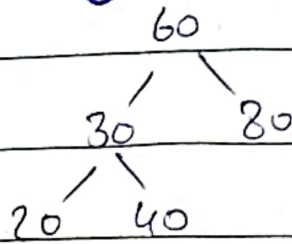
key is $x = 40$

goto root

$x \, != root \, \&\& \, x < root$

root $\longrightarrow$ 60
```
        60
       /  \
     30    8.
    /  \
  20    40
```
goto left
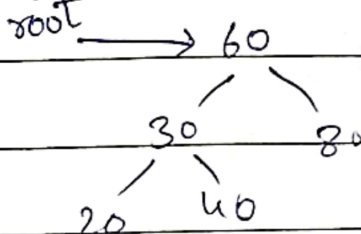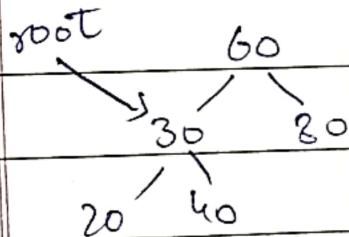
root
```
        60
      / /  \
    30    80
   /  \
 20    40
```
$x \, != root \, \&\& \, x > root$

goto right

```
        60
       /  \
     30    80
    /  \
  20    40 ← root
```
$x == root$
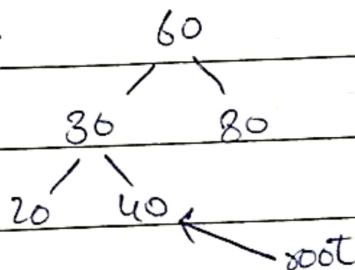
key found

Preorder Traverse in BST

Root → Left → Right

10
20   30
40   50   60
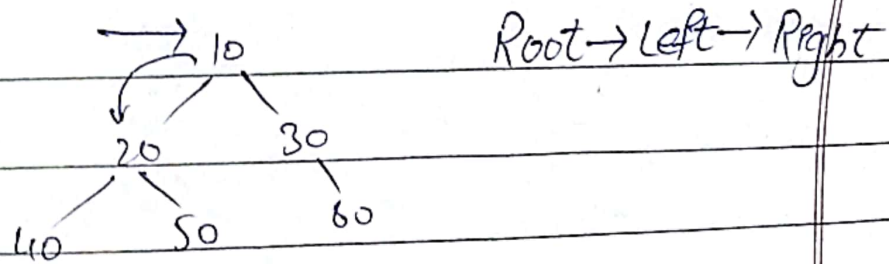
20 is root again print (1p)

10
20   30
40   50   60
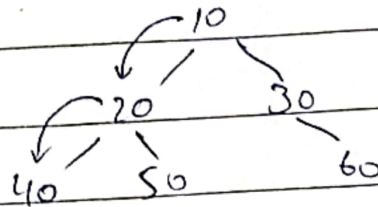
⇒ 40 is left and leaf print (40)
⇒ goto right

10
20   30
40   50   60

print (50)
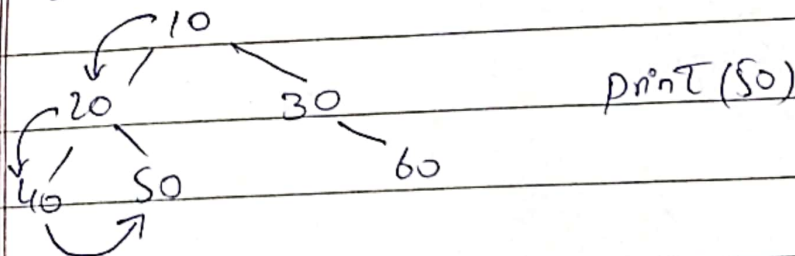
goto right of parent

10
20   30
40   50   60
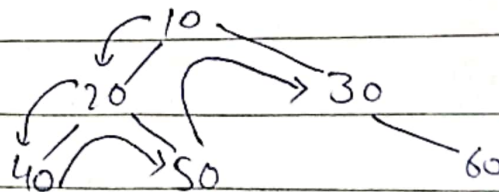
There is not left of 30 goto right

10
20   30
40   50   60

10→20→40→50→30→60
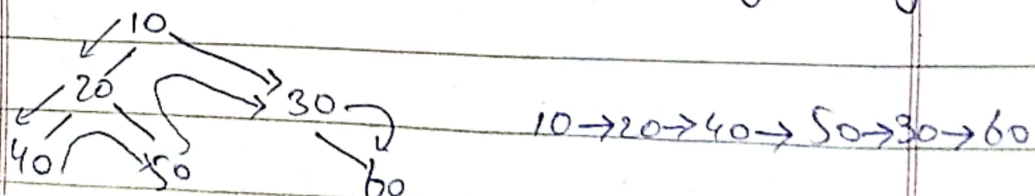
Post order in BST

Left → Right → Root

root → 10
 20   30
40 50 60

goto left
⇒

10
20   30
40 50 60
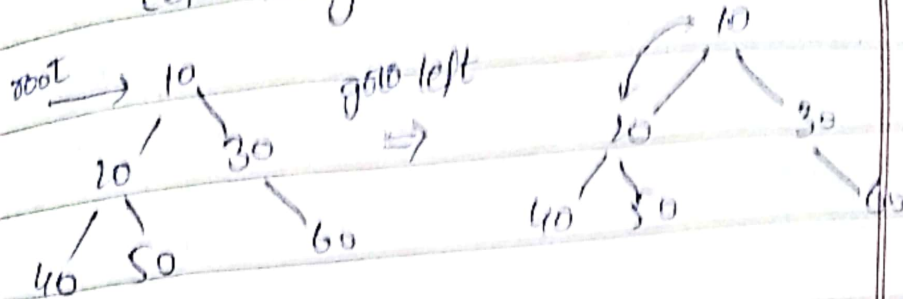
20 is root of subtree goto left.

10
20   30
40 50 60

print (40)
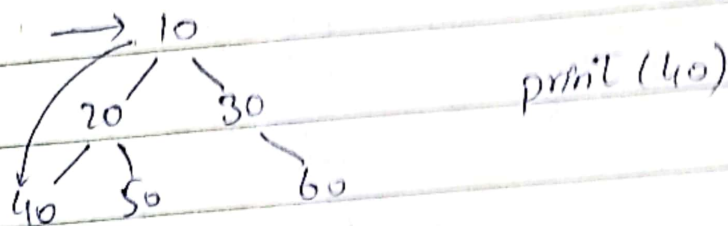
now goto right of subtree

10
20   30
40 50 60

print (50)
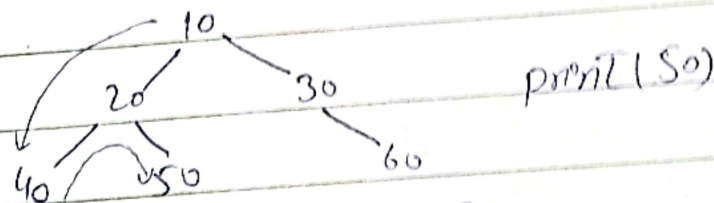
go back to root of subtree.

10
20   30
40 50 60

print (20)

goto right

10
20   30
40 50 60

print (60)
print (30)
print (10)
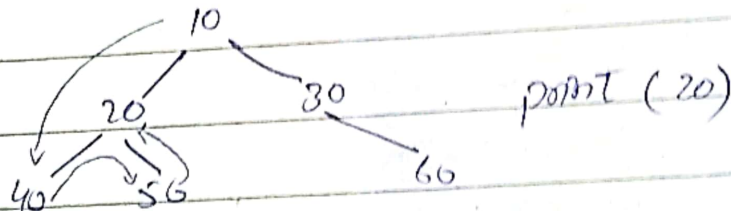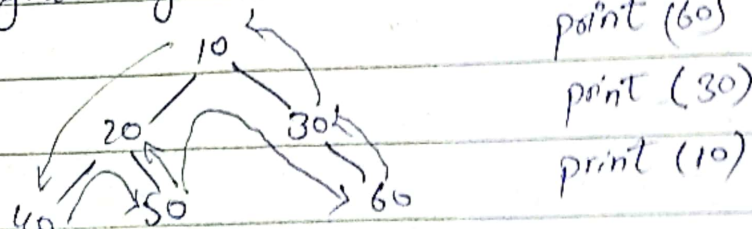
Inorder in BST

Left → root → right

goto left

print (40)

goto root of subtree

print (20)

goto right of subtree

print (50)
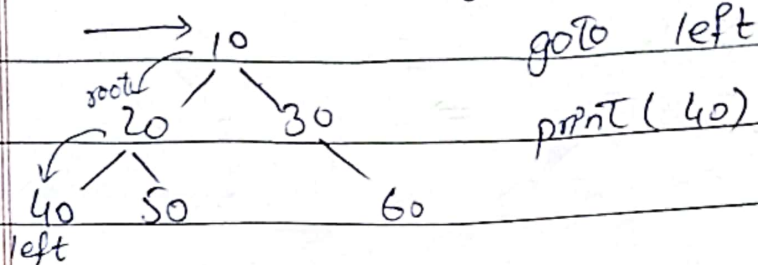
goto to root of tree

print (10)

goto right of tree

print (30)

Left is NULL
goto root

goto right of subtree

```
            10
          /    \
       20        30
      / \          \
    40   50        60
```
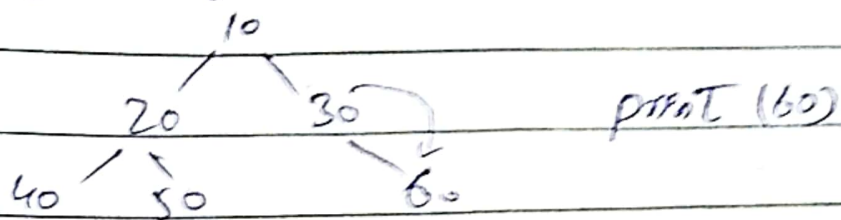
print (60)

$40 \rightarrow 20 \rightarrow 50 \rightarrow 10 \rightarrow 30 \rightarrow 60$