**LABWORK 4:**

**GROUP : CE**

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**INTRODUCTION:**

In this lab work, we have implemented binary search tree using array and linked list. We have done following operations.

(a) isEmpty(): Returns true if the tree is empty, and false otherwise

(b) addBST(newNode): Inserts an element to the BST

(c) removeBST(keyToDelete): Removes the node with the given key from the BST

(d) searchBST(targetKey): Returns true if the key exists in the tree, and false otherwise

**IMPLEMENTATION**:

Using array and linked list data structures, we have implemented the above operations.

In array,

* We have checked if array is empty for isEmpty() operation of BST.
* We have added element to next index of array which is either the index of left node or right node of BST (depending upon the value of key) for addBST(newNode) operation.
* We have removed the node with target key directly if it has no child, and we have removed the target node and replaced it with minimum value in right sub tree, if it has both children for removeBST(keyToDelete) operation. For removing, we have replaced the value of to be removed key in array with -1 (default value in array).

In linked list,

* We have checked if root node is null for isEmpty() operation of BST.
* We have added element to either LeftChild or Right Child of BinarySearchTree Node depending upon the value of keyfor addBST(newNode) operation.
* We have removed the node with target key directly if it has no child, and we have removed the target node and replaced it with minimum value in right sub tree, if it has both children for removeBST(keyToDelete) operation. For removing, we have removed the memory space of that node.
* Key is displayed in <> brackets and value is followed in display fuction.

**INPUT:**

We have used the following binary search tree in out program:

3,5,9,1,13,2,0,7

On removing 0:

On removing 5:

On removing 3:

**OUTPUT:**

Below inserted are the screenshots of output of the program.



