# National University of Computer & Emerging Sciences (NUCES) Islamabad,

Department of Computer Science

**DATA STRUCTURES – FALL 2021**

**LAB 10**

**Learning Outcomes**

In this laboratory, you will implement operations of Binary Search Tree.

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**TASK 1**

We have discussed the structure and how to access each node of BST in the previous lab. In this lab we will perform deletion and retrieval in BST.

**Note: You are allowed to use the implementation from the previous lab and add functionality to that code.**

Implement the following operations of BST.

**BSTree ()**

Constructor. Creates an empty binary search tree.

**~BSTree ()**

Destructor. Deallocates (frees) the memory used to store a binary search tree.

**insert ()**

Inserts new DataItem into a BST. If a data item with the same key as newDataItem already exists in the tree, then updates that data item’s nonkey fields with newDataItem’s nonkey fields.

**retrieve ()**

Searches BST for the data item with the user given key. If this data item is found, it returns true. Otherwise returns false.

**delete()**

Search for the data item with the user given key and delete it. Remember deletion of a node can follow three cases.

* Deletion of leaf node
* Deletion of node having one child
* Deletion of node having two children

Make sure you handle all the cases.

**displayPreOrder()**

Displays the dataItem of nodes in pre-order manner.

**displayPostOrder()**

Displays the dataItem of nodes in post-order manner.

# TASK 2

# Implement a function height() that finds the height i.e. the maximum depth of a BST.

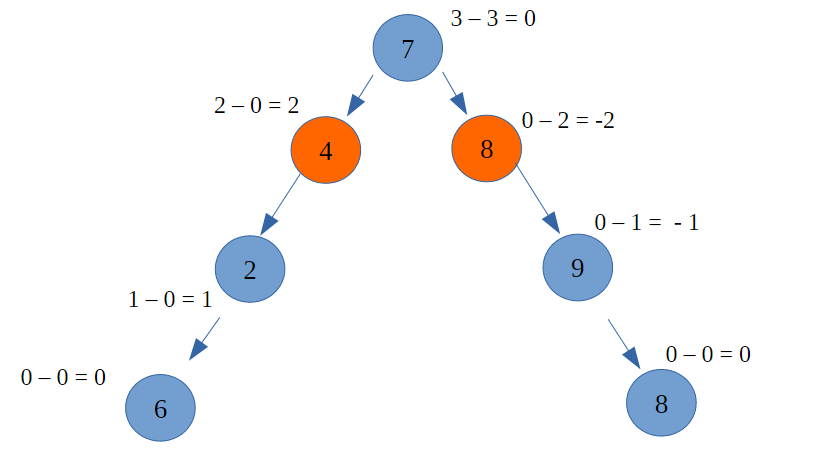
# BONUS TASK

# Create a function isBalanced() to determine whether the tree is height balanced or not.

A tree is balanced when the difference between the heights of subtrees under each node is not greater than one. Consider the figure below which shows a balanced tree.

# 

The tree given below is not a balanced tree.



# 

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