Assignment 2: Playing with Binary Search Tree

You have been provided with an implementation of a **Binary Search Tree**. The following functions are already implemented in the file:

- **insertItem**: Inserts a new item in the binary search tree.
- **searchItem** : Searches for an item in the tree.
- **calcHeight**: Calculates the height of an item/node.
- **printInOrder**: Print in-order traversal of the tree

For this assignment, you are required to add the following functions to the above implementation:

Task 1: Add a new function- **getSize**. This function returns then size of the tree. The size of a tree is the number of nodes in the tree.

Task 2: Add **calcDepth** function. It will calculate the depth of an item. The function receives an item value and returns the depth of the item in the tree. See the **calcHeight** function for hints.

Task 3: Add **getMaxItem** function. That will find and return the maximum item of the tree.

Task 4: Add **deleteItem (int item)** function. The function will delete an existing item from the tree.

Task 5: Add two functions- **printLevelOrder,** and **printPostorder** These functions will print level order and in-order traversals of the tree respectively. See the **printInOrder** function for hints.

Task 6: add **deleteKsmallest (int k)** function. Find the K’th smallest item from the tree and delete the Containing Node.

Task 7: add **findSubtreeSum (int item)** function. Given a node item, it will find the sum of all items in the subtree rooted at that node.

Task 8: add **changeItem (int oldItem, int newItem)** function. It will replace an old item with a new item, and keep the BST properties.

Task 9: In this task you have to handle duplicate items in BST. For this, you need to keep a count variable for each node, and any duplicate insertion will update the count variable of the respective node.

Assignment designed by Md. Rafi-Ur-Rashid, Lecturer, CSE, UIU

Points:

Task 4 has 10 points. The rest of each problem has 5 points. So, the total point is 50.

Important Instructions:

1. You **must** use the code base provided with the assignment. Do necessary modification/ extension on them.
2. **Only** C programming Language is allowed for this assignment.
3. Try to perform as much as you can. There is a plenty of scope for partial marking.
4. There will be a **viva evaluation** for this assignment. **Remember, your final marking of this assignment highly depends on the viva.**
5. Submit only the given file which contains your necessary modifications. Any extra files apart from that will be discarded.
6. Submission deadline: Sept 19, 11:59 pm

   Evaluation date & time: Sept 20, 2:30 pm

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