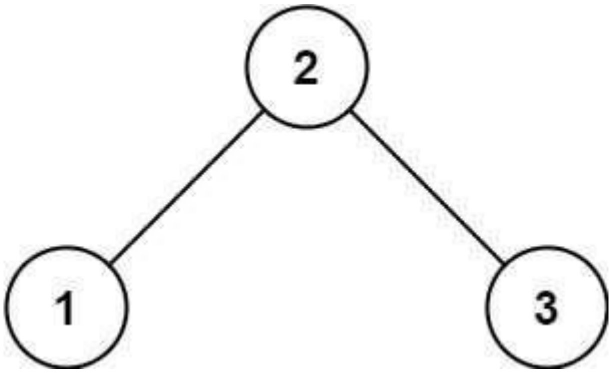
PACE UNIVERSITY SEIDENBERG SCHOOL OF CSIS

CS608-SPRING2023: ALGORITHMS & COMPUTING THEORY

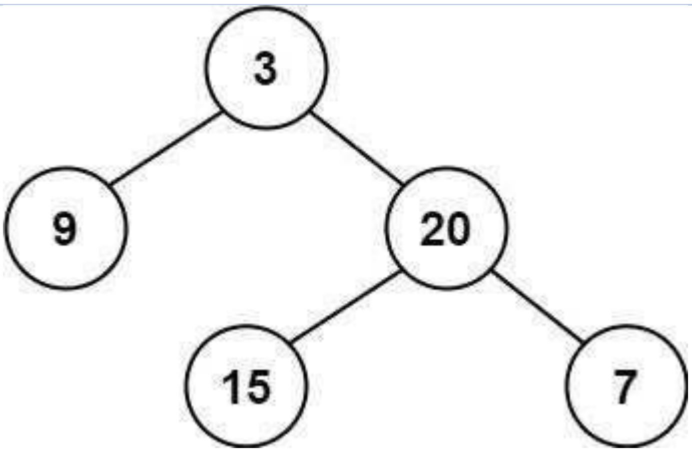
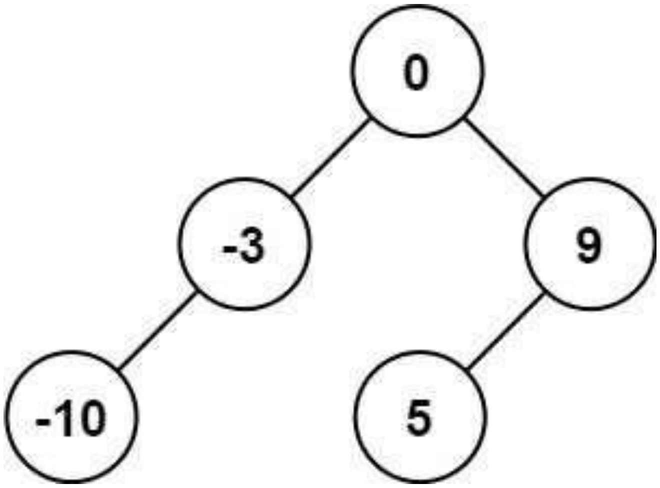
Assignment#3 - TOTAL POINTS: 100

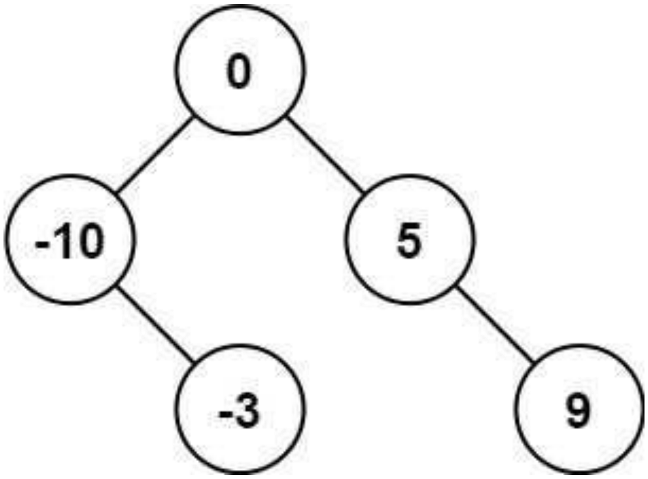
DUE DATE: 04/16/2023 (April 16th)

Team Assignment

S.No.	Questions	Points	Self-Assessment
1	**Validate Binary Search Tree** Determine if a given root of a tree is a valid binary search tree (BST) A valid BST is defined as follows: • Given root, the **left subtree** of a node contains only nodes with keys **less than the node's key**. • Given root, the **right subtree** of a node contains only nodes with keys **greater than the node's key**. • Ensure that both the left and right subtrees are also binary search trees. **Example:**  **Input:** root = [2,1,3] **Output:** true	30	The code includes methods for creating the tree from user input and determining whether it is a valid binary search tree (BST), as well as for implementing a binary tree data structure with a TreeNode class. The isValidBST method checks node values against upper and lower boundaries in a recursive manner to validate the BST property, whereas the buildTree function builds the tree level-wise utilizing a queue for speedy building. Points: 30

2	**Balanced Binary Tree** Determine if a binary tree is height-balanced. A height-balanced binary tree is defined as a binary tree in which the left and right subtrees of every node differ in height by no more than 1. **Example:**	**40**	The binary tree is built level-by-level in the code using a queue-based strategy, assuring proper development of the left and right child nodes. The code uses a recursive function to calculate each node's height, making it possible to quickly determine whether a property is height-balanced by comparing height disparities. Points: 40

	 **Input:** root = [3,9,20,null,null,15,7] **Output:** true		
3	**Convert Sorted Array to Binary Search Tree** Given an integer array, where the elements are sorted in **ascending order**, convert it to a **height-balanced** binary search tree. A **height-balanced** binary tree is a binary tree in which the depth of the two subtrees of every node never differs by more than one. **Example 1:**  **Input:** nums = [-10,-3,0,5,9] **Output:** [0,-3,9,-10,null,5]	**30**	The code successfully creates a balanced binary search tree (BST) from a sorted array using a recursive method, producing an effective solution with an O(n) time complexity. The program handles input and output adequately, accepting user input, saving tree nodes in level-order, producing output in the chosen format, and correctly handling empty arrays and None values. Points: 30

	Explanation: [0,-10,5,null,-3,null,9] is also accepted:  		

Submission

- Submit a python **notebook**(of file type **.ipynb**) with comments above each code block/line explaining its purpose. Also, submit **screenshot** of the result/output you get.
- You may not be graded full points if your program doesn't execute or produce the intended results.
- Late submission up to one week after the **due date** will incur a **10% loss** of total points earned. 5% every week thereafter until the end date.
- **Be careful not to share your code. You may lose points by sharing your work. Similarity scores will be checked.**
- Attach this file with self-assessment. This is for your reference if you answered the question completely.