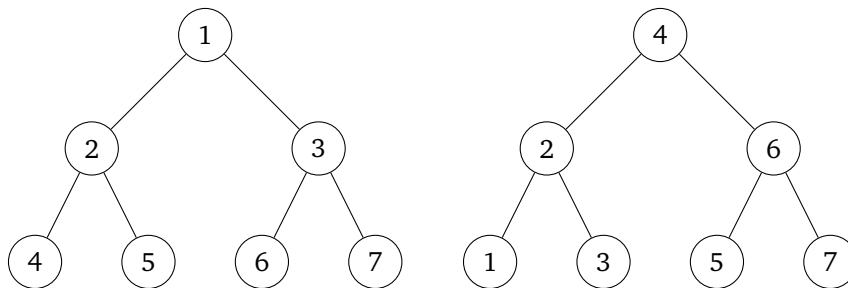

CS21003 ALGORITHMS-1

(Tutorial 4: Trees)

Date: Sep 26 2020

1 Binary Tree to BST with Minimum Swaps

Given an array representation of a complete binary tree with N nodes and each node stores a distinct integer A_i . Find the minimum number of swaps to convert the binary tree into binary search tree (BST). In one swap, you can select any two nodes and swap their values.



Swap 1: Swap node 4 with node 1

Swap 2: Swap node 5 with node 6

Swap 3: Swap node 6 with node 3

2 K^{th} Largest Element in BST

Given a Binary Search Tree with N nodes and a positive integer k , find the K^{th} largest element in the Binary Search Tree without using any extra space. What is the time complexity of your algorithm?

3 Maximum Weight

Assume that each node in a binary tree T contains only a positive integer value and two child pointers (left and right). No parent pointers or additional values can be stored in the nodes. Let r be the root of the tree, and v any node in the tree T . The weight of v is defined as the sum of all the values stored on the unique $r - v$ path. Your task is to locate the maximum of the weights of all the nodes in T in $O(n)$ time.

4 Reconstruction of Tree

The vertex set of a binary tree T on eight nodes is $\{a, b, c, d, e, f, g, h\}$. The inorder listing of the vertices of T is $bfdcgheha$, and the postorder listing is $fdghecbha$. Reconstruct the tree T . Explain the relevant steps.

5 Optimal sequence for AVL tree insertion

Henry has been given an array of N integers to be added to an AVL tree. However, Henry doesn't understand rotations. Help him to find the sequence in which these integers should be added to an AVL tree such that no rotations are required to balance the tree.

Array = [10, 20, 15, 25, 30, 16, 18, 19]