

# Homework 5

## OPTIONAL PROBLEMS

(No due date)

### 1 Written Problems

#### First Common Ancestor

Design an algorithm and write code to find the first (farthest from the root) common ancestor of two nodes in a binary tree. Avoid storing additional nodes in a data structure.

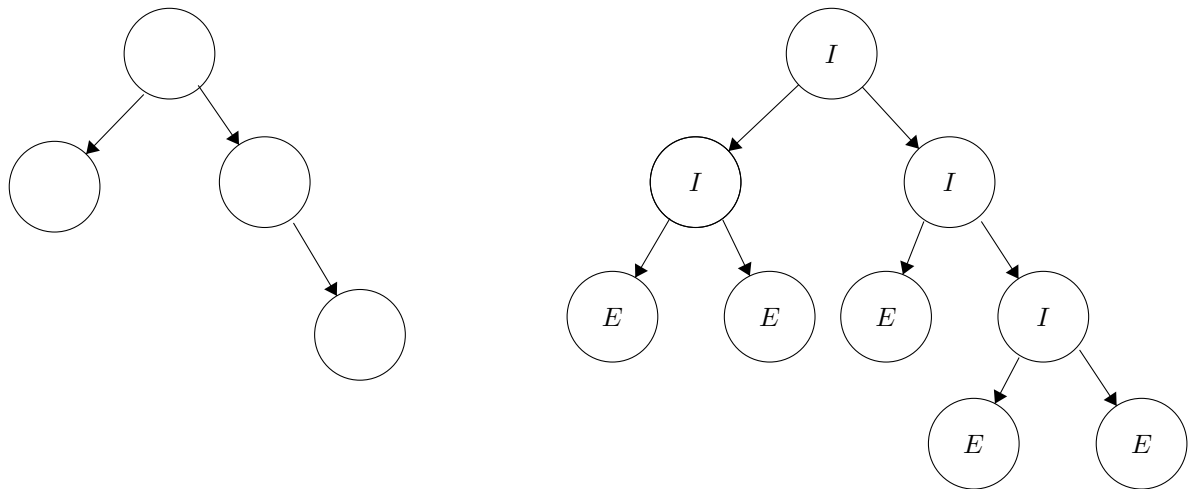
**Note:** This is not necessarily a binary *search* tree.

#### Next Node

Write an algorithm to find the next node (e.g., in-order successor) of a given node in a binary search tree where each node has a link to its parent.

#### External Nodes

An extended binary tree is a tree, such as the one pictured below, in which each missing child is replaced with an external node (labeled with an *E*). Prove by strong induction that an extended binary tree with  $n$  internal nodes has  $n+1$  external nodes.



**Reverse Leaves**

Write an algorithm to reverse the order of the leaves in a given binary tree. The tree can be manipulated and changed, so long as the leaves are reversed. For example:

