Homework 02 (Due: Wednesday, March 5, 2025, 11 : 59 : 00PM (Eastern Time))

CPSC 3120

Instructions

This assignment consists of 4 analytical problems and 3 programming problems. Your solutions to the analytical problems must be submitted, as one PDF **without spaces, tabs, parentheses, pound signs, or percent signs in the filename**, via Canvas. While handwritten (then scanned) solutions to the analytical problems are acceptable, you are strongly encouraged to typeset your solutions in LaTeX or a word processor with an equation editor. The legibility of your solutions is of great importance.

Programming Assignment

Your methods will be tested on `newton.computing.clemson.edu`, using
`gcc version 9.4.0 (Ubuntu 9.4.0-1ubuntu1~20.04.1)` and be compiled for C++ 2017. To ensure proper execution, you should review the reports that will be sent back to you on Canvas.

You will submit `OurCPSC3120Tree.h`, and `OurCPSC3120Tree.cpp`, along with your PDF, via Canvas.

`rotateLeft`

`rotateLeft` is a function that will rotate a `OurCPSC3120Tree` to the left.

`rotateRight`

`rotateRight` is a function that will rotate a `OurCPSC3120Tree` to the right.

`deleteNode`

`deleteNode` is a function that will receive a number and (if it exists in the `OurCPSC3120Tree`) delete it.

General Guidelines

Sample header, source, and testing files have been provided. You may modify the `.h` and `.cpp` files as needed, but you will only be turning in the four files mentioned above. The grading system will be compiling the code with the command
`g++ -std=c++17 -o /path/to/executable.out /path/to/source/files/*.cpp` for each part.

Written Assignment

Question 1 (10 points)
Question R-3.3 in *Algorithm Design and Applications*

Question 2 (10 points)
Question R-3.11 in *Algorithm Design and Applications*

Question 3 (10 points)
Prove that for a proper binary tree T with n nodes and heigh h, the total number of nodes is at least $2h + 1$ and at most $2^{h+1} - 1$.

Question 4 (10 points)
Prove that for a proper binary tree T with n nodes and height h, the height is at least $\log(n + 1) - 1$ and at most $\frac{n-1}{2}$.

Automated Report Notes

Reports will be generated every 5 minutes. Your programs should terminate within 60 seconds.

Point Allocation

Question	Points
Question 1	10%
Question 2	10%
Question 3	10%
Question 4	10%
`OurCPSC3120Tree` Compilation	15%
`rotateLeft`	
Test Cases	$15 \times 1\%$
`rotateRight`	
Test Cases	$15 \times 1\%$
`deleteNode`	
Test Cases	$15 \times 1\%$
Total	100%