CS3353: Data Structures and Algorithm Analysis I
Fall 2022

Homework #4

- Full name only: _____
- Release date: Oct 31, 2022 (Monday), 5:15 PM
- Due date: **Nov 16, 2022 (Wednesday), 4:00 PM**
- It should be done INDIVIDUALLY; Show ALL your work; Submit your source code and results through Canvas.
- Total: 20 pts

1. Write a program to build a binary tree from a sequence of data. Once the tree is constructed, conduct search and tree traversal functions including breadth-first traversal and depth-first traversal (preorder, inorder, and postorder). Search and tree traversal functions are applied to the most recently constructed tree. Here is a set of requirements to follow:

- Type the homework number and your full name at the top in your source code.

```
/* Homework #4, James Bond */
```

- Your program should be a menu-driven and execute the chosen command. If you type 6, then exit the program.

```
                        M E N U

Create (0), Search (1), Breadth-First Traversal (2)
Depth-First Traversal: preorder (3), inorder (4), postorder (5)
Exit Program (6)

                        Choose?
```

- Display a message, in case when searching a node that does not exist in the tree.
- Show ALL your work. For example,

```
                        M E N U

Create (0), Search (1), Breadth-First Traversal (2)
Depth-First Traversal: preorder (3), inorder (4), postorder (5)
Exit Program (6)

                        Choose?  0  15  4  1  20  25  16


                        M E N U

Create (0), Search (1), Breadth-First Traversal (2)
Depth-First Traversal: preorder (3), inorder (4), postorder (5)
Exit Program (6)

                        Choose?  1  35

There is no such node in the tree!
```

```
                          M E N U

Create (0), Search (1), Breadth-First Traversal (2)
Depth-First Traversal: preorder (3), inorder (4), postorder (5)
Exit Program (6)

                          Choose?  2

15  4  20  1  16  25

                          M E N U

Create (0), Search (1), Breadth-First Traversal (2)
Depth-First Traversal: preorder (3), inorder (4), postorder (5)
Exit Program (6)

                          Choose?  3

15  4  1  20  16  25


                          M E N U

Create (0), Search (1), Breadth-First Traversal (2)
Depth-First Traversal: preorder (3), inorder (4), postorder (5)
Exit Program (6)

                          Choose?  4

1  4  15  16  20  25


Create (0), Search (1), Breadth-First Traversal (2)
Depth-First Traversal: preorder (3), inorder (4), postorder (5)
Exit Program (6)

                          Choose?  5

1  4  16  25  20  15
                  .
                  .
                  .
```

2. Please refer source code on Canvas.

3. **[Extra Credit]** If you can implement a delete operation, extra 5 points will be provided. You should show three delete cases: no children, one child, and two children. Your menu should be shown below,

```
                          M E N U

Create (0), Search (1), Breadth-First Traversal (2)
Depth-First Traversal: preorder (3), inorder (4), postorder (5)
Delete (6), Exit Program (7)

                          Choose?
```

4. Submit your all source codes and results (e.g., screen copy) through the Canvas before the due date, **Nov 09, 2022 (Wednesday), 4:00 PM**. The TA will build and run your source codes and test with a random input.

- Source codes – The file name should be "your name + homework number", e.g., james_bond_4.cpp, james_bond_4.h, etc.
- Results in a word file (e.g., screen copy)
    - Self-testing is required before the submission.