CS 2413 Data Structures – Spring 2016 – Programming Project 6
Due April 24, 2016 – 11:59 PM

Objectives

1. [50 Points] Create all the methods and fields to implement the parent array implementation of the multiway data structure (nodes with more than one child). **You are required to demonstrate the working of the following methods for each of the methods by invoking them from a main program.**
   a. empty constructor
   b. non-empty constructor (sets the initial size of the arrays)
   c. destructor
   d. copy constructor
   e. overloaded equal to operator
   f. ostream operator – pre order traversal
   g. size method
   h. height method
   i. getChildren
   j. preorder traversal method
   k. level order traversal method (Bonus: 25 Points) – Print the nodes in level 1, followed by level 2, followed by level 3 and so on (use the STL queue for this purpose).
2. [20 Points] Read the redirected input and create all the data structures.
3. [20 Points] Demonstrate the working of all the methods.
4. [10 Points] Document your project thoroughly as the examples in the textbook. This includes but not limited to header comments for all classes/methods, explanatory comments for each section of code, meaningful variable and method names, and consistent indentation.

Project Description

The input to your project will be as follows: The first line of input will be number of nodes in the tree. Consider the following input. There are 22 nodes. For node numbered 20 the first number on the line is the number of children in this case it is 4 numbered 5, 8, 9, and 19.

```
22
20 4 5 8 9 19
5 2 1 6
1 2 0 2
0 0
2 0
6 0
8 1 7
7 0
9 4 10 11 12 13
10 2 3 4
11 0
12 1 14
14 0
13 0
19 1 21
21 4 15 16 17 18
15 0
16 0
17 0
18 0
```

Class Structures

You are required to implement the following class structure along with the implementation of the methods associated with each of them.

```
template <class DT>
class ParentMultiTree {
    protected:
        DT* ParentArray;
        int* ChildPosition;
        int  numNodes;
    public:
        //All the required methods
};
```

Constraints

1. In this project, the only header you will use is #include <iostream>.
2. None of the projects is a group project. Consulting with other members of this class on programming projects is strictly not allowed and plagiarism charges will be imposed on students who do not follow this.