

## CS 2413 Data Structures – Spring 2016 – Programming Project 7

Due May 1, 2016 – 11:59 PM

### Objectives

1. [70 Points] Create all the methods and fields to implement the adjacency list based data structure for storing a graph. You will create a class GraphAdjList with fields and methods as follows (Note that you may have additional fields and methods as needed).
  - a. Non-empty constructor that takes in the number nodes and edge of the graph
  - b. ostream operator that prints the adjacency list
  - c. destructor
  - d. addEdge (int x, int y) – add an edge between vertex x and vertex y
  - e. dfs (int x) where x is the starting node and its output is a parent array which represents the depth first search tree (if it returns a ParentMultiTree class object you get a bonus of 10%)
  - f. bfs (int x) where x is the starting node and its output is a parent array which represents the breadth first search tree (bonus 15%)
2. [20 Points] Demonstrate the working of all the methods.
3. [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 vertices n and number of edges m in the graph. This line of input will be followed by m lines of input. Each line of input will have two integers representing an edge.

### 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 GraphAdjList {
    protected:
        list<DT>* adjList;
        int n; // Number of nodes
        int m; // Number of edges
    public:
        //All the required methods
};
```

### Constraints

1. In this project you can use the libraries from the Standard Template Library.
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.