home Work 1 – Graph Component

Due date: August 13, 2009

Problem:
Given an undirected graph $G(V, E)$, find the number of connected components in G and the size of each component. Size of a component is defined as the number of nodes in the component.

Tasks:
1. Design an algorithm to solve the above problem.
2. Write a program implementing your algorithm. Input to your program is a text file containing a graph in the following format.

Number of nodes
NodeID1 Degree1
    NeighborID11 EdgeWeight11 EdgeLabel11
    NeighborID12 EdgeWeight12 EdgeLabel12
                    . . .
NodeID2 Degree2
    NeighborID21 EdgeWeight21 EdgeLabel21
    NeighborID22 EdgeWeight22 EdgeLabel22
                    . . .
. . .   . . .

For example, below is a complete graph with 4 nodes and all edge weights be 1 and all edge labels 0.

4
1 3
    2 1 0
    3 1 0
    4 1 0
2 3
    1 1 0
    3 1 0
    4 1 0
3 3
    1 1 0
    2 1 0
    4 1 0
4 3
    1 1 0
    2 1 0
    3 1 0

Below is a chain with 4 nodes.

```
4
1 1
    2 1 0
2 2
    1 1 0
    3 1 0
3 2
    2 1 0
    4 1 0
4 1
    3 1 0
```

You do not need edge weights and edge labels to solve this problem. However, assume that the graph file contains this information in the above format, and simply ignore them when you are reading the file.

3. Submit 1-3 pages report that include pseudocode and description of your algorithm, running time and memory requirement of your algorithm, limitations of your algorithm (if any), anything else that you like to say about your algorithm.

4. Also submit the source code and the test cases you used to test your code.

5. Name your files as follow: if your last name is "xyz", name the files as "zxy-hw1.pdf", "zxy-hw1.c", "zxy-hw1.cpp", "zxy-hw1-graph1.gph", etc.