Assignment #2

Due November 22, 2015.

A. Graph algorithms. You may find the following Wikipedia article useful:

https://en.wikipedia.org/wiki/Distance_(graph_theory)

1. [Writing] What is the eccentricity of a vertex in a graph? Illustrate with an example.
2. [Writing] What is the radius of a graph? Illustrate with an example.
3. [Writing] What is the diameter of a graph? Illustrate with an example.

(10 marks)

4. [Algorithm Design] Provide detailed algorithmic solution to compute the *three* properties. You may use functions such as BFS, DFS, and Dijkstra.
5. [Complexity Analysis] What are the computational complexities of the *three* solutions?

(30 marks)

B. You are given a data file containing pairs of the names of UOIT faculty instructors. It can be obtained at:

http://db.science.uoit.ca/share/instructor-pair.txt

Each pair has shared at least one course in common since 2014.

From the file, construct a *bidirectional* graph. The vertices are the instructors, and an edge exists between x and y if they have shared a course. Namely, either (x, y) appears in the file or (y, x) appears in the file.

Create the adjacency matrix of the graph G. You must short the adjacency list alphabetically.

1. [Program] Use BFS to list all the instructors which are connected (directly or indirectly) to "Ken Pu".
2. [Program] Use DFS to list all the instructors which are connected to "Ken Pu".
3. [Program & Writing] How many connected components are there? With the help of Google, describe what each connected component represents.
4. [Program & Writing] For each connected component, measure the number of vertices and the radius of each component. Tabulate your results. Can you gain some insight into the components?

(60 marks)

Submission:

You must submit a directory with the following structure

```
.
├── report.pdf
└── src
    ├── B1.java
    ├── B2.java
    ├── B3.java
    ├── B4.java
    └── Makefile
```

If you use Python, all *.java files should be *.py files respectively. You are free to include other files for the sake of code organization.

You **must** include a Makefile with at least the following targets defined:

make B1
make B2
make B3
make B4
make clean