Assignment 3
Due: Sunday October 28, 2012

Group assignment: You are permitted to work in teams of 1 to 4 students. No special permission will be given for larger groups. Write down an object-oriented program in C++ or Java or Ocaml or another object-oriented programming language. Submissions that do not use OO concepts will be returned without evaluation. Do not use existing graph libraries.

A large publicly available data set is the Enron email communication network: http://snap.stanford.edu/data/email-Enron.txt.gz It is an undirected network with about 36,692 nodes and 367,662 undirected edges. There is an edge between node i and node j if they ever exchanged an email message.

Using this data set, write a small library that includes the following functionality:

A. Given a node i and a node j, find the length of the shortest path connecting i to j. If no such path exists, print -1; otherwise print the integer indicating the length of the shortest path.

   We will make the following call to test your program

   ./shortestpath <i> <j>

   For example,

   ./shortestpath 2 20

B. Is there a loop in this graph? Implement a Depth-First-Search routine to verify if there is a loop in the graph. Print 0 if the answer is yes and 1 if the answer is no.

   We will make the following call to test your program
   ./isloop

C. Compute the number of connected components in the graph. Print the integer indicating the number of connected components.

   We will make the following call to test your program
       ./connectedcomponents

D. Consider the adjacency matrix M representing this graph. Compute the entry (100, 100) in the matrix M^2. Print the integer indicating the entry in M^2.

   We will make the following call to test your program
       ./msquare

We will execute the Makefile in your submission folder before we make the above calls to your program. **Please submit the source-code as a zipped folder asg3.zip to the instructor and the TAs on October 28 2012** – do not include any pre-compiled binaries (otherwise your assignment will be returned without evaluation).

Submit a hard copy report summarizing the algorithms used and their run-time complexity to the TAs on Wednesday October 31, 2012. Do not submit your report via email. This report should not consist solely of code copied and pasted from your submission; it should include pseudocode with a plain-English description of its functionality.

Notes: You are required to use the function names specified above (shortestpath, isloop, connectedcomponents, and msquare). Your assignment will not be evaluated if you choose to use different names for your functions. The function parameters must also have the form specified above. Additionally, you will lose points for bad style (not indenting, not commenting).

If you violate UCF ethics by plagiarizing code from the internet or any other source, we will enforce the class policy on plagiarism.