10910EECS204001  
Data Structures Project

Due date: 2020/1/18 23:59

Upload code to iLMS

Submission

* Please upload the following to iLMS
  + Code
  + Makefile
  + Report

Description

In this project, you have two tasks to implement. Your program should take two input arguments. The first one is the file name of the input graph, and the second is an integer ***k***.

1. Core decomposition problem:

Given the input graph and an integer ***k***, you need to find all vertices that have coreness equal or larger than ***k***.

2. Maximal clique problem:

Given the input graph, you need to output the largest clique you can find.

Your programs for both tasks need to complete in 3 minutes. An *INTERRUPT* signal will be sent when your programs run for 3 minutes, and another 10 seconds later, a *KILL* signal will be sent to terminate your program.

You should provide a makefile. After the “make” command, an executable file “clique\_find.exe” should be created.

Input

Input consists of the input graph and an integer ***k***.

Output

You should output two files. The first file, named “kcore.txt”, lists the vertices whose coreness are at least ***k***,. The second file, named “clique.txt”, shows the largest clique you have found.

In “kcore.txt”, each line consists of two integers, the vertex ID and its coreness. The output vertex IDs should be sorted in ascending order.

In “clique.txt”, each line contains one integer, i.e., the vertex ID in the clique.

Sample Input

Graph input:

0 1

0 2

0 3

0 4

1 2

1 3

1 4

2 3

2 4

3 4

K: 3

Sample Output

kcore.txt:

0 4

1 4

2 4

3 4

4 4

clique.txt:

0

1

2

3

4

Scoring

There are two testcases. The first one is a public testcase provided to allow you to evaluate your program. The second testcase is a private testcase, which is employed to evaluate your program by TAs after the deadline.

* K-core (40%)
  + For the k-core problem, you should output the correct vertices and coreness
  + If you find the correct vertices set for a given ***k***, you get 40% of the project score, otherwise you get 0%
* Clique (60%)
  + For both the public and private testcases of the clique problem, the score you get is based on the size of clique you find
    - Size = 1500 : 60%
    - Size > 1400 : 54%
    - Size >= 800 : 42%
    - Size >= 500: 36%
    - Otherwise: 0%

The total score combines your results on the public testcase score (45%), private testcase (45%) and report (10%)

Example

Output correct coreness on both testcase, find clique size = 1400 on public testcase and clique size = 800 on private testcase, and write report properly.

( 40 + 54)\*0.45 + ( 40 + 42)\*0.45+10 = 89.2

Output correct coreness on public testcase, but fail to do so in private testcase. Find clique size = 1433 on both testcase.

( 40 + 54 )\*0.45 + ( 0 + 54 )\*0.45 + 10 = 76.6