Programming Assignment #5 (due 23:59:59 1/6)

Road Construction

In this assignment, you need to write a C++ program to decide how to construct a road map in a country**.** Some possible choices of constructing the road connecting all the cities are provided, and you have to connect the cities with minimum length of road. Finding **Minimum Spanning Tree** to complete the task.

Provided Files

(1) main.cpp

I. Function **parse** will parse the input file and output a graph as an adjacency list.

II. Function **MST** will execute your function to find minimum spanning tree.

III. Function **sort** will sort the vector<Edge> Answer, where you store your answer.

IV. Function **check** will compare your answer with the correct answer.

(2) Graph.h

I. An **Edge** structure including int from, to and, weight.

II. A **Graph** class including its private members and public functions.

III. **Graph** is stored as an adjacency list in the **vector< list<Edge> > AdjList.**

(3) Graph.cpp

I. `Graph(int& NumVertex)`

The constructor of the class.

You **do not** have to program the function.

II. `void AddEdge(int& from, int& to, int& weight)`

Function AddEdge adds the edges in the input file to the adjacency list.

You **do not** have to program the function.

III. `void MST(vector<Edge>& Answer)`

Function MST is the function you have to program.

You have to store your answer in the **vector<Edge>& Answer**.

(4) TestCases

Example

Input

Number of Vertex = 5

(0 , 1) 2

(0 , 3) 6

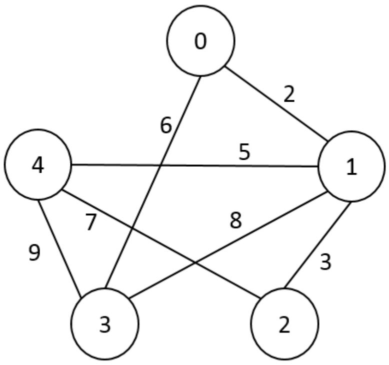
(1 , 2) 3

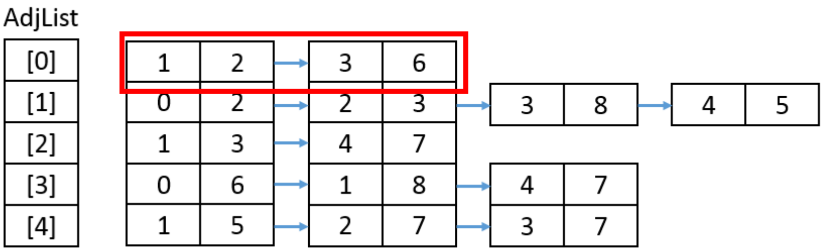
(1 , 3) 8

(1 , 4) 5

(2 , 4) 7

(3 , 4) 9





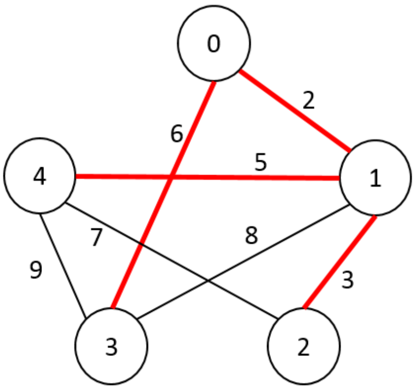
Output

0 1 2

0 3 6

1 2 3

1 4 5



Constrains:

I. You can change the structure of the graph as long as you output the correct answer.

II. The edge you store in your answer vector have to start from the node with smaller index to that with larger index. For example, though the edge (1, 4, 5) and (4, 1, 5) represent the same edge, you should store them as (1, 4, 5) in your answer vector.

III. The order you store your edge is not important, cause the function **sort** in the main.cpp will sort your answer vector. For example, you can either store (0, 1, 2) before (1, 2, 3) or store (0, 1, 2) after (1, 2, 3).

Language

C or C++

Platform

You may develop your software on UNIX/Linux.

Compile: $ g++ main.cpp -o hw5

Execution: $ ./hw5 <input file>

Submission

Please upload the following files to E3 website by the deadline.

(1) Graph.h

(2) Graph.cpp