Istanbul Sabahattin Zaim University

YAM 214E – Algorithm Analysis

Project 2 – Lightening a City

Economic crisis affected many countries. AOA Country is one of these countries. The government wants to make some savings. In the cities of AOA Country, streetlights are turned on all night. The cost of a turned on streetlight is 1 AOA Liras for 1 km. The government decides to turn off some lights but they still want to establish a safe, peaceful environment. Therefore, the government wants to supply at least one fully lighted road from an intersection to another intersection even if the road is not the shortest path between the intersections. Roads consist of one or more streets. (Intersections connect the streets to each other. Streets are double lane road, so cars both go and come back from a street.)

You are going to be given a city plan of some cities in AOA Country that holds intersections and length of the streets in kilometers. By considering the constraints of the government, maximum how many AOA Liras can be saved for a day?

City plan documentation format:

A city consists of **m** intersections and **n** streets. You are going to be given an input file called "cityplan.txt". The first line of the input file holds the numbers of **m** and **n** respectively. The following lines hold intersections $\mathbf{m_i}$ and $\mathbf{m_j}$, and length of a street between these intersections (i != j).

As an output, **print** the lighted streets by representing them with intersections that they connect. Give the total cost and total savings in AOA Liras.

Input file format:

```
7   11
0   1   7
0   3   5
1   2   8
1   3   9
1   4   7
2   4   5
3   4   15
3   5   6
4   5   8
4   6   9
5   6   10
```

Output format:

```
0       1
0       3
1       4
2       4
3       5
4       6
Total cost = 39 AOA Liras

Total savings = 50 AOA Liras
```

Implementation notes:

You are allowed to use one of the algorithms that you have learned in the Algorithm Analysis class. All your code must be written in C++, and compile and run on Dev C++. You have to use standard libraries. Do not use precompiled-header in your code. You can use C++ STL Library. **Keep the input file name** as given (cityplan.txt), and read it from your code. When you write your code, try to follow a methodology with well-chosen variable, method, and class names and comments where necessary. Your code must compile without any errors.

In Reports:

In your reports, give which algorithm you have used and explain the algorithm. Explain data structures and the critical points of your code **in detail**.

Submission Instructions: Please submit your assignment through Kampus System. Please zip and upload all your files using filename studentID.zip. In the zipped file, you must include your report and all your program.

Evaluation of your projects:

While evaluating your projects, we will consider at least these points: reading from file, dynamic creations of the related lists and arrays, correct run and correct result for each sample file, the algorithm used, coding the algorithm good, and writing a good report.

Important Note:

You may discuss the problem addressed by the project at an abstract level with your classmates, but you should not share or copy **even a part of the code** from your classmates or from the Internet. You should submit your own, individual project. Plagiarism and any other forms of cheating will be punished with **-100 points**. So, code the project by yourself without taking help from someone or the Internet. Not taking any point is better than taking -100 points.

This project is given to you to improve your coding abilities. Please do something **for yourself** and code the project by using the pseudocodes in your slides. I have given all the material and the slides you may need. You can code by yourself. I trust you.

Good luck.