BIRZEIT UNIVERSITY

Department of Computer Science

COMP2421 (Spring 2024/2025)

Project #3

Due date 13/6/2025 @ 10:00 PM

Suppose you are given a set of **Palestinian** cities and towns, then you are required to construct the road network connecting these cities with a minimal cost.

After deep think, you decided to use and implement **Kruskal's** and **Prim's** algorithms to construct such a road network. You should read the data from any given file named `cities.txt` and then compare between the two algorithms in terms of total cost of the resultant MST and the consumed execution time.

A sample input file showing the distances between a set of Palestinian cities in Kilometers is given below. Your program should deal with different graphs' orders and sizes with a minimum value of **50** for graph order and a minimum value of **200** for graph size. Preparing such a data file is one of your responsibilities.

Hint: use **`clock`**() function for execution time calculation. You might find this link is helpful: https://www.geeksforgeeks.org/how-to-measure-time-taken-by-a-program-in-c/

```
Jerusalem#Gaza#41
Akka#Haifa#35
Jenin#Qalqilya#23
Gaza#Hebron#32
Bethlehem#Jerusalem#9
Bethlehem#Jericho#41
Haifa#Nazareth#6
Akka#Jenin#34
Haifa#Tulkarem#15
Hebron#Jericho#50
Hebron#Jerusalem#34
Jenin#Tulkarem#20
Jenin#Nablus#24
Jericho#Jerusalem#28
Jericho#Ramallah#33
Haifa#Jenin#49
Ramallah#Bethlehem#35
Ramallah#Salfit#38
Ramallah#Yafa#39
Ramallah#Jerusalem#11
.....
```

Your program should provide the following menu and information:

1. **Load cities**: load the file, construct the graph, and print the graph's size and order.
2. **Apply Prim's Algorithm**: read the source city then print the total cost, consumed time and the resultant MST.
3. **Apply Kruskal's Algorithm**: print the total cost, consumed time and the resultant MST.
4. **Compare the two algorithms**: compare between the two algorithms by printing the total cost and consumed execution time.

The deadline of this project is on **Friday 13 June 2025 before 10:00 PM**. Late submissions will not be accepted for any reason. Please make sure that your application is running properly on your laptop before the discussions.

Notes and submission instructions:

1. **This is individual work**. It should represent your own efforts. Do not share your work and ideas with your colleagues. You are not allowed to post/copy from other websites and/or social media and this will be considered as cheating. Using AI tools to assist writing the code will result at least zero grade.

2. Any **plagiarized** code will result at **least** zero grade.

3. **Document format**. Please submit only the code file (**c** file) containing the code of your project. Please rename it as follows: "**P3_YourStudentID_FirstNameLastName_SectionNo.c**".
4. **Input/output file name**. Make sure that the input/output file names are the same as in the specifications.
5. Include your full name, student ID, and section number in the beginning of your file.
6. Please do not compress the file, only the C-file is needed.
7. Take more attention to points one and two.

All the best