**Writeup** (Aastha Bhatt)

**Compile**

To run the program, unzip PA3.zip to a folder and open that folder from the command prompt/terminal. Then, run the command: python main.py *or* python3 main.py

To represent the weighted undirected graph, I used an adjacency list made using dictionary of dictionaries. This is how the list is structured:

{

"Arad": {"Zerind": 75, "Timisoara": 118, "Sibiu": 140},

"Bucharest": {"Urziceni": 85, "Giurgiu": 90, "Pitesti": 101, "Fagaras": 211},

"Craiova": {"Dobreta": 120, "Pitesti": 138, "RimnicuVilcea": 146},

"Dobreta": {"Craiova": 120, "Mehadia": 75},

"Eforie": {"Hirsova": 86},

"Fagaras": {"Bucharest": 211, "Sibiu": 99},

"Giurgiu": {"Bucharest": 90},

"Hirsova": {"Eforie": 86, "Urziceni": 98},

"Iasi": {"Neamt": 87, "Vaslui": 92},

"Lugoj": {"Mehadia": 70, "Timisoara": 111},

"Mehadia": {"Dobreta": 75, "Lugoj": 70},

"Neamt": {"Iasi": 87},

"Oradea": {"Zerind": 71, "Sibiu": 151},

"Pitesti": {"Bucharest": 101, "Craiova": 138, "RimnicuVilcea": 97},

"RimnicuVilcea": {"Craiova": 146, "Pitesti": 97, "Sibiu": 80},

"Sibiu": {"Arad": 140, "Fagaras": 99, "Oradea": 151, "RimnicuVilcea": 80},

"Timisoara": {"Arad": 118, "Lugoj": 111},

"Urziceni": {"Bucharest": 85, "Hirsova": 98, "Vaslui": 142},

"Vaslui": {"Iasi": 92, "Urziceni": 142},

"Zerind": {"Arad": 75, "Oradea": 71},

}

\*\*\*\*\*\*\*\*\*\*Represent the Graph as an Adjacency List (20 Points)\*\*\*\*\*\*\*\*\*\*

Arad ---> Zerind, Timisoara, Sibiu.

Bucharest ---> Urziceni, Giurgiu, Pitesti, Fagaras.

Craiova ---> Dobreta, Pitesti, RimnicuVilcea.

Dobreta ---> Craiova, Mehadia.

Eforie ---> Hirsova.

Fagaras ---> Bucharest, Sibiu.

Giurgiu ---> Bucharest.

Hirsova ---> Eforie, Urziceni.

Iasi ---> Neamt, Vaslui.

Lugoj ---> Mehadia, Timisoara.

Mehadia ---> Dobreta, Lugoj.

Neamt ---> Iasi.

Oradea ---> Zerind, Sibiu.

Pitesti ---> Bucharest, Craiova, RimnicuVilcea.

RimnicuVilcea ---> Craiova, Pitesti, Sibiu.

Sibiu ---> Arad, Fagaras, Oradea, RimnicuVilcea.

Timisoara ---> Arad, Lugoj.

Urziceni ---> Bucharest, Hirsova, Vaslui.

Vaslui ---> Iasi, Urziceni.

Zerind ---> Arad, Oradea.

\*\*\*\*\*\*\*\*\*\*Breadth First Search (30 points)\*\*\*\*\*\*\*\*\*\*

The shortest path from Arad to Sibiu using BFS is Arad -> Sibiu.

The shortest path from Arad to Craiova using BFS is Arad -> Sibiu -> RimnicuVilcea -> Craiova.

The shortest path from Arad to Bucharest using BFS is Arad -> Sibiu -> Fagaras -> Bucharest.

\*\*\*\*\*\*\*\*\*\*Dijkstra’s Algorithm! (30 points)\*\*\*\*\*\*\*\*\*\*

The Shortest Distance from Arad to Bucharest using Dijkstra's is 418.

The shortest Path from Arad to Bucharest using Dijkstra's is Arad -> Sibiu -> RimnicuVilcea -> Pitesti.

Dijkstra's shortest path from Arad to Bucharest differs from the shortest path found in Part 2 because here, the shortest path is defined by the total path cost rather than the total number of nodes between a path.