COSC2430: Programming and Data Structures
Homework 4: Shortest Path in Graph

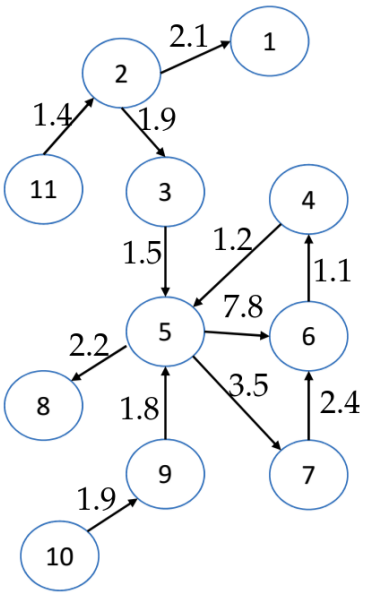
1 Introduction

You will create a C++ program to find the shortest path given a source vertex and destination vertex.

2 Input and Output

$G = (V, E)$ is a directed graph, where n vertices and m edges. G can be represented as an adjacency matrix $E, n \times n$, where $n <= 10000$. Please see Figure 1 as an example. You will read a sparse matrix E from an input file; There will be ONE matrix entry per line in the input file and each line will have a triplet of numbers $i, j, length$ where $1 \leq i, j \leq n$ indicate the entry and $length$ denotes the length for a directed edge pointing from vertex i to j. Given a source vertex $1 \leq s \leq n$ and a destination vertex $1 \leq d \leq n$, your program should display the shortest path between s and d (assume d is reachable from s).

G



E

i	j	$length$
2	1	2.1
2	3	1.9
3	5	1.5
4	5	1.2
5	6	7.8
5	7	3.5
5	8	2.2
6	4	1.1
7	6	2.4
9	5	1.8
10	9	1.9
11	2	1.4

Figure 1: The adjacency matrix E (sparse representation) for a sample graph G

Input example for Figure 1.

```
2 1 1.2
2 3 1.9
3 5 1.5
4 5 1.2
5 6 7.8
5 7 3.5
5 8 2.2
6 4 1.1
7 6 2.4
9 5 1.8
10 9 1.9
11 2 1.4
```

Output example (source=2, destination=6)

```
2 3 5 7 6
```

3 Program and input specification

The main program should be called "shortestpath". Call syntax:

```
shortestpath  E=<input_file> source=<num> destination=<num>
```

4 Requirements

- You program should get the result within 10 seconds.