Assignment#5

GRAPHS

Common Input Format

The first line of the input file contains a positive integer **N**, the number of vertices of the graph. The set of vertices, **V** contains vertices that are labeled **0**, **1**, **2**, …, **N-1**.

The second line contains a non-negative integer **E**, the number of edges of the graph. (Assume undirected graphs).

Then, **E** lines follow, each one containing three space-separated integers **u**, **v** and **c** (**u**, **v**∈**V**). This means, there is an undirected edge that connects the vertices labeled **u** and **v**, and the cost of this edge is **c**.

Note: There can be more than one different correct output for a question. The sample output given here contains only one of them.

Sample Input

```
12 20
0  9 41 0 8 27 1 2 10 1 3 11
1  4 17
2  3 7
2  5  33  2
   6 44
3  4 26
4  5 5 4 7
   8
4 8 15 4
9 16 5 6
21 6 7 31
6 10 18
6  11 29
7  8 20 8 9 13
10 11 23
```

Questions

1. **BFS**

   Write a program that performs Breadth First Search in a graph.
   Take an integer from the terminal as an extra input. Do the BFS, starting from this vertex.

Output Format

The output must contain exactly N integers on a single line – the sequence of vertex labels, in the order they are visited.

Sample Output (start at 1)

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

2. **DFS**

Write a program that performs Depth First Search in a graph.

Take an integer from the terminal as an extra input. Do the DFS, starting from this vertex.

Output Format

The output must contain exactly N integers on a single line – the sequence of vertex labels, in the order they are visited.

Sample Output (start at 1)

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

3. **DIJKSTRA**

Write a program that implements Dijkstra’s algorithm.

Take an integer from the terminal as an extra input. This is the source vertex for Dijkstra’s algorithm.

Output Format

The output must contain exactly N integers on a single line – the list of lengths of shortest paths from the source vertex (in the order of labels of vertices – 0 to N-1).

Sample Output (src node = 1)

```
59 0 10 11 17 22 14 25 32 33 32 43
```

4. **KRUSKAL**

Write a program that implements Kruskal’s algorithm.

Output Format

Output the cost of the minimum spanning tree on the first line. Below that, output the adjacency matrix of the tree.

Sample Output

```
164
 0  0  0  0  0  0  0  0 27  0  0  0
 0  0 10  0 17  0  0  0  0  0  0  0
 0 10  0  7  0  0  0  0  0  0  0  0
```

0 0 **7** 0 0 0 0 0 0 0 0 0
0 **17** 0 0 0 **5** 0 **815** 0 0 0
0 0 0 0 **5** 0 **21** 0 0 0 0 0
0 0 0 0 0 **21** 0 0 0 0 **18** 0
0 0 0 0 **8** 0 0 0 0 0 0 0
27 0 0 0 **15** 0 0 0 0 **13** 0 0
0 0 0 0 0 0 0 0 **13** 0 0 0
0 0 0 0 0 0 **18** 0 0 0 0 **23**
0 0 0 0 0 0 0 0 0 0 **23** 0

--- Best Wishes ---