Subject Lab: Algorithms & Complexity   **Lab Duration: 10:40-12:35**
Lab Code: ECSE202L   **Max Marks: 10**

Submission Guidelines:

1. The purpose of the course is to learn how to analyse the complexity of the algorithm.
2. You are supposed to do this assignment on your own. While you may discuss the problem with other students, you are not allowed to copy any part of the code from other students or to copy from any other source. Any form of **plagiarism** will not be tolerated. If there is substantial overlap between the codes submitted by two students, both will get reduction in the course grade.
3. The assignment should be **shown to lab instructor** in the lab session and **must be submitted** on LMS by **given date**.

It should also carry the following statement:

"*I have done this assignment on my own. I have not copied any code from another student or any online source. I understand if my code is found similar to somebody else's code, my case can be sent to the Disciplinary committee of the institute for appropriate action.*"

Lab Assignment 9

Q1. In this question, students are required to store the matrix representation of graph in the file Lab9_input.txt and find shortest paths to all vertices in the given graph. The graph may contain negative weight edges. Solve the question using Floyd Warshall algorithm and find iteration used in convergence.

Example: Case 1:
```
number of vertices=8
number of edges=9

Information of all edges(source, destination, weight)
1 2 8
2 3 7
2 4 3
3 5 5
3 6 2
4 7 -4
4 8 6
5 7 -3
6 8 9

Expected Result:

The all pairs shortest distance matrix is
            1      2      3      4      5      6      7      8
_____
    1 |     0      8     15     11     20     17      7     17
    2 |   INF      0      7      3     12      9     -1      9
```

```
    3 |   INF   INF     0   INF     5     2     2    11
    4 |   INF   INF   INF     0   INF   INF    -4     6
    5 |   INF   INF   INF   INF     0   INF    -3   INF
    6 |   INF   INF   INF   INF   INF     0   INF     9
    7 |   INF   INF   INF   INF   INF   INF     0   INF
    8 |   INF   INF   INF   INF   INF   INF   INF     0
```

Case-2

```
number of vertices=4
number of edges=8

Information of all edges(source, destination, weight)
1 2 8
2 3 7
3 4 6
4 1 5
1 4 4
4 3 3
3 2 2
2 1 1

Expected Result:

The all pairs shortest distance matrix is
            1     2     3     4

_____
    1 |     0     8     7     4
    2 |     1     0     7     5
    3 |     3     2     0     6
    4 |     5     5     3     0
```

Q2. In this question students are required to find the shortest distance from a given source vertex to all the vertices in the graph using Bellman Ford algorithm. Also find the number of iterations used in the procedure. The query graph is given below:

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