CSN-261: Data Structures Laboratory

Lab Assignment 5 (L5)

**Instructions:**

1. **Use either C/C++ for solving the assignment.**
2. **Submit your** zipped folder (**<filename>.zip**)**.** The submitted zipped folder must contain the following:
   (a) The source code files in a folder
   (b) A report file (**<filename>.DOC** or **<filename>.PDF**) should contain the details like:
       i.   Title page with details of the student
       ii.   Problem statements
       iii.   Algorithms and data structures used in the implementation
       iv.   Snapshots of running the codes for each problem

Problem 1:

Write a C++ program to implement a graph using adjacency list (linked list**) without using STL**. Perform following operations on the graph after creating the graph based on the edge list given in the input file.
1. BFS traversal
2. DFS traversal
3. Cycle finding in the graph
4. Calculate diameter of the graph

Input:
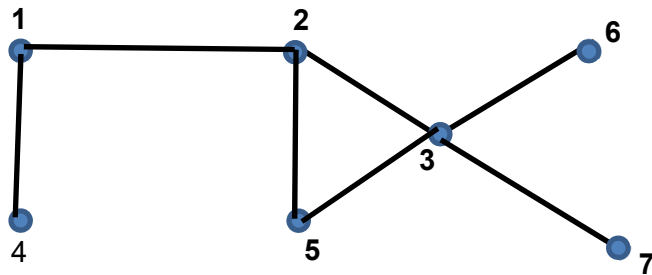
Content of the file testcase.txt
7
1 2
1 4
2 5
2 3
3 5
3 6
3 7

Outputs:
1. 1 2 4 5 3 6 7
2. 1 2 3 7 6 5 4
3. Yes
4. Diameter: 4

Problem 2:
Given a set of nodes connected to each other in the form of a weighted undirected graph G, find the minimum spanning tree (*MST*). A spanning tree *T* of an undirected graph *G* is a subgraph that is a tree which includes all of the vertices of *G*, with minimum possible number of edges. *G* may have more than one spanning trees. The weight of a spanning tree is the sum of weights given to each edge of the spanning tree. A *minimum spanning tree (MST)* is a spanning tree whose weight is less than or equal to that of every other spanning tree.

For given input graph (given as a text file having the format as shown in the example below), implement **Kruskal's algorithm** in C++ program using **UNION-FIND** data structures (**without using STL**) and show all the edges of the *MST* as output in both the command line and in the "dot file", where DOT is a **graph description language**. Also, print the total edge weight of the *MST*. For more details follow this link https://www.graphviz.org/doc/info/lang.html. Further use the "dot file" file to visualize the output graph in .pdf or .png file using **Graphviz.**

Use the online GraphViz for visualization of DOT file: https://edotor.net/

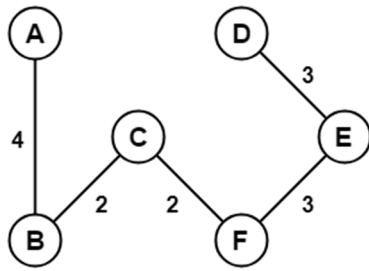**Input: (Consider the vertices having integer IDs)**
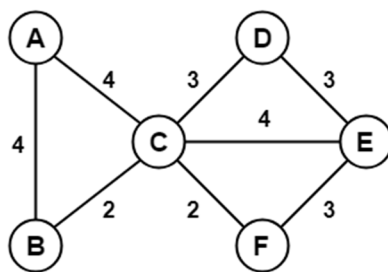
Node1 Node2 Weight
A B 4
A C 4
B C 2
C D 3
C F 2
C E 4
D E 3
F E 3

OUTPUT: (Consider the DOT file format to return as the output)
Node1 Node2 Weight
B C 2
C F 2
F E 3
D E 3
A B 4

Total edge-weight of the MST = 14