

## Lab Task#10: Find the shortest path in an unweighted graph

1. You are given an undirected or bidirected graph and a source from which you will start your journey. You have to find the minimum number of edges required to arrive at each of the reachable vertices and print the path as given in the output section in a sequence.
  - a. First will have the total number of nodes (**n**) and the total number of edges (**m**).
    - i. Nodes are numbered from **0** to **n-1**
  - b. Next m lines will be followed by m pairs of integers denoting the bi-directional edges.
    - i. a b
      1. It means there is a connection from **a to b** and
      2. Also, a connection from **b to a**.
  - c. Then a single integer **s** denoting the source node.
2. Outputs:
  - a. Print the number of edges required at minimum to reach a particular node from the source in a sequence from 0 to n-1.
  - b. Avoid printing the distance for the source node.
  - c. If a node is not reachable. Mention that.
  - d. See the output format for more details
3. Use the idea of Graph traversal to solve the problem.
4. Try to solve the problem in paper first to understand how you might approach it.
5. Implementation should be done in either C or C++ or Python or Java.
  - a. Explain your code in words if possible.
  - b. Also, if I ask you about your code, you better be able to answer. So please, understand the code before submitting it.
6. **Assignment File Name:** AlgoLabAssign10\_ShortestPathInU-W-Graph\_191-115-**ZZZ**
  - a. Replace **ZZZ** with your roll.
7. Related material: <https://youtu.be/FhCn2DkVrZU>
8. If You find any problem in the question, let me know. I will correct it.

Input #1	Output#1
14 12 0 1 0 4 0 2	<u>From the <b>source 0</b> :</u>  Minimum <b>1</b> edges needed to reach <b>1</b> Path taken: 0 1

1 3 1 4 3 5 5 6 5 7 6 8 2 11 11 10 9 13 0	Minimum 1 edges needed to reach 2 Path taken: 0 2  Minimum 2 edges needed to reach 3 Path taken: 0 1 3  Minimum 1 edges needed to reach 4 Path taken: 0 4  Minimum 3 edges needed to reach 5 Path taken: 0 1 3 5  Minimum 4 edges needed to reach 6 Path taken: 0 1 3 5 6  Minimum 4 edges needed to reach 7 Path taken: 0 1 3 5 7  Minimum 5 edges needed to reach 8 Path taken: 0 1 3 5 6 8  9 is not reachable.  Minimum 3 edges needed to reach 10 Path taken: 0 2 11 10  Minimum 2 edges needed to reach 11 Path taken: 0 2 11  12 is <b>not</b> reachable.  13 is <b>not</b> reachable.
<b>Input #2</b>	<b>Output#2</b>
14 10 0 1 0 2 0 4 1 3 1 4 2 11 3 5	<u>From the source 4 :</u>  Minimum 1 edges needed to reach 0 Path taken: 4 0  Minimum 1 edges needed to reach 1 Path taken: 4 1

6 7 8 9 10 13 <b>4</b>	<p>Minimum <b>2</b> edges needed to reach <b>2</b>  Path taken: 4 0 2</p> <p>Minimum <b>2</b> edges needed to reach <b>3</b>  Path taken: 4 1 3</p> <p>Minimum <b>3</b> edges needed to reach <b>5</b>  Path taken: 4 1 3 5</p> <p>6 is <b>not</b> reachable.</p> <p>7 is <b>not</b> reachable.</p> <p>8 is <b>not</b> reachable.</p> <p>9 is <b>not</b> reachable.</p> <p>10 is <b>not</b> reachable.</p> <p>Minimum <b>3</b> edges needed to reach <b>11</b>  Path taken: 4 0 2 11</p> <p>12 is <b>not</b> reachable.</p> <p>13 is <b>not</b> reachable.</p>
<b>Input #3</b>	<b>Output#3</b>
7 5 1 2 1 4 2 5 3 6 0 6 <b>6</b>	<p><u>From the <b>source 6</b> :</u></p> <p>Minimum <b>1</b> edges needed to reach <b>0</b>  Path taken: 6 0</p> <p>1 is <b>not</b> reachable.</p> <p>2 is <b>not</b> reachable.</p> <p>Minimum <b>1</b> edges needed to reach <b>3</b>  Path taken: 6 3</p> <p>4 is <b>not</b> reachable.</p> <p>5 is <b>not</b> reachable.</p>