Data Structures and Algorithms

Lab 11 – Graph

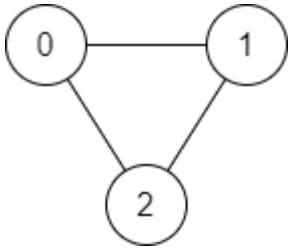
Exercises/Tasks:

1. There is a bi-directional graph with n vertices, where each vertex is labeled from 0 to n - 1 (inclusive). The edges in the graph are represented as a 2D integer array edges, where each edges[i] = [ui, vi] denotes a bi-directional edge between vertex ui and vertex vi. Every vertex pair is connected by at most one edge, and no vertex has an edge to itself.

   You want to determine if there is a valid path that exists from vertex source to vertex destination.

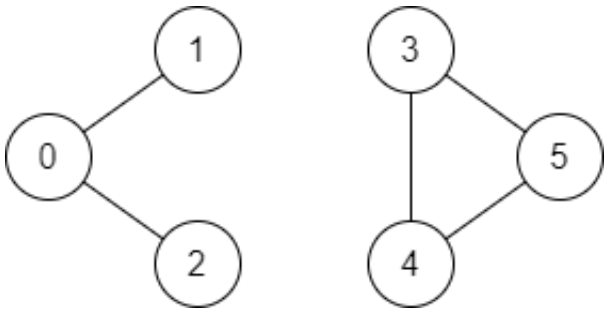
   Given edges and the integers n, source, and destination, return true if there is a valid path from source to destination, or false otherwise.

   Example 1:

   Input: n = 3, edges = [[0,1],[1,2],[2,0]], source = 0, destination = 2
   Output: true
   Explanation: There are two paths from vertex 0 to vertex 2:
   - 0 → 1 → 2
   - 0 → 2

   Example 2:

Input: n = 6, edges = [[0,1],[0,2],[3,5],[5,4],[4,3]], source = 0, destination = 5
Output: false
Explanation: There is no path from vertex 0 to vertex 5.

2. Write the code to count the total number of nodes and edges in a graph. Then run the code in the main method to show how works.
3. Write the code to check if there exists any cycle in the graph. A cycle exists if you can start from a vertex and follow edges to return to the same vertex without repeating any edges.
4. Given a starting vertex and a number k, find all vertices that are exactly k edges away from the start vertex.
5. Write the code to print All Possible Paths Between Two Vertices i.e., list all possible ways to reach from a source vertex to a destination vertex using the available edges.