Assignment 6

Problem 1: Finding All Paths Between Two Nodes
Given a directed graph, find all possible paths between two nodes u and v.

Problem 2: Hamiltonian Path and Circuit
Given a graph G (V, E), determine if there exists a Hamiltonian path or circuit in the graph.
- **Hamiltonian Path:** A path in an undirected or directed graph that visits each vertex exactly once.
- **Hamiltonian Circuit/Cycle:** A Hamiltonian path that starts and ends at the same vertex, thus forming a cycle.

Test case:

```
   A                          5
  / | \                       0 1 1 1 1
 B-C-D                        1 0 1 1 1
  \ | /                       1 1 0 1 1
   E                          1 1 1 0 1
                              1 1 1 1 0
```

Problem 3: Shortest Path in a 3D Grid with Obstacles

You are given a 3-dimensional grid of dimensions X×Y×Z. Each cell in this grid can either be free or blocked. The task is to find the shortest path from a given source cell to a destination cell, considering that you can only move to adjacent cells (left, right, up, down, forward, backward).

Input Format:

1. The first line contains three integers X, Y, and Z representing the dimensions of the grid.
2. The next line contains six integers x_s, y_s, z_s, x_d, y_d, z_d representing the coordinates of the source and destination cells. (Coordinates of Start or Source Cell: x_s, y_s, z_s and Coordinates of Destination Cell: x_d, y_d, z_d)
3. The next X lines each contain Y lines, with Z integers each (0 or 1), representing the grid where 0 indicates a free cell and 1 indicates a blocked cell.

Test Case:

4 5 3

0 0 0 3 4 2

0 1 1
0 1 0
1 0 0
0 0 0
0 0 0

1 1 0
1 1 0
0 0 0
0 1 1
0 0 0

0 1 1
0 1 0
0 1 1
0 1 0
0 0 1

0 1 0
1 1 1
1 0 0
1 1 0
0 0 0