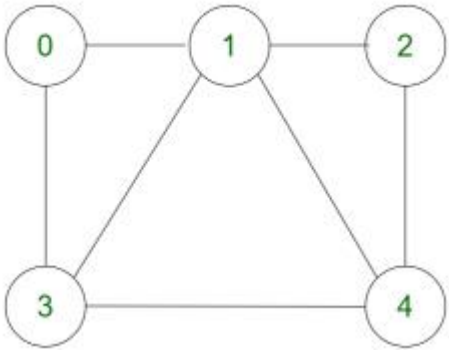
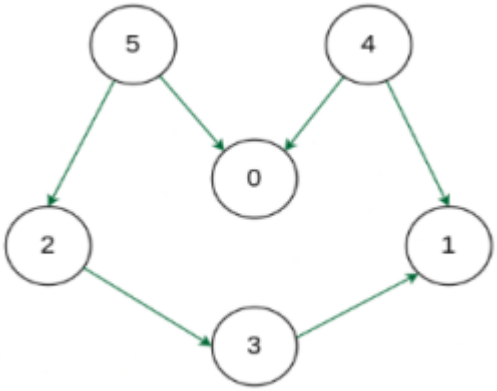
UCS415 – Design and Analysis of Algorithms
Lab Assignment 5 (Graph Algorithms)

1. Write a program to determine a Hamiltonian circuit in a graph.
   Given an undirected graph, the task is to determine whether the graph contains a Hamiltonian cycle or not. If it contains, then prints the circuit.
   Input: *graph[][] = {{0, 1, 0, 1, 0},{1, 0, 1, 1, 1},{0, 1, 0, 0, 1},{1, 1, 0, 0, 1},{0, 1, 1, 1, 0}}*
   Output: *{0, 1, 2, 4, 3, 0}*

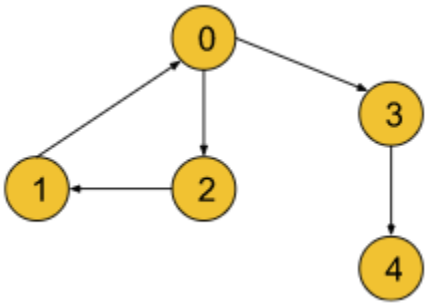


2. For a Directed Acyclic Graph, implement topological sorting using Kahn's algorithm and DFS.
   Input: *V=6 , E = [[2,3], [3,1], [4,0], [4,1], [5,0], [5,2]]*
   Output: *4 5 2 0 3 1*



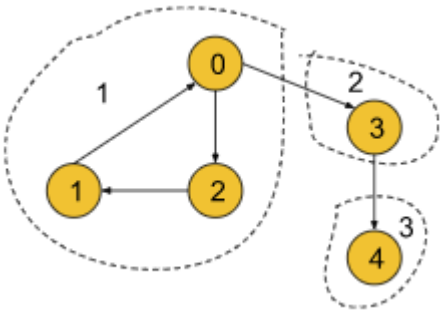
3. Given a Directed Graph with V vertices (Numbered from 0 to V-1) and E edges, find the number of strongly connected components in the graph using Kosaraju's algorithm.

A subgraph of a directed graph is considered to be an **Strongly Connected Components (SCC)** if and only if for every pair of vertices **A** and **B**, there exists a path from **A** to **B** and a path from **B** to **A**.
Input:



Output: 3

Three strongly connected components are marked below:



Additional Questions:

1. Travelling Salesman Problem using backtracking
   https://www.geeksforgeeks.org/travelling-salesman-problem-implementation-usingbacktracking/
2. Depth First Search or DFS for disconnected Graph
   Depth First Search or DFS for disconnected Graph | GeeksforGeeks
3. Fleury algorithm for printing Euler Path
   https://www.geeksforgeeks.org/fleurys-algorithm-for-printing-eulerian-path/
4. Hierholzers algorithm for printing Euler Path
   https://www.geeksforgeeks.org/hierholzers-algorithm-directed-graph/