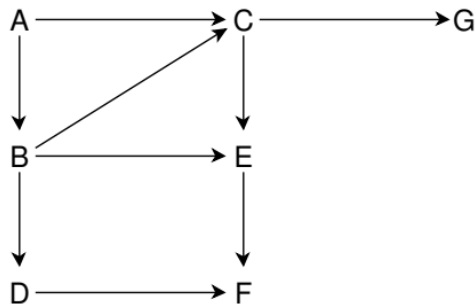


CSE 3500 – Algorithms and Complexity
Homework 3

Question 1 (20 points)

Perform depth-first search on the given graph, beginning from vertex A. If there are multiple vertex options, choose the one that comes first alphabetically.



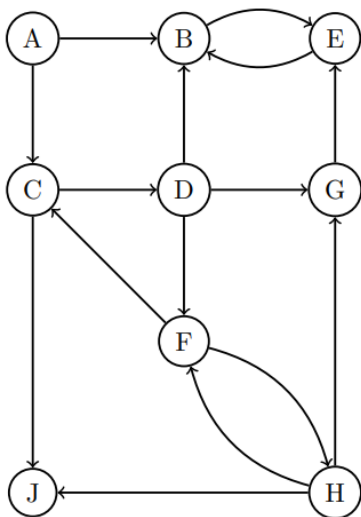
- a. Complete the table with the discovery and finish times for each vertex.

	A	B	C	D	E	F	G
Discovery	1						
Finish							

- b. Next, Assign a label (tree, back, forward, or cross edge) to each edge in the provided graph.

Question 2 (30 points)

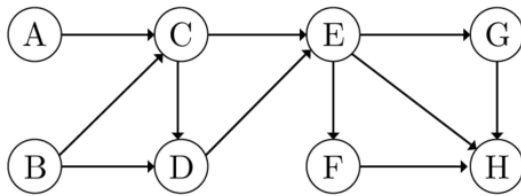
For the directed graph below



- find the strongly connected components.
- draw the DAG of strongly connected components.
- Provide a valid topological sort for the directed acyclic graph (DAG) that you created in part b.

Question 3 (20 points)

Consider the following graph, where each node represents a course. Find an order in which these courses can be taken, ensuring none are taken without meeting the necessary requirements.



Question 4 (30 points)

State whether the following statements are true or false, and explain why:

1. A depth-first search of a directed graph always produces the same number of tree edges (i.e. independent of the order in which the vertices are provided and independent of the order of the adjacency lists)
2. Given an undirected, unweighted, connected graph G , suppose we run a DFS on G starting on some node s . We find that the DFS tree has the property that for any vertex v , the path in the DFS tree from s to v is the shortest (fewest number of edges) path from s to v in G . Then G is a tree.