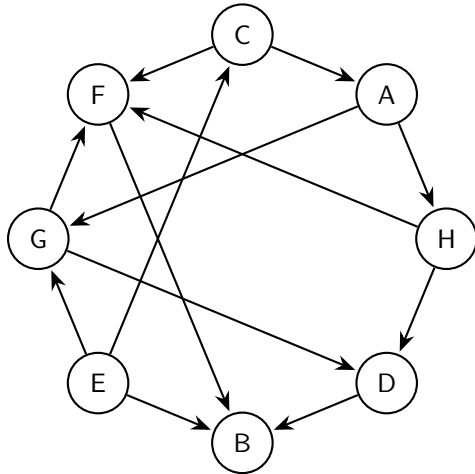
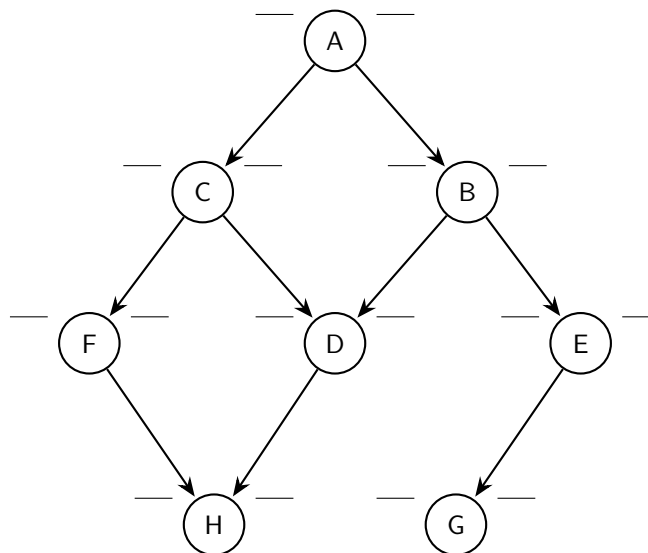


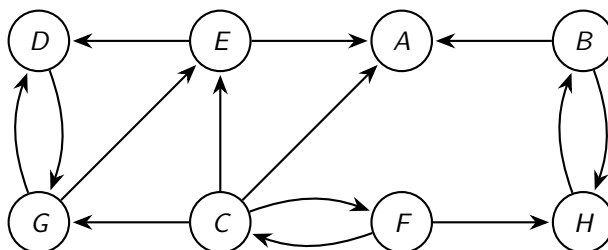
PROBLEM 1 Find two valid topological orders for the following graph:



PROBLEM 2 Run DFS with pre-ordering and post-ordering on the following graph. When deciding between multiple paths, you should break ties in alphabetical order. On the top left of each node, give its pre-order. On the top right of each node, give its post-order. Then, below, using the post-ordering, give a topological ordering for the graph.



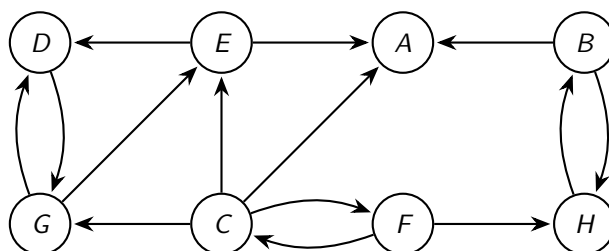
PROBLEM 3 Follow Kosaraju's algorithm to find the strongly-connected components of this graph as follows:



1. Draw the graph below with edges reversed, and use it to run DFS, again starting from A and breaking any ties alphabetically. Mark the post-order of the vertices, and when you do, add them in order to the list below.

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2. Run DFS on the vertices of the original graph, starting from the last vertex in the list. When the DFS pass ends, circle all vertices in that connected component, and repeat from the next vertex in the list, moving from back to front and ignoring any already-visited vertices.



3. Draw a linearized DAG of the graph, where each vertex in the DAG is a strongly connected component in the original graph. Label each SCC with the vertices it contains. Make sure you only draw the existing edges between SCCs.