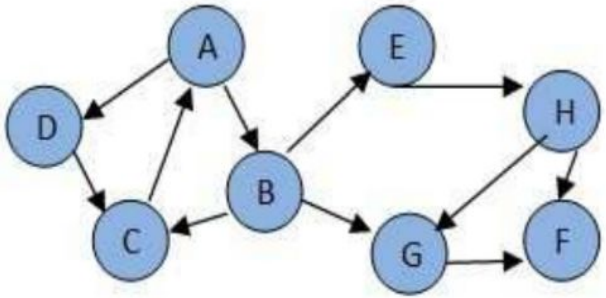
Exercise

Graph Traversal

- Consider the following graph. If there is ever a decision between multiple neighbor nodes in the BFS or DFS algorithms, assume we always choose the letter closest to the beginning of the alphabet first.

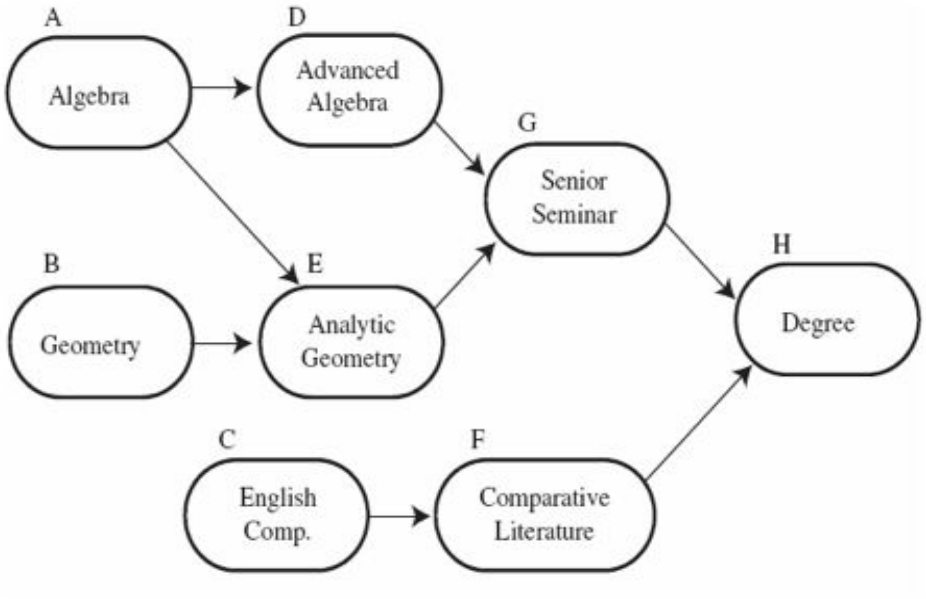


In what order will the nodes be visited using a Breadth First Search? In what order will the nodes be visited using a Depth First Search?

Breadth First Search: The answer is: ABDCEGHF

Depth First Search : The answer is: ABCEHFGD

Find and return an ordering in which all the given courses can be taken while satisfying all the prerequisites.



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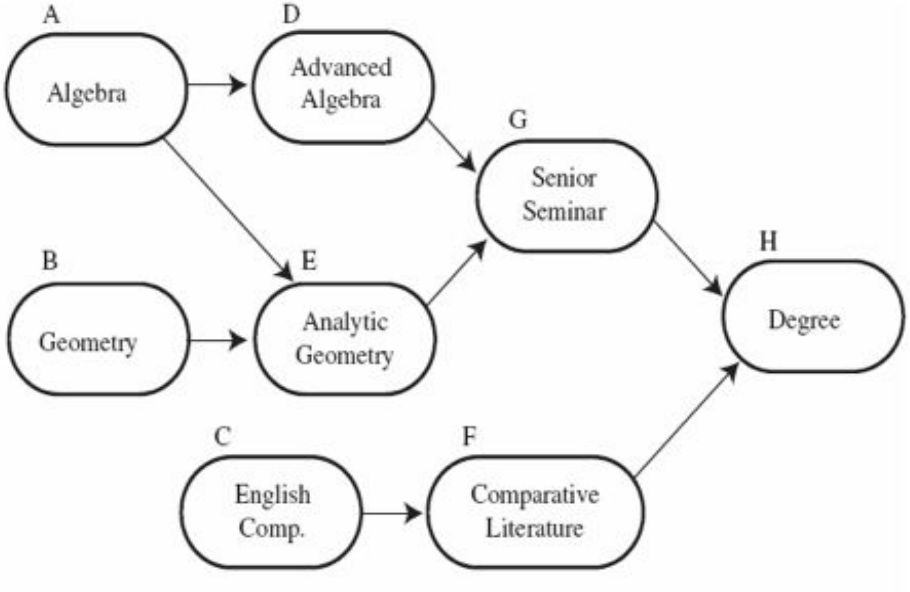
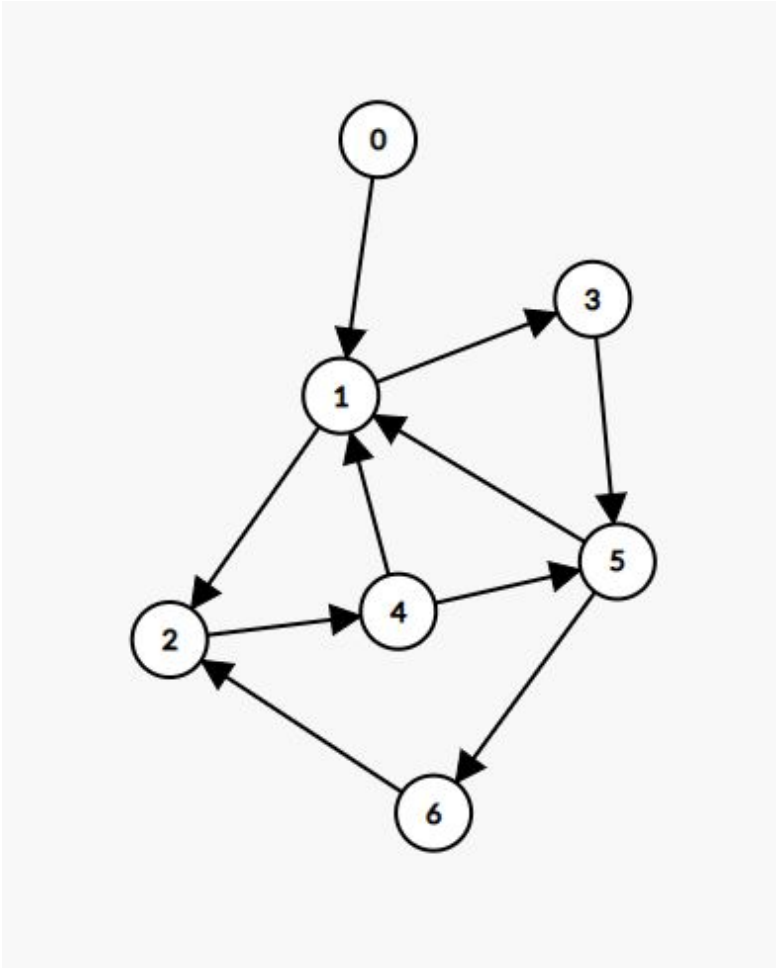


- Use Topological sort
- You may start DFS from C or B or A

Given a directed graph write an algorithm to find out whether graph contains cycle or not.



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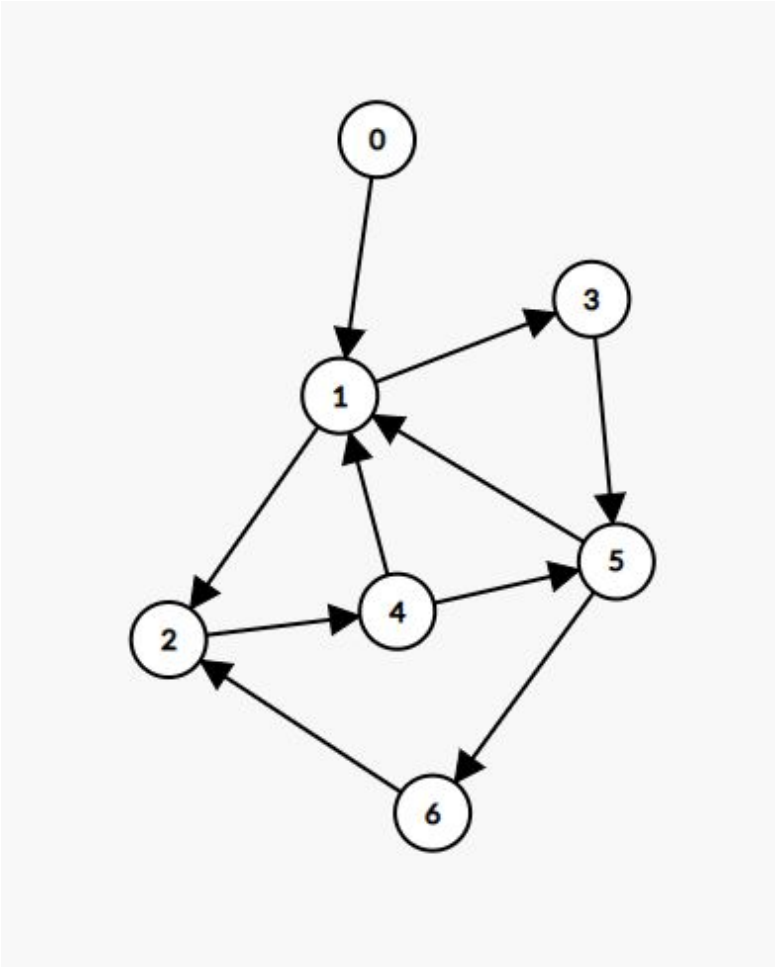


- Run DFS for each connected component of G and check if the number of back edges is equal to zero for all such components, if so, then G is acyclic. Otherwise G contains at least one cycle.

- Run BFS(G). If En = ∅, then G is acyclic. Otherwise G contains at least one cycle.

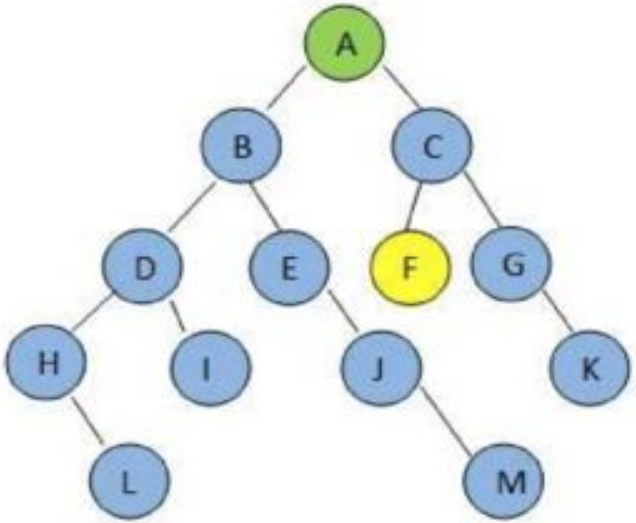
Starting from the green node at the top, which algorithm will visit the least number of nodes before visiting the yellow goal node?

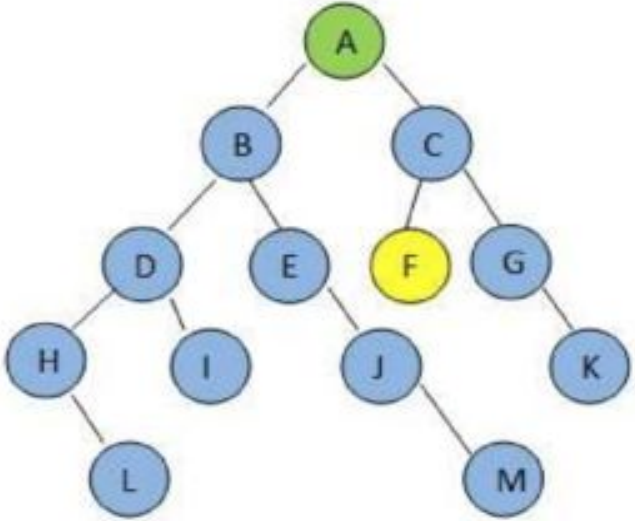
A: BFS

B: DFS

C: Neither BFS nor DFS will ever encounter the goal node in this graph.

D: BFS and DFS encounter same number of nodes before encounter the goal node





Ans: **BFS**

For BFS algorithm, visiting a node's siblings before its children, while in DFS algorithm, visiting a node's children before its siblings

Before countering goal node F: BFS algorithm encounters nodes: ABCDE

DFS algorithm encounters nodes: ABDHLIEJMC

An employee is working on a project which comprises of given tasks-

1. Testing the built code
2. Writing the source code
3. Refactor the code
4. Documentation of the source code
5. Collect requirements from the customer

   To accomplish the following tasks; there are some constraints imposed by the management

   1. Task 2 comes before task 1 & 3
   2. Task 4 should be the last task
   3. Task 3 should be completed after task 1 and before task 4
   4. Task 5 is the first task to be completed

      Which algorithm can help the employee to schedule his tasks in an efficient manner? Show your solution approach

An interval graph is an undirected graph where the nodes are closed intervals on the real number line, and the edges connect intervals that overlap. Draw the depth first search(DFS) tree with all tree edges, and back edges (see page 483 of Cormen) of the following interval graph: [1, 3], [2, 4], [6, 9], [5, 10], [8, 9], [8, 11], [3, 6], [1, 4], [3, 7]. Assume that the graph data structure orders the nodes as they are listed, and you start your search from the first node.