Fundamentals of Artificial Intelligence

Laboratory

Dr. Mauro Dragoni

Department of Information Engineering and Computer Science
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Exercise 3.1

- Give a complete problem formulation for each of the following. Choose a formulation that is precise enough to be implemented.

  - Using only four colors, you have to color a planar map in such a way that no two adjacent regions have the same color.

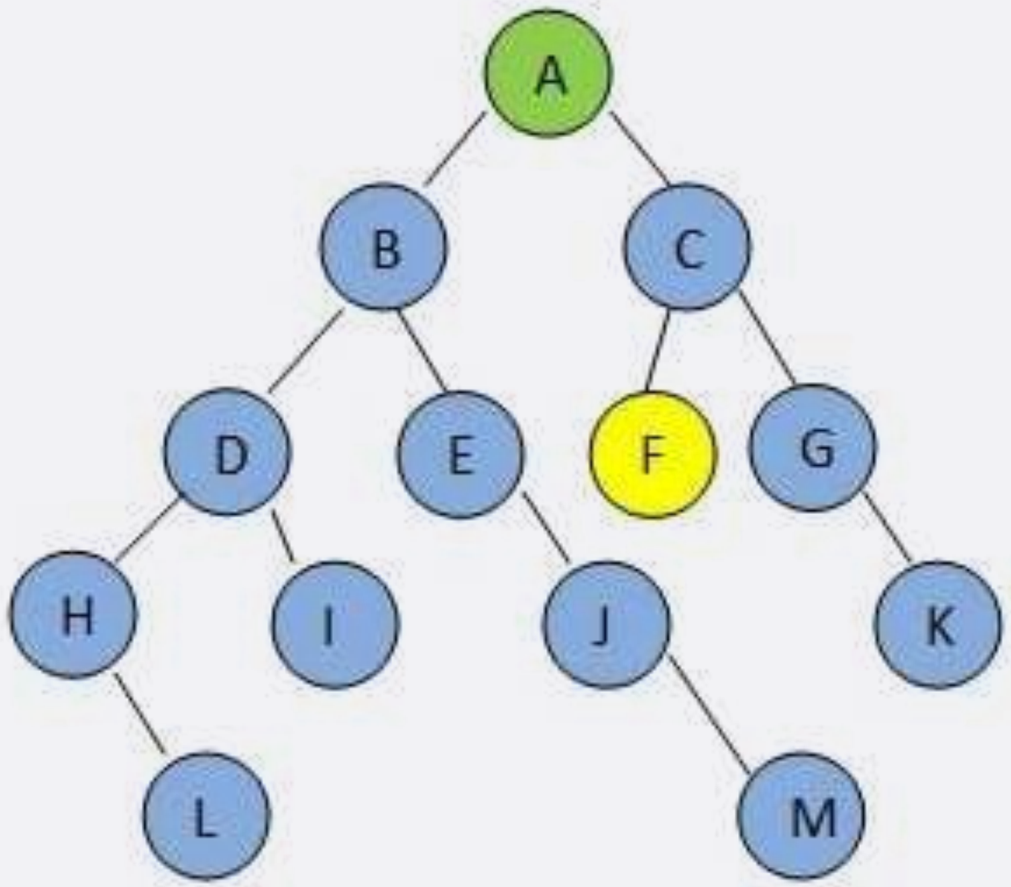
  - A 3-foot-tall monkey is in a room where some bananas are suspended from the 8-foot ceiling. He would like to get the bananas. The room contains two stackable, movable, climbable 3-foot-high crates.

  - You have a program that outputs the message “illegal input record” when fed a certain file of input records. You know that processing of each record is independent of the other records. You want to discover what record is illegal.

  - You have three jugs, measuring 12 gallons, 8 gallons, and 3 gallons, and a water faucet. You can fill the jugs up or empty them out from one to another or onto the ground. You need to measure out exactly one gallon.

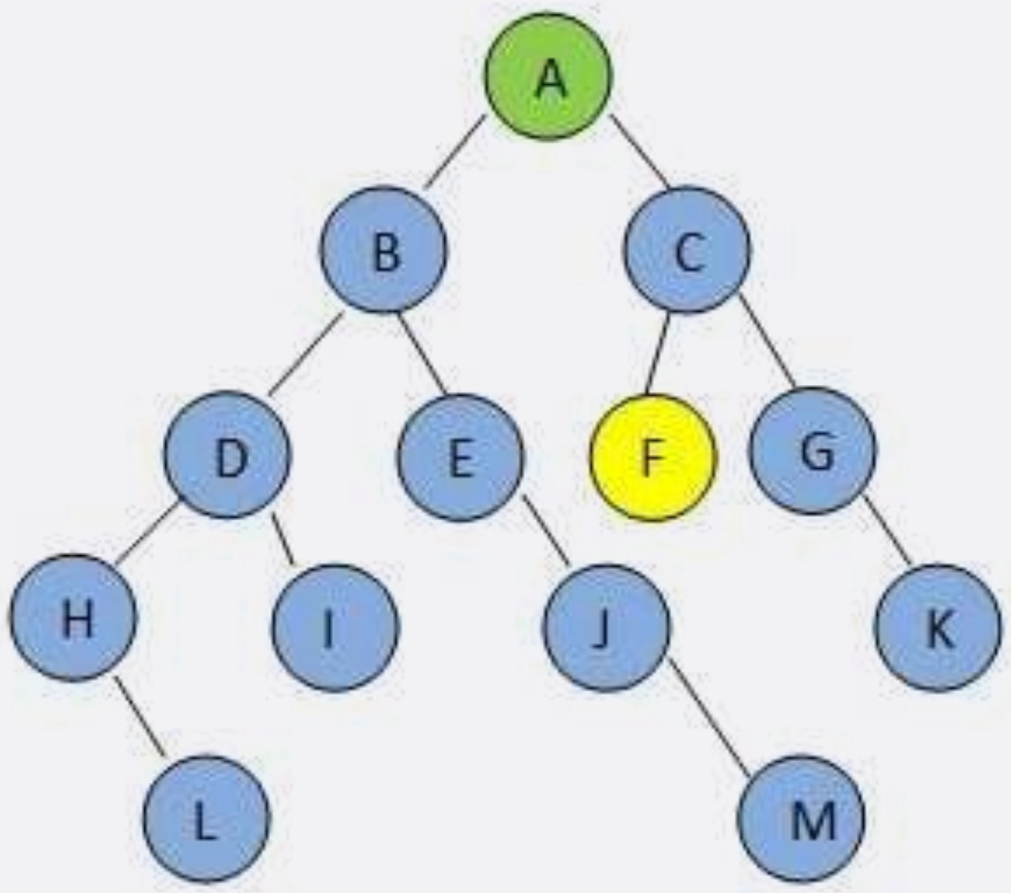
Exercise 3.2

- In the following graphs, assume that if there is ever a choice amongst multiple nodes, both the BFS and DFS algorithms will choose the left-most node first.
- Starting from the green node at the top, which algorithm will visit the least number of nodes before visiting the yellow goal node?



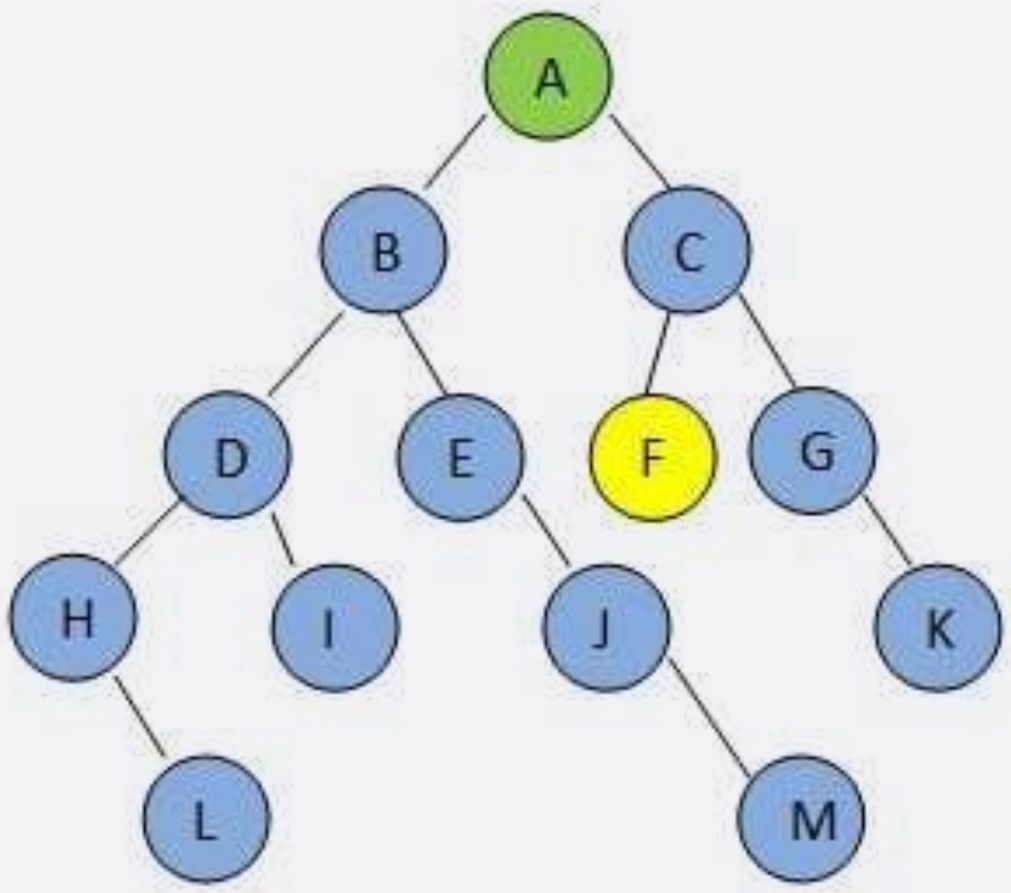
Exercise 3.2

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



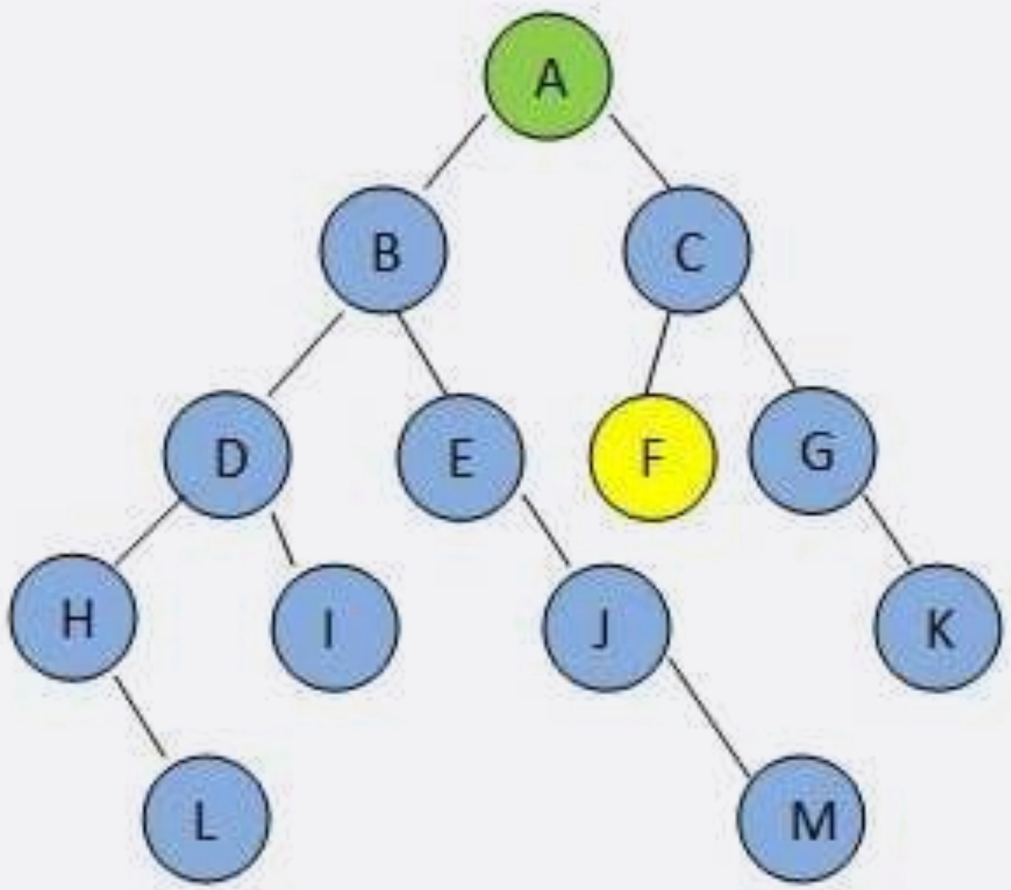
Exercise 3.2

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



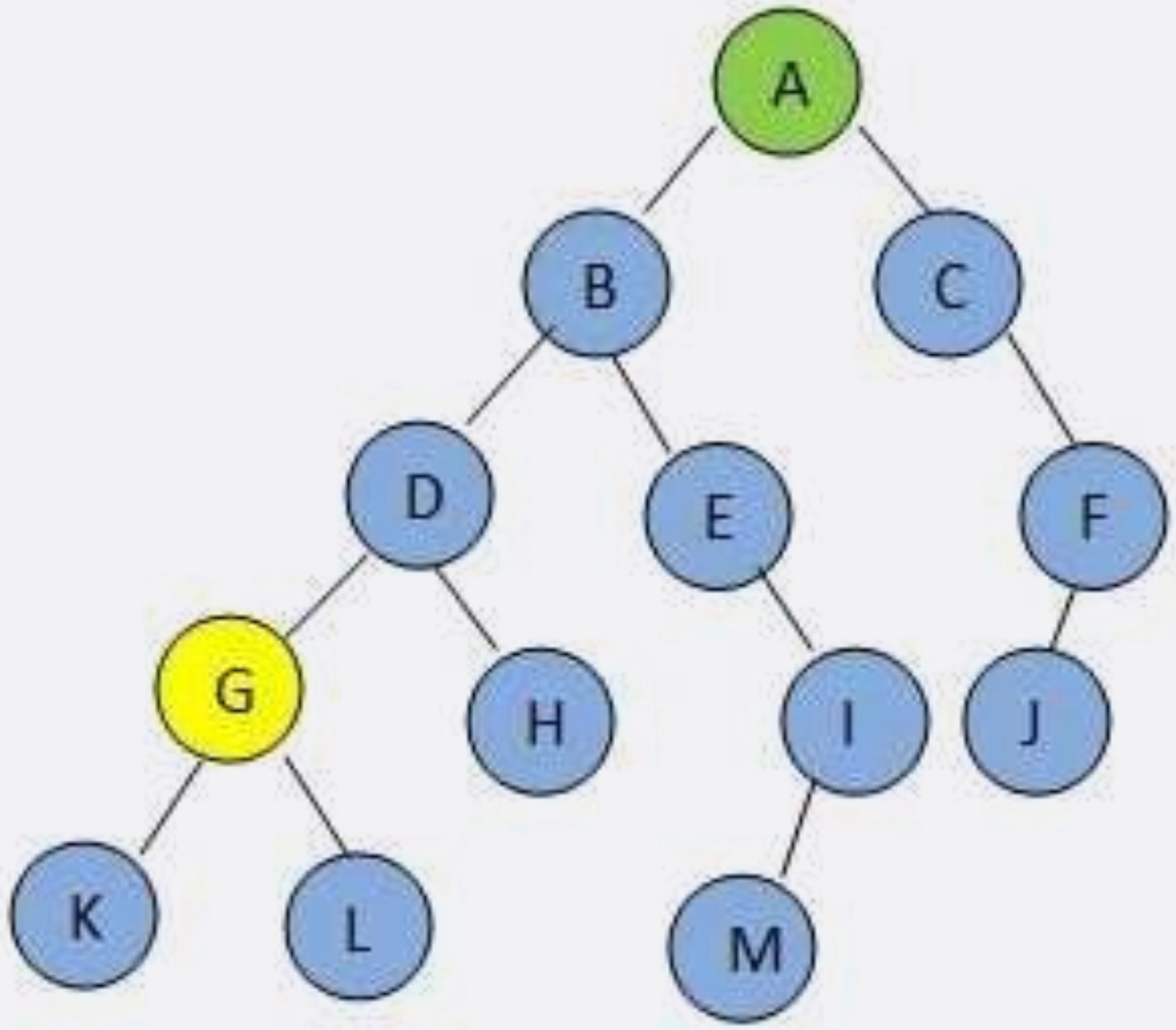
Exercise 3.2

- 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



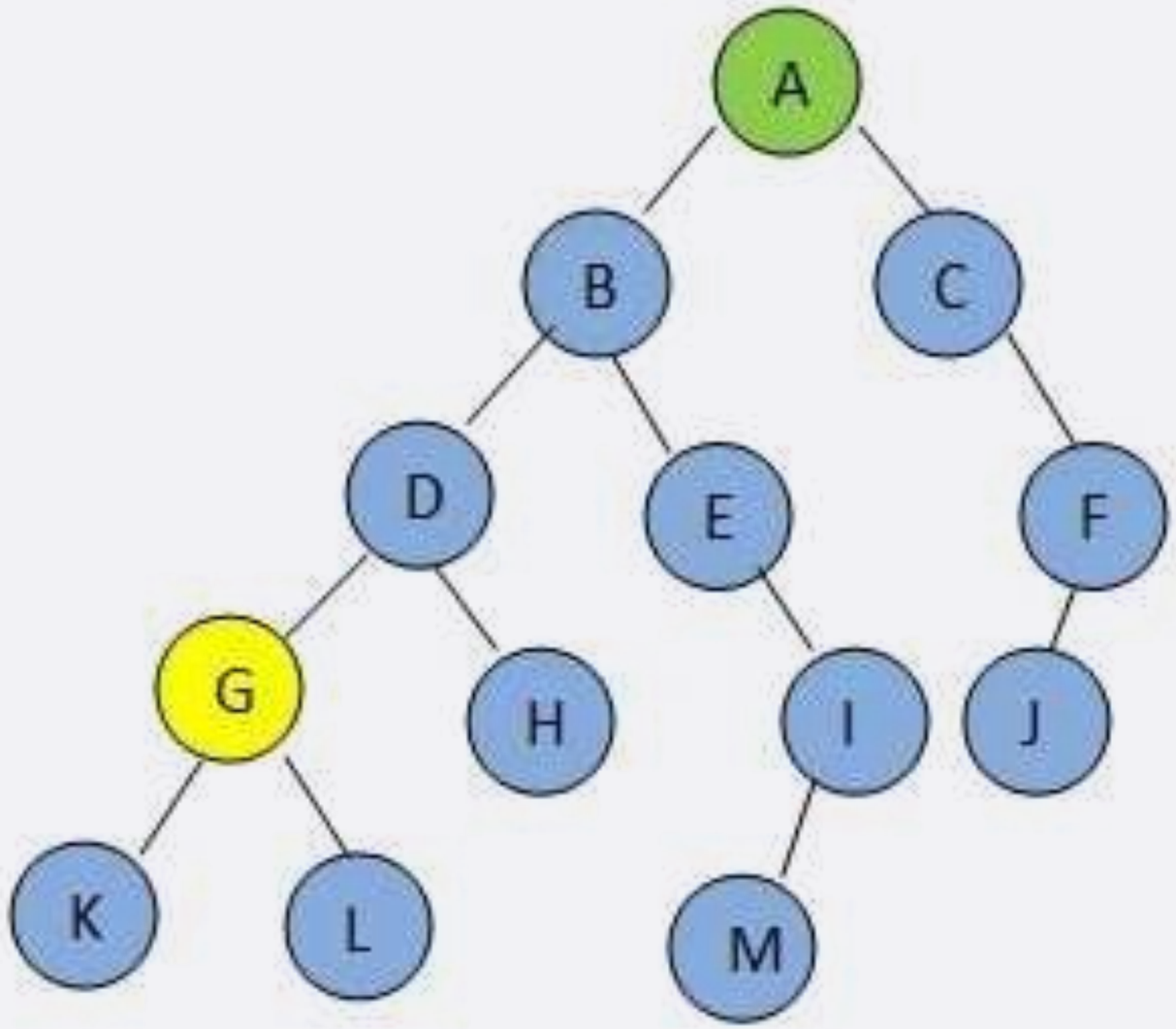
Exercise 3.3

- In the following graphs, assume that if there is ever a choice amongst multiple nodes, both the BFS and DFS algorithms will choose the left-most node first.
- Starting from the green node at the top, which algorithm will visit the least number of nodes before visiting the yellow goal node?



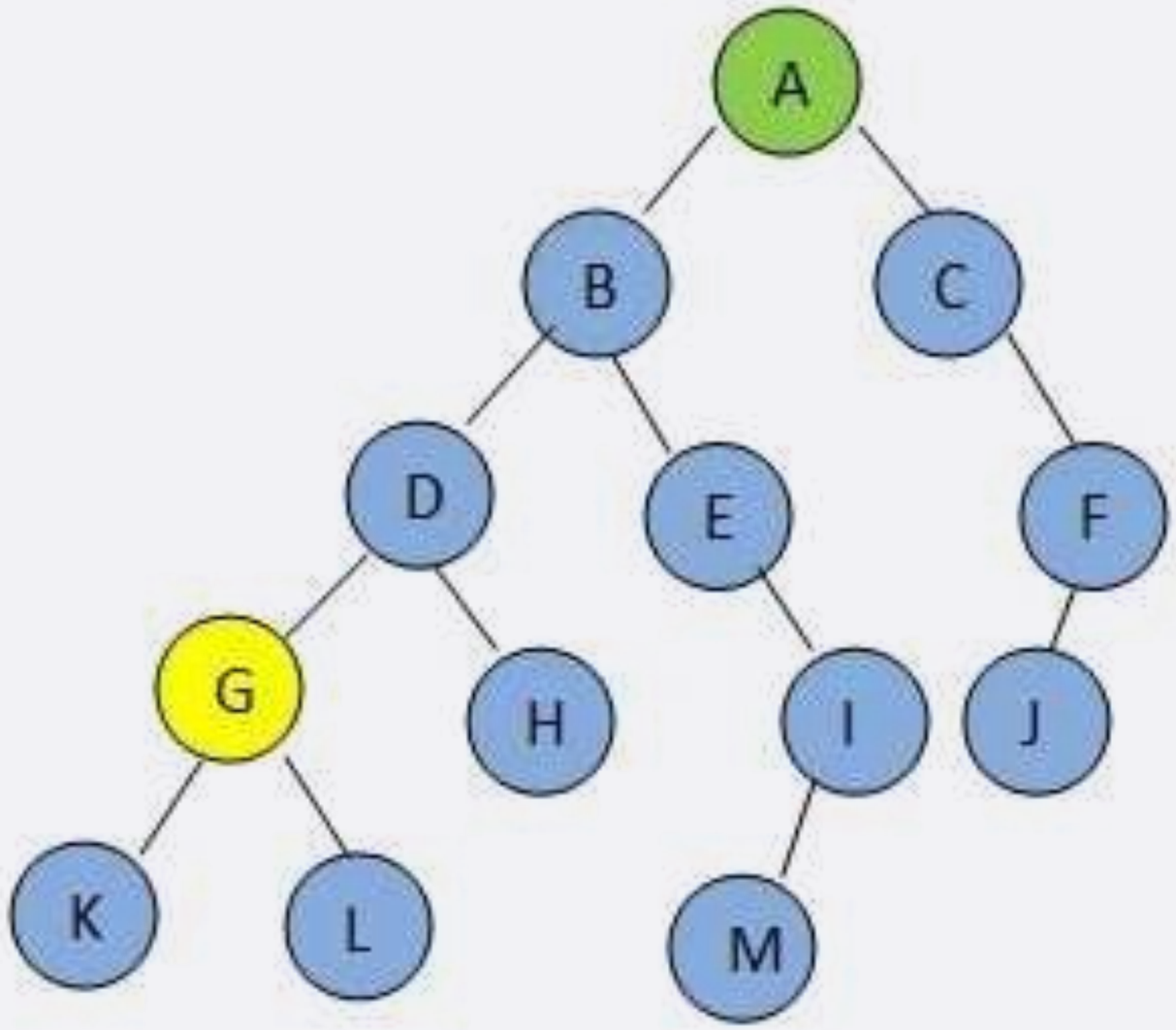
Exercise 3.3

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



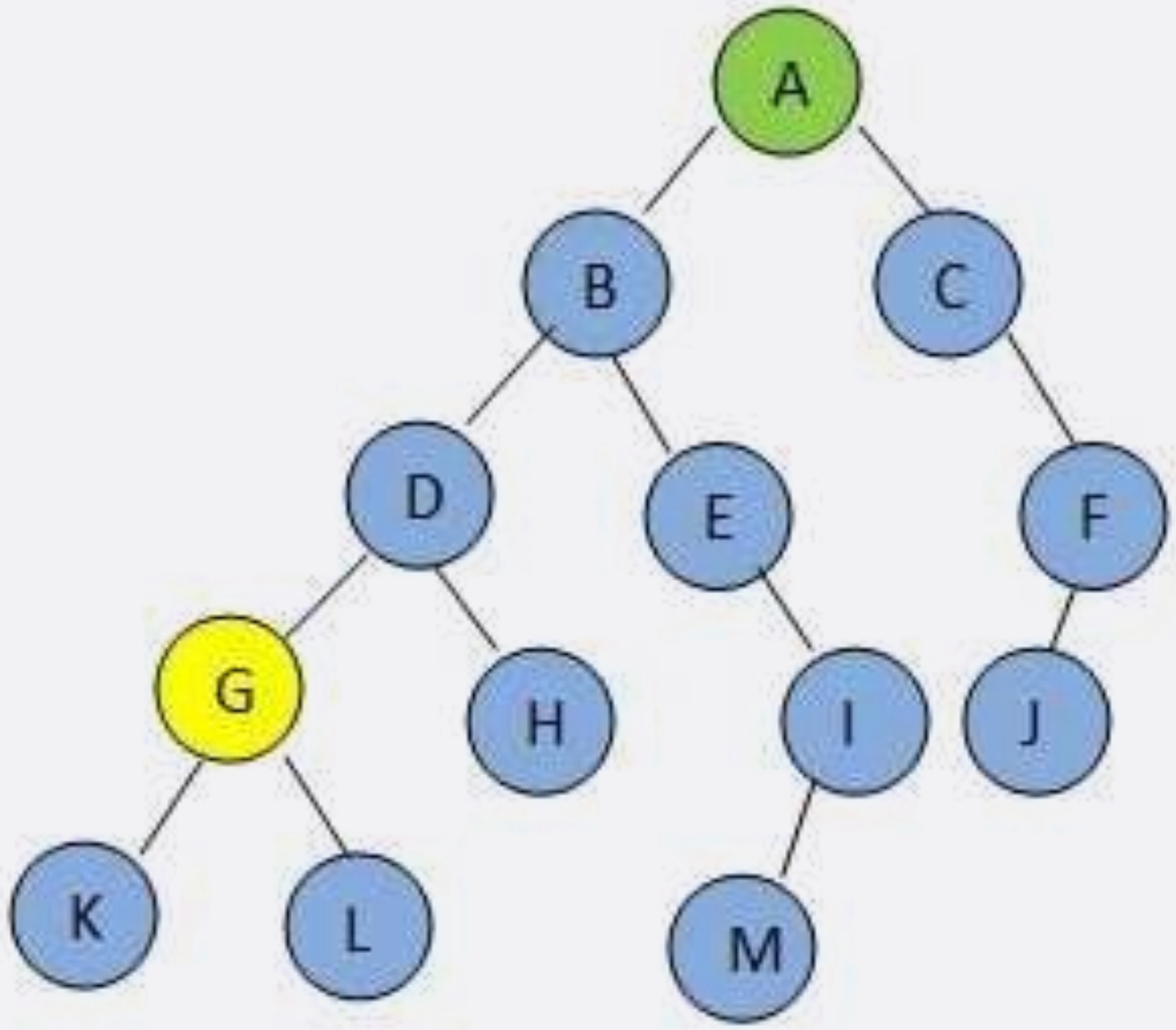
Exercise 3.3

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



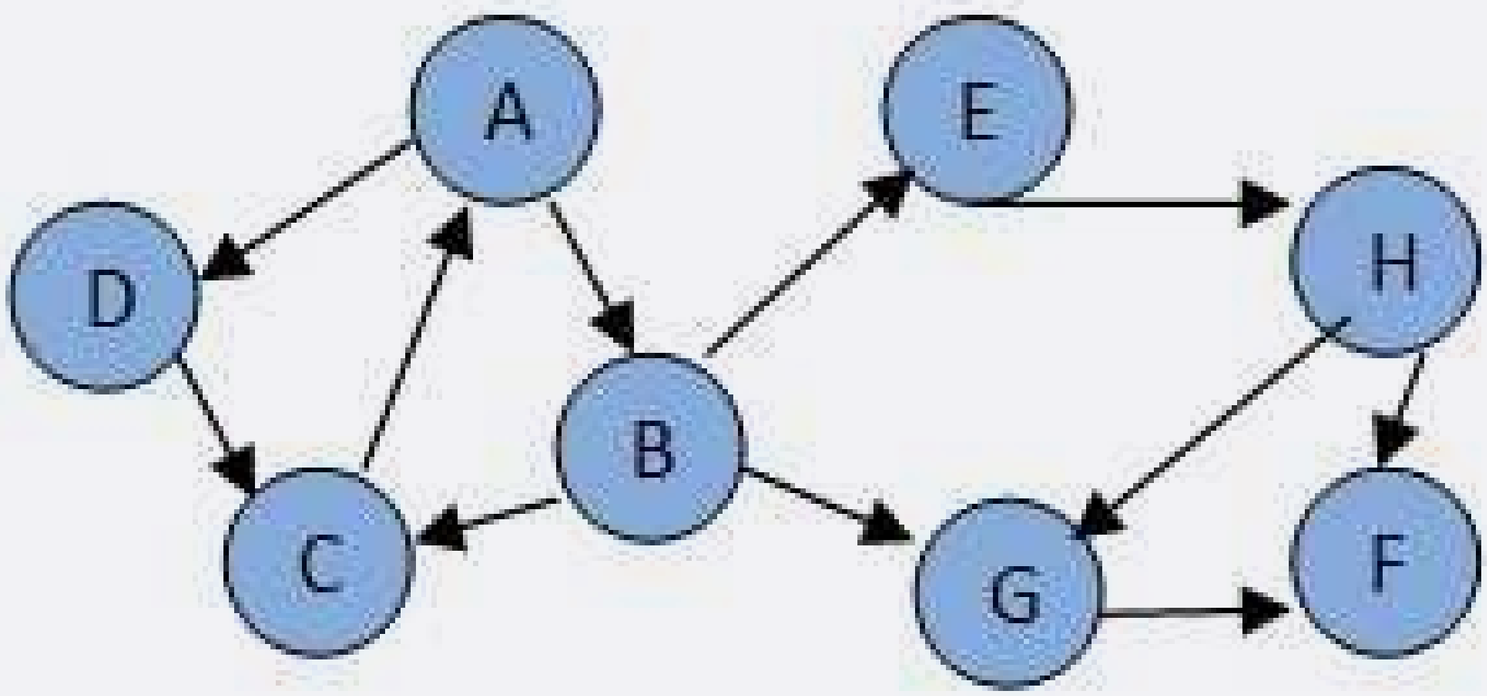
Exercise 3.3

- 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 G:
- BFS algorithm encounters nodes: ABCDEF
- DFS algorithm encounters nodes: ABD



Exercise 3.4

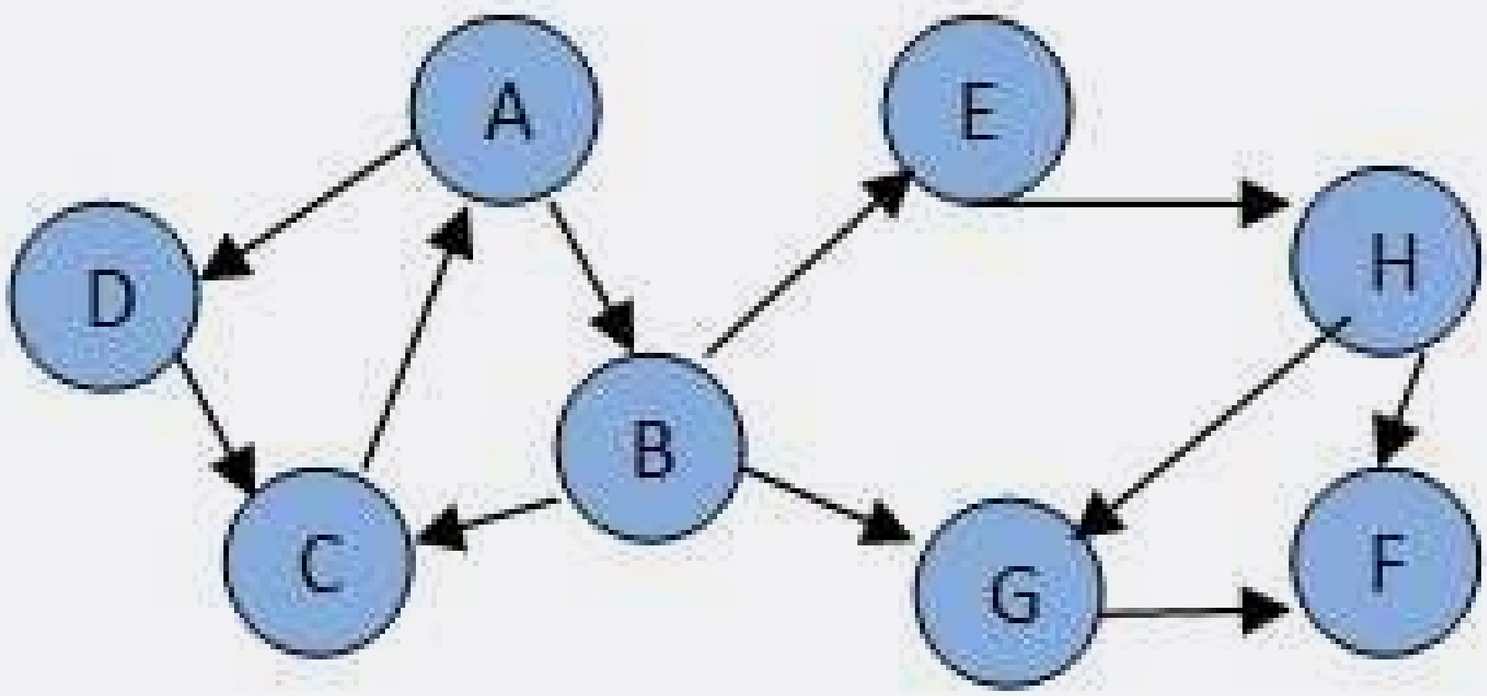
- Consider the following graph. If there is ever a decision between multiple neighbor nodes in the BFS or DFS algorithms, assume we always choose the letter closest to the beginning of the alphabet first. In what order will the nodes be visited using a Breadth First Search? In what order will the nodes be visited using a Depth First Search?



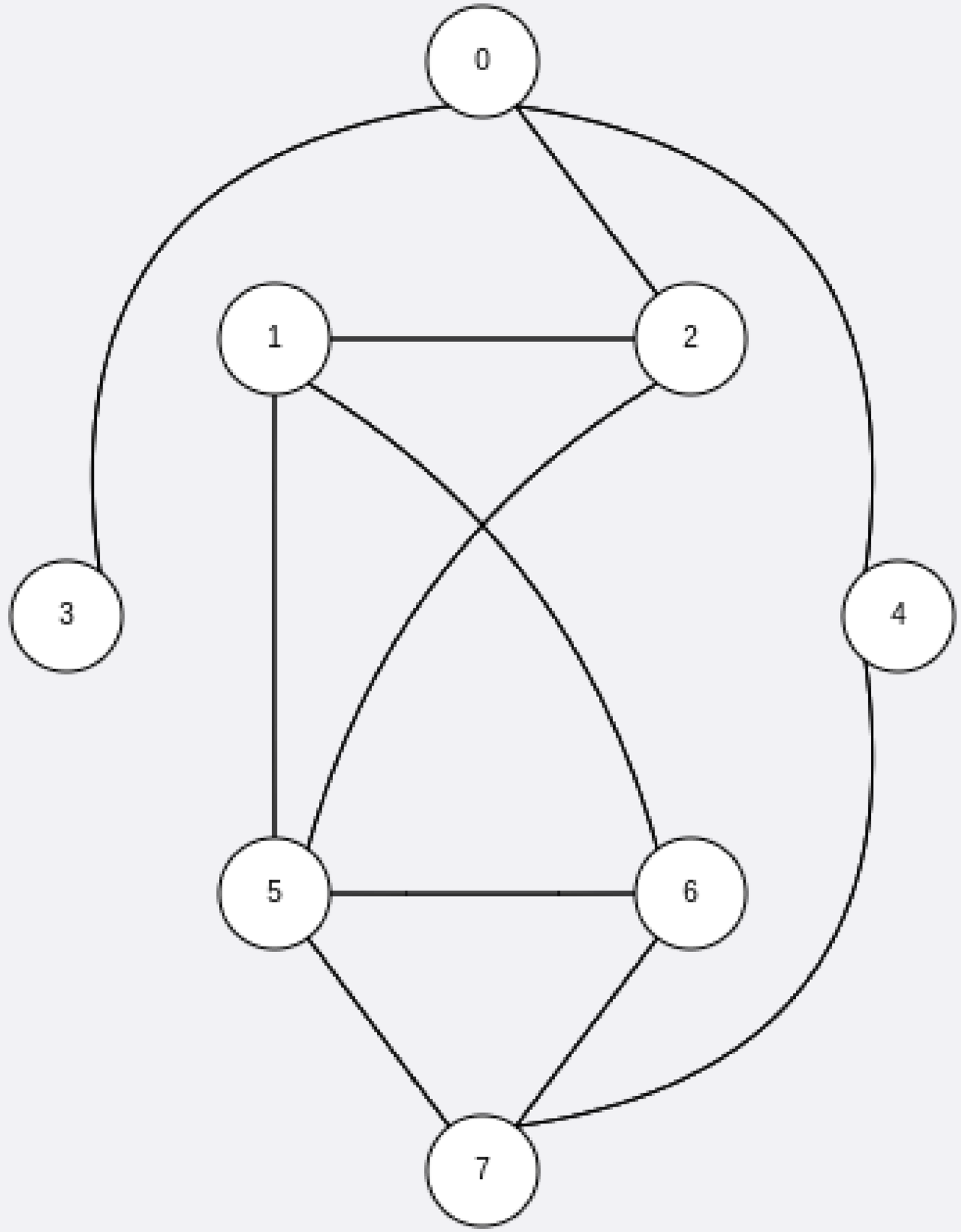
Exercise 3.4

- In what order will the nodes be visited using a Breadth First Search?
  The answer is: **ABDCEGHF**

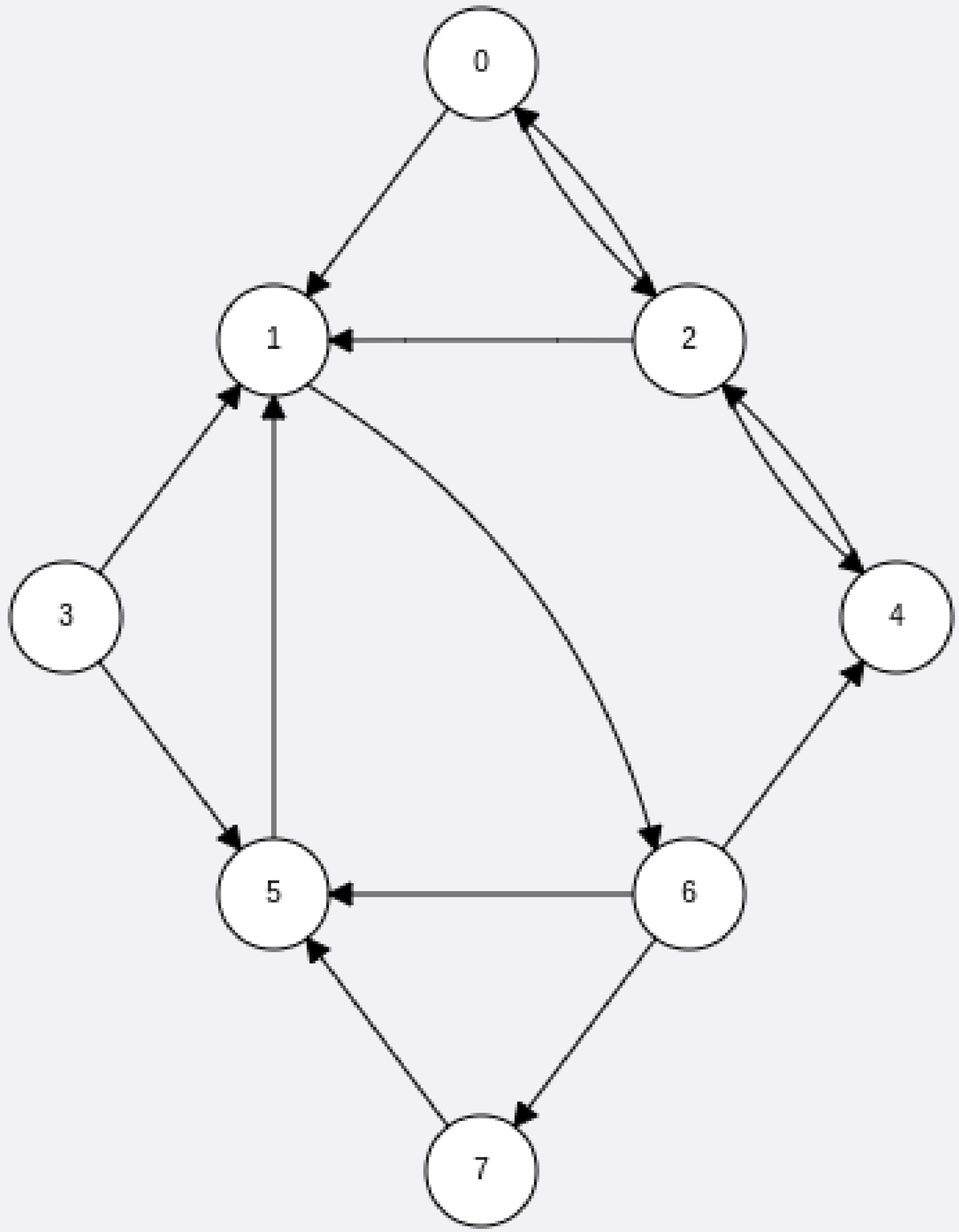
- In what order will the nodes be visited using a Depth First Search?
  The answer is: **ABCEHFGD**



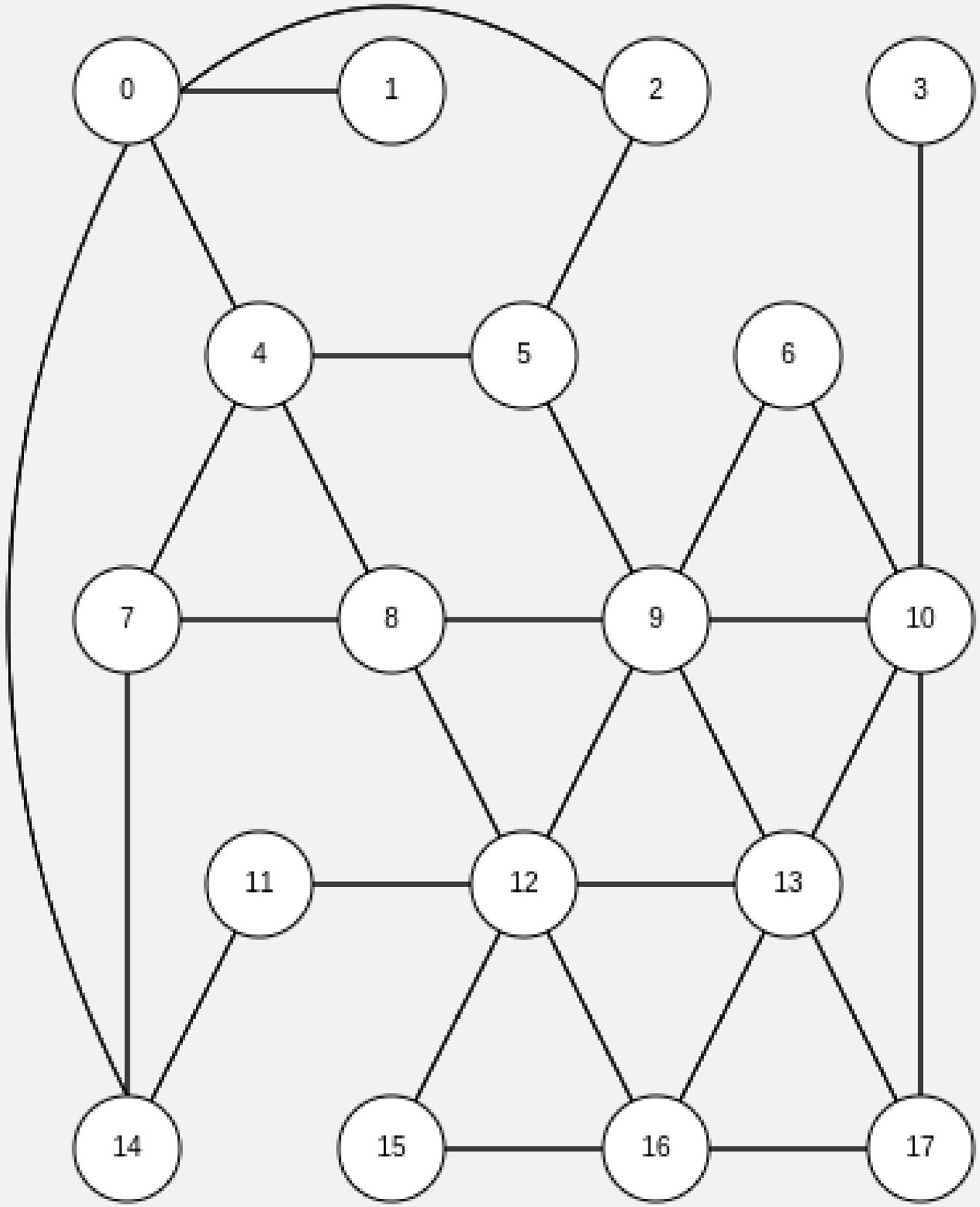
Exercise 3.5



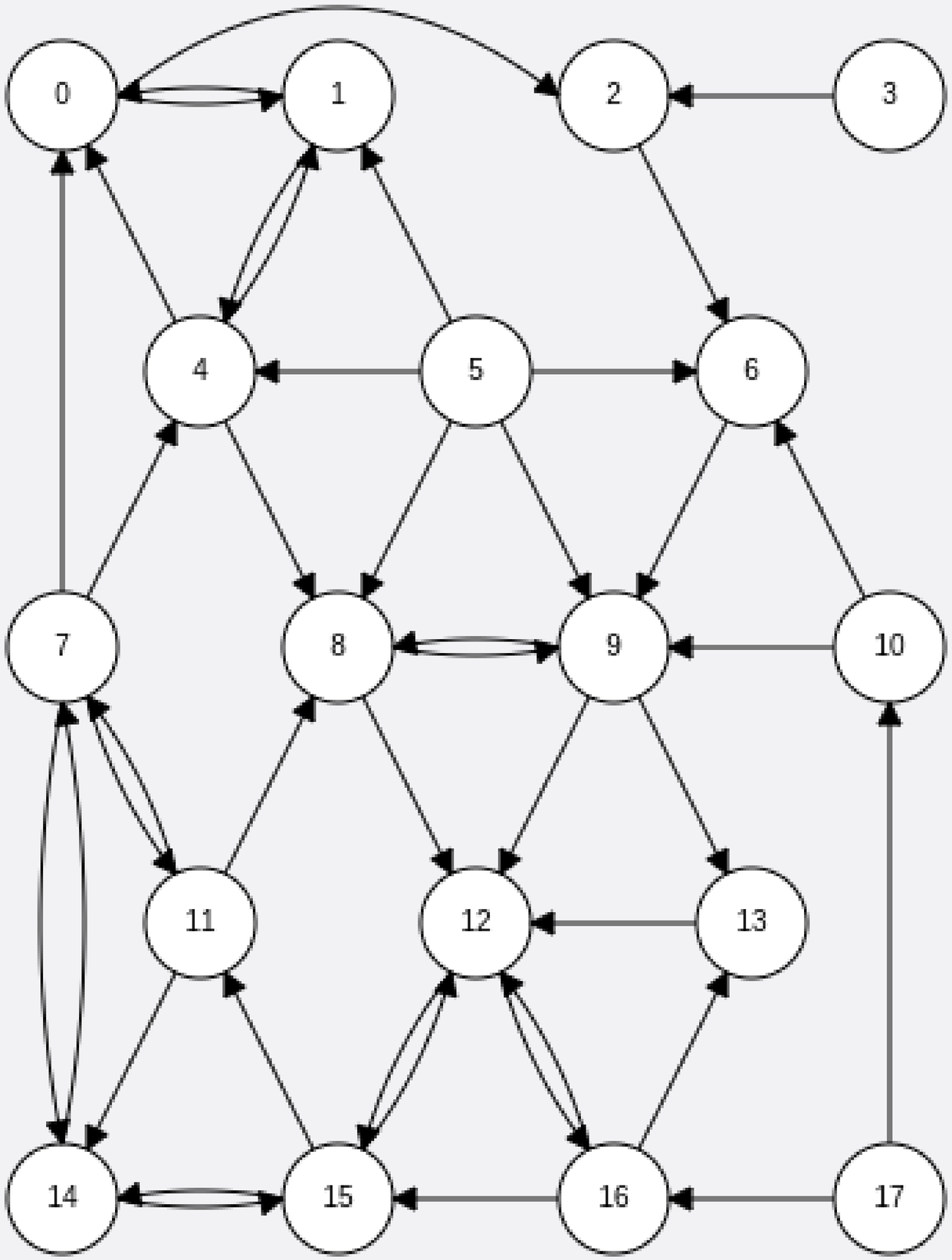
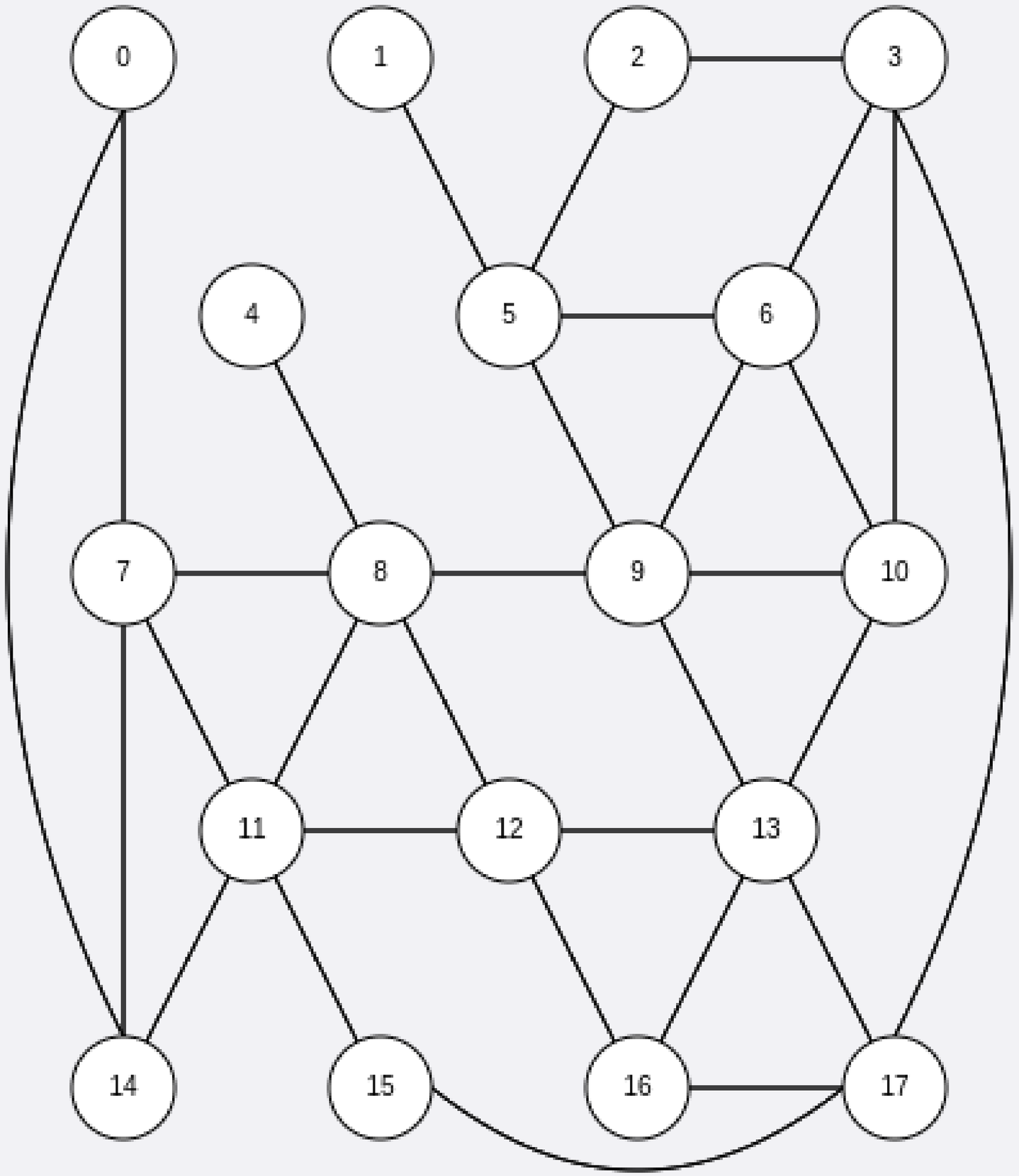
Exercise 3.6



Exercise 3.7



Exercise 3.8



Exercise 3.9