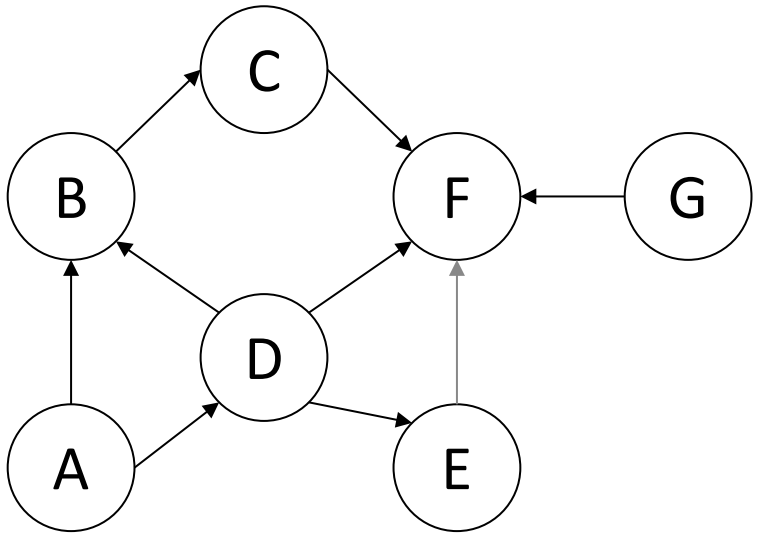
Lecture 12
Graphs
Exercises ANS

Department of Computer Science
Hofstra University

Acknowledgement: Lecture slides based on UofW Course on Data Structures

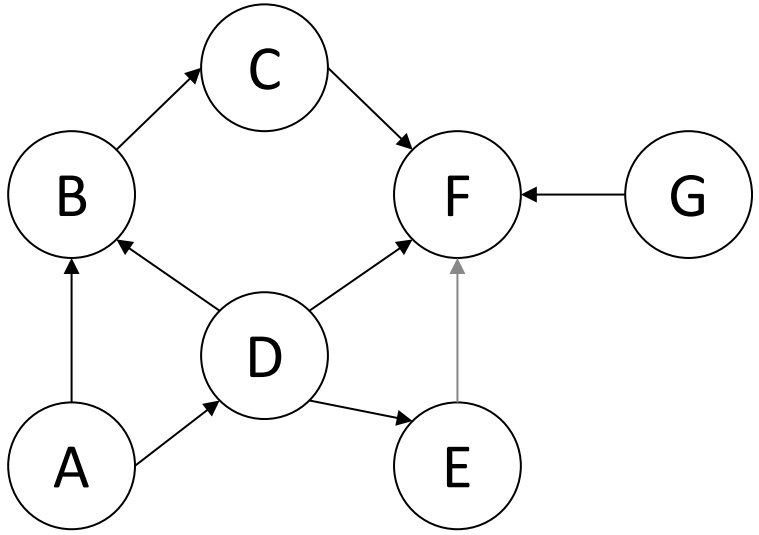
Q. Adjacency matrix and adjacency list

- Write out the adjacency matrix and adjacency list for the directed graph.

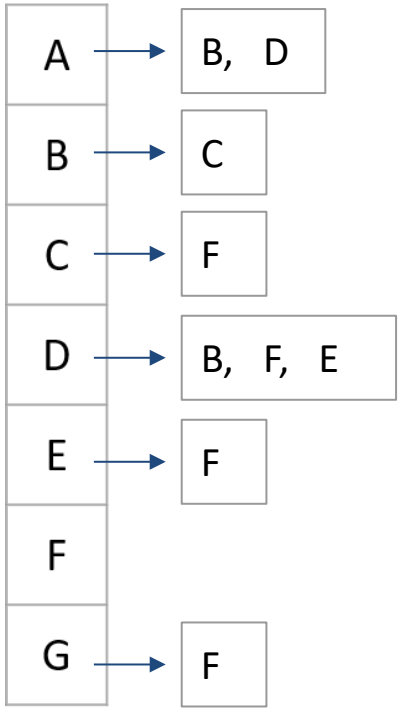


Q. Adjacency matrix and adjacency list ANS

- Write out the adjacency matrix and adjacency list for the directed graph.

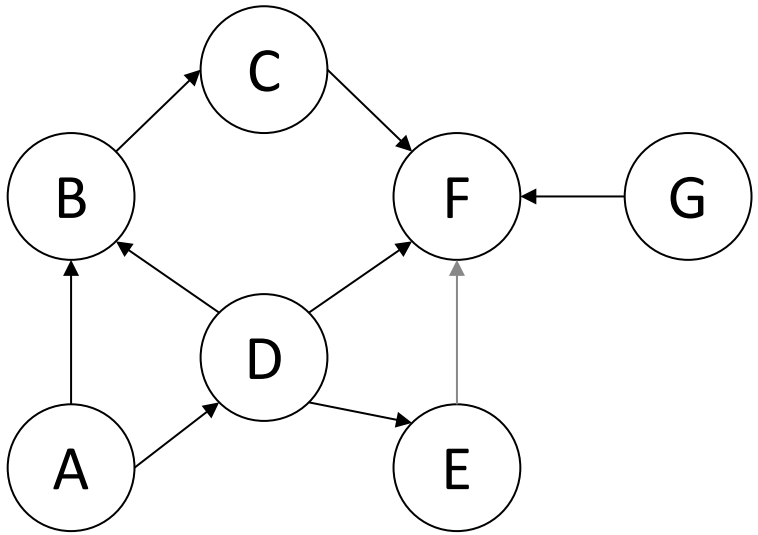


	A	B	C	D	E	F	G
A	0	1	0	1	0	0	0
B	0	0	1	0	0	0	0
C	0	0	0	0	0	1	0
D	0	1	0	0	1	1	0
E	0	0	0	0	0	1	0
F	0	0	0	0	0	0	0
G	0	0	0	0	0	1	0



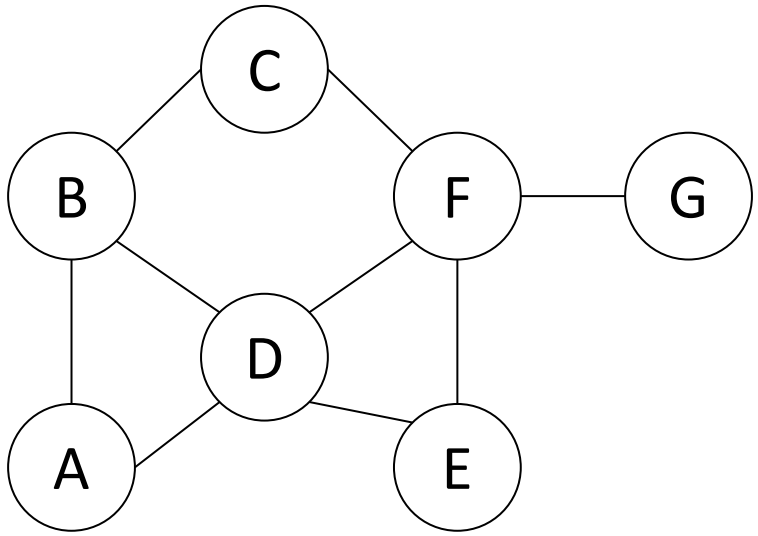
Q. Adjacency matrix and adjacency list

- Write out the adjacency matrix and adjacency list for the undirected graph.

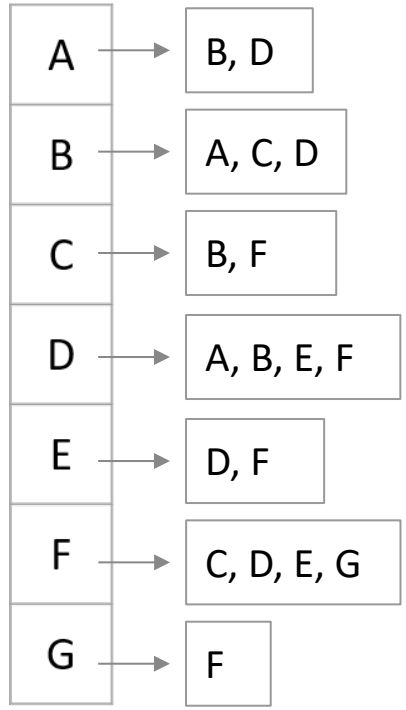


Q. Adjacency matrix and adjacency list ANS

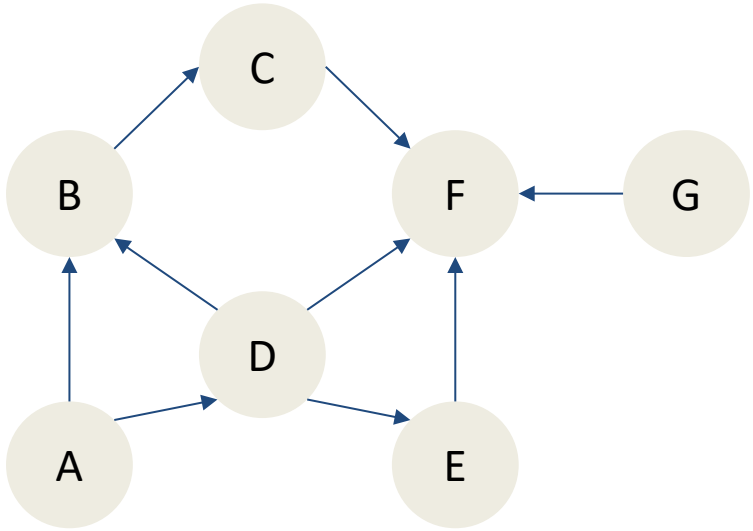
- Write out the adjacency matrix and adjacency list for the directed graph.



	A	B	C	D	E	F	G
A	0	1	0	1	0	0	0
B	1	0	1	1	0	0	0
C	0	1	0	0	0	1	0
D	1	1	0	0	1	1	0
E	0	0	0	1	0	1	0
F	0	0	1	1	1	0	1
G	0	0	0	0	0	1	0



Q: Graph Traversals (Pre-Order & Post-Order)



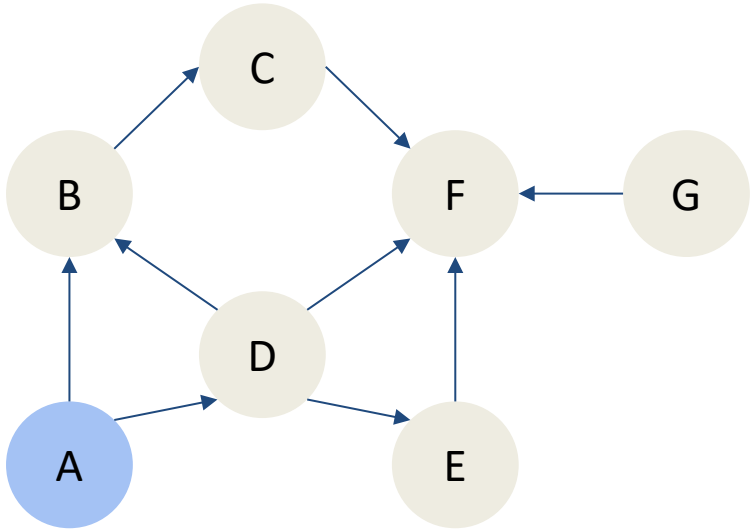
Give the DFS pre-order and post-order traversals of this directed graph, starting from node A. When there are muliple possible orders of visiting the next node, select the next node in alphabetical order.

DFS Pre-Order:

DFS Post-Order:

Stack:

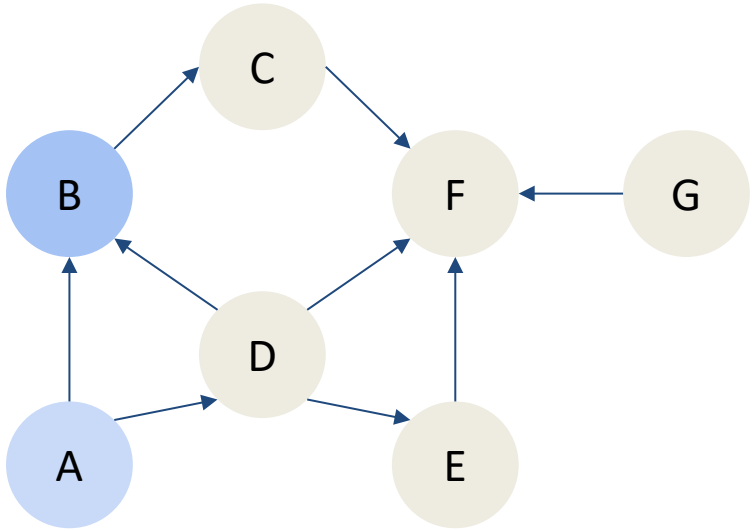
You do NOT need to write out the stack or queue contents in the exam



Stack: A

DFS Pre-Order:
A

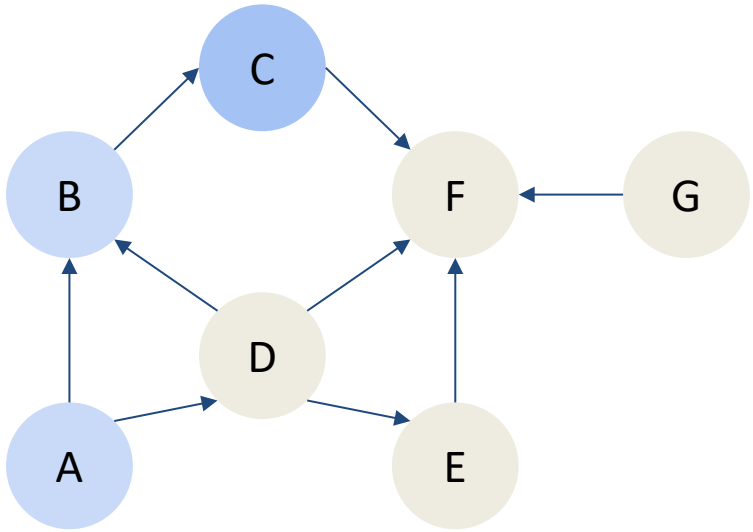
DFS Post-Order:



Stack: A, B

DFS Pre-Order:
A, B

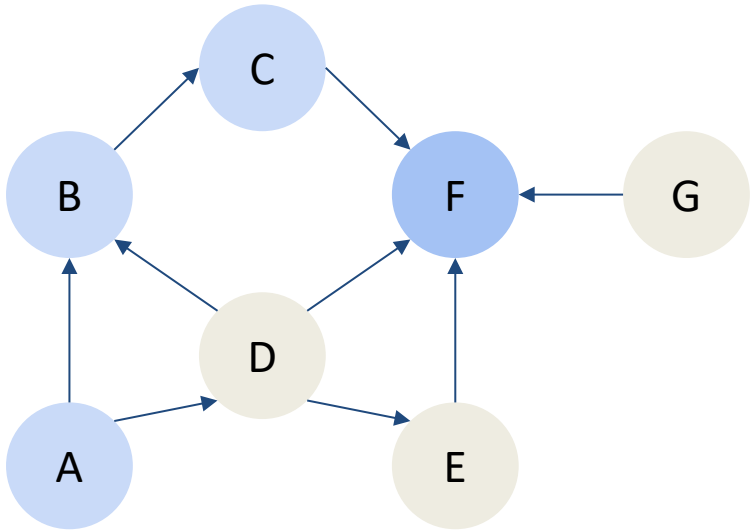
DFS Post-Order:



DFS Pre-Order:
A, B, C

DFS Post-Order:

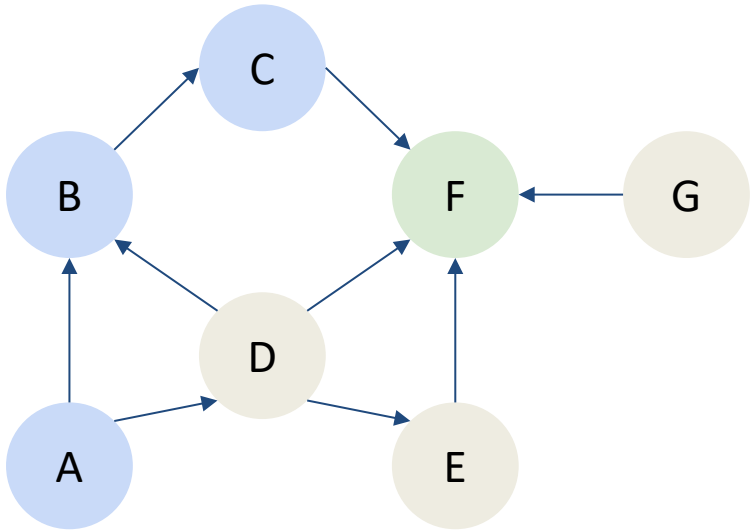
Stack: A, B, C



DFS Pre-Order:
A, B, C, F

DFS Post-Order:

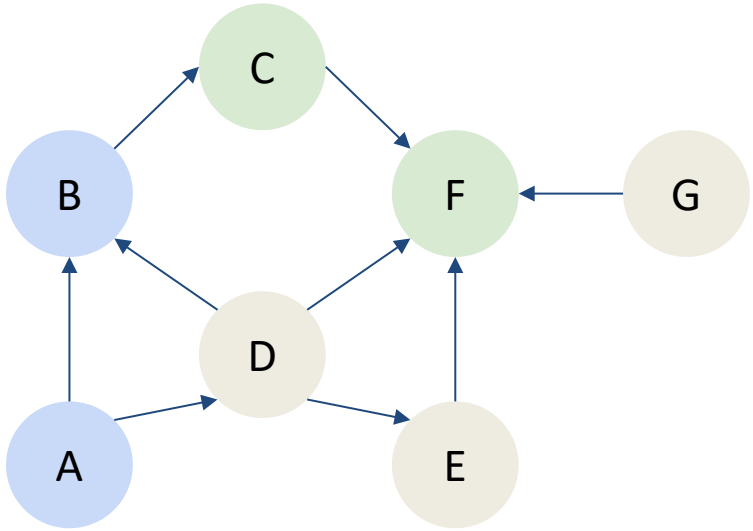
Stack: A, B, C, F



Stack: A, B, C

DFS Pre-Order:
A, B, C, F

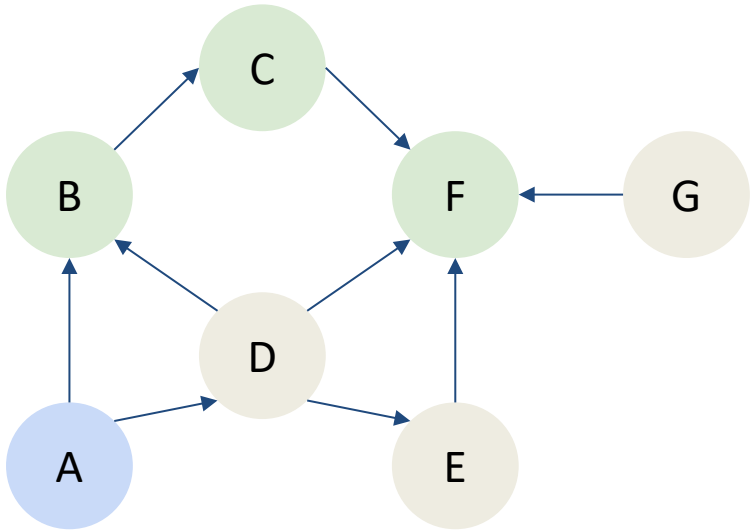
DFS Post-Order:
F



DFS Pre-Order:
A, B, C, F

DFS Post-Order:
F, C

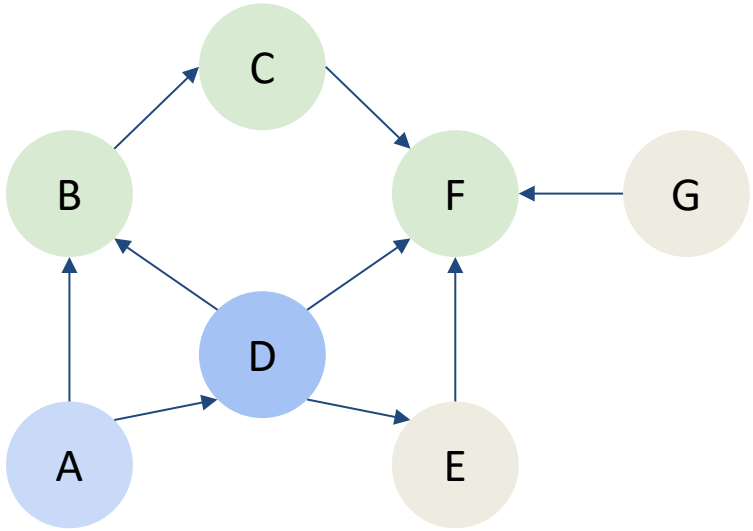
Stack: A, B



DFS Pre-Order:
A, B, C, F

DFS Post-Order:
F, C, B

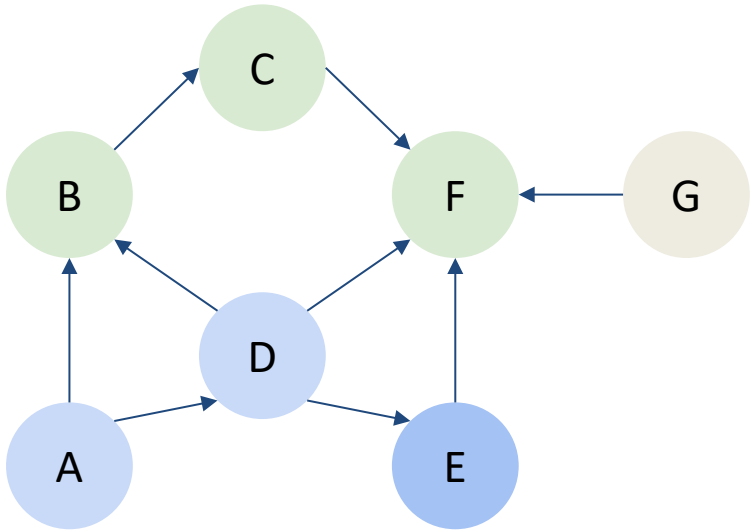
Stack: A



DFS Pre-Order:
A, B, C, F, D

DFS Post-Order:
F, C, B

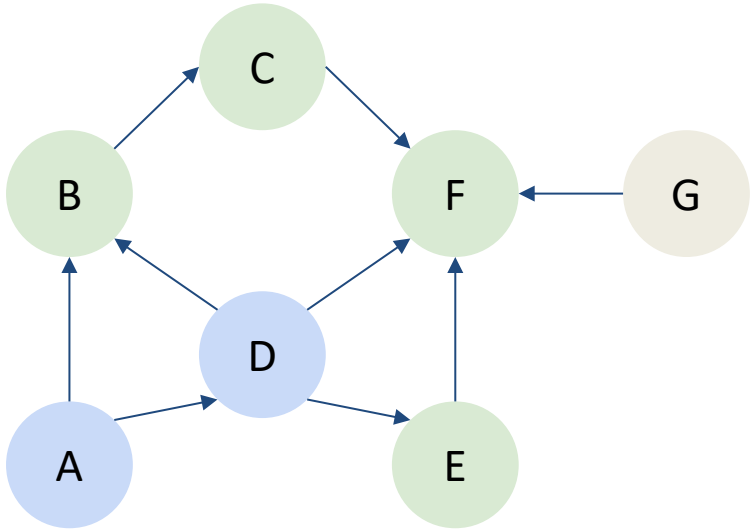
Stack: A, D



DFS Pre-Order:
A, B, C, F, D, E

DFS Post-Order:
F, C, B,

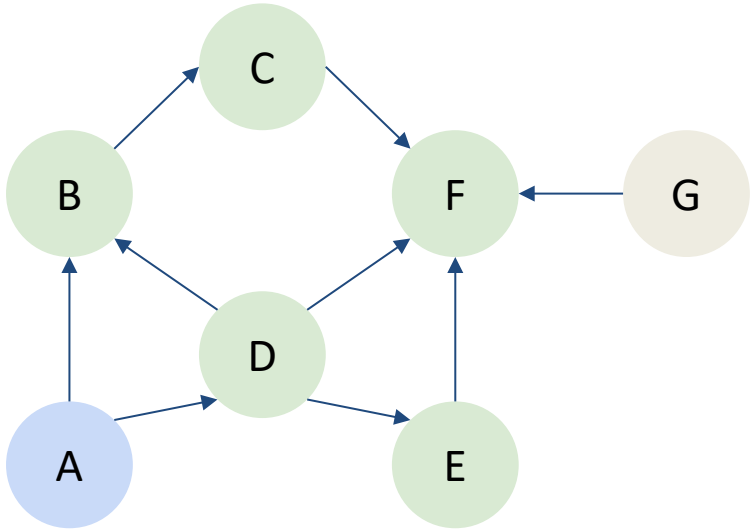
Stack: A, D, E



DFS Pre-Order:
A, B, C, F, D, E

DFS Post-Order:
F, C, B, E

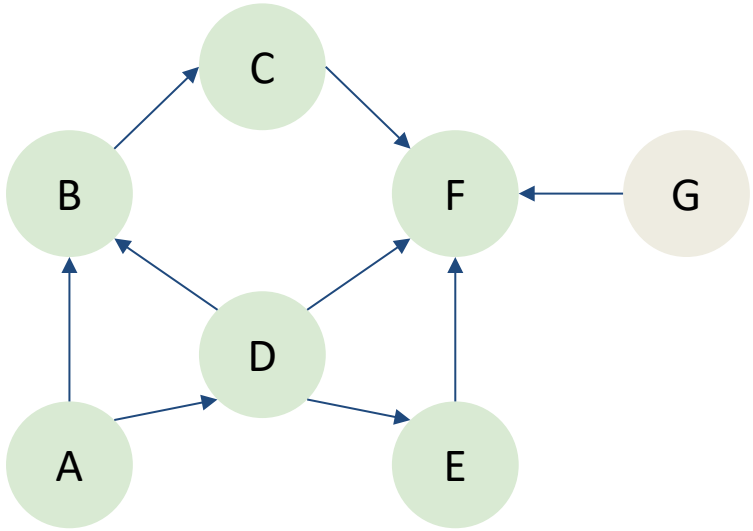
Stack: A, D



DFS Pre-Order:
A, B, C, F, D, E

DFS Post-Order:
F, C, B, E, D

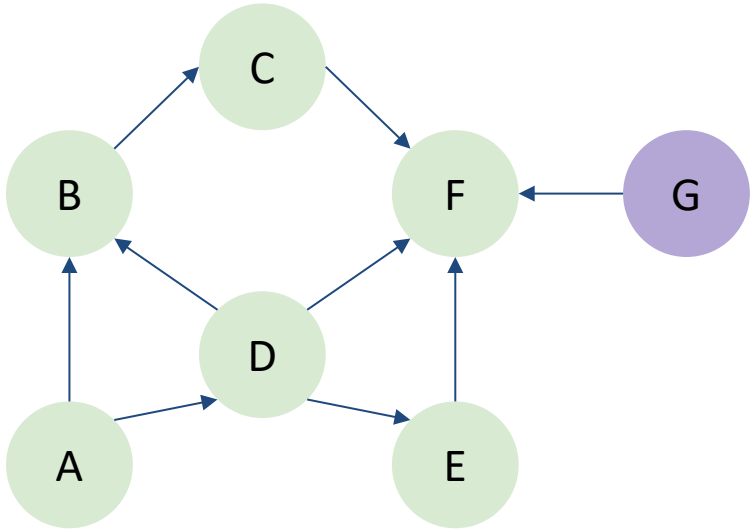
Stack: A,



DFS Pre-Order:
A, B, C, F, D, E

DFS Post-Order:
F, C, B, E, D, A

Stack:



Stack:

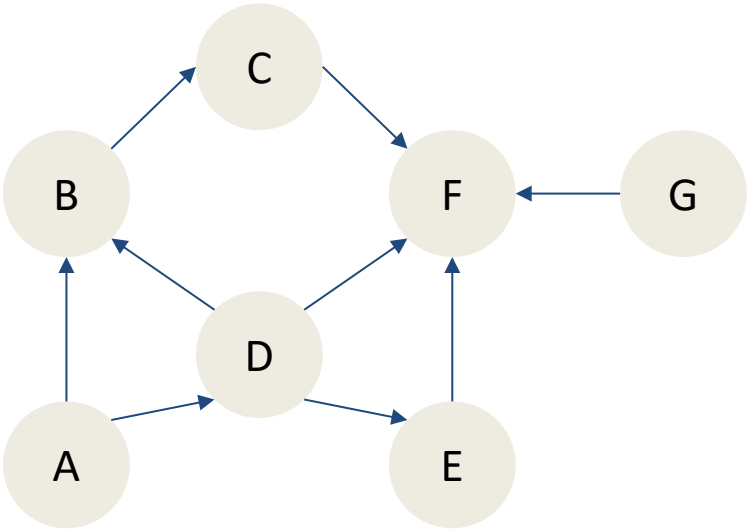
DFS Pre-Order:
A, B, C, F, D, E, G

DFS Post-Order:
F, C, B, E, D, A, G

Toplogical Sort (reverse of DFS Post-Order):
G, A, D, E, B, C, F

* After visiting F, restart on unmarked node G. G would be added to the stack (and forming the last element in both pre-order and post-order traversals)

Q: Graph Traversals (BFS)

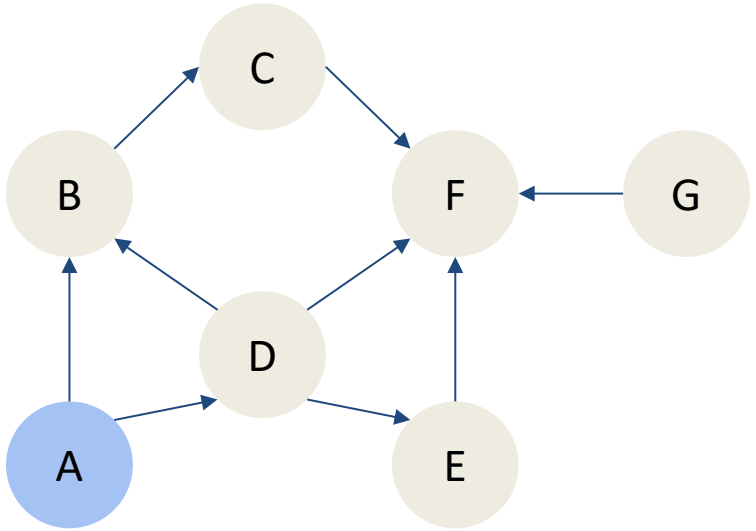


Give the BFS traversal of this directed graph, starting from node A. When there are muliple possible orders of visiting the next node, select the next node in alphabetical order.

BFS:

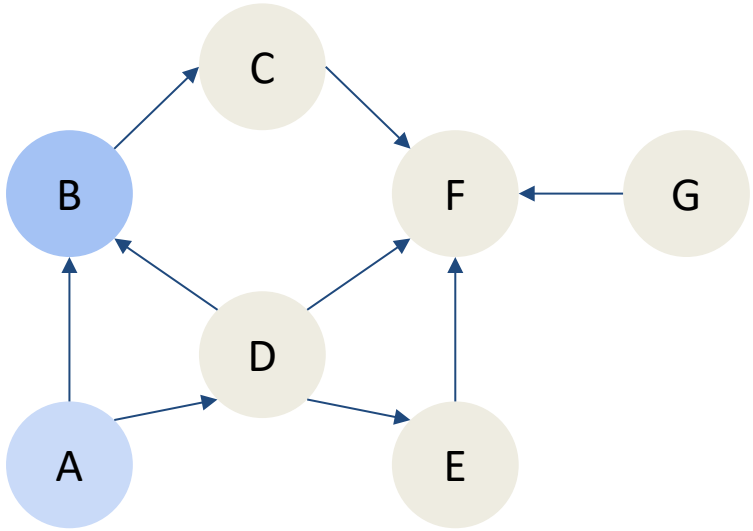
Queue: A

You do NOT need to write out the stack or queue contents in the exam



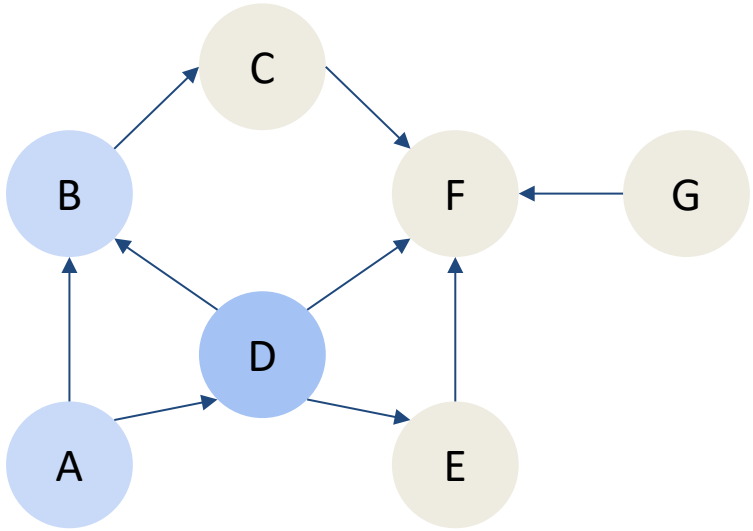
BFS:
A

Queue: B D



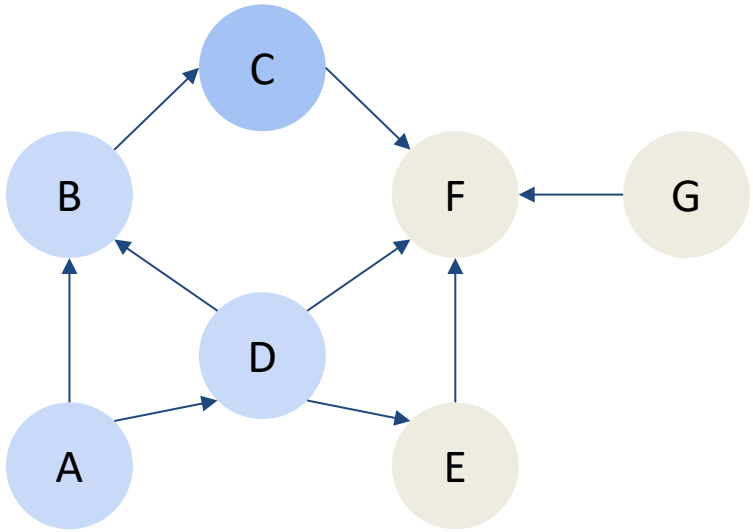
BFS:
A B

Queue: D C



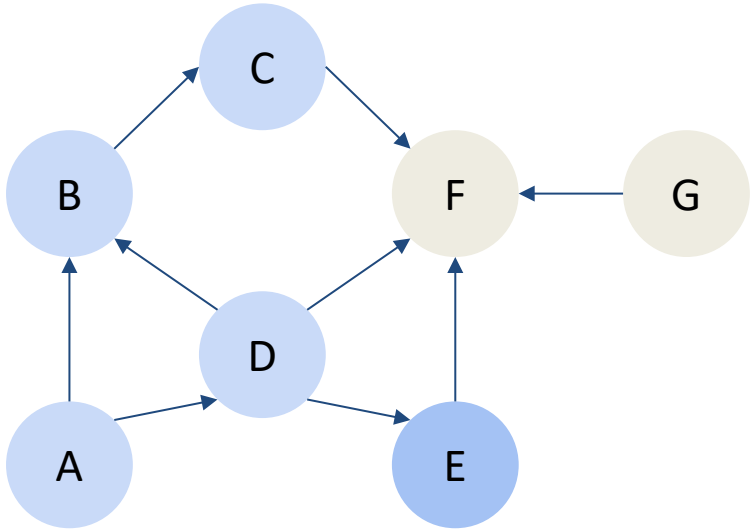
BFS:
A B D

Queue: C E F



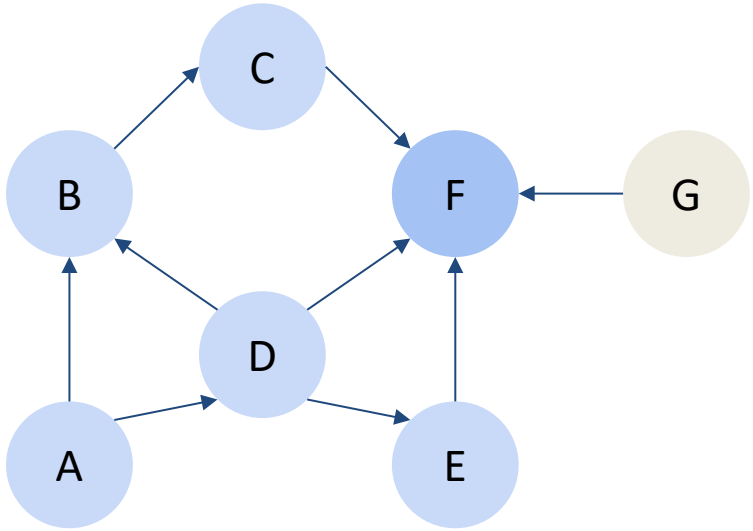
BFS:
A B D C

Queue: E F



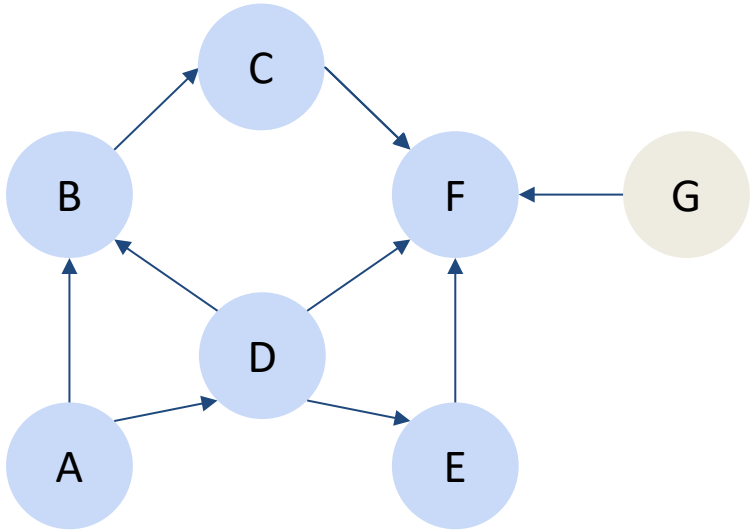
BFS:
A B D C E

Queue: F



BFS:
A B D C E F

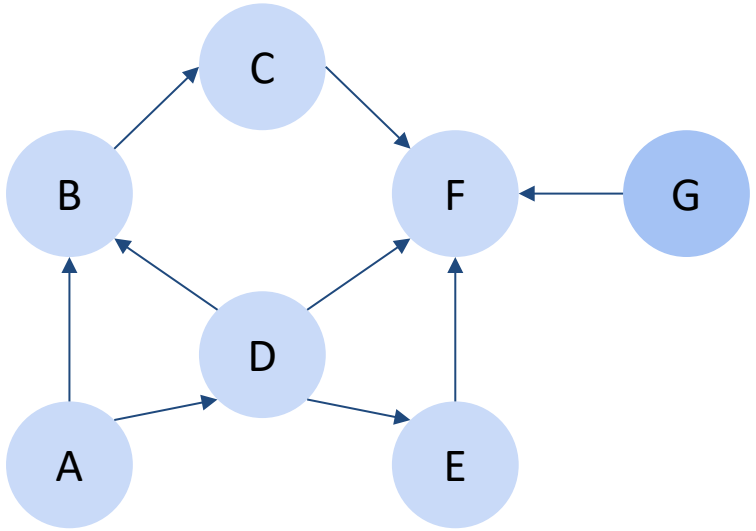
Queue:



BFS:
A B D C E F

Queue: G

Q: Graph Traversals (BFS) ANS

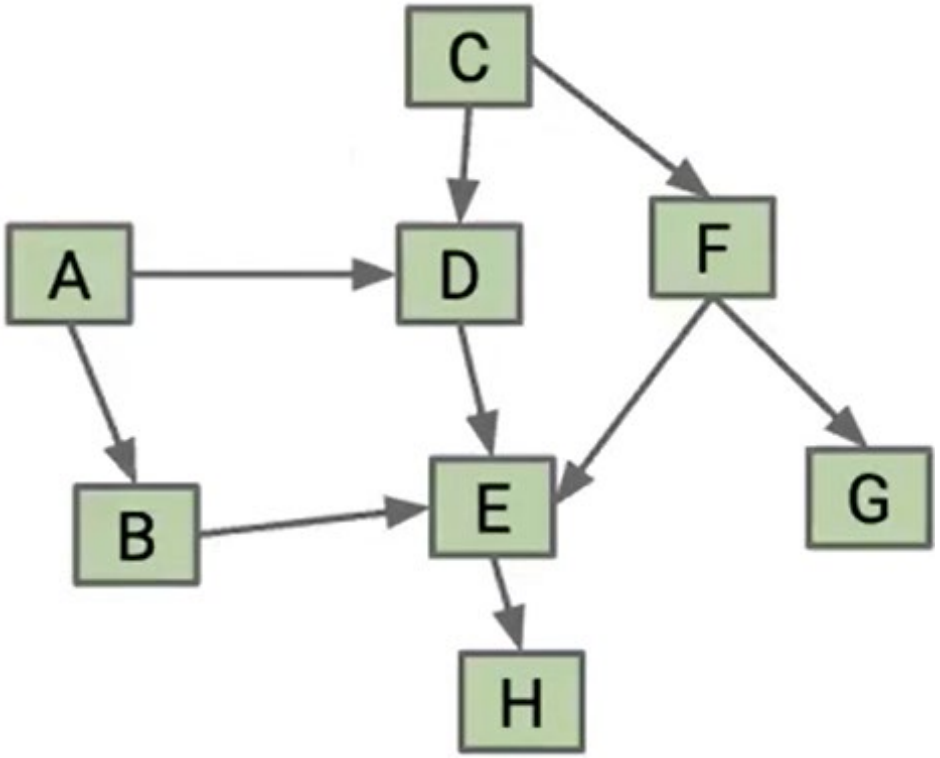


BFS:
A B D C E F G

Queue:

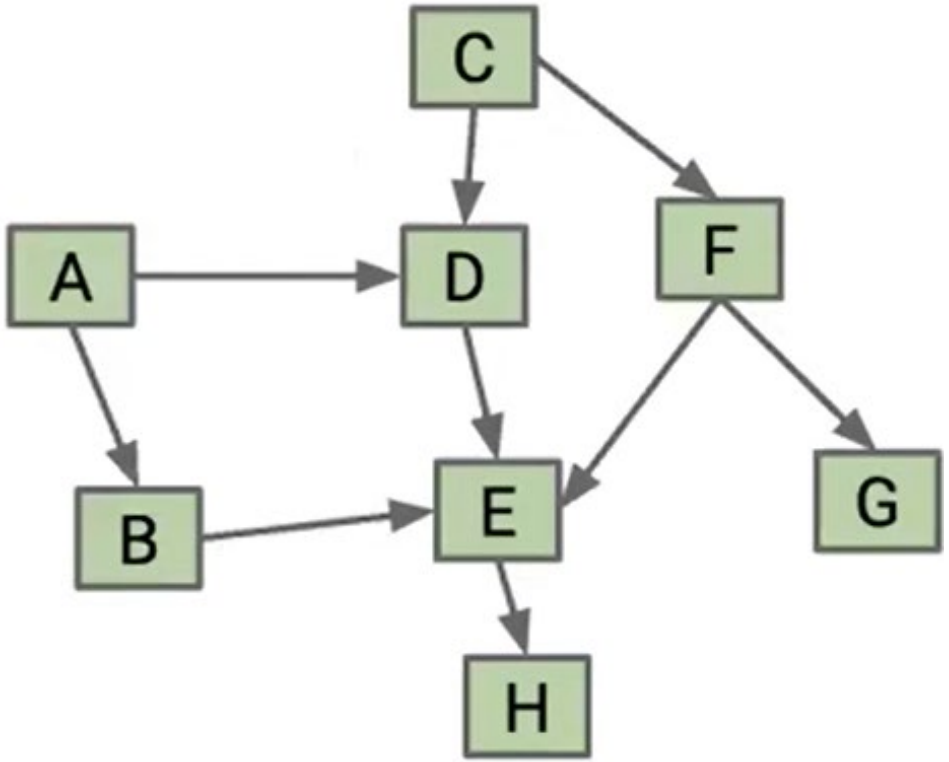
Q. Graph Traversal (Directed Graph)

Give the BFS, DFS pre-order and post-order traversals, topological sort of this directed graph, starting from either A or C. When there are muliple possible orders of visiting the next node, select the next node in alphabetical order.



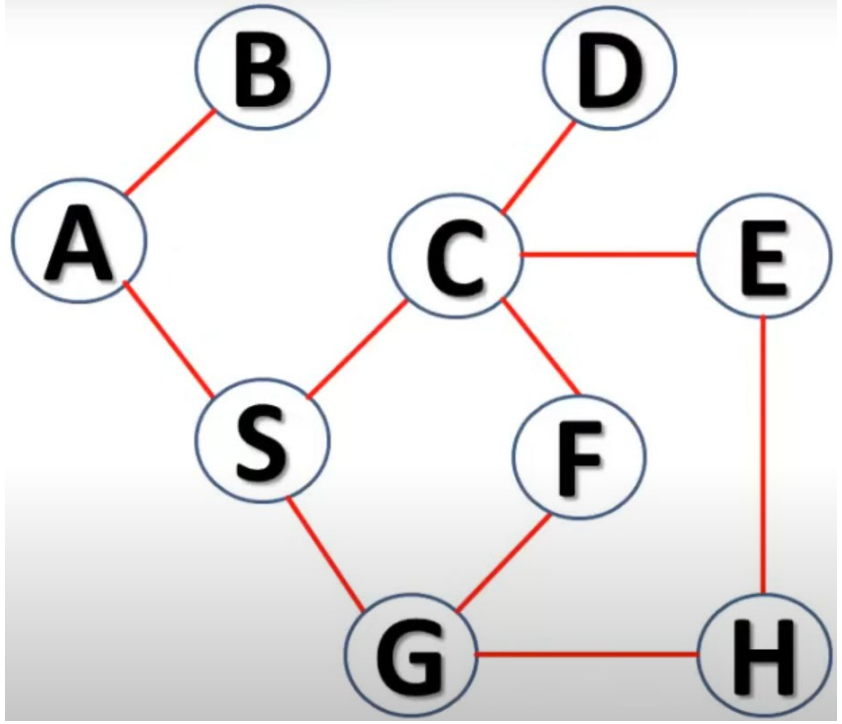
Q. Graph Traversal (Directed Graph) ANS

- Starting from node A:
  - Pre-order traversal: (A, B, E, H, D, C, F, G)
  - Post-order traversal: (H, E, B, D, A, G, F, C)
  - Topological Sort: (C, F, G, A, D, B, E, H)
  - BFS: (A, B, D, E, H, C, F, G)
- Starting from node C, ‘
  - Pre-order traversal: (C, D, E, H, F, G, A, B)
  - Post-order traversal: (H, E, B, D, A, G, F, C)
  - Topological Sort: (C, F, G, A, D, B, E, H)
  - BFS: (C, D, F, E, G, H, A, B)



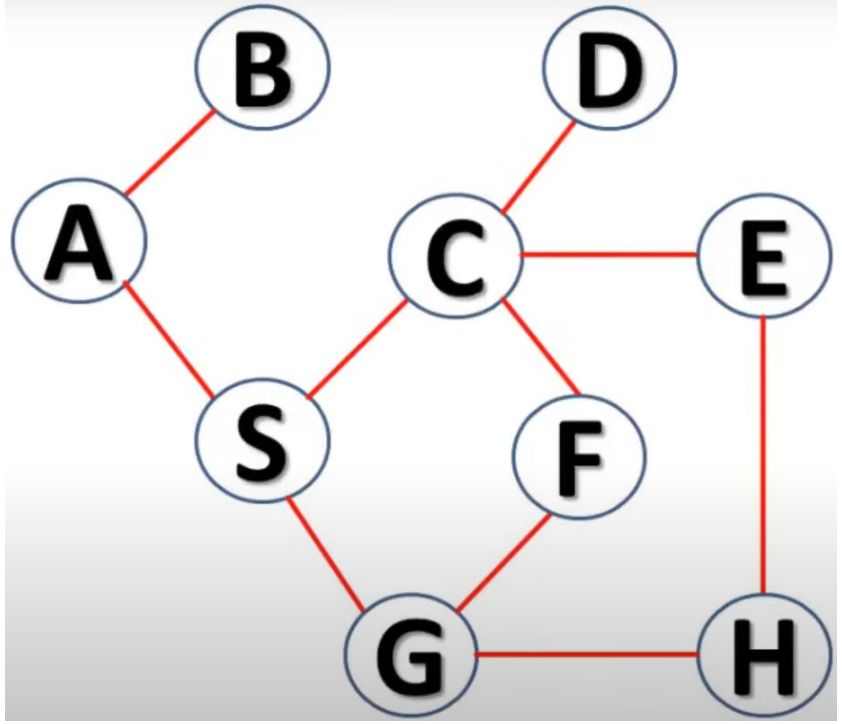
Q. Graph Traversal (Undirected Graph)

Give the BFS, DFS pre-order and post-order traversals of this undirected graph, starting from either A. When there are muliple possible orders of visiting the next node, select the next node in alphabetical order.



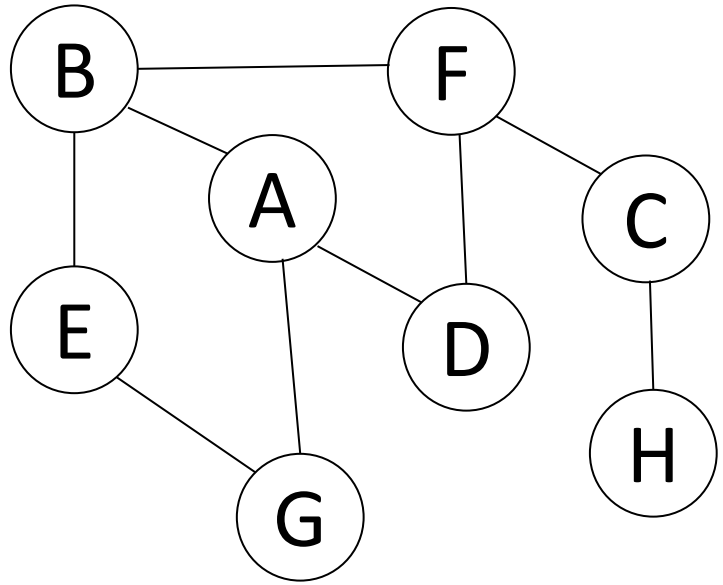
Q. Graph Traversal (Undirected Graph) ANS

- Starting from node A:
  - Pre-order traversal: A B S C D E H G F
  - Post-order traversal: B D F G H E C S A
  - BFS: A B S C G D E F H
  - (Topological Sort: N/A, since it is only for DAG)
- Depth First Search Algorithm, Go GATE IIT
  - https://www.youtube.com/watch?v=iaBEKo5sM7w



Q. Graph Traversal (Undirected Graph)

Give the BFS, DFS pre-order and post-order traversals of this undirected graph, starting from either A. When there are muliple possible orders of visiting the next node, select the next node in alphabetical order.



Q. Graph Traversal (Undirected Graph)

- Starting from node A:
  - Pre-order traversal: A B E G F C H D
  - Post-order traversal: G E B H C F D A
  - BFS: A B D G E F C H
  - (Topological Sort: N/A, since it is only for DAG)
- Graph Traversals - Breadth First and Depth First
  - https://www.youtube.com/watch?v=bIA8HEEUxZI