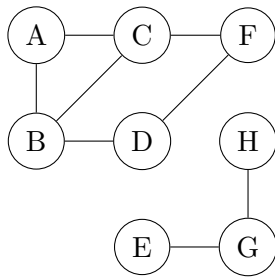


Week 10 Exam Style Practice Problems

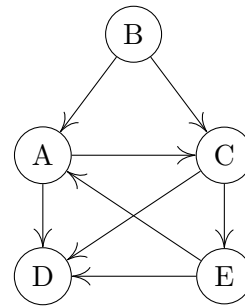
Tobias Edwards

Question 1. Consider the following graphs:

(i)



(ii)

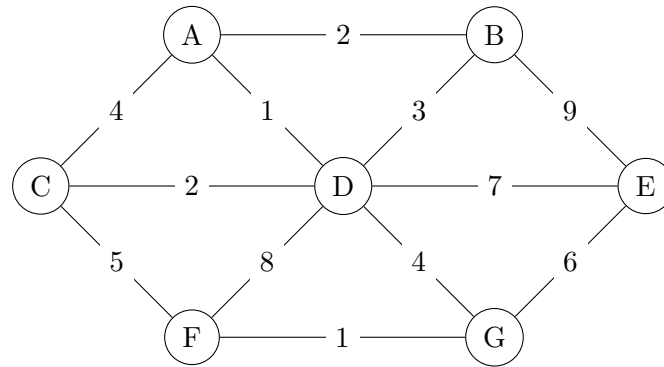


Answer the following questions for graph (i) and graph (ii):

- (a) Which graph is **directed**, and which is **undirected**?
- (b) Give a **path** from A to D in the graph of length 2.
- (c) Which node in the graph has the highest **degree**? In the case of the directed graph, give the node with the highest **in-degree** (*i.e.*, the node with the most incoming edges).
- (d) Identify the **connected components**¹ in the graph.
- (e) Give an example of a **cycle** in the graph.

¹Note that the corresponding concept in a directed graph is called a *strongly connected component*, which is a set of nodes such that there is a path between every pair of nodes (or, alternatively every node can reach every other node).

Question 2. Consider the following *weighted undirected graph*:



Answer the following questions by running the specified graph algorithm. For all parts break ties by visiting nodes in alphabetic order.

- (a) Use the **depth first search** graph traversal algorithm to find a path from A to F.
- (b) Use the **breadth first search** graph traversal algorithm to find a path from A to F.
- (c) Use **Dijkstra's** algorithm to find the *shortest path* from A to F.
- (d) Which algorithm gave the **shortest path**?
- (e) Dijkstra's algorithm is guaranteed to give the shortest path in graphs without negative edge weights. In which situations would **breadth first search** always give the **shortest path**?