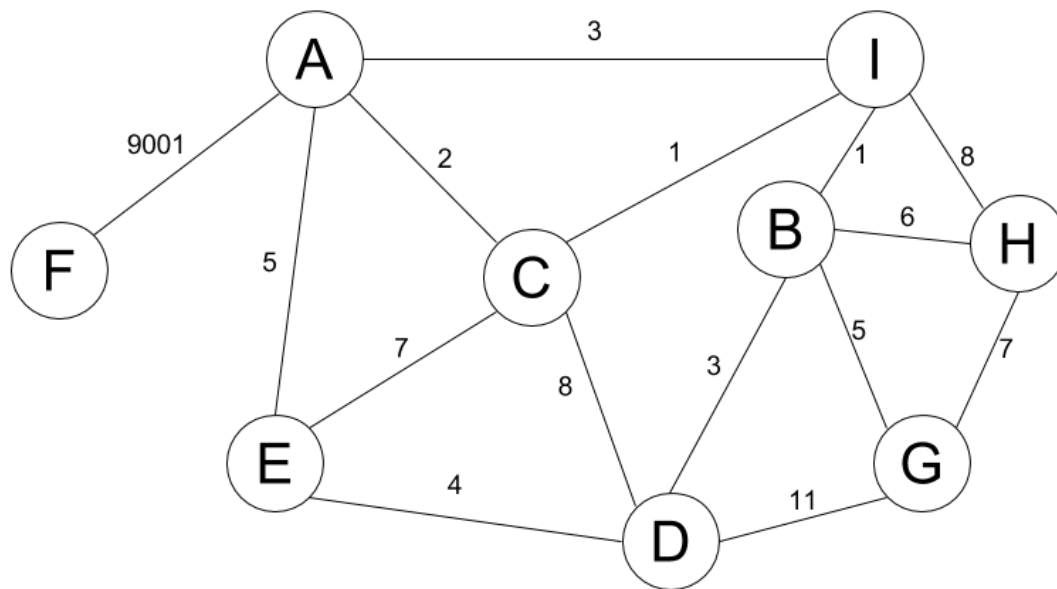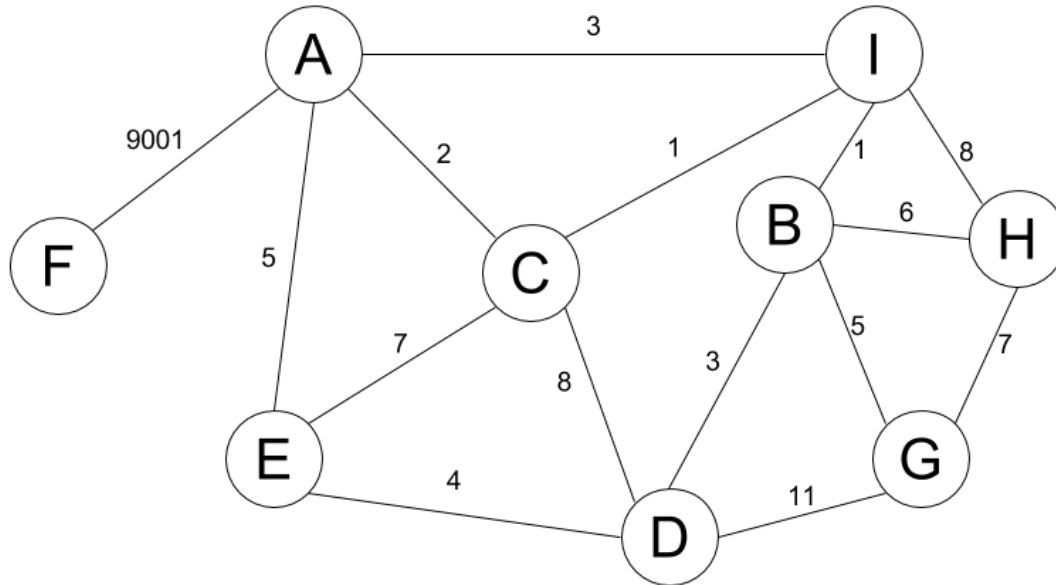# 1 Prims

Suppose we have the graph below, and run Prim's algorithm on the graph **starting from vertex A**.

What is the order that vertices are visited? Enter your answer as a space separated list, e.g. A B C.

2   Kruskals

Suppose we have the same graph from before, which has been recopied below. Run Kruskal's algorithm on the below graph.

(a) Select the edges that are included in the resulting MST. Note, as this is an undirected graph the order of the elements in the edge does not matter. In other words, edge A-B is exactly equivalent to edge B-A. For simplicity, we will only include the alphabetically ordered edges.

[ ] A-F   [ ] A-C   [ ] A-E   [ ] A-I   [ ] C-E   [ ] C-D   [ ] C-I   [ ] D-E   [ ] D-G   [ ]
B-I   [ ] B-D   [ ] B-G   [ ] B-H   [ ] H-I   [ ] G-H

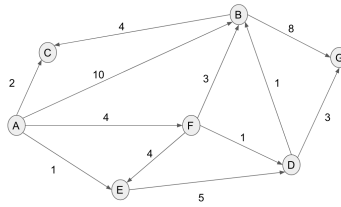(b) If we change the edge AF to 0, would this change the MST found by Kruskals'?

( ) Yes
( ) No

(c) If we change the edge DG to 4, would this change the MST found by Kruskals'?

( ) Yes
( ) No

3 Dijkstra's

All parts of this question refer to the below graph.

Recall Dijkstra's shortest paths algorithm, which finds the shortest path from a starting vertex v to all other vertices in the graph. Run Dijkstra's algorithm on the above graph **starting at vertex A**.

(a) What is the order that vertices are visited? Enter your answer as a space separated list, e.g. A B C.

(b) What is the final edgeTo map?

( ) {'A': null, 'B': 'F', 'C': 'A', 'D': 'F', 'E': 'D', 'F': 'A', 'G': 'D'}

( ) {'A': null, 'B': 'A', 'C': 'A', 'D': 'E', 'E': 'A', 'F': 'A', 'G': 'D'}

( ) {'A': null, 'B': 'F', 'C': 'A', 'D': 'F', 'E': 'A', 'F': 'A', 'G': 'D'}

( ) {'A': null, 'B': 'D', 'C': 'A', 'D': 'E', 'E': 'A', 'F': 'A', 'G': 'D'}

(X) {'A': null, 'B': 'D', 'C': 'A', 'D': 'F', 'E': 'A', 'F': 'A', 'G': 'D'}

( ) None of the above

(c) What is the maximum value we can change the edge BC to so that running Dijkstra's on the modified graph from A **fails to the shortest path** to C? Note that this is a challenging problem so we recommend only attempting it after finishing the rest of the quiz. Hint: Make the edge negative.