

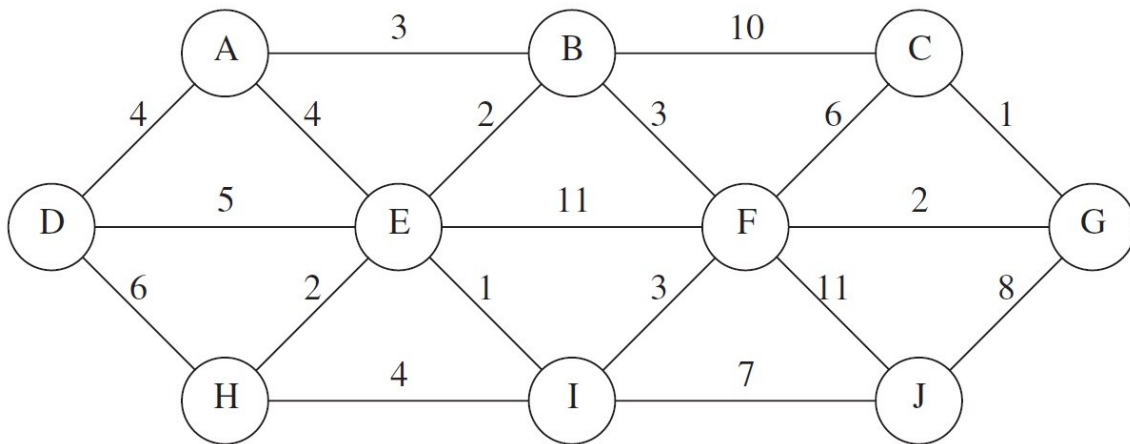
CS218 Data Structures
Spring 2020 FAST-NU, Lahore

Assignment 7 – Graphs

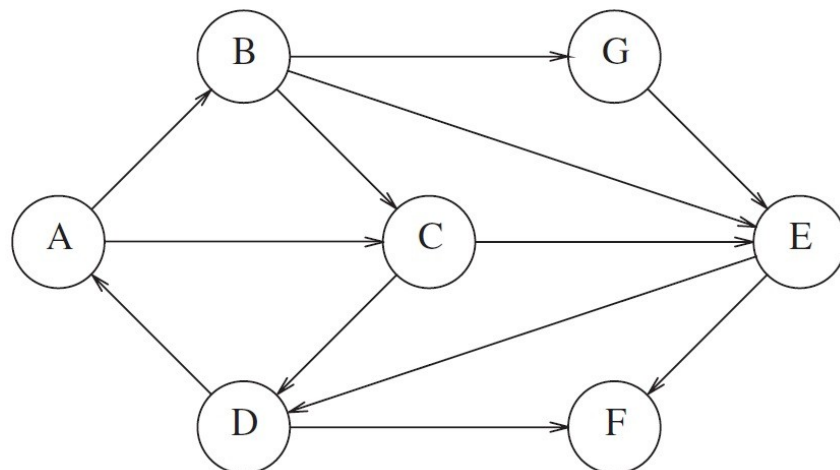
Question 1. We covered the following topics in the lectures. Provide pseudocodes for them:

1. Prim's Algorithm
2. Kruskal's Algorithm
3. Finding Strong Components

Question 2. Find a minimum spanning tree of the graph given in the figure below using both Prim's and Kruskal's algorithms.



Question 3. Find the strongly connected components of the following graph:



Question 4. A graph is k -colorable if each vertex can be given one of k colors, and no edge connects identically colored vertices. Give a linear-time algorithm to test a graph for two-colorability. Assume graphs are stored in adjacency-list format; you must specify any additional data structures that are needed.

Question 5. A bipartite graph, $G = (V, E)$, is a graph such that V can be partitioned into two subsets, V_1 and V_2 , and no edge has both its vertices in the same subset. Give a linear algorithm to determine whether a graph is bipartite.

Question 6. Let G be a directed graph with N vertices. A vertex s is called a **sink** if, for every v in V such that $s \neq v$, there is an edge (v, s) , and there are no edges of the form (s, v) . Give an $O(N)$ algorithm to determine whether or not G has a sink, assuming that G is given by its $n \times n$ adjacency matrix.