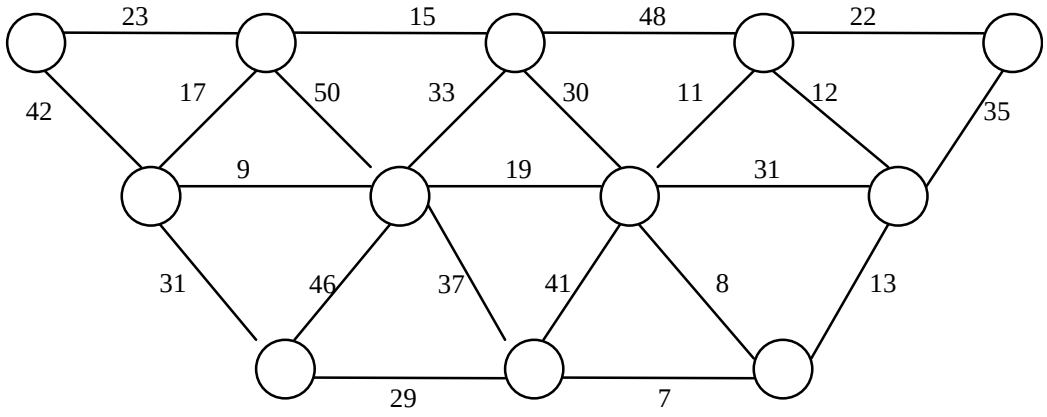
I.E. 2001 OPERATIONS RESEARCH

(*Homework Assignment 10: Due April 16, 2020*)

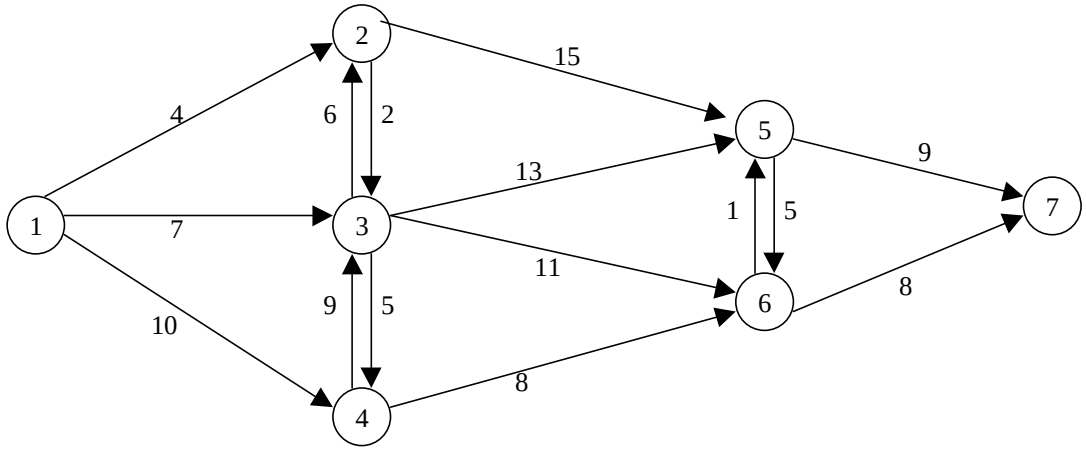
Question 1:

Find the minimum spanning tree for the following network:



Question 2:

In the following network, find the shortest path from Node 1 to every other node in the network, using Dijkstra's algorithm.



Question 3:

Consider the data in Question 2, page 472 of the text. Suppose that currently a total of 600 calls are being sent from NY to LA via the following routing scheme: 100 calls from NY-Memphis-Dallas-LA; 500 calls from NY-Chicago, 250 from Chicago-Denver-LA and 250 from Chicago-Dallas-LA. Using this flow as a starting point, increase the total number of calls from NY-LA as much as possible via the Ford-Fulkerson algorithm and show what the optimal flows are. Verify that the final flow is optimal.

2 Telephone calls from New York to Los Angeles are transported as follows: The call is sent first to either Chicago or Memphis, then routed through either Denver or Dallas, and finally sent to Los Angeles. The number of phone lines joining each pair of cities is shown in Table 39.

a Formulate an LP that can be used to determine the maximum number of calls that can be sent from New York to Los Angeles at any given time.

b Use the Ford–Fulkerson method to determine the maximum number of calls that can be sent from New York to Los Angeles at any given time.

TABLE 39

Cities	No. of Telephone Lines
N.Y.–Chicago	500
N.Y.–Memphis	400
Chicago–Denver	300
Chicago–Dallas	250
Memphis–Denver	200
Memphis–Dallas	150
Denver–L.A.	400
Dallas–L.A.	350

Question 4:

Consider the following network where oil is to be pumped from node 1 (source) to node 8 (sink). The bold-face numbers above each arc represent the maximum rate of flow possible along that arc, and the numbers alongside in parentheses denote the current flow rate; if there are no numbers in parentheses alongside it means that current flow along that arc is equal to zero. Starting with the current flow of 8 units, use the Ford-Fulkerson algorithm to find the maximum flow possible from source to sink.