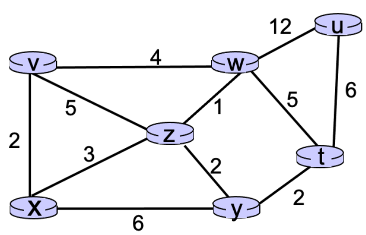
TELCOM 2310: Fall 2022
HW 7: Chapter 5

Solutions must be typed and submitted on Canvas as Word or PDF documents. Please show your steps/reasoning (otherwise we cannot assign partial credit).

You may use your textbook and notes to complete this assignment, and may discuss *concepts* with other students or use online resources that help you better understand the concepts involved. **You are NOT permitted look at other students' solutions, or online solutions to substantially similar problems. Similarly, you are not permitted to share your solutions with other students, or post your solutions online. Ask the instructor if you have any questions about this policy.**

1. Consider the network depicted below.



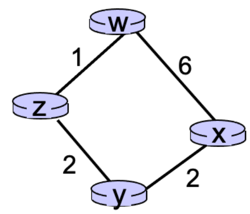
Step	N'	D(t),p(t)	D(u),p(u)	D(v),p(v)	D(w),p(w)	D(y),p(y)	D(z),p(z)
0	x	inf	inf	2,x	inf	6,x	3,x
1							
2							
3							
4							
5							
6							

(a) Using Dijkstra's algorithm, compute the shortest path from node x to all other nodes. Show the steps the algorithm takes by completing the table above, similar to the example we did in lecture.

(b) Based on your result from part (a), draw the resulting least-cost-path tree from x (see example from Lecture 13).

(c) Based on your result from part (a), write out the forwarding table at node x. That is, for each destination, which outgoing link will x use? Denote x's outgoing links as (x,v), (x,y), and (x,y).

2. Consider the network depicted below. Assume that this network uses *distance vector* routing. Initially, each node only knows its own link costs, resulting in distance tables as shown below.



Node w	w	x	y	z
w	0	6	inf	1
x				
z				

Node x	w	x	y	z
w				
x	6	0	2	inf
y				

Node y	w	x	y	z
x				
y	inf	2	0	2
z				

Node z	w	x	y	z
w				
y				
z	1	inf	2	0

(a) Assume the protocol operates in synchronous time steps: if some node a sends out an update to some other nodes b,c,d at time T = 0, all b,c,d receive and process that update at time T = 1. If that causes any of b,c,d to send out an update, it will be received at time T = 2, and so on. At time T = 0, the initial distance tables are as shown above. Show the state of all four distance tables at time T = 1 (i.e. after the first vector exchange + processing).

(b) After the vector exchange + processing described in part (a), i.e. at time T = 1, have the routes converged to a state where no further updates will be sent (assuming the costs of the links remain as shown)? If yes, state why. If no, give an example of 1 vector that will be sent at time T = 1, and state which node(s) it will be sent to.

3. Consider our discussion of BGP policies and route advertisements.

(a) Suppose a small ISP X pays a larger ISP A to connect it to the rest of the Internet and also pays another ISP B to provide a fall-back connection to the Internet in the event that the loses connectivity via ISP A. If ISP X learns of a path to some prefix via ISP A, should it advertise that path to ISP B? Why or why not?

(b) Consider 2 small ISPs Y and Z and two large ISPs A and B. Y pays A (but not B) to connect it to the rest of the Internet, while Z pays B (but not A) for its connectivity. If ISP A learns of a path to some prefix via ISP B and ISP Z, should it advertise that path to ISP Y? Why or why not?