CMPEN/EE 362 - HW5

Student Name: ___________________________________

Problem 1

Consider the network shown in Figure 1.

a) Use Dijkstra's algorithm to compute the minimum-cost paths from c to all the nodes. You need to show the steps by giving a table as shown in class.
b) Give the resulting routing tree from c.
c) Give the resulting forwarding table at c (each entry has fields "destination" and "link" as shown in class).

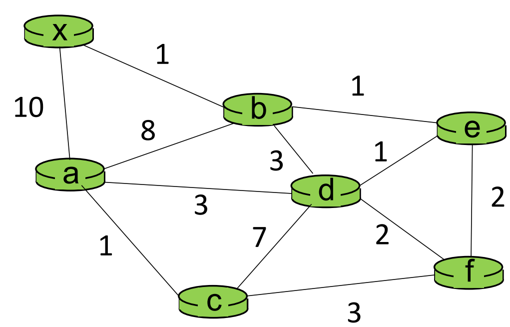

Figure 1. Example for Dijkstra's algorithm

Problem 2

Consider the network shown in Figure 2. Suppose that the network uses a synchronous version of DV algorithm, where in each iteration, each node exchanges its distance vectors (computed in the previous iteration) with its neighbors and updates its distance vectors based on the exchanged information. Let $D_i(x)$ and $n_i(x)$ denote the distance and the next-hop node to route from node i to node x (i= y, w, z).

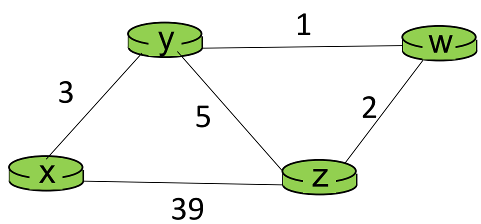

Figure 2. Example for DV algorithm

a) Complete the following table by giving values of $D_i(x)$ and $n_i(x)$ to show how DV converges. You need to show all iterations until convergence. How many iterations does it take to converge? (Recall: DV needs an extra iteration after the last distance vector update to inform the neighbors.)

source	iteration t=0	t=1	t=2	…
i = y	3, x			
i = w	∞			
i = z	39, x			

b) Suppose that poisoned reverse is not used. Suppose now that the link cost between x and y increases to 50. Use a table similar to the one used in a) to show how DV re-stabilizes from the previous stable state (i.e., initially, it is in the stable state computed in a)). How many iterations are needed for DV to converge?

c) Repeat b), but now suppose that poisoned reverse is used. How many iterations are needed now? Does poisoned reverse prevent the count-to-infinity problem (i.e., does it prevent routing loop)?

d) What is the minimum integer value of c(y, z) such that there is no count-to-infinity when c(x, y) changes from 3 to 50, if poisoned reverse is used?

Problem 3

Consider the network shown in Figure 3. Suppose that AS1 and AS2 use OSPF (basically Dijkstra's algorithm) for their intra-AS routing, and AS3 and AS4 use IGRP for intra-AS routing. Initially, *no physical link* exists between AS4 and the other ASes. Suppose all the intra-AS links have equal cost.

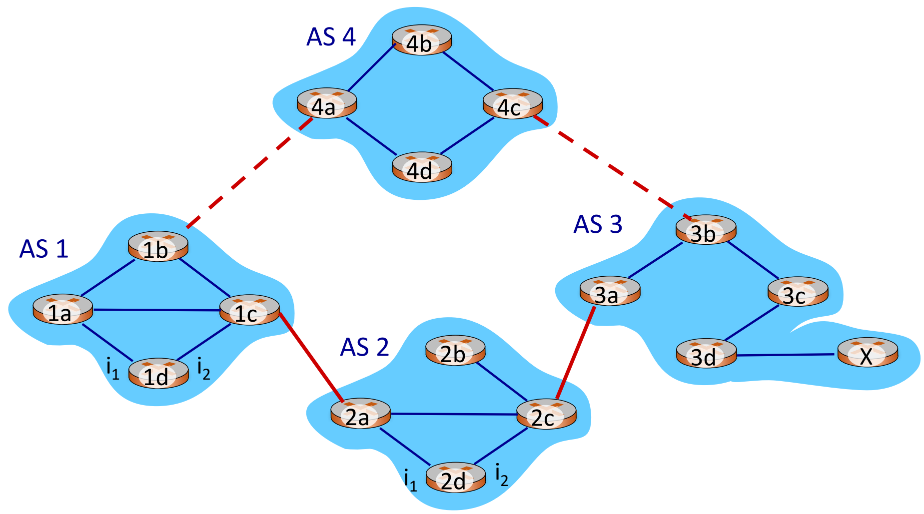

Figure 3. Example of BGP.

a) Give the routing protocol used to learn about prefix x at each of the following routers: 3a, 2c, 2d, 1a. (hint: select among OSPF, IGRP, eBGP, iBGP)

b) Which interface (i_1 or i_2) will router 2d use to reach x? Why?

c) Now suppose that links are added between AS4 and AS1/AS3 as shown in Figure 3. Suppose router 2d learns that x is reachable via both AS3 and AS1, with identical local preference. Which interface will 2d use to reach x? Why?

d) Again suppose that links are added between AS4 and AS1/AS3 as shown in Figure 3. Suppose router 1d learns that x is reachable via both AS2 and AS4, with identical local preference. Which interface will 1d use to reach x? Why?