Homework Assignment 2: 100 points
Due date: May 3, 2023 (Wednesday)

Question 1: (25 points)
Regarding the MAC address
(a) What is the binary form of the MAC address of "1A-2F-BB-76-09-AD"? (5 points)
(b) What is the special meaning of the MAC address of "FF-FF-FF-FF-FF-FF"? (5 points)
(c) What the difference between the MAC address and IP address? (5 points)
(d) As shown in Figure 1, suppose that host A sends a datagram to host B. Will the source/destination IP addresses be changed when the datagram traverses through the router R? (5 points)
(e) As shown in Figure 1, suppose that host A sends a datagram to host B. Will the source/destination MAC addresses be changed when the frame traverses through the router R? (5 points)

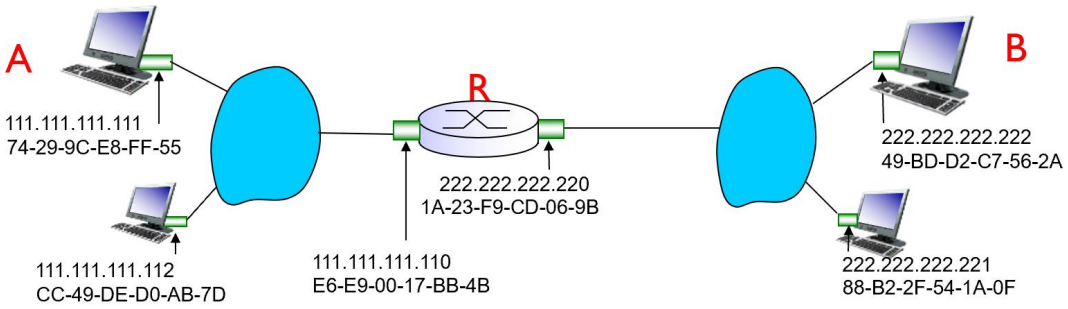

Figure 1

Question 2: (15 points)
(a) What does "ARP" refer to? (5 points)
(b) Suppose that host A aims at sending a datagram to host B in a same LAN. Host A knows host B's IP address. However, host A does not know host B's MAC address. Please specify the procedures when host A runs ARP to obtain host B's MAC address. (10 points)

Question 3: (20 points)
Consider the network topology as shown in Figure 2. Suppose that all routers use Link-State based routing algorithm for finding the optimal routing.

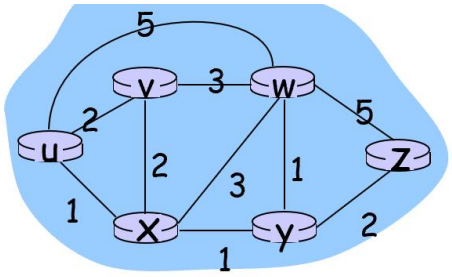

Figure 2

(a) Consider that router "u" is performing the Link-State routing algorithm. Please specify the detailed procedures for performing the Dijkstra algorithm by filling the following table. (10 points)

Step	N'	D(v), p(v)	D(w), p(w)	D(x), p(x)	D(y), p(y)	D(z), p(z)
0						
1						
2						
3						
4						
5						

(b) Consider that router "z" is performing the Link-State routing algorithm. Please specify the detailed procedures for performing the Dijkstra algorithm by filling the following table. (10 points)

Step	N'	D(v), p(v)	D(w), p(w)	D(x), p(x)	D(y), p(y)	D(u), p(u)
0						
1						
2						
3						
4						
5						

Question 4: (20 points)

(a) Consider the network topology shown in Figure 3. Suppose that the distance vector based algorithm is used for routing. Please specify convergence process as shown in the following Figure 4. (10 points)

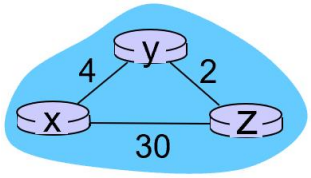

Figure 3

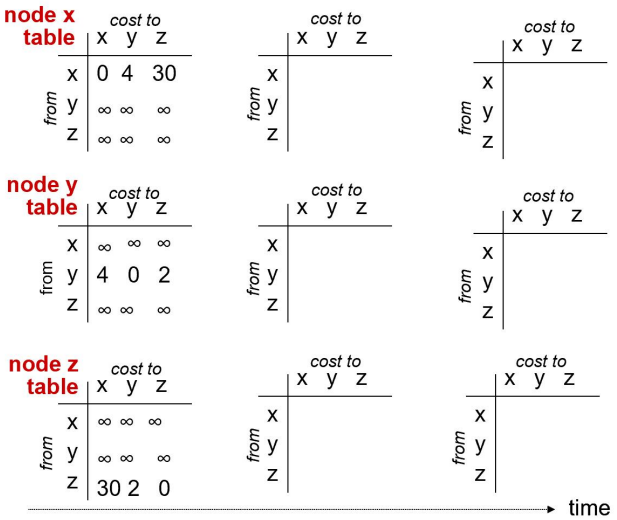

Figure 4

(b) After convergence of the distance vector based algorithm in the above Question 4(a), if the link cost between router x and router y is increased to 60 as shown in Figure 5 below, will the distance vector based algorithm converge quickly after this increased link cost? Please explain your reasons. (10 points)

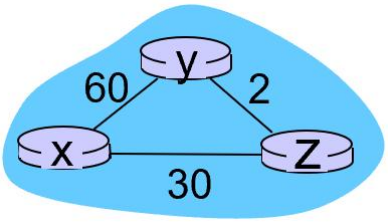

Figure 5

Question 5: (20 points)

(a) Consider the following with three autonomous systems (ASs) as shown in Figure 6. Does router "3b" perform both the Inter-AS routing algorithm and Intra-AS routing algorithm simultaneously? Please explain your reasons. (10 points)

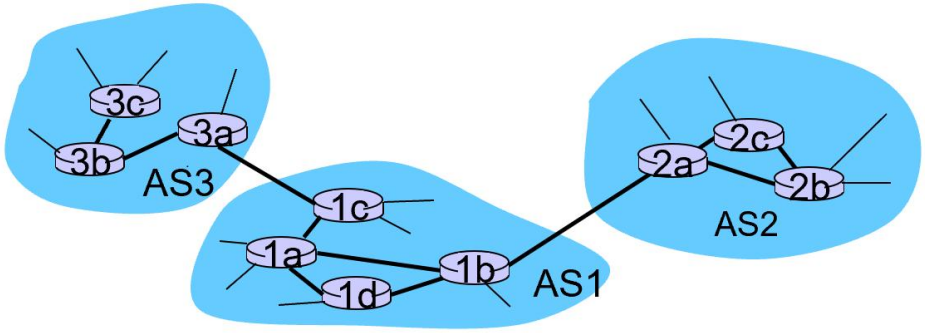

Figure 6

(b) Please specify an example of Intra-AS routing algorithm and an example of Inter-AS routing algorithm. (10 points)