CS305: Computer Networking
2022 Fall Semester Written Assignment # 2

Please answer questions in English and submit through Sakai.

Please submit all your answers in ONE PDF file.

Q 1. Consider a datagram network using 8-bit host addresses. Suppose a router has four links, numbered 0 through 3, and uses longest prefix matching. It has the following forwarding table:

Prefix Match	Interface
111	0
111000	1
111111	2
otherwise	3

(a) For each of the four interfaces, give the associated range of destination host addresses and the number of addresses in the range.

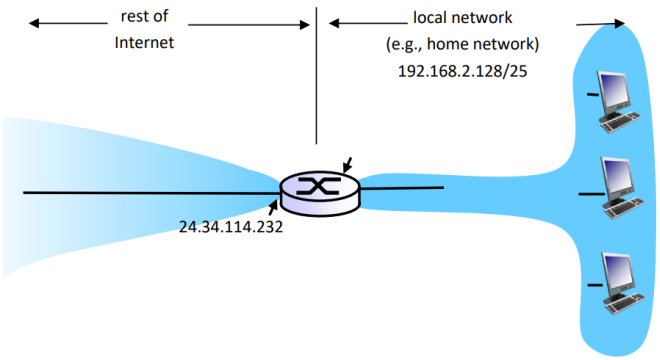
(b) Describe how your forwarding table determines the appropriate link interface for 11001000, 11100001, and 11110000, respectively.

Q 2. Suppose an ISP owns the block of addresses of the form 128.119.40.0/23. Suppose it wants to create four subnets from this block and assign them to four organizations, respectively.

- Organization 1: at least 200 IP addresses
- Organization 2: at least 96 IP addresses
- Organization 3: at least 62 IP addresses
- Organization 4: at least 60 IP addresses

What are the prefixes (of form a.b.c.d/x) for the four subnets?

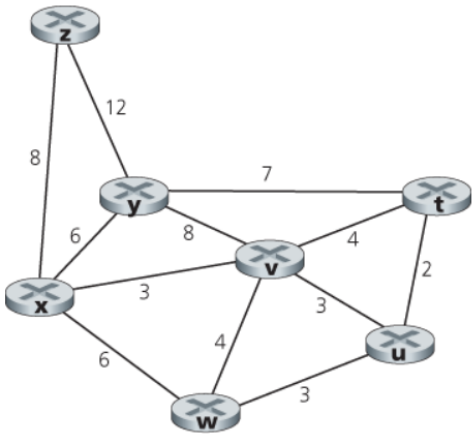
Q 3. Consider the network setup in the figure below. Suppose that the ISP instead assigns the router the address 24.34.114.232 and the network address of the home network is 192.168.2.128/25.



(a) Assign addresses to the interfaces of the three hosts in the home network.

(b) Consider two hosts with IP addresses 192.168.2.200 and 192.168.2.201. Each host has two ongoing TCP connections, associated with port numbers 3000 and 3001, respectively. All these TCP connections are connected to port 80 at server host 128.121.40.87. Provide the four corresponding entries in the NAT translation table. For the information we do not provide, you can choose any values as long as they are feasible.

Q 4. Consider the following network. With the indicated link costs, use Dijkstra's shortest-path algorithm to compute the shortest path from x to all network nodes. Show how the algorithm works by computing a table similar to Table 5.1 in our textbook (or the table on Page 49 in lecture note 10).



Q 5. Consider a network as shown in the figure below. The distance vector algorithm is used to calculate the forwarding table. Assume that the distance vectors have already been calculated correctly, then both x and y detect that the link cost $c(x, y)$ and $c(y, x)$ changed from 4 to 60, if the poisoned reverse is used (z tells y that $D_z(x)$ is infinite if packets from z to x go through y, similar for x). Note: although the values of $c(x, y)$ and $c(y, x)$ are the same in the recent setting, $c(x, y)$ and $c(y, x)$ are not interchangeable when using the Bellman-Ford equation.

- Write down how the distance vectors of these routers change resulting from the link cost change until the algorithm converges. Draw tables similar as those in Figure 5.6 in our textbook (or the tables on Page 16 in lecture note 11).
- Provide the messages (i.e., the distance vector) transmitted during the procedure.