Homework assignment 3, CIS 427, Fall 2022

Submission Due: 11:59 PM, 11/10/2022

1. (24 points) Suppose a route has built up the routing table shown in the following table.

SubnetNumber	SubnetMask	Next hop
128.96.39.0	255.255.255.128	Interface 0
128.96.39.128	255.255.255.128	Interface 1
128.96.40.0	255.255.255.128	R2
192.4.153.0	255.255.255.192	R3
Default		R4

The router can deliver packets directly over interfaces 0 and 1, or it can forward packets to routers R2, R3, or R4. Describe what the router does with a packet addressed to each of the following destinations:

(a) 128.96.39.138

(b) 128.96.39.24

(c) 128.96.40.14

2. (20 points) The following table is a routing table using CIDR. Address bytes are in **hexadecimal**.

Net/MaskLength	Next hop
C4.50.00.00/12	A
C4.5E.10.00/20	B
C4.60.00.00/12	C
C4.68.00.00/14	D
80.00.00.00/1	E
40.00.00.00/2	F
00.00.00.00/2	G

State to what next hop the following will be delivered.

(a) C4.5E.8A.82

(b) C4.6B.23.09

(c) 3E.43.92.12

(d) C4.63.31.2E

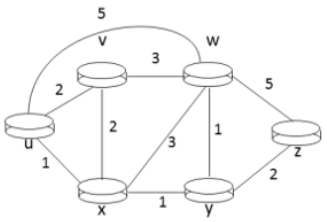
3.(26 points) Link-state routing protocols (8 points each for a and b, 10 for c)

This question explores how to set the (configurable) link weights in link-state routing protocols like OSPF inside a single Autonomous System (AS) to achieve AS-wide goals.

a) How should the network operators set the link weights if their goal is to minimize the number of hops each packet traverses to reach its destination?

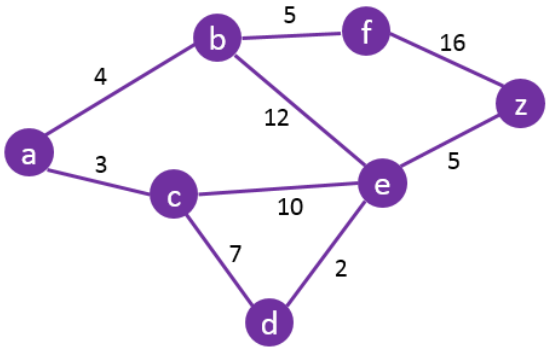
b) How should the operators set the link weights to minimize the end-to-end delay the traffic experiences? Assume the network is lightly loaded, so queuing delay is insignificant.

c) Using the Dijkstra shortest-path algorithm, one can compute the shortest path from node u to all network nodes. Given a 6-node network illustrated in the figure below. The table underneath indicates the steps deriving the cost (denoted by D) and previous hop (denoted by p) on the shortest paths.



Travel Set	D(v),p(v)	D(w),p(w)	D(x),p(x)	D(y),p(y)	D(z),p(z)
u	2,u	5,u	1,u	infinity	infinity
ux	2,u	4,x		2,x	infinity
uxy	2,u	3,y			4,y
uxyv		3,y			4,y
uxyvw					4,y
uxyvwz					

Now, consider the 7-node network illustrated in the figure below. Generate the table indicating the steps deriving the cost and previous hop on the shortest paths from node *a* to all other network nodes. Note that when the path costs are equal, add nodes to the Travel Set in alphabetic order.



4.(30 points) Distance Vector Routing Protocols

Consider the network shown above in Problem 4.

a) What are A, B, C, D, E, and F's distance vectors? Note: you do not have to run the distance vector algorithm; you should be able to compute distance vectors by inspection. Recall that a nodes distance vector is the vector of the least cost paths from itself to each of the other nodes in the network.

b) Now consider node C. From which other nodes does C receive distance vectors?

c) Consider node C again. Through which neighbor will C route its packets destined to z? Explain how you arrived at your answer, given the distance vectors that C has received from its neighbors.