CSE3300/5299: Computer Networking

Homework 5

Due Date: Sunday, November 16, 2025. Submission through HuskyCT. Full score: 100 for both CSE3300 and CSE5299 students.

1. **Subnet Address (15 points).** Consider a router that interconnects three subnets: Subnet 1, Subnet 2, and Subnet 3. Suppose all of the interfaces in each of these three subnets are required to have the prefix 137.99.17/24. Also suppose that Subnet 1 is required to support up to 80 interfaces, and Subnet 2 and 3 are each required to support up to 40 interfaces. Provide three network addresses (of the form a.b.c.d/x) that satisfy these constraints. Please justify that your design works, i.e., the address blocks of the three subnets do not have any overlap, the address block of each of three subnets is within 137.99.17/24, and each of the subnets has a sufficient number of IP addresses.

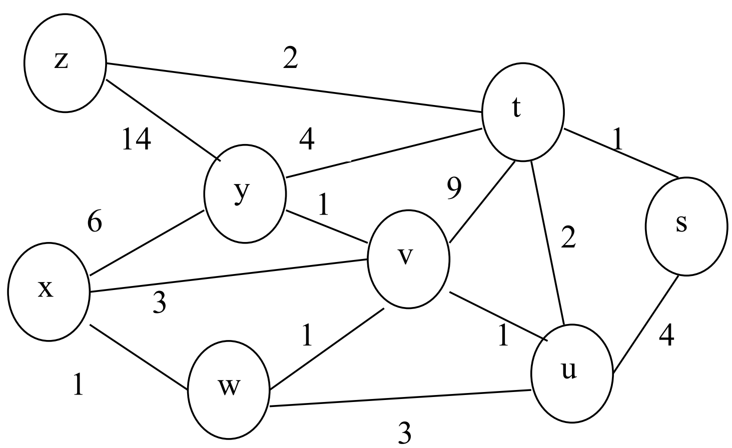
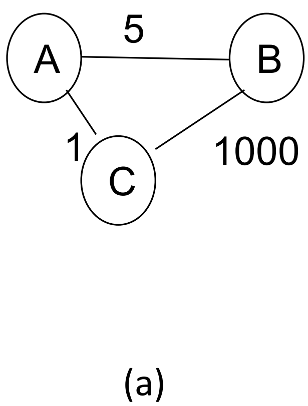


Figure 1: A graph of routers with cost on each link. Run Link State routing protocol to find the shortest path from x to the other nodes.

2. **Link State Routing (15 points).** Consider the network shown in Fig. 1. With the indicated link costs, use Dijkstra's shortest path algorithm to compute the shortest path from x to all other network nodes. Show your computation using a table as was done in class. Your table should show:
   Step N' $\quad D(s), P(s) \quad D(t), P(t) \quad D(u), P(u) \ldots D(z), P(z)$.

3. **Distance Vector Routing (30 points).**

   a. (10 points) Consider the network shown in Fig. 2(a) with the indicated link costs. Use distance vector routing algorithm to obtain the distance vector table at each node until convergence. Assume that all nodes exchange messages with their neighbors within one time step. Show your intermediate steps as in the slides.



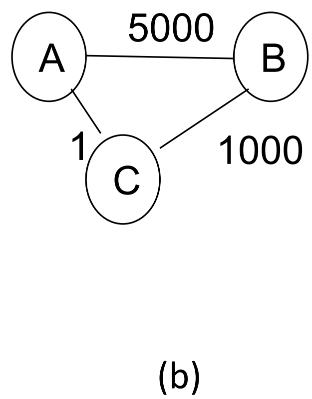


Figure 2: A graph of three routers with cost on each link. Run Distance Vector algorithm on the graph. (a) The original graph. (b) The graph after one link cost is increased.

b. (10 points) Suppose at a later time, the cost of one link is increased (see Fig. 2(b)). Show that count-to-infinity problem occurs in this case. Specifically, after how many iterations will the distance vector table at each node converge?

c. (10 points) Describe how to use poisoned reverse technique to resolve the count-to-infinity problem that you see in the previous problem. Specifically, with reverse poison, after how many iterations will the distance vector table at each node converge? Be specific in terms of how you count, which may lead to different numbers.

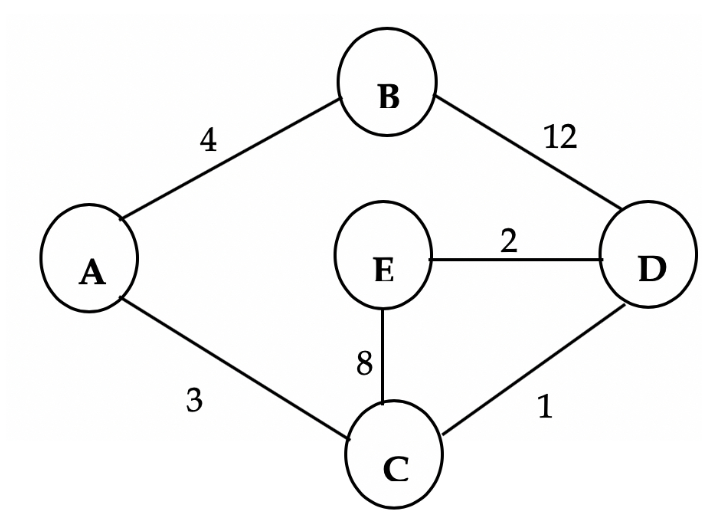


Figure 3: A graph of five routers with cost on each link. Run Distance Vector algorithm on the graph

4. **Distance Vector Routing (10 points).** Consider the 5-node network shown in Fig. 3. Suppose that each node knows the costs to its neighbors. The distance vector algorithm is used by all the nodes. What is the initial distance vector table at node D? You only need to list the initial distance vector table at node D; no need to show any later steps.

5. **Wireshark Lab (30 points).** Do problems 1-15 in the IP wireshark lab (posted in HuskyCT).