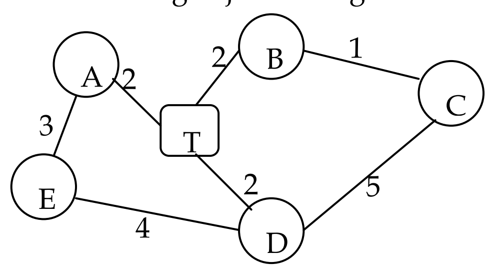
CSE 473 – Introduction to Computer Networks

Review Questions 15

Your Name:

Please print out this form (two-sided, if you can) and write your answers *legibly* in the spaces provided. If you can't write legibly, type.

1. Consider the network below that consists of 5 routers A to E and one transit networ T. Costs of point-to-point links are symmetric, and costs from the routers to the transit network are as shown on the figure. Compute the shortest path tree from E using Dijkstra's algorithm and highlight the edges in the tree.



Dijkstra at node E proceeds as follows:

E(0);*A(3),D(4),T(∞),B(∞),C(∞)*

E(0),A(3);*D(4),T(5),B(∞),C(∞)*

E(0),A(3),D(4);*T(5),B(∞),C(9)*

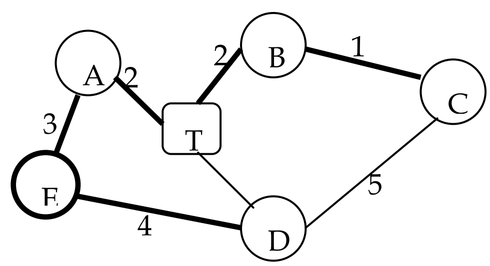
E(0),A(3),D(4),T(5);*B(5),C(9)*

E(0),A(3),D(4),T(5),B(5);*C(6)*

E(0),A(3),D(4),T(5),B(5),C(6)

Where nodes in bold are in the labeled set

The final shortest path tree is as shown on the right



2. In the Bellman-Ford algorithm, suppose that a node x has a distance vector [0 3 2 8 6 - 15 -] where a dash means that there is no known distance to that destination yet. The zero entry in the distance vector reflects the zero-length path from x to itself. x has only two neighbors, y and z, with an edge of length 3 to y and an edge of length 2 to z. The last distance vector x received from y is [3 0 4 5 10 - 12 -] and the last distance vector it received from z is [2 4 0 7 4 - 14 -].
   Suppose x receives a new distance vector [3 0 4 5 8 7 11 -] from y. How does this change its distance vector?

   For each entry in its distance vector, x takes the minimum of its cost to y plus the cost for that entry in y's distance vector and its cost to z plus the cost for that entry in z's distance vector. Given the new distance vector received from y, x new distance vector d(x) is obtained as follows:

   d(x) = [0 min{3+[0 4 5 8 7 11 -];2+[4 0 7 4 - 14 -]} = [0 3 2 8 6 10 14 -]

3. Consider a network with 100 routers running a link-state protocol. Assume that the network uses only point-to-point links and that each router has 10 links. If each router experiences a change to the status of one of its incident links every second, what is the maximum number of LSAs that a router can receive in a second? How many of these are not duplicates?

   *If each router experiences a change in the status of one of its links every second, then a router can receive up to 99*10 = 990 LSAs per second (one update from each one of the other 99 routers, which is forwarded by all 10 neighbors of the router. In this case, 9 out of 10 LSAs are duplicates, i.e., the router only receives 99 truly new LSAs per second.*