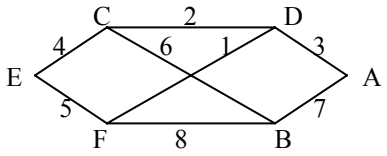
Homework #6:
5 Points Each

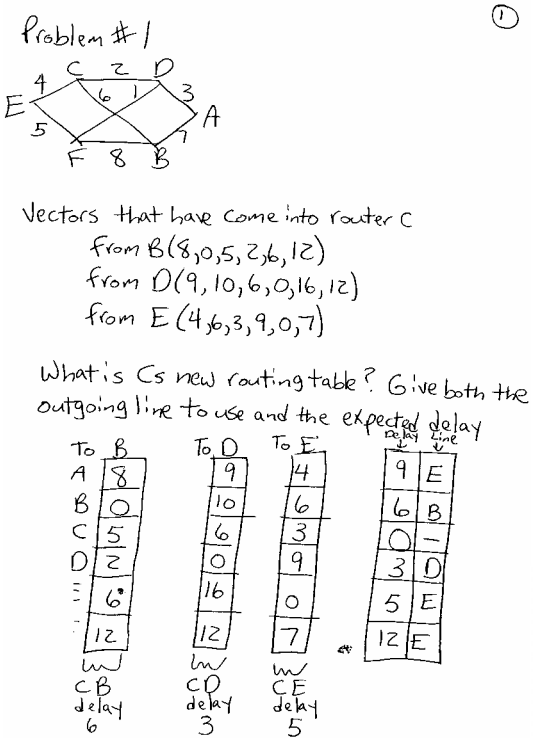
Problem 5.8
Give a simple heuristic for finding two paths through a network from a given source to a given destination that can survive the loss of any communication line (assuming two such paths exist). The routers are considered reliable enough, so it not necessary to worry about the possibility of router crashes.

Many possible answers. One possible answer: Pick a route using the shortest path. Now remove all the arcs used in the path just found, and run the shortest path algorithm again. The second path will be able to survive the failure of any line in the first path, and vice versa. It is conceivable, though, that this heuristic may fail even though two line-disjoint paths exist. To solve it correctly, a max-flow algorithm should be used.

Problem #2



Consider the subnet above. Distance vector routing is used, and the following vectors have just come in to router C: from B: (8,0,5,2,6,12); from D: (9,10,6,0,16,12); and from E: (4,6,3,9,0,7). The measured delays to B, D, and E, are 6, 3, and 5, respectively. What is C's new routing table? Give both the outgoing line to use and the expected delay.



Problem #3
Looking at the subnet of Fig. 5.9 (a), how many packets are generated by a broadcast from D, using
(a) reverse path forwarding?

(b) the sink tree?

Problem #3

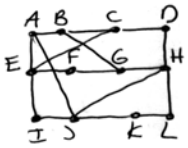


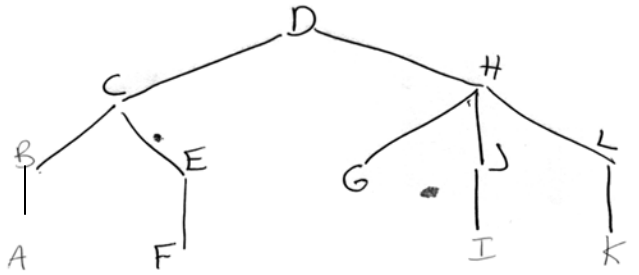
Fig 5.9

how many packets are generated by a broadcast from D, using (a) reverse path forwarding? (b) the sink tree?

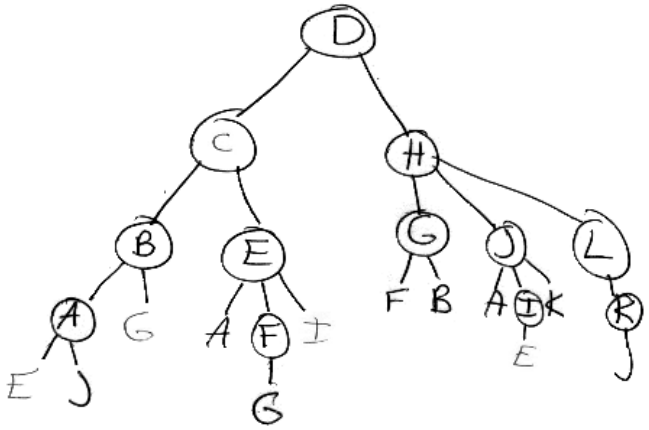
Since no timing information (delay) is given with respect to router D, there are several possible solutions to the sink tree.

Use number of hops for this case. (Still several possible solutions.)

Sink tree for router



(a) reverse path forwarding? 23 packets



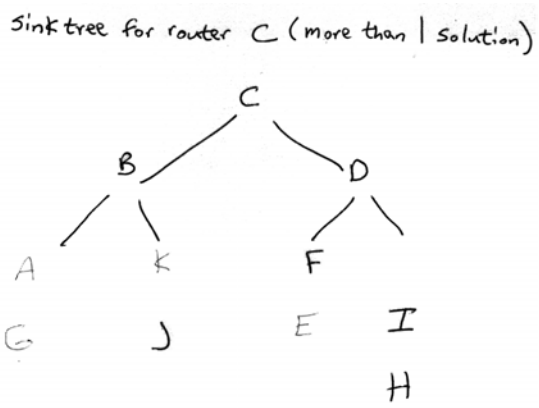
(b) sink tree? 11 packets

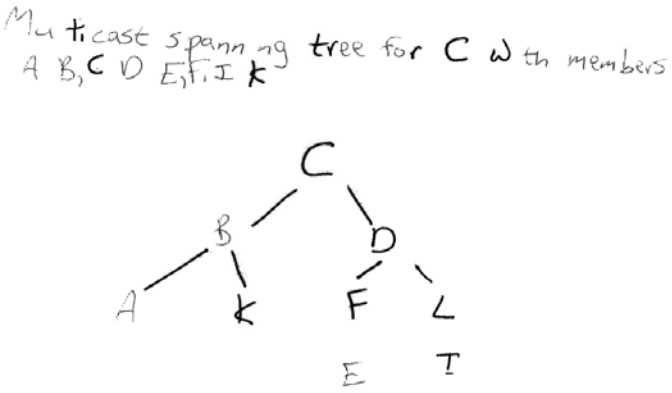
Problem 5.10

If delays are recorded as 8-bit numbers in a 50-router network, and delay vectors are exchanged twice a second, how much bandwidth per (full-duplex) line is chewed up by the distributed routing algorithm? Assume that each router has three lines to other routers.

The routing table is 400 bits. Twice a second this table is written onto each line, so 800 bps are needed on each line in each direction.

Problem 5.16
Compute a multicast spanning tree for router C in the following subnet for a group with members at routers A, B, C, D, E, F, I, and K.





Problem #6
Pick a component of the network layer in the Internet (section 5.6) that is of interest to you and a write up to a one page description of that component. Address issues such as the impact on the evolution of the Internet and importance to the operation of the Internet.

Answers will vary.