CS/ECE 438: Communication Networks — Fall 2007
Problem Set 3 — Due Wednesday, Oct 17

NOTE: There will be **no automatic extension** for this assignment. If you do not hand in the assignment by the start of class on Oct 17, you will get no credit for the assignment.

1. **Learning Switches**

   Refer to Figure 1 for this question. The octagons with numbers denote learning switches, with ports labeled by small numbers, and letters denote hosts (attached to LAN segments).

   (a) Suppose switching tables for all switches are initially empty, and then the following two transmission occur: $A \rightarrow G$, $D \rightarrow A$. The following transmission is $I \rightarrow D$. Which hosts hear the third transmission?

   (b) Show the switching table at switch 1 after the three transmissions.

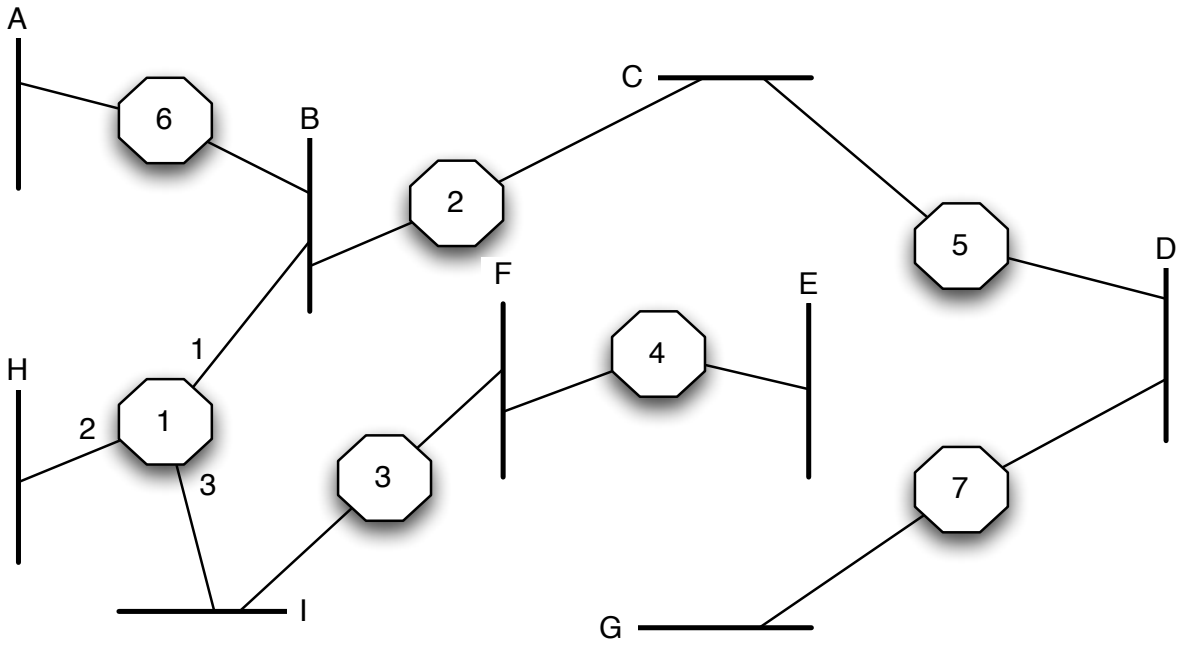

Figure 1: Diagram for Problem 1.

2. **Virtual Circuits**

Figure 2 shows hosts (A–N) connected by virtual circuit routers (1–6). Assume that each VC may have a different VCID on each link, and VCIDs are assigned starting at 0 and using the next available ID. Suppose that there are virtual circuits established between: $F \to I$, $M \to A$, $C \to N$, $F \to B$, $E \to B$, in that order.

(a) Show the forwarding table at router number 3.

(b) Suppose there is an additional virtual circuit formed from D to J. Show the virtual circuit IDs that a packet will use traveling along that virtual circuit.

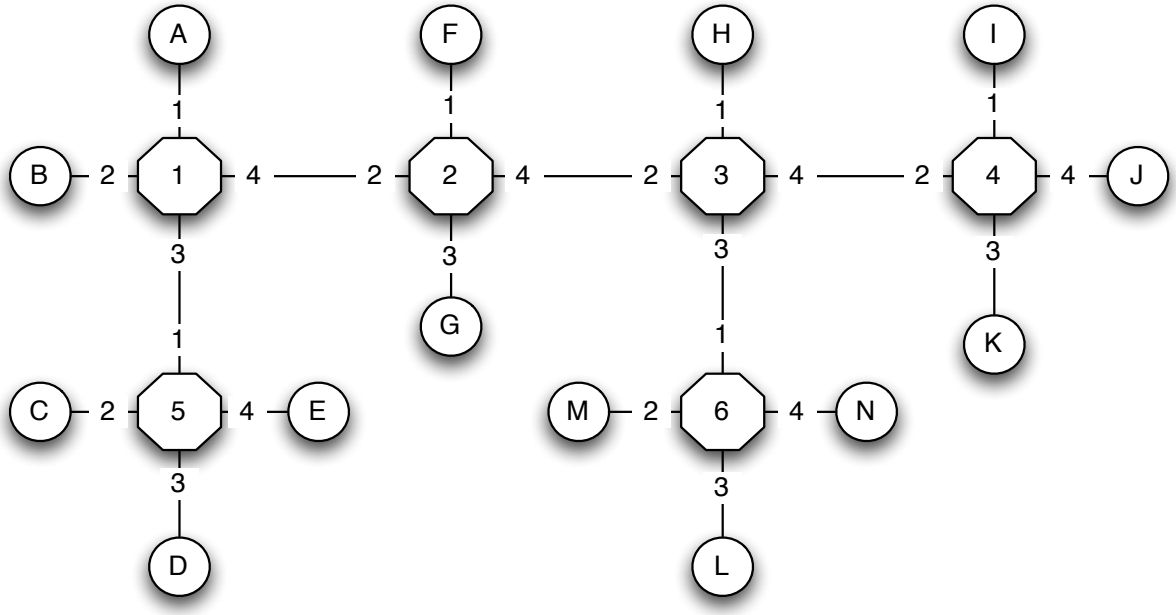

Figure 2: Diagram for Problem 2.

3. (a) Refering to Figure 3, compute the least-cost paths from router A to all the other routers using Dijkstra's algorithm. Use a table similar to Table 4.9 on p.282 of the textbook to record your work (p. 287 of 3rd ed.). You do not need to show the "Comments" column of the table.

   (b) Now suppose the routers are running a synchronous version of a distance vector algorithm. Every minute, at exactly the same time, each router sends its current distance vector to its neighbors. Then it updates its own vector based on what it receives, and sends out the updated vector the next minute.

   Starting all routers in an initial state where they only know the cost of reaching their neighbors,(i.e. the distance to all other routers is infinity), show the updated distance vector tables at each router after the first update.

   (c) How many minutes will it take for all routers to reach a stable state? (Hint: you do not need to compute the DV algorithm to answer this question.)

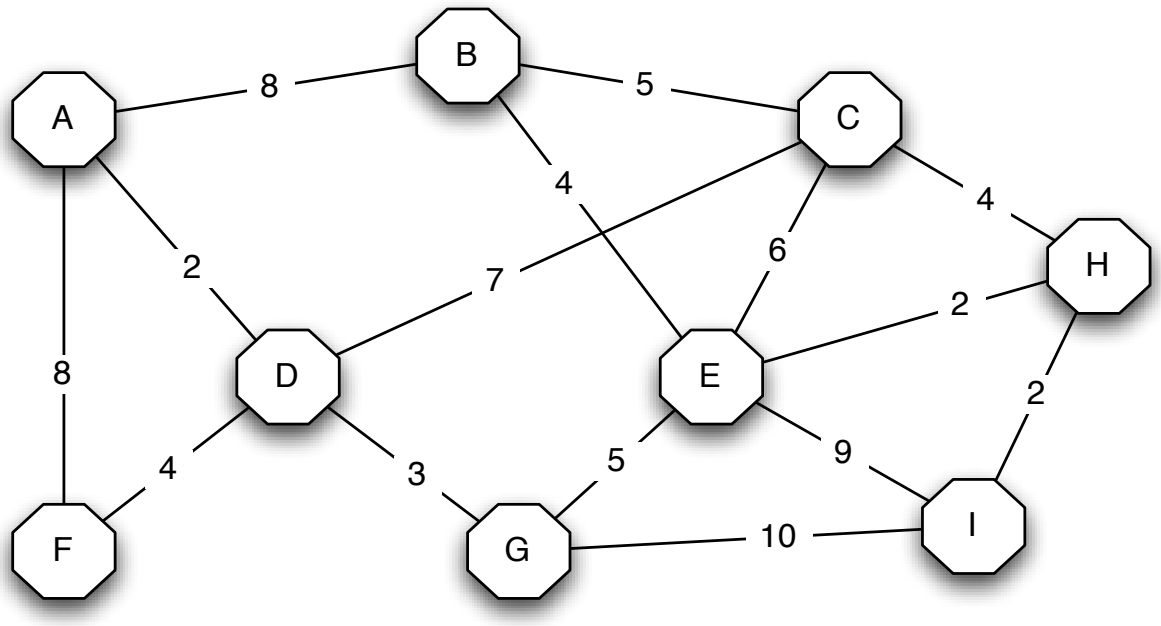

Figure 3: Diagram for Problem 3.