Note: In all written assignments, please show as much of your work as you can. Even if you get a wrong answer, you can get partial credit if you show your work. If you make a mistake, it will also help the grader show you where you made a mistake. Your submitted homework should be printed out (i.e., please don’t hand in hand-written answers, unless you need to hand-annotate the printed text, or draw a figure). See the class web-page for more information about handing in homework assignments.

Problem 1. Suppose a government investigator observes an individual’s behavior on a peer-to-peer network (e.g., advertising content) and suspects that individual of distributing illegal digital material.

a) Does the 4th amendment prohibit the investigator from downloading material from that individual without a warrant? Explain. Answer: No. If you are on a P2P network, you have no expectation of privacy. See slide 50 from presentation by Marc Liberatore: “Courts have repeatedly affirmed that sharing this information is voluntary, akin to leaving your drapes open while committing a crime in your living room, and a clear example of acting “in plain view.”

Suppose the suspect is using a wireless network in his/her home and that the transmissions of that wireless network reach a public place, such as a sidewalk or road. Do you think the 4th amendment prohibits the investigator from positioning him/herself in a public area and warrantlessly recording the packets being sent over the suspect wireless network? Why? Answer: This is area where the law is still not clear, and so I was hoping that people would Google around a bit to learn about the current interpretation of the issue. The best document that I’ve found to date to answer this question:
(same journal as the network neutrality paper). This paper concludes that “concluding that although current cases read the Wiretap Act as permitting certain private instances of Wi-Fi sniffing, the Fourth Amendment should prohibit the government from intercepting unsecured Wi-Fi signals.” [Note: underlined emphasis is mine, to show the different standard to which non-government versus government entities are held]

Problem 2. Suppose an ISP, FlyByNightISP is one of two or three ISPs available in a region. FlyByNightISP decides that when material is downloaded from its competitors’ web sites to its own customers in that region, that FlyByNight will give those packets lowest scheduling
priority, thus making their competitors’ web sites look slow and un-responsive. FlyByNightISP doesn’t tell anyone that it is doing this, and never applies this to its own web site.

a) Which of the FCC’s Open Internet Rules are being violated by FlyByNightISP?
   Answer: This would violate The FCC Internet Policy statement that customers are entitled to “competition among network providers, application and service providers, and content providers.”

b) Suppose FlyByNightISP only does this during times of network congestion. Does this form of traffic control seem like a “reasonable network management” practice to you? Explain. Answer: FlyByNight is able to drop traffic during times of congestion, but should not do so in a way that prejudices against a given application or a given provider if it can drop traffic fairly/equally among other ISPs. To do so would violate the requirement that customers are entitled to “competition among network providers, application and service providers, and content providers.” However if the competitor’s network traffic were somehow the only possible traffic it could drop in order to manage it’s network, then this would likely be OK.

Problem 3: Dijkstra’s Link State Routing. Consider the 6-node network shown below, with the given link costs. Using Dijkstra’s algorithm, find the least cost path from source node u to all other destinations. Show your work in tabular format, as in Table 4.3 in the text.

**Solution:**

<table>
<thead>
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<th>Nprime</th>
<th>D(u),p(u)</th>
<th>D(v),p(v)</th>
<th>D(w),p(w)</th>
<th>D(x),p(x)</th>
<th>D(y),p(y)</th>
<th>D(z),p(z)</th>
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<td>-</td>
<td>-</td>
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<td>-</td>
<td>-</td>
</tr>
<tr>
<td>u w</td>
<td>-</td>
<td>7, u</td>
<td>2, u</td>
<td>6, u</td>
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<tr>
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<td>-</td>
<td>6, u</td>
<td>9, w</td>
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<td>-</td>
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<td>9, w</td>
<td>11, w</td>
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<tr>
<td>u w v x y z</td>
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</tbody>
</table>

Problem 4: Distance Vector Routing.
Consider the network fragment shown below. x has only two attached neighbors, w and y. w has a minimum-cost path to destination u (not shown) of 5, and y has a minimum-cost path to u of 6. The complete paths from w and y to u (and between w and y) are not shown. All link costs in the network have strictly positive integer values. You can assume that any path between w and y has a larger cost than the direct-link cost (of 2).

![Network Diagram]

a) Give x’s distance vector for destinations w, y, and u. Answer: x’s distance vector to (w,y,u) is (2,4,7).

b) Give y’s distance vector for destinations x, w, and u. Answer: y’s distance vector to (x,w,u) is (4,2,6). Note this assumes there is not an unshown path of cost 1 between y and w.

Problem 5: BGP and path advertisement.

Figure 4.42 of the text (slide 4-61 in Module4a) is shown to the right. w is customer of A, x is a customer of B and C and y is a customer of C.

a) Will network A advertise the path Aw to provider network C? Explain your answer. Answer: Yes, A will advertise its path to w to everyone. Since A is a customer of C, C wants everyone to know the path to reach A through it (C).

b) Assuming that network A advertises path Aw to C, would C advertise a path Caw to B? Explain your answer. Answer: No. C will not advertise the path Caw to B. Since C w is not a customer of C, C has no interest (financial) in carry traffic between provider networks B and A. C will advertise the path Caw to its customer networks, Y.