Networks Homework #12 (9 points)
Due to Gradescope by 11:45 PM on Thursday, April 2nd
You need to submit a pdf to Gradescope; failure to mark which pages your questions are on will result in a 10% deduction on your grade

Homework Goal: Understand how the Internet works including the five network layers, various protocols, and network diagrams.

1. Practice your vocab from this chapter! (1 point)
   a. ISP stands for ____________________________, of which there are _______ (number) tiers.
   b. The ____________________________ algorithm is the basis for all Data Link Control protocols that are currently used. This algorithm utilizes an ____________________________ that is sent by the receiver to indicate the receiver received a packet correctly.
   c. ____________________________ is the principle that all packets on the internet should be treated equally.

2. List the five network layers discussed in class and the goal of each one. (2 points)

3. What are TCP and UDP, and what is the key difference between them? Give an example of where you would use each. (1 point)
4. Why does the Medium Access Control Protocol require computers to wait a *random* amount of time before attempting retransmission after a collision occurs? (0.5 points)

5. For the following questions, assume that we want to transmit a 3-second color video. This video has 25 frames per second and each frame is 1280 x 720 pixels. (1.5 points)
   a. How many bits are we going to transmit? Leave your answer in bits.
   b. Based on your answer to part (a), how long will it take to transmit the video on a 60Kbps modem (dial up)?
   c. What about on a 1.5 Mbps DSL line (an older DSL line)?
   d. What about on a 10 Gbps Ethernet link (10-gigabit Ethernet)?
6. Use the network diagram for the following questions. (1.5 points)

   a. Identify the 3 different network structures that are shown in the figure.

   b. Suppose A wants to send a message to C. How many nodes (not counting A) will see the message if T1 and T2 are repeaters?

      What if T1 and T2 are bridges?

   c. What is the length of the shortest path from A to B? Will a packet always take this path? If not, what is the length of an alternative path?
7. Given the following network, the numbers represent the delay for each link. (1.5 points)

a. List all non-looping paths that take exactly 4 hops from A to G

b. What are the two fastest (not necessarily shortest) paths from D to F? What is the total delay of each of these two paths?

c. Suppose node C goes down. Does this change the fastest path from D to F? If so, what is the new fastest path and what is its total delay?