Name: _____

Homework #12: Networks (9 points)

Due to Gradescope by 11:45 PM on Thursday, November 4th

You need to submit a pdf to Gradescope; failure to assign questions to pages will result in a 10% deduction on your grade

Homework Goal: Understand how the Internet works including the five network layers, various protocols, and analyzing 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 a(n) _____ that is sent by the receiver to indicate that they received a packet correctly.
    c. A _____ has knowledge about the nodes connected to it while a _____ just amplifies and forwards the signal.

2. List the five network layers and the goal of each one. (1 point)

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)

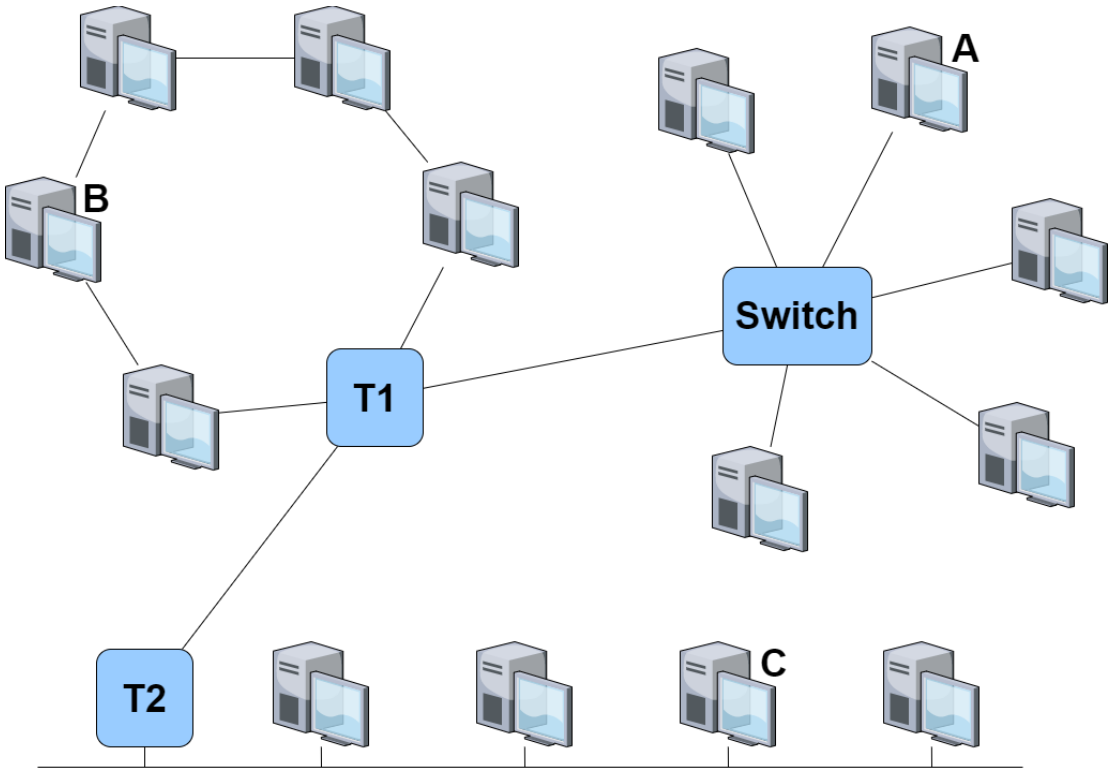
5. You found a cool GIF online that you want to send to your family members. It's a 4-second color (RGB) GIF with 30 frames per second. Each frame is 1280 x 720 pixels. The GIF format supports 1 byte per pixel.
   (2 points)
   a. How many total bits are you going to transmit? Leave your answer in bits.

   b. Based on your answer to part (a), how long will it take to transmit the video to your brother on his 56 Kbps modem (dial up)? Leave your answer in minutes.

   c. What about sending to your sister on her 2 Mbps DSL line (an older DSL line)? Leave your answer in seconds.

   d. What about sending to your parents on their 10 Gbps Ethernet link (10-gigabit Ethernet)? Leave your answer in seconds.

6. Use the network diagram for the following questions. (2 points)
   Repeaters, bridges, and switches are not counted as nodes.
   Everyone on a ring sees a message if it is sent on the ring.



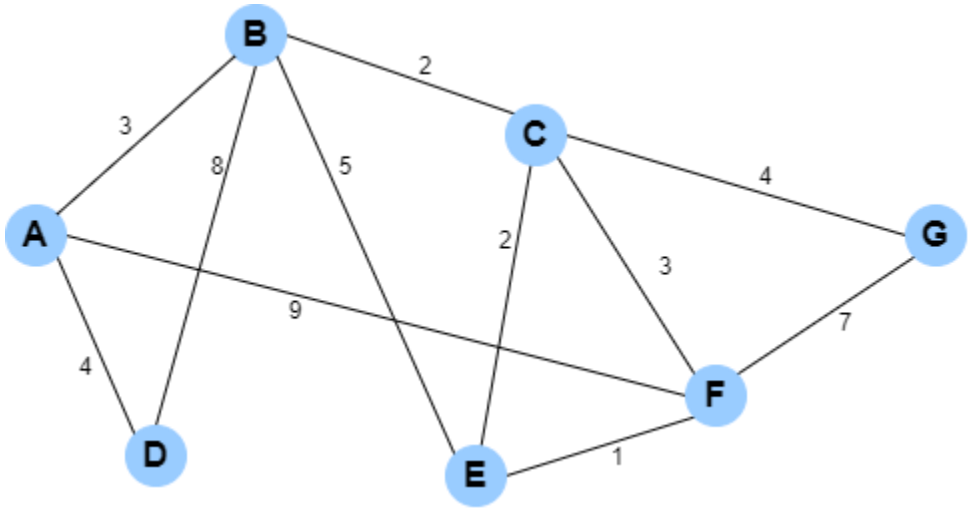
   a. Identify the 3 different network structures that are shown in the figure.

   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?

   c. What if T1 and T2 are bridges?

   d. What is the length of the shortest path from A to B (include the switch, T1, and T2 in the length)? 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?