

*This homework is due at the beginning of class on September 18, 2017 and is worth 1.5% of your grade.*

Name: \_\_\_\_\_

CCIS Username: \_\_\_\_\_

| <b>Problem</b> | <b>Possible</b> | <b>Score</b> |
|----------------|-----------------|--------------|
| 1              | 20              |              |
| 2              | 25              |              |
| 3              | 30              |              |
| 4              | 25              |              |
| Total          | 100             |              |

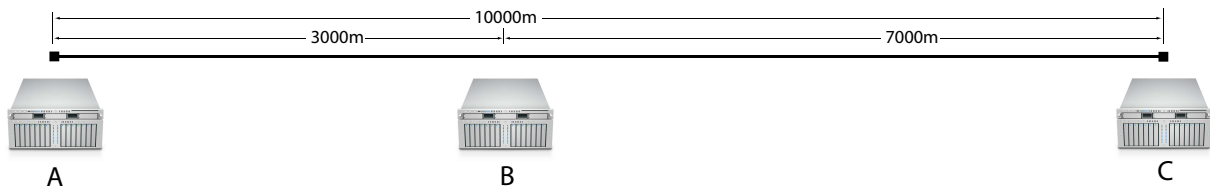
**1a.** Why is it important for protocols configured on top of Ethernet to have a length field in their header indicating how long the message is? (5 pts)

**1b.** What kinds of problems can arise when two hosts on the same Ethernet share the same hardware address? Describe what happens and why that behavior is a problem. (10 pts)

**1c.** Give **two** reasons why Ethernet sends a 64-bit preamble before every packet consisting of alternating 0s and 1s. (5 pts)

2a. Suppose that we have an Ethernet which has a bandwidth of 5 megabits/second. If the speed of light in copper is assumed to be  $2.5 \times 10^8$  meters/second, what is the minimum frame size that we must select for a LAN of length 10,000 meters? *Note that there are 1000 bits in a kilobit, 1000 kilobits in a megabit, etc.* (10 pts)

2b. Suppose the layout of our LAN is as shown below.



What would happen if host A transmitted a frame that was smaller than this minimum frame size? Under what circumstances would problems occur? (10 pts)

2c. What is the minimum frame size that host B could send without any problems? (5 pts)



4a. Show that two-dimensional parity allows detection of all 3-bit errors.

(10 pts)

4b. Give an example of a 4-bit error that would not be detected by a two-dimensional parity. What is the general set of circumstances under which 4-bit errors will be undetected? (5 pts)

4c. Show that two-dimensional parity provides the receiver enough information to correct any 1-bit error (assuming the receiver knows only 1 bit is bad), but not any 2-bit error. (10 pts)