Be neat and concise. You may use your calculator and one page cheat sheet. Show your work. Good luck!

Name: _____

| Problem | Points | Score |
|:-------:|:------:|:-----:|
| 1 | 25 | |
| 2 | 25 | |
| 3 | 25 | |
| 4 | 25 | |
| Total | 100 | |

1. **Routing.** Give an example network that demonstrates that Dijkstra's algorithm and the Bellman-Ford-Moore algorithm will not always find the same path from a source to a destination. Include in your answer an indication of the source, destination and (different) paths found by the two algorithms.

2. **Ethernet.**

    (a) Consider the Ethernet segment below, with four stations. Give the necessary timing of events at specific stations to demonstrate that *carrier sensing* prior to transmission cannot avoid all collisions.
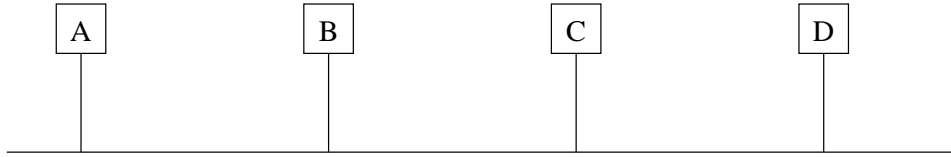


    (b) What form of back-off algorithm does Ethernet use? How does it adapt to load?

3. **IP.** Suppose an IP packet with 1200 data bytes is generated at station A, destined for station B. The IP addresses of the interfaces are indicated in the diagram. The largest transmission unit of each local area network (LAN) is indicated in the diagram.

142.33.25.9

128.92.8.0    128.92.34.5    142.33.25.7

LAN 2

A    LAN 1    B

1000
bytes

500
bytes
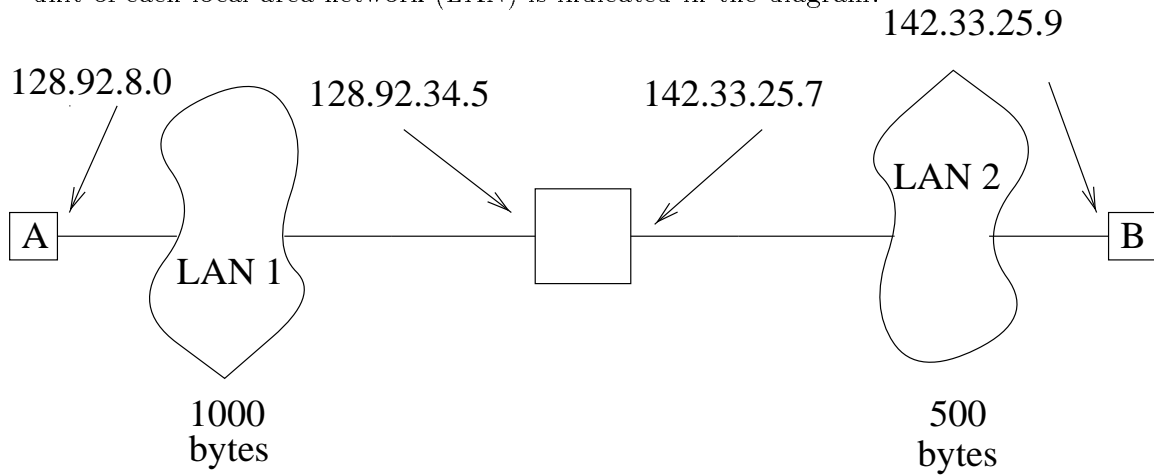
(a) Give the source and destination IP addresses in the packet as it traverses LAN 2.

(b) Give the number of fragments, the size of each fragment, and the value in the fragment offset field for the fragments traversing LAN 2. (Use as many rows of the table below as you need.)

| Fragment number | Size (in bytes) | Offset |
| --- | --- | --- |
| 0 | | |
| 1 | | |
| 2 | | |
| 3 | | |
| 4 | | |
| 5 | | |

4. **Short Answer.** Give short answers for the following questions:

   (a) What is the "counting to infinity" problem in routing?

   (b) Demonstrate (with a picture) the relationship between the logical link control packet and the medium access control packet.

   (c) Why does IP have different address classes?

   (d) Why does slotting help the performance of the ALOHA random access scheme?