Assignment 5

Due Wednesday, May 13. Show your work. Hand in your assignment using the appropriate dropbox on the course web site. Assignments submitted after the solutions are made available will be given a mark of zero.

Question 1

An Ethernet frame containing the following bytes is received. The first column is the offset in hex from the start of the frame. What are the values of the individual fields the Ethernet header? What type of payload does this Ethernet frame carry?

```
0000  52 54 00 12 35 02 08 00 27 18 68 48 08 00 45 00
0010  00 28 46 32 40 00 40 06 d0 15 0a 00 02 0f 3f f5
0020  d8 84 8c 81 01 bb 1e 4d 4f 87 02 8e 4c 02 50 10
0030  39 08 24 a3 00 00
```

Question 2

You need to choose a bus topology for a data network that provides a link between various sensors and actuators in vehicle. Data rates are low and privacy is not an issue but minimizing the amount of cabling is important. Would you choose a bus or star topology? Why?

Question 3

An office has been wired so that each desk is serviced by one four-pair Cat-5 cable. However, one of these pairs is already in use for POTS phone use. What Ethernet PHYs could be run over the remaining pairs?

Question 4

An Ethernet switch has four ports with the first three ports (ports 1-3) on VLAN 1 and the fourth (port 4) on VLAN 2.

The Ethernet switch is reset and frames with the following destination and source Ethernet addresses are received by the switch through the ports indicated in the order shown. A1, A2, and A3 are three different Ethernet addresses, and B indicates the broadcast Ethernet address.

Destination	Source	Port
B	A2	3
B	A1	2
A2	A1	2
B	A3	4
A3	A2	3

On what port(s) will each frame be output?

Question 5

The following diagram shows a network consisting of three Ethernet bridges. Specify a set of port(s) that could be disabled so the network forms an acyclic spanning tree?
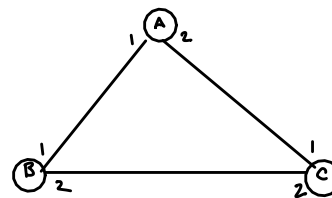
Question 6

An IP frame begins with the following bytes. Is this an IPv4 or IPv6 header? How long is the whole IP frame? What IP protocol is being used? What are the source and destination IP addresses?

```
0000  45 00 00 28 37 23 40 00  40 06 54 6c 0a 00 02 0f
0010  48 15 5b 1d
```

Question 7

Compute the IP (1's complement) checksum of the following values (shown in hexadecimal notation):
    d5 53 00 00 06 67 63 6f

Question 8

After a power failure you turn on a laptop and notice it has an IP address of 169.254.89.26 but no internet connectivity. How did it get that IP address? What likely happened?

Question 9

If you wanted to generate a PRBS at 1 MHz that did not repeat for an hour, how many bits of state would the PRBS generator need?

Question 10

The time-domain waveform of a modulated signal is given by the equation:

$$s(t) = a(t)cos(\omega_c t) + b(t)sin(\omega_c t)$$

where $a(t)$ and $b(t)$ are signals that can take on a value of -1, 0 or 1. Draw the constellation diagram. If we don't use the point with zero amplitude, how many bits can be transmitted per symbol?

Question 11

Show a Gray-coded assignment of bits to signal levels for a 4-level baseband signal.

Question 12

What is the frequency deviation of a GMSK signal that has a data rate of 270 kb/s?