CSE 461 Homework 2
Due Friday October 15, 1999

Topics for questions 1 and 2 have already been covered. You should be able to answer question 3 after friday's lecture. Material for questions 4 and 5 will be covered on monday. Details of Ethernet are described in the attached excerpt from Andrew Tanenbaum's *Computer Networks*.

1. What is the (15,11) hamming codeword for the 11 user data bits: 1011 1110 001? Hint: your answer should be 15 bits long.

2. Give an example of a 4-bit error that would not be detected by a rectangular code (Sec 12.2.2). Example 12.4 is replicated below. For your answer, circle four bits that, if all received incorrectly, would result in an undetected error.

1	0	1	1	0	0	*1*
0	1	1	1	0	0	*1*
0	0	1	0	0	1	*0*
1	0	1	0	0	0	*0*
0	0	1	1	0	1	*1*
0	1	0	1	0	0	*0*
0	*0*	*1*	*0*	*0*	*0*	*1*

3. Supercomputers often have a set of different interfaces of different types, and their administrators are under a small amount of pressure to tune the system to adequately use those interfaces.

   For example, the Cray T3E in San Diego has three external network interfaces: one fast ethernet, one FDDI (a fiber based, token ring network), and one HIPPI (High Performance Parallel Interface, a data channel consisting of several copper wires in parallel, designed specifically for supercomputers). Like most machines, it also has a virtual "loopback" interface that bypasses the network devices entirely and delivers packets to the local machine. Each of these interfaces is identified by its type, and an integer; think what would happen if there were more than one ethernet interface.

   A simplified, and slightly altered, forwarding table for this machine is presented below. Draw a radix trie corresponding to this table.

Destination	Dest address in binary	Interface
0.0.0.0/0	0	fddi1
127.0.0.1	01111111 . 00000000 . 00000000 . 00000001	lo0
129.116.218.96/27	10000001 . 01110100 . 11011010 . 01100000	hippi0
129.116.218.129	10000001 . 01110100 . 11011010 . 10000001	fddi1
129.116.218.130	10000001 . 01110100 . 11011010 . 10000010	fddi1
132.249.40.55	10000100 . 11111001 . 00101000 . 00110111	lo0
132.249.89/24	10000100 . 11111001 . 01011001 . 00000000	hippi0
132.249.90/24	10000100 . 11111001 . 01011010 . 00000000	hippi0
147.219.155/28	10010011 . 11011011 . 10011011 . 00000000	ether0
147.219.155.16/28	10010011 . 11011011 . 10011011 . 00010000	ether0
147.219.155.18	10010011 . 11011011 . 10011011 . 00010010	lo0
192.67.81/24	11000000 . 01000011 . 01010001 . 00000000	hippi0

4. Three stations (A,B,C) are connected to a single, 185 meter, 10 Mbps ethernet. The physical medium is 10Base2, which has a maximum segment length of 185 meters, and a signal propagation speed of $0.65c$, where c is the speed of light in a vacuum (3.0×10^8 meters/sec).

   Station B is halfway between station A and station C.

   Each station has 99 bytes of data to send, which are packaged up into 125-byte frames: 22 bytes preamble and header, a 4 byte checksum, and 99 bytes of data.

   Station B transmits its frame first. While B transmits, the interface adapters of A and C both receive their frames to transmit, but sensing the medium to be active, wait until B finishes transmitting to send their frames.

   Draw a diagram similar to Figure 7.2, where time increases downward and the signal propagates horizontally. Include every transmission until A, B, and C have successfully transmitted their packets. Note that it doesn't matter which station these frames are intended for: the signal propagates in both directions on the shared bus. In the event of collision, let station A be the first to successfully retransmit a packet.

   Calculate and label the following numerically: *transmission time, propagation delay*, and (random exponential) *backoff delay.* Each station should choose a correct possible backoff delay. Don't forget to abort the transmission on collision and show the jam signal.

   Use the attached page. We've filled in B's transmission for you, and put blanks where propagation delay and transmission time should be labelled. Your diagram need not be to scale.

5. On a FDDI ring with a total fiber length of N meters, one station transmits continuously. What happens to that station's throughput if the fiber length is doubled to $2 \times N$?

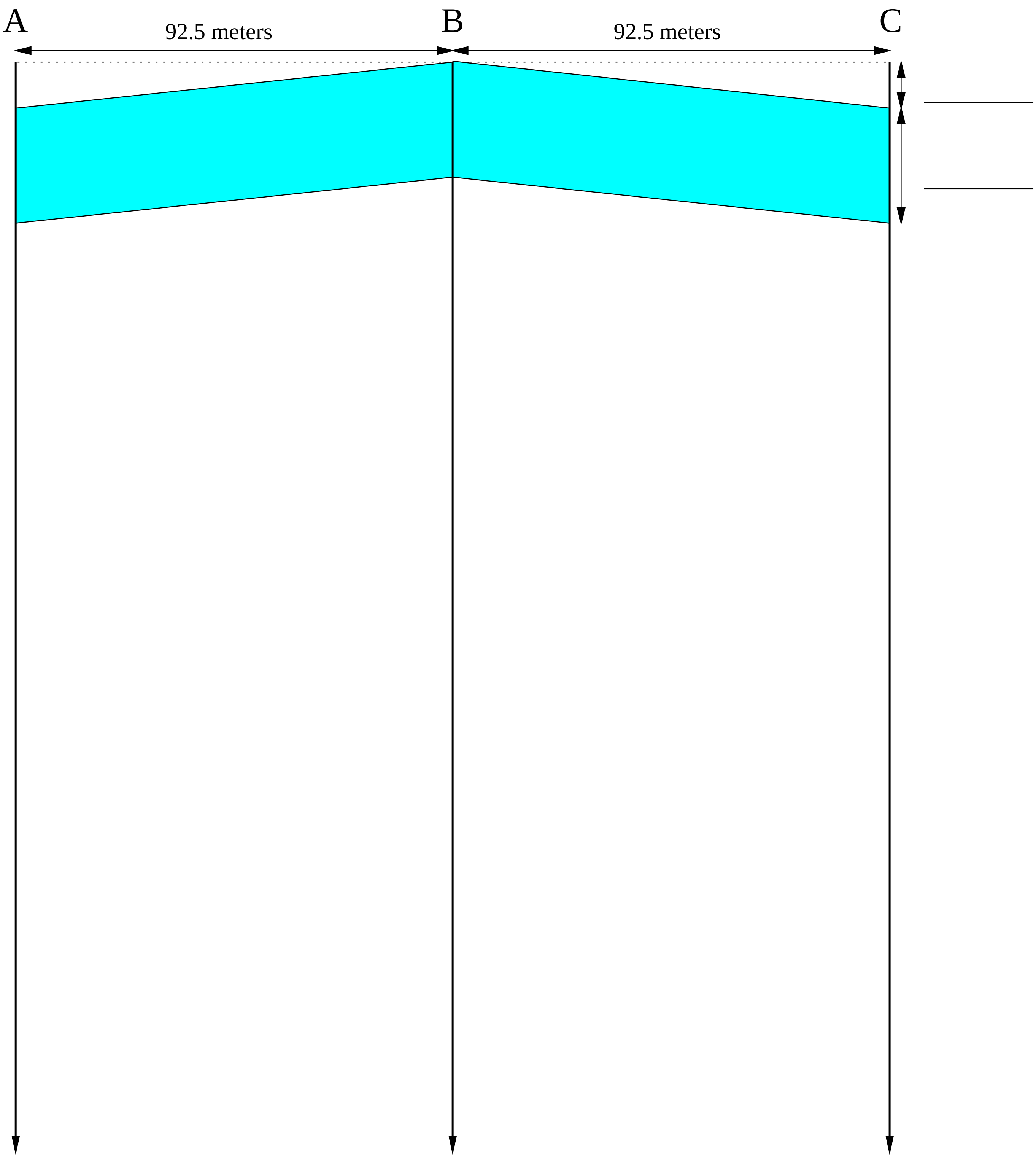

Figure 1: For question 4