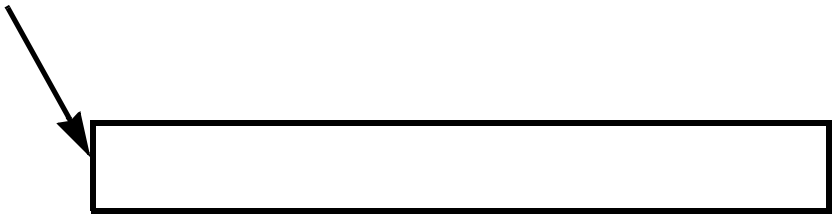
Check to be sure that there are 5 problems on 5 pages. You are encouraged to answer all 5 problems. Your grade will be based on the four best answers. You have 2 hours and 30 minutes. Note that some problems are more time-consuming than others. Use your time wisely. This is an open book and open note examine.

Show all your work. If a problem statement is unclear to you, state your assumptions. If you use additional sheets of paper, identify them and arrange them in sequence.

Write down your name here



work phone or
home phone
(optional)

Problem 1. Token Ring

Consider a 1Gbps token ring with 4 stations **equally separated**. Assume the signal propagation speed is 200m/μsec.

a) 6pts. If the bit stream are delayed by the 1-bit delays, how far two bits will be separated in terms of meter?

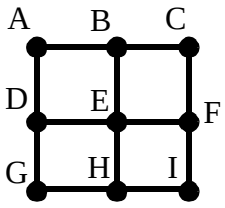
b) 7pts. What is the minimum length of the ring that can avoid the insertion of the artificial delay?

c) 6pts. Given a 100-m ring, how long will it takes for the first bit of the frame to return to the sender?

d) 6pts. Given 10 msec holding time, what is the largest frame size can be sent by this 1Gbps token ring in terms of bytes?

Problem 2. Routing.

25pts. Consider the mesh network shown below.
Assume that the ARPAnet routing algorithm is used. Node B receives three rout-



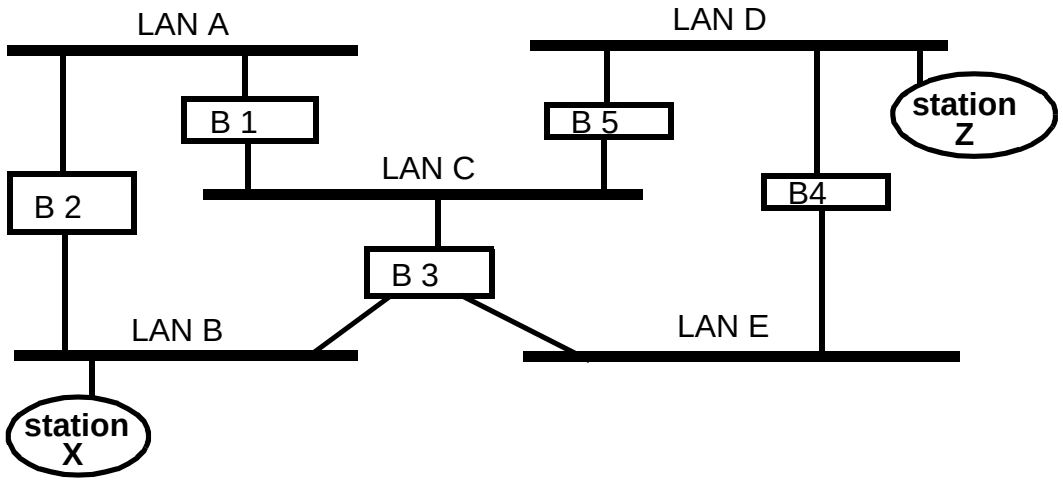
	A	E	C
A	0	6	7
B	2	4	5
C	7	9	0
D	14	11	20
E	6	0	9
F	13	15	6
G	24	21	30
H	15	9	16
I	18	12	13
	BA delay = 30	BE delay = 10	BC delay = 8

New estimated delay from B	via Line

ing vectors from A, E and C. With the above link delays to A, E, and C, calculate B's new routing table and fill your result into the above vacant entries.

Problem 3. Routing with Bridges.

For the following network,



a) 15 pts. Assume the delay over any bridge port or LAN is the same one unit. Specify the spanning tree generated by the 802.1 spanning tree algorithm by marking the root bridge, the root port in each bridge and the designated bridge for each LAN. If there is a tie, use the bridge or LAN with the lower ID.

Assume no bridge learning (or station Z has been quiet for some time.) For a message sent by X to Z,

b) 5 pts. How many copies of the same message will be generated in this intranet?

c) 2 pts. How many copies of the same message will be received by Bridge B3?

d) 3 pts. How many copies of the same message will B3 forward?

Problem 4. Wireless LAN and CDMA.

25 pts. Assuming the chip sequences defined in Fig. 4-16(b), page 273. A CDMA basestation the following signal: (-1 -3 +1 +1 +3 +1 +1 +1). Describe which mobile stations transmitted, and what bit did the sending mobile station send.

Problem 5. FEC vs. ARQ

a) 9pts. With Hamming Single Error Correcting Code, the receiver receive the following code-word, 01110110110. What is the correct 7bit data code should be delivered to the upper layer?

Given 10 kbits to be sent over a channel with bit error rate of 10^{-3}.

If we use a block with data field size =500bits, not including check bits,

b) 8pts. How many retransmission blocks are needed if we used EDC with partiy checking? Note that retransmission blocks can be garbled and require to be retransmitted

c) 8pts. When use Hamming's SECC code, with data field size=500bit, how many check bits are needed?