In the text a B indicates bytes (8 bits) and b indicates bits.
When referring to data, 1KB is 1024 Bytes of data (8192 bits)
When referring to transmission rates (bandwidth), 1Kbps = 1,000 bits per second

Turn in the following numbered problems

1) (5 pts) Chapter 2 Text Book Problem 8

2) (5 pts) Chapter 2 Text Book Problem 18

3) (5 pts) Chapter 2 Text Book Problem 20 –
a) by adding 000 or 111 to the 3 bits making up p, it is shown that both bit additions are valid for the procedure. The same value for q is obtained (remainders are different, but those are ignored for this method)
b) For the table, calculate the two missing q values by taking the corresponding value for p, appending 3 0's to p and then dividing that by C to get q for that p. For the missing Cxq values, multiply C by the q given or calculated. When multiplying C and q, the results will be a 1 from 1x1 or 0 from 0x1 or 0x0. The addition is performed modulo two with no carry: 1+1=0 no carry 1+1+1 = 1 no carry. Arithmetic is done at the bit level.
c) Division is performed 3 bits at a time. Take the first three bits of the number that is being divided – that corresponds to a p in the table. For that value of p there is a q and a Cxq value. q is the quotient and goes over bits 4,5 and 6 of the number being divided. The Cxq value goes beneath the first 6 bits. The first 3 bits of both match and result in 0. The last three bits have to be added as explained in part b. The resulting 3 bits from this addition make up the next p which is used to access the table. Bring down the next 3 bits of the number being divided and put them next to the 3 bits just determined. q for the value of p just found is put next to the first q, and Cxq is placed below the current 6 bits. This process continues until all numbers are divided. The resulting quotient is at the top and the remainder should be 0 for this problem. This is a faster method for verifying the CRC at the receiver (see if there is an error)
Example, divide 100010101 by 1101 using the table in the problem.

```
        111001
1101 | 100010101
       100011
          001101
          001101
             000
```

Red represents p – 100 and 001
Blue represents q – 111 and 001
Purple represent Cxq – 100011 and 001101

4) (5 pts) Chapter 2 Text Book Problem 23

5) (5 pts) Chapter 2 Text Book Problem 31 – look at extra problem #32 for a timeline example. In this problem, assume that it takes ***¼ RTT to transmit*** a frame(propagation time is ½ RTT). Use a timeout of 2 RTT.
a) When frames 5 and 6 are received no ack is sent. An ack is sent for frames 4,5 and 6 once the retransmitted frame 4 is received.

Something to keep in mind (but not part of this problem) is when a frame is received (but not 4), protocol could have the receiver send an ack for frame 3 again which indicates a frame received but not 4.

b) When frames 4-6 are sent, the transmitter needs to wait for an ack or for timeout before sending another frame.

The following problems are extra problems that you should consider working.

A) Chapter 2 Text Book Problem3
B) Chapter 2 Text Book Problem 7
C) Chapter 2 Text Book Problem 19 ←
D) Chapter 2 Text Book Problem 25
E) Chapter 2 Text Book Problem 28
F) Chapter 2 Text Book Problem 32