Assignment 3

Due Thursday, May 12. Show your work. Submit 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

Apply the simplified HDLC framing described in the course notes to a sequence of bits equal to eight '1' bits followed by the last three digits of your student number converted to a binary number (e.g. 123 = 1111011). Add flag sequences and any necessary bit stuffing.

Question 2

(a) Calculate the CRC for the bit sequence 1101 0010 using a generator polynomial of 1001. Assume the CRC used is the remainder after dividing by the generator polynomial.

(b) Calculate the value of the CRC if an error is made in the transmission of the third bit (i.e. assuming the sequence 1111 0010 followed by the CRC computed above is received).

Question 3

A communication system uses 64-ary modulation (it transmits one of 64 different symbols in each symbol period). We wish to transmit a frame that has 64 *bytes*. How many padding bits need to be added? Show how you arrived at your answer.

Question 4

Consult section 4.4.2 and 4.5.2 of RFC 1662 to answer the following questions with respect to an asynchronous ("RS-232")[1] PPP link:

(a) How many flag characters are required between frames? How many are allowed?

(b) What range of values are allowed for the number of start, data and stop bits? Can a serial link be configured for 9600,E,8,1?

[1] PPP is also used over octet-synchronous links like Ethernet.

Question 5

You are testing a 10 Gb/s communications link and you want to generate a ML-PRBS test sequence that repeats no sooner than every 24 hours.

(a) If this test sequence was to be generated using the shift register structure described in the lectures, how many bits of state would be required?

(b) What would be the longest continuous runs of 1's in this sequence?

(c) Assuming 4-level signalling, what is the duration of this run of 1's?

Question 6

Refer to page 1597 of the IEEE 802.11-2012 WLAN standard (available on the course web site) which describes the scrambler used for 802.11a/g.

(a) Is this a frame-synchronous or convolutional scrambler?

(b) What is the scrambling sequence period (in bits)?

(c) Is each frame scrambled with exactly the same scrambling sequence? Explain.

(d) How does the receiver determine the scrambling sequence used at the transmitted?