ELEX 4340 : Data Communication
2014 Fall Session

Assignment 5

Due Friday, December 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

What is the maximum slew rate of: (a) a sine wave of amplitude 1V and frequency f? (b) a triangle wave of the same amplitude and frequency?

Question 2

A baseband communication system uses a 3-level code with voltages of +1, 0, and -1 V. What is the noise margin?

Question 3

Design a resistive network composed of two resistors and a 5V (ideal) voltage source that provides a termination impedance of 100 ohms and provides a 5V pull-up that supplies a short-circuit current of 10mA. Do not worry about efficiency.

Question 4

The input to an HDLC framer consists of a sequence of 14 consecutive ones. What is the output, including flags? Divide your result into groups of 4 bits to make it easier to read.

Question 5

Draw the waveform output by a differential Manchester line coder for an input of 0110 1001 assuming: voltages of +/- 1V, a baud rate of 20 Mb/s, a '1' is encoded as a change, and that the immediately preceeding symbol included a high-to-low transition.

Question 6

A code uses the four codewords 10101010, 01010101, 11111111, and 00000000.

(a) How many *information* (not including parity bits and not the total bits) bits are transmitted per codeword? (b) What are the values of k and n? (c) What is the code rate? (d) What is the minimum distance of this code? (e) How many errors can this code detect? (f) How many errors can this code correct? (e) If the FEC decoder received the codeword 11101011 would an error be detected? (f) If there was an error could it be corrected? (g) If it could be corrected, what is the corrected codeword and what was/were the error(s)?

Question 7

Compute the 4-bit CRC for the data sequence 10110 assuming a generator polynomial of $x^4 + 1$.