Cpr E 489 Spring 2020
Homework #2
Due Date: 2/13/2020 (Thu) by 11:00 AM
Type your answers and submit on Canvas

1. (40 points)

Consider the 2-out-of-5 error detection code. In this code, each codeword is 5-bit long; 2 out of 5 bits are "1"s and the others are "0"s. For example, 11000 is a valid codeword, but 01110 is not.

   a. (10 points) List all the valid codewords.

   b. (15 points) What fraction of errors is undetectable by this code, i.e., what is the FUE of this code? Justify your answer.

   c. (15 points) What fraction of *4-bit errors* is undetectable by this code, i.e., what is the FUE(M=4) of this code? Justify your answer.

2. (60 points)

Consider a CRC code with a generator polynomial of $g(x) = x^4 + x^3 + 1$.

   a. (20 points) Show step by step (using the longhand division) how to find the codeword that corresponds to information bits of 1101.

   b. (20 points) Show the shift-register circuit that implements this CRC code.

   c. Suppose the codeword length is 8. Answer the following questions, with proper justifications.
      i. (10 points) Give an example of undetectable *error burst of length 6*;
      ii. (10 points) Give an example of undetectable *6-bit error*;