Homework 2

EE/TE 4367: Telecommunications Networks

NOTE: **Please, complete the following table and keep record of your assignment number.**

First Name	
Last Name	
Student ID	
Assignment #	0

Exercise 1. Consider an error detection system based on concurrent use of horizontal (K bits per row) and vertical (J bits per column) parity checks.

A) Find an example of a pattern of six errors that cannot be detected [pt. 10]. [Hint: each row with errors and each column with errors will contain exactly two errors.]

Exercise 2. Consider an error detection system based on concurrent use of horizontal (K bits per row) and vertical (J bits per column) parity checks.

A) Find the total number of different patterns of four errors that will not be detected [pt. 10]. [Hint: consider using a combinatorial approach.]

Exercise 3. Consider a parity check code with three data bits and four parity checks. Suppose that three of the code-words are: 1001011, 0101101, and 0011110.

A) Find the rule for generating each of the parity checks [pt. 10].

B) Find the set of all eight code-words [pt. 10].

C) What is the minimum distance of this code [pt. 10].

Exercise 4. Let $g(D) = D^4 + D^2 + D + 1$ be the generator polynomial of a CRC system, and let $s(D) = D^3 + D + 1$ be the polynomial describing the string of data bits to be transmitted.

A) Find the remainder when $D^4 s(D)$ is divided by $g(D)$, using modulo 2 arithmetic [pt. 10].

B) Find the complete string of bits to be transmitted, inclusive of data and CRC bits, starting left with the first bit to be transmitted [pt. 10].

Exercise 5. Consider a generator polynomial $g(D)$, which contains the factor $D + 1$.

A) Show that when using $g(D)$ to compute the CRC bits, any odd number of errors in the received string is detected [pt. 10]. [Hint: Recall that a non-zero error polynomial $e(D)$ is detected unless $e(D) = g(D)z(D)$ for some polynomial $z(D)$. Look at what happens if 1 is substituted for D in this equation.]