EE5160: Error Control Coding
Problem Set 4

1. Consider the $(6,3)$ linear code generated by the following matrix.

$$G = \begin{bmatrix} 0 & 1 & 1 & 1 & 0 & 0 \\ 1 & 0 & 1 & 0 & 1 & 0 \\ 1 & 1 & 0 & 0 & 0 & 1 \end{bmatrix}.$$

   Find the standard array for this code.

2. Show that no two $n-$tuples in the same row of a standard array are identical, and that every $n-$tuple appears in one and only one row.

3. Consider a binary linear block code with the following matrix as a generator matrix:

$$G = \begin{bmatrix} 1 & 1 & 1 & 0 & 1 & 0 & 0 & 0 \\ 1 & 0 & 0 & 1 & 1 & 1 & 0 & 0 \\ 1 & 1 & 0 & 0 & 0 & 1 & 1 & 0 \\ 0 & 1 & 1 & 0 & 0 & 0 & 1 & 1 \end{bmatrix}$$

   (a) Put the given generator matrix into systematic form and find the corresponding parity check matrix. (Solved in problem set 3)

   (b) Suppose a (systematic) codeword is transmitted over the BSC with transition probability $p = 0.01$ and $\mathbf{r} = (01110110)$ is the corresponding received vector. Compute the syndrome of the received vector.

   (c) Find all the error patterns that have the syndrome you have computed.

   (d) Compute the probabilities of the error patterns you have found and determine the most probable error pattern.

   (e) Compute the probability of an undetected error of the code.