Information and Coding Theory

ENEE 5304

Problem Set 4

Cyclic Redundancy Check Codes

1. Consider the (7, 4) CRC code with a generator polynomial:
$$g_1(x) = x^3 + x + 1$$
   a. Find the codeword corresponding to the message (1011)
   b. Can this polynomial detect the error pattern (0000101)?
   c. Can this polynomial detect the error burst (0011100)?
   d. What is maximum size of the burst error that this code can detect?

2. Consider the (7, 4) CRC code with a generator polynomial:
$$g_2(x) = x^3 + x^2 + 1$$
   a. Find the codeword corresponding to the message (1011)
   b. Can this polynomial detect the error pattern (0000101)?
   c. Can this polynomial detect the error burst (0011100)?
   d. What is maximum size of the burst error that this code can detect?

3. Find the product of $g_1(x)g_2(x)$

4. Consider a CRC code with a generator polynomial:
$$g(x) = x^4 + x + 1$$
   a. Find the maximum length of the codeword generated by this polynomial?
   b. Can this code detect single error patterns?
   c. Can this code detect double error patterns?
   d. What is maximum size of the burst error that this code can detect?

5. Consider a CRC code with a generator polynomial:
$$g(x) = x^5 + x^3 + 1$$
   a. What are the error detection capabilities of this polynomial?
   b. Find the maximum size of a frame such that the error detection capabilities of Part a can be exploited?