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?

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