

Assignment 4

Due Tuesday, April 28. Show your work. Hand in your assignment using the appropriate dropbox on the course web site. Assignments submitted after the solutions are made available will be given a mark of zero.

Question 1

What would be the value of the parity bit if a serial interface transmitted the character 'e' with even parity? Show your work.

Question 2

What is the Hamming distance between the two 8-bit codewords 0x071 and 0x93?

Question 3

A code consisting of four (4) 6-bit codewords is formed by taking all possible 2-bit values and replicating them three times. For example, the first codeword is 000000 (binary), the second is 010101, etc.

- What are n and k ?
- What is the code rate?
- What is the minimum distance of this code?
- How many errors can this code detect? How many can it correct?
- You receive the codeword 001010. What codeword was most likely transmitted? Why? How many errors were corrected?
- You receive the codeword 001001. How many errors were detected? Can you tell what they are?

Question 4

A system requires a transmit power of 1 kW to obtain a throughput of 1 Mb/s. What is E_b in units of Joules/bit? By using coding, an alternative design can achieve a throughput of 1.2 Mb/s at an output power of 600 W. What is the E_b for this system? What is the coding gain?

Question 5

What is the polynomial representation of the bit sequence 100010?

Question 6

What sequence of bits is represented by the polynomial $x^3 + x + 1$? What is the polynomial after being multiplied by x^3 ? What is the sequence of bits?

Question 7

A CRC's generator polynomial is $x^3 + 1$. How many bits will the CRC have? Compute the CRC for the message sequence 1001 using this generator polynomial.

Question 8

Append the CRC computed above to the message (1001). Compute the CRC again. Does the CRC computation indicate an error?