CENG 3331 Intro to Telecommunication and networks

Homework 6

Due at the beginning of class, 10/31/2022

Q1. (50) Given the (7, 4) Hamming code parity check equations:

$$\begin{cases} a_6 \oplus a_5 \oplus a_3 \oplus a_2 = 0 \\ a_6 \oplus a_4 \oplus a_3 \oplus a_1 = 0 \\ a_5 \oplus a_4 \oplus a_3 \oplus a_0 = 0 \end{cases}$$

a) (15) Please give the parity check matrix and its generator matrix

b) (15) Suppose we have message m = 1010. What is the codeword after encoding?

c) (10) In receiver side, in order to decode the received codeword to message, the syndromes are needed. Please calculate the syndromes for the error bits in each location. (fill them in the table below)

S_1	S_2	S_3	Error bit
			a_0
			a_1
			a_2
			a_3
			a_4
			a_5
			a_6
			No error

d) (10) Now, suppose the codeword received by the decoder is 1010000. What is the most likely transmitted message m?

Q2. (50) A (7, 3) cyclic code, the $g(x) = x^4 + x^2 + x + 1$.

a. (15) Please give the generator matrix, and the systematic form.

b. (15) Assume we have a message m = 110, please find the codeword after encoding.

c. (10) In the receiver side, the syndromes are also needed for decoding. Please list the syndromes in polynomial expression in the table.

Syndromes	Error bit
	x^6
	x^5
	x^4

d. (10) Suppose we have a codeword 1001100 at the receiver side. What is corrected codeword and the original message m?

Q3. (Extra 10) Join the discussion of IoT on Blackboard. Attach only the screenshot of your answer from Blackboard.