MATH 280 Discrete Mathematical Structures Assignment #12 Name _____

The point values for each question is given within []. The total number of points for this assignment is 30.

[5] 1. Each of the following sets claim to be a group code. Indicate which sets are group codes. For those that are not group codes, show why they are not group codes.

(a) $\{0000, 1010, 0101, 1111\}$

(b) $\{1010, 0101, 1111\}$

(c) $\{0000, 0101, 1111\}$

[5] 2. Compute the given Hamming distances.

(a) $H(00101, 01110)$

(b) $H(10001, 01111)$

(c) $H(00101, 00101)$

[10] 3. Consider the messages {left, right, forward, reverse}.

(a) What is the set of binary m-tuples representing the set of messages?

(b) What is n, the length of the corresponding code words that would be used for single error correction?

(c) Construct M, the canonical parity check matrix used for verifying the correctness of code words and correcting all single errors.

(d) Provide the set of code words and show that they are indeed code words.

(e) Choose one of your code words, change bit 2, and show how your matrix can be used to correct the error.

(f) Choose another one of your code words, change bit 1, and show how your matrix can be used to correct the error.

[10] 4. Consider the messages {000, 001, 010, 011, 100, 101, 110, 111}.

(a) What is the set of binary m-tuples representing the set of messages?

(b) What is n, the length of the corresponding code words that would be used for single error correction?

(c) Construct M, the canonical parity check matrix used for verifying the correctness of code words and correcting all single errors.

(d) Provide the set of code words and show that they are indeed code words.

(e) Choose one of your code words, change bit 3, and show how your matrix can be used to correct the error.

(f) Choose another one of your code words, change bit 4, and show how your matrix can be used to correct the error.