Student: Benny Jones **Date:** 7/19/16	**Instructor:** Thara Lowndes **Course:** Math 101 -Summer 2016-Sec. 953 (Choden)	**Assignment:** HW 15-Matrix Codes (7.3 & 7.4)

1. Suppose that the generator matrix for a (4,8)-code is:

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 & 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 0 & 0 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 1 & 0 & 0 & 1 \end{bmatrix}$$

The codeword corresponding to 1010 is _____.

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2. Suppose that the generator matrix for a (4,8)-code is:

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 & 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 0 & 0 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 1 & 0 & 0 & 1 \end{bmatrix}$$

The codeword corresponding to 1101 is _____.

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3. Determine all the codewords for the code having the generator matrix:

$$\begin{bmatrix} 1 & 0 & 1 & 0 & 1 \\ 0 & 1 & 1 & 1 & 0 \end{bmatrix}$$

List all possible codewords, separated by commas: _____.

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4. Determine all the check matrix associated with the generator matrix:

$$\begin{bmatrix} 1 & 0 & 1 & 1 & 0 \\ 0 & 1 & 0 & 0 & 1 \end{bmatrix}$$

Using the table, correctly fill in the check matrix values:

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5. Determine the check matrix associated with the generator matrix:

$$\begin{bmatrix} 1 & 0 & 0 & 1 & 1 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 1 & 0 & 1 \end{bmatrix}$$

Using the table, correctly fill in the check matrix values.

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6. The given codeword was received after being decoded using the generator matrix and transmitted.

$$\begin{bmatrix} 1 & 0 & 0 & 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 & 1 & 1 & 0 \\ 0 & 0 & 1 & 1 & 1 & 0 & 1 \end{bmatrix}$$

Determine the syndrome of the word 1001110, and decode if it is a codeword or if it differs from a codeword in a single digit.

The syndrome is _____.

If a codeword, enter the codeword. If not a codeword enter 0. _____

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7. The given codeword was received after a message was encoded using the generator matrix

$$\begin{bmatrix} 1 & 0 & 0 & 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 & 1 & 1 & 0 \\ 0 & 0 & 1 & 1 & 1 & 0 & 1 \end{bmatrix}$$

and then transmitted. Determine the syndrome of the received word 1110100, and decode it if it is a codeword or if it differs from a codeword in a single digit.

The syndrome is _____.

The original message was _____ (if the word cannot be decoded, enter 'unknown').

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8. Determine the syndrome of each word using the check matrix:

$$\begin{bmatrix} 1 & 0 & 0 & 1 \\ 0 & 1 & 1 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

Decode 110011 and give the syndrome and codeword.

The syndrome is _____ and the message is _____ (if not a codeword enter 0).

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9. Determine the syndrome of each word using the check matrix:

$$\begin{bmatrix} 1 & 0 & 0 & 1 \\ 0 & 1 & 1 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

Decode 011111 and give the syndrome and codeword.

The syndrome is _____ and the message is _____ (if not a codeword enter 0).