

CMSC 442/653
Fall 2006
Instructor: Dr. Lomonaco
Homework 4

- **Reading Assignment:** Review relevant slides on “Overview of Coding Theory” found at <http://www.cs.umbc.edu/~lomonaco/f06/653/Slides653.html>
- **Optional Reading assignment:** Peterson & Weldon, "Error-Correcting Codes," MIT Press, (Second Edition), Chapter 3, Pages 40-47.

1U) Let V be the linear code over $GF(3)$ determined by the generator matrix

$$G = \begin{pmatrix} 0 & 2 & 1 & 2 & 0 \\ 2 & 1 & 1 & 0 & 2 \\ 2 & 2 & 0 & 1 & 1 \end{pmatrix}$$

- Find a parity check matrix H for the linear code V .
- What is the length n of V .
- Put the generator matrix of V in echelon canonical form to find the dimension k of V .

2U) Let V be the binary linear code given by the generator matrix

$$G = \begin{pmatrix} 1 & 0 & 1 & 0 & 1 & 1 \\ 0 & 1 & 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 1 & 1 \end{pmatrix}$$

- Find a parity check matrix H of the binary linear code V .
- Use the generator matrix to create a list of all code vectors of V .
- Use the list generated in in b) to determine the minimum d distance of V
- Explain why it is easier to find the minimum distance for a linear code than it is for a non-linear code.

3U) Let V be the binary linear code given by the parity check matrix

$$H = \begin{pmatrix} 1 & 0 & 1 & 1 & 1 & 1 \\ 1 & 1 & 0 & 1 & 1 & 1 \\ 1 & 0 & 0 & 1 & 0 & 1 \end{pmatrix}$$

Find a generator matrix G for V .