

**Exam 1**  
**Algebraic Coding Theory**  
**Math 525**  
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**Problem 3:**

- (a) An error pattern of weight  $d$  that  $C$  does not detect.

Given that  $C$  is defined as below:

$$C = \{001100, 110111, 011001, 100010\}$$

I was able to see the distance from  $u = 001100$  to  $v = 011001$  was  $d(u, v) = 3$ . There is an error pattern  $e$  of weight  $d$  that can be defined as below:

$$e = u + v = 010101$$

Thus we have an error pattern of weight  $d = 3$ , that is not detectable by  $C$

- (b) An error pattern of weight  $\lfloor \frac{d-1}{2} \rfloor + 1$  that  $C$  does not correct.

I was able to see the distance from  $u = 001100$  to  $v = 011001$  was  $d(u, v) = 3$ . Notice that with  $d = 3$ ,  $\lfloor \frac{d-1}{2} \rfloor + 1 = 2$ . So I need to find an error pattern of weight 2, that  $C$  does not correct. Because  $d(u, v) = 3$ , if I make an error pattern of weight 2 and add it to  $u$ , the result  $u + e$  will be closer to  $v$ . So let  $e = 010100$  such that

$$w = u + e = 011000$$

Now notice that  $d(w, u) = 2$  but the  $d(w, v) = 1$ . So  $C$  will not correct  $e = 010100$ .