Assignment #3 2-15-05

p 62 4.4, 4.7

4.4 $G = \begin{bmatrix} 1&0&0 \\ 0&1&0 \\ 0&0&1 \\ 0&1&1 \\ 1&0&1 \\ 1&1&0 \\ 1&1&1 \end{bmatrix}$

G rank 3, code has $2^3 = 8$ words:

000	0000
100	0111
010	1011
001	1101
110	1100
101	1010
011	0110
111	0001

minimum weight = 4
so $d = 4$

G standard $\Rightarrow$ H standard $\Rightarrow$ $H = \begin{bmatrix} 0&1&1&1&0&0&0 \\ 1&0&1&0&1&0&0 \\ 1&1&0&0&0&1&0 \\ 1&1&1&0&0&0&1 \end{bmatrix}$

There are $2^{7-3} = 2^4 = 16$ rows.
The row with 0 has leader 0, rows with leaders of weight 1 have unique least weight elements:

row leader	syndrome
0000000	0000
1000000	0111
0100000	1011
0010000	1101
0001000	1000
0000100	0100
0000010	0010
0000001	0001

~~weight~~ rows with weight 2 elements:

row leader	syndrome	other leaders same weight
1100000	1100	~~1100000~~, 0010001, 0001100
1010000	1010	0001010, 0100001
1001000	1111	0100100, 0010010
1000100	0011	0101000, 0000011
1000010	0101	0011000, 0000101
1000001	0110	0110000, 0000110

row leader	syndrome	other leaders same weight
0100010	1001	0010100, 0001001

rows with weight 3 leaders

0001110	1110	1001001, 0100101, 0010011
		1100010, 1010100, 0111000

to get the syndrome 1110, add a column to 0001110, i.e. change the column in position 4, 5, 6. This leads to other words of weight 3 in the listed leaders above

Ex. 7 $H = \begin{bmatrix} 1&1&1&0&0&0&1&0&0&0 \\ 1&0&0&1&1&0&0&1&0&0 \\ 0&1&0&1&0&1&0&0&1&0 \\ 0&0&1&0&1&1&0&0&0&1 \end{bmatrix}$ $n = 10,\ m = 6$

$2^{10-6} = 2^4 = 16$ rows

Begin table with syndromes of 0, e_i $1 \le i \le 10$ (columns of H)

leader	syndrome
0000000000	0000
1000000000	1110
0100000000	1010
0010000000	1001
0001000000	0111
0000100000	0101
0000010000	0011
0000001000	1000
0000000100	0100
0000000010	0010
0000000001	0001

weight 2

1000100000	1111
1000000010	1110
1000000001	1101
0100100000	1011
0001000100	0111

3.17; ~~8~~ word

word	syndrome	
1010111011	1000	~~codeword~~ differs from codeword at 7
0101011111	0000	codeword
1011010111	1001	differs from codeword at 3
1101101010	1111	differs from codeword at 1, 6

2-11-01-3

3.18 if correcting at most two codeword, then
bits in rows 0 through 10, so 5 rows, each of length $2^6 = 64$,
for a total of 320 word of length 10 that are at distance
2 or more from a codeword.