

Coding Theory Answers

1) Codewords: $\underline{0}$, 001011, 010111, 011100, 100110, 101101, 110001, 111010.

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

Min Weight: 3, Errors Detected: 2, Errors Corrected: 1

Syndrome	Coset Leader
110	100000
111	010000
011	001000
100	000100
010	000010
001	000001

Message w	Syndrome wH	Coset Leader H	Corrected Message $w+H$	Result (first 3 numbers)	Letter
110011	010	000010	110001	110	T
011101	001	000001	011100	011	H
011011	111	010000	001011	001	A
010001	110	100000	110001	110	T
111110	100	000100	111010	111	S
000010	010	000010	000000	000	
100010	100	000100	100110	100	G
101101	000	000000	101101	101	R
110111	110	100000	010111	010	E
001001	010	000010	001011	001	A
111001	011	001000	110001	110	T

2) Codewords: 0, 10010010, 01001010, 00100101, 11011000, 10110111, 11111101, 01101111.

Min Weight: 3, Detected: 2, Corrected: 1.

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

Syndrome	Coset Leader
10010	10000000
01010	01000000
00101	00100000
10000	00010000
01000	00001000
00100	00000100
00010	00000010
00001	00000001

Message	Syndrome	Coset Leader	Corrected	Result	Letter
10100111	10000	00010000	10110111	101	R
11111111	00010	00000010	11111101	111	E
01100101	01010	01000000	00100101	001	S
01101111	00000	00000000	01101111	011	U
00001010	01010	01000000	01001010	010	L
00100000	00101	00100000	00000000	000	T

3) Codewords: 1001101, 0100101, 0011010, 1101000, 1010111, 0111111, 0.

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

Min weight: 3, Detected: 2, Corrected 1.

Syndrome	Coset Leader
1101	1000000
0101	0100000
1010	0010000
1000	0001000
0100	0000100
0010	0000010
0001	0000001

Message	Syndrome	Coset Leader	Corrected	Result	Letter
1001000	0101	0100000	1101000	110	M
0100101	0000			010	A
0011010	0000			001	T
1101101	0101	0100000	1001101	100	R
1010011	0100	0000100	1010111	101	I
0111110	0001	0000001	0111111	011	C
0000000	0000			000	E
1101101	1010	0010000	1111101	111	S