ECS 455: In-Class Exercise # 13

Instructions

1. Separate into groups of no more than three persons.
2. The group cannot be the same as your former group.
3. Only one submission is needed for each group.
4. ***Write down all the steps*** that you have done to obtain your answers. You may not get full credit even when your answer is correct without showing how you get your answer.
5. **Do not panic.**

Date: 28 / 04 / 2017			
Name	ID (last 3 digits)		
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Consider a systematic cyclic (7,4) code whose generator polynomial is $x^3 + x^2 + 1$.

Note that this is not the same as the g(x) that was used in lecture.

1. Suppose the message is 0100. Find the corresponding codeword.

$c(x) = x^{n-k} m(x) + r(x)$

$n-k = 7-4 = 3$

$\underline{m} = 0100 \Leftrightarrow m(x) = x$

$x^{n-k} m(x) = x^3 m(x) = x^4$

$$
\begin{array}{r}
x + 1 \\
x^3+x^2+1 \;\big)\; x^4 \qquad\qquad \\
x^4 + x^3 \qquad + x \\
\hline
x^3 \qquad + x \\
x^3 + x^2 \qquad + 1 \\
\hline
x^2 + x + 1
\end{array}
$$

$r(x) = 1 + 1x + 1x^2 \Leftrightarrow 111$

These lines can be skipped.

$= 0 + 0x + 0x^2 + 0x^3 + 1x^4 + 0x^5 + 0x^6$

$c(x) = x^{n-k} m(x) + r(x)$

$= 1 + 1x + 1x^2 + 0x^3 + 1x^4 + 0x^5 + 0x^6$

So, $\underline{c} = 111\overbrace{0100}^{\underline{m}}$

2. Suppose the message is 1000. Find the corresponding codeword.

$c(x) = x^{n-k} m(x) + r(x)$

$n-k = 7-4 = 3$

$\underline{m} = 1000 \Leftrightarrow m(x) = 1$

$x^{n-k} m(x) = x^3 m(x) = x^3$

$$
\begin{array}{r}
1 \\
x^3+x^2+1 \;\big)\; x^3 \qquad\qquad \\
x^3 + x^2 \qquad + 1 \\
\hline
x^2 \qquad + 1
\end{array}
$$

$r(x) = 1 + 0x + 1x^2 \Leftrightarrow 101$

These lines can be skipped.

$= 0 + 0x + 0x^2 + 1x^3 + 0x^4 + 0x^5 + 0x^6$

$c(x) = x^{n-k} m(x) + r(x)$

$= 1 + 0x + 1x^2 + 1x^3 + 0x^4 + 0x^5 + 0x^6$

So, $\underline{c} = 101\overbrace{1000}^{\underline{m}}$