Assignment # 10 Due 4-26-05

17.1

987654321 =

1001 1000 0111 0110 0101 0100 0011 0010 0001 =

x^3+1 x^3 x^2+x+1 x^2+x x^2+1 x^2 $x+1$ x 1 =

α^4 α^3 α^7 α^{13} α^9 α^2 α^{12} α 1 =

$h(x) = \alpha^4 x^8 + \alpha^3 x^7 + \alpha^7 x^6 + \alpha^{13} x^5 + \alpha^9 x^4 + \alpha^2 x^3 + \alpha^{12} x^2 + \alpha x + 1$

encode systematically:

$x^6 h(x) + r_h(x)$ where $x^6 h(x) = q_h(x) g(x) + r_h(x)$

Divide $g(x) = x^6 + \alpha^{12} x^5 + x^4 + \alpha^2 x^3 + \alpha^7 x^2 + \alpha^{11} x + \alpha^6$

into $x^6 h(x) = \alpha^4 x^{14} + \alpha^3 x^{13} + \alpha^7 x^{12} + \alpha^{13} x^{11} + \alpha^9 x^{10} + \alpha^2 x^9 + \alpha^{12} x^8 + \alpha x^7 + x^6$

get $q_h(x) = \alpha^4 x^8 + \alpha^{10} x^7 + \alpha^4 x^6 + x^5 + x^4 + \alpha^{14} x^3$

$r_h(x) = \alpha^{13} x^5 + \alpha^6 x^4 + \alpha^6 x^3 + \alpha^6 x^2 + \alpha^5 x + \alpha^8$

So encode as

$\alpha^4\ \alpha^3\ \alpha^7\ \alpha^{13}\ \alpha^9\ \alpha^2\ \alpha^{12}\ \alpha\ 1\ \alpha^{13}\ \alpha^6\ \alpha^6\ \alpha^6\ \alpha^5\ \alpha^8$

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17.3 first part

C =

1110 0011 1000 1110 0011 1000 1110 0011 1000 1001 1001

1110 0011 1101 0110 =

$x^3+x^2+\alpha$ $x+1$ x^3 x^3+x^2+x $x+1$ x^3 x^3+x^2+x $x+1$ x^3 x^3+1

x^3+x^2+x $x+1$ x^3+x^2+1 x^2+x =

$\alpha^8 x^{14} + \alpha^{12} x^{13} + \alpha^3 x^{12} + \alpha^8 x^4 + \alpha^{12} x^{10} + \alpha^3 x^9 + \alpha^8 x^8 + \alpha^{12} x^7$
$+ \alpha^3 x^6 + \alpha^4 x^5 + \alpha^4 x^4 + \alpha^8 x^3 + \alpha^{12} x^2 + \alpha^{11} x + \alpha^{13}$

divide by generator polynomial
$x^6 + \alpha^{12} x^5 + x^4 + \alpha^2 x^3 + \alpha^7 x^2 + \alpha^{11} x + \alpha^6$

and see remainder = 0.

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17.6 Use polynomial encoding generator:
this is a ~~[illegible]~~ 15 × 9 matrix with columns (the transposes of vectors of coefficient of) $x^8 g(x), \dots, g(x)$
where $g(x)$ is the degree 6 generator:

1	0	0	0	0	0	0	0	0
α^{12}	1	0	0	0	0	0	0	0
1	α^{12}	1	0	0	0	0	0	0
α^2	1	α^{12}	1	0	0	0	0	0
α^7	α^2	1	α^{12}	1	0	0	0	0
α^{11}	α^7	α^2	1	α^{12}	1	0	0	0
α^6	α^{11}	α^7	α^2	1	α^{12}	1	0	0
0	α^6	α^{11}	α^7	α^2	1	α^{12}	1	0
0	0	α^6	α^4	α^7	α^2	1	α^{12}	1
0	0	0	α^6	α^4	α^7	α^2	1	α^{12}
0	0	0	0	α^6	α^{11}	α^7	α^2	1
0	0	0	0	0	α^6	α^4	α^7	α^2
0	0	0	0	0	0	α^6	α^4	α^7
0	0	0	0	0	0	0	α^6	α^{11}
0	0	0	0	0	0	0	0	α^6