Tutorial 3 Cyclic Codes

1. Consider a binary cyclic Hamming (7,4) code. Show that there are 2 versions possible for this code. For each version work out the weight distribution of the code.

2. Let C be the code generated from x^7+1 using $g(X) = x^4+ x^3+ x^2+1$

   (i) Show that W(C) is [1, 0 ,0 ,0 ,7, 0, 0 ,0].
   (ii) Suppose that $r(X) = x^5+ x = 1$. Find the most likely code polynomial v(X) for transmission over a BSC channel.

3. For C generated using a $g(X) = x^3+ x^2+1$ for a (7,4) code, design a syndrome and Meggitt decoder.
   Hence show the operation of the Meggitt decoder when an $r(X) = x^5+ x^2$ vector is received.

4. Devise an encoder shift register circuit, and a decoder circuit, for the (15,11) code generated by $g(X) = X^4 + X + 1$.

5. Shorten the (15,11) cyclic Hamming code by deleting the seven leading high order digits. The resultant code is an (8,4) code. Design a decoder for this shortened cyclic code.