

CCE5102 Information Theory and Coding
Department of Communications and Computer Engineering
Faculty of ICT

Assignment – 2010-2011

Write a program that generates a single error correcting cyclic Hamming code of any size. Then, for the (7,4), (15,11) and (31,26) use an appropriate primitive polynomial over GF(2) as a generator polynomial.

In each case design a program to work out, the codewords, based on the division by $g(x)$. Work out also the factors of the codeword in terms of $g(X)$, ie $v(X) = g(X) \cdot f(X)$.

Hence use this to set up a feedback shift register type of circuit to obtain the syndrome, and a Meggitt Decoder to correct the error bit.

Set up a random message of 1,000,000 bits, as input to the three codes. Corrupt the message using a BSC channel with crossover probabilities of 0.1, 0.01, 0.001 and 0.0001.

In each case work out

- (i) $P(C)$ the probability of a correct and correctable decoding, and
- (ii) the $P(U)$ the probability of an undetectable error.

For each message stream determine the bit error rate after decoding and compare to theoretical results. Plot your results