Number Systems and Codes

Assignments

1. Consider the following four codes:

   Code A: 0001, 0010, 0100, 1000
   Code B: 000, 001, 011, 010, 110, 111, 101, 100
   Code C: 01011, 01100, 10010, 10101
   Code D: 000000, 001111, 110011

   Which of the following properties is satisfied by each of the following codes?
   (a) Detect single errors
   (b) Detects double errors
   (c) Detects triple errors
   (d) Corrects single errors
   (e) Corrects single and detects double errors

2. Design a single error correcting Hamming code for:
   (a) 5 message bits
   (b) 6 message bits
   considering all possible combinations of the messages in designing the codewords.

3. Given a Gray code word $G = g_n \oplus g_{n-1} \oplus g_{n-2} \oplus \ldots \oplus g_0$, prove that the i-th digit of the corresponding binary number $B = b_n \oplus b_{n-1} \oplus b_{n-2} \oplus \ldots \oplus b_0$ is given by

   $b_i = g_n \oplus g_{n-1} \oplus g_{n-2} \oplus \ldots \oplus g_i$, for $0 \leq i \leq n$
   $b_n = g_n$