

Homework IV**Due: February 19, 2009**

Let $n = 7$ and $g(x) = 1 + x^2 + x^3$.

- (i) Find a generator matrix G for the cyclic code C generated by the polynomial $g(x)$.
- (ii) Display all the codewords in C .
- (iii) Find a parity-check matrix associated with G using the **Cyclic Coding Algorithm**.
- (iv) The following words were received.

$$v_0 = 0100111, v_1 = 1101010, v_2 = 1100110, v_3 = 1011101, v_4 = 1000011;$$

correct those words using the **Cyclic Decoding Algorithm** and indicate all the corrected words that are in C .

- (v) Use some row operations to change G into \tilde{G} such that if:

$$v = (v_1, v_2, v_3, v_4, v_5, v_6, v_7) \in C,$$

then v_3, v_5, v_6, v_7 are message bits and v_1, v_2, v_4 are parity bits calculated as follows:

1. v_1 is chosen to make $\alpha = v_1 + v_3 + v_6 + v_7 \equiv 0 \pmod{2}$.
2. v_2 is chosen to make $\beta = v_2 + v_5 + v_6 + v_7 \equiv 0 \pmod{2}$.
3. v_4 is chosen to make $\gamma = v_4 + v_3 + v_5 + v_7 \equiv 0 \pmod{2}$.

- (vi) The following words were received:

$$v_0 = 0100111, v_1 = 1101010, v_2 = 1100110, v_3 = 1011101, v_4 = 1000011;$$

correct those words using the **Hamming Decoding Algorithm**.

Note. I will not respond to any email asking a question about the homework.