Homework assignment #4 of Error-Correcting Codes

Due date Dec. 26, 2019

Consider a (63,55) Reed-Solomon code over $GF(2^6)$ with generator polynomial $g(X) = (X+\alpha)(X+\alpha^2)(X+\alpha^3)(X+\alpha^4)(X+\alpha^5)(X+\alpha^6)(X+\alpha^7)(X+\alpha^8)$, where the primitive element α of the finite field $GF(2^6)$ satisfies $1+\alpha+\alpha^6=0$.

1. Let $r(X) = \alpha^{36}+\alpha^4X+\alpha^{33}X^2+\alpha^{21}X^3+\alpha^{56}X^4+\alpha^{52}X^5+\alpha^{47}X^6+\alpha^{13}X^7+\alpha^{39}X^8+X^9+\alpha^5X^{10}+\alpha^{11}X^{23}+\alpha^{37}X^{60}$ be the received sequence. Use Berlekamp-Massey decoding algorithm to recover the transmitted codeword.
   (a) Show r, Δ_r, $T(X)$, $B(X)$, $\Lambda(X)$, L for each iteration r.
   (b) Find the error locations and error values.
   (c) Find the decoded codeword.

2. Let $r(X) = \alpha^{36}+\alpha^4X+\alpha^{33}X^2+\alpha^{21}X^3+\alpha^{56}X^4+\alpha^{52}X^5+\alpha^{47}X^6+\alpha^{13}X^7+\alpha^{39}X^8+X^9+\alpha^5X^{10}+\alpha^{11}X^{23}+\alpha^{37}X^{60}$ be the received sequence. Use Euclidean algorithm to recover the transmitted codeword.
   (a) Show $s^{(r)}(X)$, $t^{(r)}(X)$, $Q^{(r)}(X)$, $A^{(r)}(X)$, for each iteration r.
   (b) Find the error locations and error values.
   (c) Find the decoded codeword.