Homework assignment #4 of Error-Correcting Codes

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 $r(X) = \alpha X^7 + \alpha^5 X^5 + \alpha^{11} X^2 + \alpha^{37} X^{60}$ 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.

2. Let $r(X) = \alpha X^7 + \alpha^5 X^5 + \alpha^{11} X^2 + \alpha^{37} X^{60}$ 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.

3. Let $r(X) = \alpha^{36} + \alpha^4 X + \alpha^{33} X^2 + \alpha^{21} X^3 + \alpha^{56} X^4 + \alpha^{52} X^5 + \alpha^{47} X^6 + \alpha^{13} X^7 + \alpha^{39} X^8 + X^9 + \alpha^5 X^{10} + \alpha^{11} X^{23} + \alpha^{37} X^{60}$ 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.

4. Let $r(X) = \alpha^{36} + \alpha^4 X + \alpha^{33} X^2 + \alpha^{21} X^3 + \alpha^{56} X^4 + \alpha^{52} X^5 + \alpha^{47} X^6 + \alpha^{13} X^7 + \alpha^{39} X^8 + X^9 + \alpha^5 X^{10} + \alpha^{11} X^{23} + \alpha^{37} X^{60}$ 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.