

## EE 605: Error Correcting Codes

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Assignment 3 : **15 points**

**Due date:** August 31, 2010

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Each of the following exercises is worth 3 points. Every nontrivial step in a proof should be accompanied by justification.

1. Let  $F_q$  be a finite field. Evaluate the sum and product of the non-zero elements of  $F_q$ .
2. Construct a finite field  $F_8$  with 8 elements. You have to write down the addition and multiplication tables for this field.
3. Determine all the primitive elements of  $F_7$  and  $F_{17}$ .
4. Determine all the prime polynomials of degree 5 in  $F_2[x]$ .
5. Prove that every element of  $F_q$  is the  $k$ th power of some element in  $F_q$  if and only if  $\gcd(q-1, k) = 1$ .