EGE 534 HW #2 Dr. Izadi

First Name:______________________ Last Name: _______________________

Problem 1 (20 Points)
A cyclic code is to be based on the Generator polynomial $X^7 + X^6 + X^5 + X^2 + 1$.

a. Generate a codeword for the input data 10111.
b. Using logic gates, design an appropriate encoder and decoder the given generator.

Problem 2 (10 Points)
Design a totally self-checking checker with 8 inputs.

Problem 3 (20 Points)
Using full adders and basic gates, design a 3N code encoder, where N is a 4-bit binary number.

Problem 4 (20 Points)
Consider a low-cost residue code based on module 15.

a. Show how do you obtain residue-15 check bits of $X_7\ X_6\ X_5\ X_4\ X_3\ X_2\ X_1\ X_0$ using recursive addition technique?
b. What is the theoretical base for this easy encoding process?

Problem 5 (15 Points)
Convert 0 to 14 to RNS using modules [3,5,7].

a. For the given range, does the code has the capacity for error detection?
b. For this given range, does the code has the capacity for error correction?

Problem 6 (20 Points)
Using the combinatorial model, determine the reliability of a simplex, TMR, and 5MR systems as a function of reliability of a simplex system, R(t) . You may assume a fault-free voter. Using MathLab, plot the reliability of the three systems versus R and comment on their relative reliabilities.

Problem 7 (25 Points)
Using Markov model, determine the discrete solution for the reliability of a 5MR system with λ failure rate and μ repair rate. You may assume that the system initially is fault free. Moreover, you may assume that once the 5MR has 3 more faulty modules, it enters a failed state that can't be repaired. Using MathLab plot R(t) from 0 to 5 hours using

a. $\Delta t = 0.1$, $\lambda = .0001$ and $\mu. = .1$
b. $\Delta t = 0.1$, $\lambda = .001$ and $\mu. = .1$
c. $\Delta t = 0.1$, $\lambda = .001$ and $\mu. = .01$

Due 3/8/2014