EGE -534 HW #2 Dr. Izadi

Name: ____

Problem 1 (10 Points)
Design a totally self-checking checker with 8 inputs.

Problem 2 (20 Points)
Using full adders and basic gates, design a 5N code encoder, where N is a 4-bit binary number.

Problem 3 (20 Points)
Consider a low-cost residue code based on module 7.

a. Show how do you obtain residue-7 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 4 (15 Points)
Convert 0 to 19 to RNS using modules [4,5,7]. Within this range demonstrate if the code is single error detecting. Repeat the same for single error correcting.

Problem 5 (20 Points)
Consider a random-access memory that has a word format $X_4\ X_3\ X_2\ X_1\ X_0$ of size 5 bits. We can use Hamming code to correct any single bit in this memory.

a) What is the H (or P) matrix?
b) Given the four syndromes s_i computed by your SEC Hamming code for single-bit errors affecting data bit x_i, $0 \leq i \leq 4$. Also give the error-free syndrome s^*.
c) Explain how you would modify the SEC code you have defined above in order to obtain an SEC/DED code.

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. $\Delta t = 0.01$, $\lambda = .001$ and $\mu. = .1$
b. $\Delta t = 0.01$, $\lambda = .01$ and $\mu. = .1$
c. $\Delta t = 0.01$, $\lambda = .001$ and $\mu. = .01$

Due: March 16, 2012