

First Name: _____ Last 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.

- 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?
- 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)

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 MatLab, plot the reliability of the three systems versus R and comment on their relative reliabilities.

Problem 6 (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 Matlab plot $R(t)$ from 0 to 2 hours using

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

Due: March 8, 2013

Test 1 March 15 2013 (Closed book and notes)