EGE 534 HW #3 Dr. Izadi

First Name:_____ Last Name: _____

Problem 1 (20 Points)
A cyclic code is to be based on the Generator polynomial $X^6 + X^5 + X^3 + 1$.
a. Generate a codeword for the input data 10101.
b. Using logic gates, design an appropriate encoder and decoder the given generator.

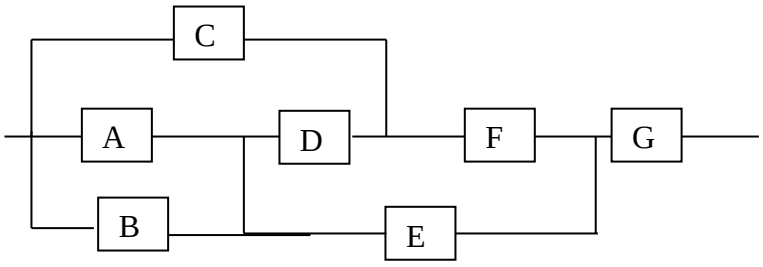
Problem 2 (20 Points)
a. Using full adders and basic gates, design a 7N code encoder, where N is a 3-bit binary number.
b. Based on the code distance, determine if the code has error detecting and/or error correcting capability.

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 (20 Points)
Convert 0 to 29 to RNS using modules [2,3,5,7].
a. For the given range, does the code has the capacity for error detection? If yes, how many bits?
b. For this given range, does the code has the capacity for error correction? If yes, how many bits?

Problem 5 (15 Points)
Design a totally self-checking checker with 6 inputs. After showing the internal circuitry of one module, you may use block form to implement the design of an 6 input unit.

Problem 6 (25 Points)
a) Determine an exact expression for the reliability of the following system, given that the reliability of each component X is R_X.
b) Assume that $R_A=R_B=R_C=R_D=R_E=R_F=R_G=R$, determine the reliability of the system in term of R.
c) Determine the upper limit approximation of the system reliability.



Problem 7 (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 8 (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 5 hours using

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

Due: Friday 3/9/ 2017