EE111 - TEST II

NAME _____

Show all your work in the space provided. Answers with a simple "yes", "no", or a single number are incomplete and will not be given full credit. Answers in the form: ans = $\frac{a+sqrt(b)}{c}$ are fine where appropriate. Good English is required on essays.

Problem 1. (20 points) Using the Karnaugh map method, find all possible reduced standard sum-of-products forms for the following Boolean function: $F(w,x,y,z) = wxy'z + y'x + w'xz + wx'y' + xyz'$.

a) (5 points) Karnaugh Map

b) (5 points) Prime Implicants

c) (5 points) Essential Prime Implicants

d) (5 points) Standard SOP forms

Problem 2. (10 points) Using the Quine-McCluskey tabulation method, find a minimal cover for $F(x,y,z) = \sum m(0,1,4,5,7)$

Problem 3. (13 points) Implement the function $F(w, x, y, z) = wx'y' + yw'z'$ using only 3-input NOR gates. Include the appropriate logic circuit.

Problem 4. (12 points) For the following circuit, identify at least one way to reduce a) overall cost and b) propagation delay. Use the library of gates handed out with your test.

a) Reduce cost (# of transistors)

b) Reduce propagation delay

Problem 5. (10 points) In the following Karnaugh map, show where static hazards may exist in the proposed solution for F. Show a solution for F which corrects for these hazards.

wx \ yz	00	01	11	10
00	1	1		
01	1	1		1
11		1	1	1
10				

$F = w'y' + wxz + xyz'$

Problem 6. (10 points) For the following circuit, $A_1A_0 = 10_2$ and $E = 1$. What are the (binary) values of $S_3S_2S_1S_0$ and $X_3X_2X_1X_0$?

Problem 7. (10 points) What is noise margin and why is it important?

Problem 8. (15 points) Prepare a truth-tables for an arithmetic logic unit which will perform the functions: ADD, Complement (of input a), XOR, and NOR. Be sure to specify select bits and to include a truth-table for the carry-bit. Some portions are already filled out below.