CSCE 211H Digital Logic Design **Test 1** **September 30, 2010**

Name:_____ Email:_____

Instructions

. No Calculators!!

- Make sure your exam is complete. There should be 9 pages including this cover sheet and a collection of figures.
- No Calculators, cell phones, or other electronic devices.
- All questions are equally weighted.
- Answer in the space provided if at all possible.
- If a question is unclear please ask early in the test.
- There is a Take Home question. It will be emailed today.
- Some Boolean Algebra Theorems are given in figures
- Good Luck!

1. (a) Convert Octal 657.2_{10} to hexadecimal (to two "decimal" places)

   (b) Convert 173.745_8 to hexadecimal.

   (c) Convert $A3.1AB_{16}$ to decimal using no calculator, leave your answer as an expression.

   (d) Convert 0000 1111 1111 0000 1111 1111 0000 0000_2 to decimal. Express your answer as an expression that is a sum of terms of the form 2^k.

2. Signed Numbers

   (a) Represent 84 as an unsigned integer using eight bits.

   (b) Represent 84 in signed-magnitude using eight bits.

   (c) Represent -84 in signed-magnitude using eight bits.

   (d) Represent 84 in two's complement using sixteen bits.

   (e) Represent -84 in two's complement using sixteen bits.

   (f) If x has two's complement representation [x] what is the number that is represented by two's complement of [x].

   (g) What is the main advantage of two's complement over signed magnitude?

3. Simplify boolean functions

   (a) Simplify F(X,Y,Z)=$\sum$(0,2,3,7) in sums-of-products form.

   (b) What is a non-essential implicant set? Give an example?

   (c) Simplify F(A,B,C,D)=Π(3, 6, 7, 9, 11) in sums-of-products form, with don't care d(A,B,C,D)=$\sum$(10,12,13,14,15)

4. (a) Simplify using Axioms $F = A' \bullet B' \bullet C \bullet D + A' \bullet B' \bullet C \bullet D' + A' \bullet B \bullet C \bullet D + A' \bullet B \bullet C \bullet D' + A \bullet C \bullet D' + A \bullet B' \bullet C \bullet D'$

(b) Why would a function have don't care conditions? Give an example.

5. (a) Draw a 4 to 1 multiplexer

   (b) Show how to implement F(X,Y,Z)=$\sum$(0,4,6,7) using a decoder.

6. Carry Lookahead

   (a) In a 14 pin package what are usually connected to pins 7 and 14?

   (b) Give the formula for G_i

   (c) Give the formula for P_i

   (d) In a 5 bit carry look ahead unit what is the formula for G_{block} ?

   (e) On figure F, show how to wire up G_i and P_i

7. Identify from the collection of figures (extra handout)

   (a) A.

   (b) B.

   (c) C

8. Show how to build a 11 to 1 multiplexer from 4 to 1 multiplexers.

9. (a) Explain how a transistor is turned on by placing a charge on the gate. Provide a drawing.

   (b) Analyze the CMOS Circuit in figure D on the collection of figures but just for the one set of inputs asked for on the figure!!!!

   (c) Draw a CMOS three input NOR

10. VHDL

    (a) Give an VHDL entity section for a 1 to 4 demultiplexer

    (b) Give a VHDL specification for Full Adder