ECE 331 Digital System Design

Fall 2007 Nathalia Peixoto

Student:_____
Grade: _____

HOMEWORK 5 – due October 2nd at ≤6pm

1) Feedback (3pts) – to be completed after you finish.

- F1. If you worked on it with classmates and your solutions might be TOO similar, write their names here:_____
- F2. How long did it take you to work on the homework (don't count the reading assignment!) 2h 4h 6h 8h 10h infinite hours
- F3. Do you have suggestions on how to improve it? (ideas for new exercises?) Let us know here (and/or use your own homework sheets):

2) Binary Numbers.

Write the following numbers in unsigned, signed, 1's complement, and 2's complement representations.

Number (base 10)	Number of bits to use	Unsigned (base 2)	Signed (base 2)	1's complement	2's complement
-59	8				
500	10				
126	8				
-500	10				

3) Adding and subtracting in 2's complement.

Complete the table: Write Y/N for the columns labeled "overflow". The first is for addition, the second for subtraction. X and Y are 9 bit numbers. All other columns are to be given in 2's complement.

X	Y	X (2's)	Y (2's)	X+Y	Overflow?	X-Y	Overflow?
-200	100						
239	-56						
64	243						
-177	-156						

4) Digital codes

(a) Write the first five letters of your name using an 8-bit ASCII code. The MSB should be the parity bit (use ODD parity). The other seven bits are the usual ASCII code. Please write your answers in the appropriate spaces for items a through c:

Answer:

(b) What's the decimal representation of this BCD number?

-0011 1100 0101 1010.0111 1110

(c) Write the BCD code for the following decimal numbers:

-12.34
-7698.561

5) VHDL

Given the following 4-variable function, minimize it using K-maps, and then write the VHDL code for the minimized expression (entity and architecture).

$$F=\bar{g}\bar{m}\bar{u}t+gmut+\bar{g}mut+g\bar{m}\bar{u}\bar{t}+gm\bar{u}\bar{t}+\bar{g}\bar{m}ut$$

6) Tabular Minimization (extra credit)

Use the Quine-McKluskey Method to minimize the following function (show all steps):

$$Q_{a,b,c,d}=\Sigma\ 0,1,3,4,7,11,13,15+d(9,12,14)$$