UNCA CSCI 255
Exam 1 Fall 2012
11 October, 2012

This is a closed book and closed notes exam. It is to be turned in by 10:40 AM. Calculators, PDA's, cell phones, and any other electronic or communication devices may not be used during this exam.
If you want partial credit for imperfect answers, explain the reason for your answer!

Name:_____

Problem 1 (12 points) Decimal to two's complement conversion
Convert the following six signed decimal numbers into eight-bit two's complement representation. Some of these numbers may be outside the range of representation for eight-bit two's complement numbers. Write "out-of-range" for those cases.

-128	**-33**
-1	**1**
42	**128**

Problem 2 (8 points) Two's complement to decimal conversion
Convert the following four six-bit two's complement numbers into signed decimal representation.

111100	**000111**
010101	**100111**

Problem 3 (12 points) Adding
Add the following pairs of six-bit two's complement numbers **and indicate which additions result in an overflow by writing either "overflow" or "no overflow" in each box**.

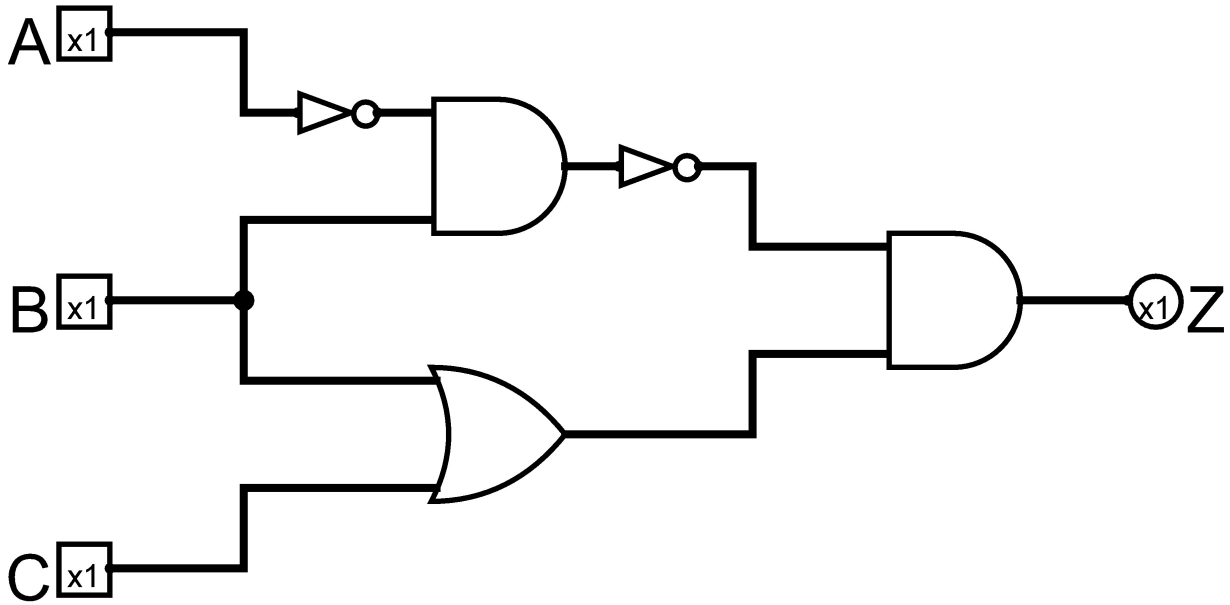
000101 **+ 000001**	**011010** **+ 100110**
110110 **+ 001010**	**111101** **+ 111101**
110000 **+ 110000**	**011111** **+ 011111**

Problem 4 (8 points) Memories
A 16 MB memory has a 32-bit word size. How many words are contained in this memory?

A memory has 256 M words. Each word contains 16 bits. How many bytes are contained in this memory?

How many bits are required to address the 256 M words of this memory?

Problem 5 (15 points) Digital logic to truth table
A gate-level circuit is shown below with three inputs on the left and a single output on the right. (Ignore the "x1" in the pins. It's the bit width.) Complete the truth table so that it corresponds to this digital logic circuit.



A	B	C	Z
0	0	0	
0	0	1	
0	1	0	
0	1	1	
1	0	0	
1	0	1	
1	1	0	
1	1	1	

Problem 6 (5 points) Digital logic to Boolean expression
Write a Boolean expression that corresponds to the logic circuit shown in Problem 5. You can build on your Problem 5 answer if that seems appropriate.

Problem 7 (15 points) Truth table to digital logic
Draw a logic circuit at the gate level that will implement the following truth table, where A, B, and C are inputs and Z is the single output.

A	B	C	Z
0	0	0	1
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	0

Problem 8 (5 points) Truth table to Boolean expression
Write a Boolean expression that corresponds to the truth table shown in Problem 7. You can build on your Problem 7 answer if that seems appropriate.

Problem 9 (10 points) Boolean expression to truth table

Complete the truth table below so that it corresponds to the following Boolean equation

$X = A\ B\ C + A\ \overline{C}$

If you prefer that your inversions be primes, you can think of the equation as

X = A B C + A C'

Or, if you really like Java conditional expressions, you can go with

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X = A && B && C || A && !C
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Problem 10 (10 points) Boolean expression to digital logic

On the remainder of this page, draw a logic circuit at the gate level that will implement the Boolean equation given in Problem 9. You can build on your Problem 9 answer if that seems appropriate.

A	B	C	Z
0	0	0	
0	0	1	
0	1	0	
0	1	1	
1	0	0	
1	0	1	
1	1	0	
1	1	1	