UNCA CSCI 255
Exam 1 Fall 2009
24 September, 2009

This is a closed book and closed notes exam. It is to be turned in by 2:35 pm. Calculators, PDA's, cell phones, and any other electronic or communication devices may not be used during this exam.

Name:_____

If you want partial credit for imperfect answers, explain the reason for your answer!

Problem 1 (8 points) Decimal to two's complement conversion
Convert the following four signed decimal numbers into five-bit two's complement representation.

13	8
-2	-8

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

1111	1010
1000	0011

Problem 3 (12 points) Adding
Add the following pairs of six-bit two's complement numbers **and indicate which additions result in an overflow**.

111111 + 100001	101010 + 101010
100001 + 011111	011000 + 001110

Problem 4 (6 points) Ranges
What is the number of different values that can be represented by 10 binary digits?

What is the greatest number that be represented in 10-bit two's complement notation?

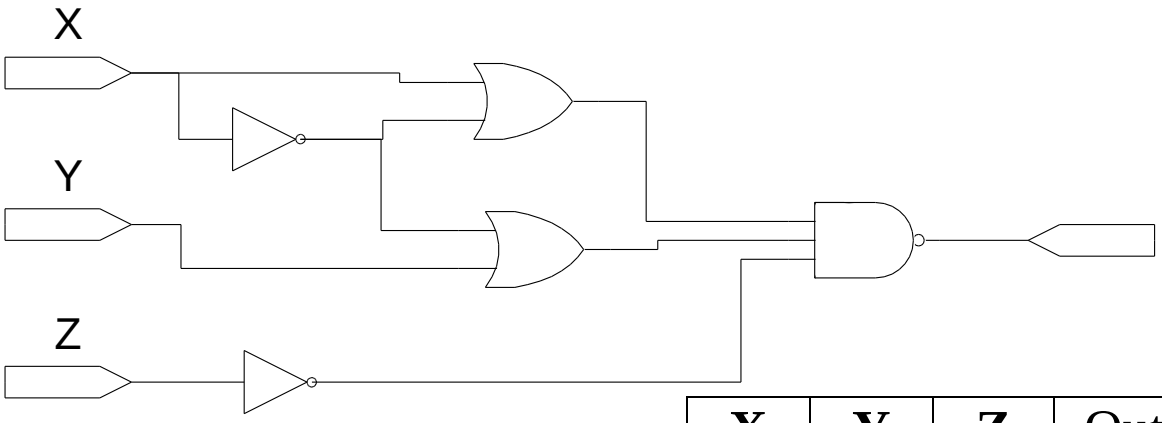
What is the smallest number that can be represented in 10-bit two's complement notation?

Problem 5 (4 points) Removed

Problem 6 (8 points) Floating point
Express the following two numbers in IEEE floating point notation. I've left some spaces between the major bit fields in the number, and I've also expressed the numbers in both decimal and binary fixed point notation. None of these answers should involve long calculations.

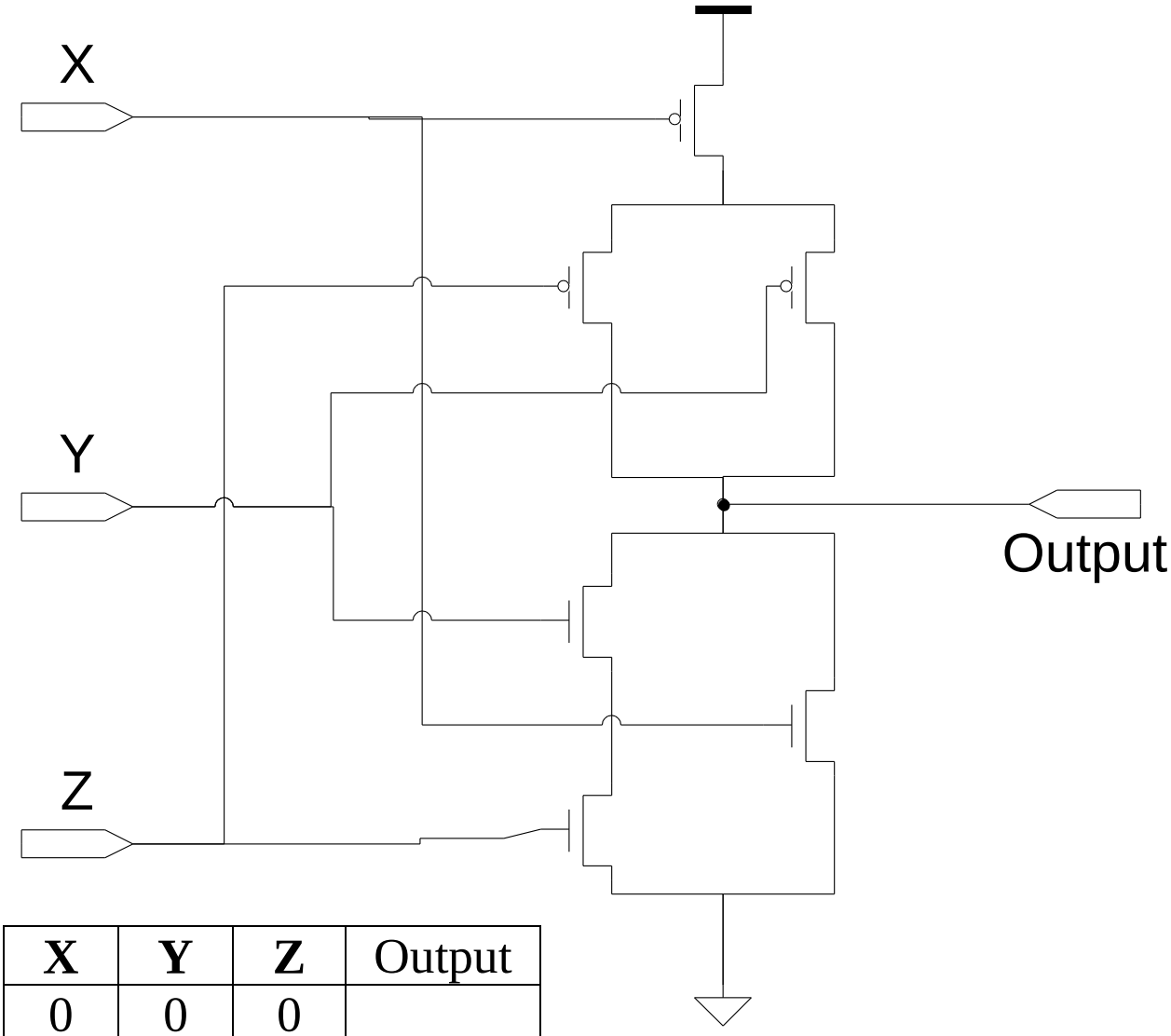
0.125 *or* 0.001 _ _______ _____
-25.5 *or* 1101.1 _ _______ _____

Problem 7 (15 points) Gates to truth
Give the truth table for the gate-level circuit shown below. The inputs are on the left, the output is on the right.



X	Y	Z	Output
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 8 (15 points) Transistors to Truth
Give the truth table for the transistor-level circuit shown below. The three inputs are on the left, the output is on the right.



X	Y	Z	Output
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 9 (9 points) Bitwise operations
Perform the following bit-wise logical operations on 8-bit numbers expressed as two hexadecimal digits. Your answer should also be expressed in hexadecimal.

Speed up hint: Consider using the numbers in the table below. (They are the right binary.) But remember, the answer must be hex.

00000111	00000111	00000111
00101100	00101100	00101100

ADD(07,2C) -->
AND(07,2C) -->
OR (07,2C) -->

Problem 10 (15 points) Truth to Gates
Draw a circuit, at the gate level, that will implement the following truth table, where A, B, and C are inputs and where Z is the single output.

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