## UNCA CSCI 235 <br> Exam 1 Spring 2019 <br> 1 April 2019

This is a closed book and closed notes exam. Communication with anyone other than the instructor is not allowed during the exam. Furthermore, calculators, cell phones, and any other electronic or communication devices may not be used during this exam. Anyone needing a break during the exam must leave their exam with the instructor. Cell phones or computers may not be used during breaks.

This exam must be turned in before 6:55 PM.
Name: $\qquad$

## Problem 1 (30 points) C expressions

In the left column, there are fifteen and not-so tricky $C$ expressions. Write their values in the right column. Express your answers in simple base 10 expressions, such as 235 or -235 . You may assume that all of these numbers are stored in 16-bit two's complement representation, the usual short.

| 0235 |  |
| :---: | :---: |
| 0x5A |  |
| 21 / 5* 4 |  |
| 21 * 5 / 4 |  |
| 21 \&\& 14 |  |
| 21 \& 14 |  |
| 21 14 |  |
| 21 ^ 14 |  |
| 21 >> 2 |  |
| $21<2$ |  |
| $21>2$ |  |
| $21<2$ |  |
| !-21 |  |
| ~21 |  |
| $5 *(14==14)+3$ |  |

Problem 2 ( 16 points) Decimal to two's complement conversion
Convert the following four signed decimal numbers into five-bit two's complement representation. Some of these numbers may be outside the range of representation for five-bit two's complement numbers. Write "out-of-range" for those cases.

| 35 | -16 |
| :---: | :---: |
| 16 | -5 |

Problem 3 ( 16 points) Q4. 4 to decimal conversion Convert the following four Q4.4 two's complement numbers (four fixed and four fractional bits) into signed decimal representation.

## 01000010

## 01100000

## 10001000

## 10010010

## Problem 4 ( 12 points) Decimal to Q4.4 conversion

Convert the following three signed decimal numbers into Q4.4 two's complement numbers (four fixed and four fractional bits). If you can't express the number exactly, give the nearest Q 4.4 representation.

## -5. 0

## 0.1

### 3.14159

## Problem 5 (4 points) Tools of the trade

## Answer the following three questions.

What component was wired in series to an LED when we used the Arduino? (Hint: It limits current.)

What does the tar.gz at the end of the filename lab.tar.gz mean?

To keep harmony within the Department of Computer Science, what do we always do at the end of a lab?

## Problem 6 ( 22 points) C Programming

Write a program that reads (using scanf) pairs of integers from a terminated standard input stream and counts and prints (using printf) how many times (a) the first number was greater than the second, (b) the two numbers were equal, and (c) the first number was less than the second. Your output must have neatly formatted lines as illustrated below.

First was larger:
2019
Numbers were equal:
13
Second was larger:
1984
The input is totally unformatted and only contains integers. In the following sample input, each of these three possibilities occurs twice:
$\begin{array}{lllllllll}431 & 2019 & 32 & 32 & 2 & 1 & 1000 & -1000 & 235 \\ 235 & -5 & -4 & & & & & & \\ \end{array}$

Here's two lines to get you started:
\#include <stdio.h>
int main(int argc, char *argv[]) \{
\}

