CS 163 Discrete Math **Fall 2019**
http://neilklingensmith.com/teaching/loyola/cs163/

Homework 3

Due: September 24, 2019

Name:

1. (20 points) Binary addition
   (a) (5 points) Compute the following longhand **binary** addition:

$$\begin{array}{r} 1011 \\ +0101 \\ \hline \end{array}$$

   (b) (5 points) What is the decimal representation of 1011_2?

   (c) (5 points) What is the decimal representation of 0101_2?

   (d) (5 points) What is the decimal representation of the sum you computed in part 1(a) above?

2. (20 points) Hex addition.
   (a) (5 points) Compute the following longhand **hex** addition:

$$\begin{array}{r} DEAD \\ +BEEF \\ \hline \end{array}$$

   (b) (5 points) Convert the hex number 0xDEAD to binary.

   (c) (5 points) How many bits do we need to represent the hex number 0xDEAD in binary?

   (d) (5 points) Is 0xDEAD a positive or negative number in 2's complement representation? How do you know?

3. (20 points) Binary bitwise logic
   (a) (5 points) Compute the following longhand **binary** exclusive OR:

$$\begin{array}{r} 101100 \\ \oplus 010100 \\ \hline \end{array}$$

(b) (5 points) Compute the following longhand **binary** AND:

$$\begin{array}{r} 101111 \\ \&\,010101 \\ \hline \end{array}$$

(c) (5 points) Compute the following longhand **hex** AND:

$$\begin{array}{r} \mathrm{DEAD} \\ \&\ 0\ 3\ \mathrm{F}\ \mathrm{F} \\ \hline \end{array}$$

(d) (5 points) Is the output of the hex AND operation in part 3(c) above a positive or negaive number in 2's complement representation? How do you know?

4. (20 points) Bit shifts

(a) (5 points) Compute $1000\,0101_2 >> 3$

(b) (5 points) What is the decimal representation of $1000\,0101_2$?

(c) (5 points) What is the decimal representation of the result of part a above?

(d) (5 points) Write out the operation being performed in part 4(a) above in terms of a decimal multiplication or division and calculate the result of the multiplication/division. *Hint: should be the same as the result of the bit shift*