**CS 255 Homework 1**

1. Computer X uses (an illogical format of) 3-byte words (i.e. each word consists of 3 bytes) and each byte consists of 8 bits. It uses the two's complement number system to represent signed numbers.

   (a) (5 pts.) How many different patterns can be used to store a word?

   (b) (10 pts.) What are the two's complement representations for the values $2017314_{10}$ and $-2017314_{10}$ in computer X?

   (c) What decimal values are represented by the following patterns in computer X?

      i. (2 pts.) 0010 1110 0011 1101 0101 1001

      ii. (2 pts.) 1111 0101 1101 1001 1100 0011

   (d) (7 pts.) Give the binary pattern that results from adding the two patterns in (c). What decimal value is represented by this pattern?

2. Do the following arithmetic in binary (representing unsigned integers). Show complete "tail" work (demonstrated in lecture notes) for full credit.

   (a) (10 pts.) $101101_2 * 1001_2$

   (b) (10 pts.) $10011010_2/110_2$

3. (10 pts.) Do the following arithmetic in base-4. Give complete "tail" multiplication to get full credit.

   $3201_4 * 1323_4$

4. (a) (5 pts.) Give the representation of the value $4120_{10}$ in the octal number system.

   (b) (5 pts.) Give the representation of the value $8326_{10}$ in the hexidecimal number system.

   (c) (5 pts.) Translate the octal/hexidecial values from parts (a) and (b) respectively to binary directly. Show how you arrive at your answer.

5. Show the binary representation (in bits) for the following data items when they are stored in computer memory.

   (a) (5 pts) The string "e3!*" (Assume 8 bit ASCII characters.)

   (b) (5 pts) The hexideciaml number DF2A.

   (c) (5 pts) The signed integer -172 (in 16 bits) in two's complement format

   (d) (5 pts) The signed integer -172 (in 16 bits) in excell-$2^{15}$ format.

   (e) (5 pts) The single precision floating point number 31.75

   (f) (5 pts) The single precision floating point number -14.8125