Name: _____

Due: Thursday, Oct. 3rd at the start of class

Submission: Hard copy to professor

Instructions: Show your work to receive partial credit. Document any collaboration and the Honor Code in the README file for Part II.

1. **Two's Complement Encoding**
   Computer X uses 2-byte words (a "word" is an ordered set of bytes which acts as a unit of storage) and each byte consists of 8 bits. It uses the 2's complement number system to represent signed numbers.

   (a) (5 points) How many different patterns can be stored in a word?

   (b) (10 points) What are the 2's complement representations for the values 5127_{10} and -5127_{10} in computer X ?

   (c) What decimal values are represented by the following patterns in computer X if the patterns represent 2's complement integers?

   i. (3 points) 0011 1001 1111 0010

   i. _____

   ii. (3 points) 1101 0110 1001 1111

   ii. _____

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

2. **Octal, Hexadecimal and Other Numbers**

   (a) (5 points) Give the representation of the value 4901_{10} in the octal number system.

   (b) (5 points) Give the representation of the value 4901_{10} in the hexadecimal number system.

   (c) (5 points) Give the representation of the value 3197_{10} in the "penta number system" (base 5).

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

   (a) (5 points) The string "-604" (assume 8 bit ASCII characters not 16 bit Unicode)

(b) (5 points) The hexadecimal number C69D

(c) (5 points) The signed integer -341 in 16 bits 2's complement format

(d) (2 points) The signed integer -341 in 16 bits sign magnitude format

(e) (5 points) The single precision floating point number 18.75

(f) (5 points) The single precision float point number -19.5