

Concordia University Department of Software Engineering Winter 2015

SOEN 228 Practice Problem Set #3

These problems focus on the conversion of numbers into different base systems and operations using binary arithmetic.

**Problem 1)** Convert the numbers into the new base. These numbers are unsigned integers

- 1)  $17_{10}$  into base 2, base 8 and base 16.
- 2)  $FF_{16}$  into base 2, base 8 and base 10.

**Problem 2)** Convert the numbers into the new base (these are unsigned integers) assuming that you have 8 bits to represent the number

- 1)  $125_{10}$  into base 2 and base 16
- 2)  $107_{10}$  into base 2 and base 16

**Problem 3)** Convert 34 (base 5) into base 8.

**Problem 4)**

Perform the operation:  $67_{10} - 94_{10}$  using 8-bit two's complement bit and binary arithmetic. Show all of your work and confirm that the answer agrees with the base 10 answer.

**Problem 5)**

The hexadecimal (base 16) number  $D2_{16}$  is a signed integer in sign magnitude representation. Determine the base 10 equivalent number. Show all of your work.

**Problem 6)**

Represent the decimal values 26, -37, and -123 as signed, 10-bit binary numbers in the following formats: (a) sign and magnitude (b) 2's complement

**Problem 7)**

Consider the binary numbers in the following addition and subtraction problems to be signed, 6-bit values in **2's complement representation**. Perform the operations indicated, specify whether overflow occurs, and check your answer by converting operands and results to decimal representation:

- (i) 
$$\begin{array}{r} 010110 \\ + 001001 \end{array}$$

(ii) 011001  
+ 010000

(iii) 010110  
- 011111

**Problem 8)**

Convert the following decimal number 43981 into a 16-bit binary unsigned integer.

Convert the following decimal number into binary 0.1972 12-bit binary fraction.

**Problem 9)** Convert the numbers in problem 8 into IEEE 754 32-bit floating point format. Write these numbers in binary and hex format.