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**CS 330 Computer Organization/Assembly Language**

**Homework Assignment 3**

**2/16/18**

1. Given the following eight bit two’s complement binary numbers, complement them; that is, express the value in eight bit two’s complement with the same absolute value but opposite sign. Show your work at each step.

First, you invert the digits (0 becomes 1, 1 becomes 0). Then you add one.

1111 0000 0000 1111 0000 1111 + 0000 0001 **0001 0000**

1101 1010 0010 0101 0010 0101 + 0000 0001 **0010 0110**

0111 0101 1000 1010 1000 1010 + 0000 0001 **1000 1011**

1011 1011 0100 0100 0100 0100 + 0000 0001 **0100 0101**

1. Convert the following two’s complement binary numbers into decimal (base 10).

If positive (first digit is 0), simply convert to decimal.

If negative (first digit is 1), invert the digits, add one, and then convert to decimal.

%1001 0101 0110 1010 0110 1010 + 0000 0001 0110 1011 1 + 2 + 8 + 32 + 64 **-107**

%0100 1110 2 + 4 + 8 + 64 **78**

%1011 1000 0100 0111 0100 0111 + 0000 0001 0100 1000 8 + 64 **-72**

%1000 0101 0111 1010 0111 1010 + 0000 0001 0111 1011 1+2+8 + 16 + 32+ 64**-123**

1. Convert the following decimal numbers into two’s complement binary representation.

If positive, simply convert to binary.

If negative, convert to binary as if it was a positive number, then invert the digits and add one.

–120 64 + 32 + 16 + 8 0111 1000 1000 0111 1000 0111 + 0000 0001 **1000 1000**

–51 32 + 16 + 2 + 1 0011 0011 1100 1100 1100 1100 + 0000 0001 **1100 1101**

–108 64 + 32 + 8 + 4 0110 1100 1001 0011 1001 0011 + 0000 0001 **1001 0100**

120 64 + 32 +16 + 8 **0111 1000**

1. Convert the following hexadecimal values into decimal. Convert each one twice; one time given that it represents an unsigned integer value, and one time given that it represents a signed integer value.

Convert to binary and then negate if negative sign, otherwise convert to decimal.

$F8 1111 1000 128 + 64 + 32 + 16 + 8 **248 (unsigned)**

$F8 1111 1000 0000 0111 0000 0111 + 0000 0001 0000 1000  **-8 (signed)**

$63 0110 0011 64 + 32 + 2 + 1 **99 (unsigned)**

$63 0110 0011 64 + 32 + 2 + 1 **99 (signed)**