

**ELEC 2220 Homework #4**  
**Due Monday, June 1**

**(Refer to Textbook Chapter 2 and Digital Logic Circuits Textbook Chapter 1)**

**2's Complement Arithmetic and Relational Operators**

**Part 1.** In testing the relationship  $M < N$ , a CPU would compute  $M - N$  (using two's complement arithmetic) and then test the resulting condition flags.

Given 8-bit numbers:  $M = 00100001$     $N = 01010000$

1. Determine the values of the four condition codes (N,C,V,Z) for  $M - N$ . (To be used in both cases of step 2 – do not repeat calculation of  $M - N$  for each.)
2. For each of the following two cases, from the above condition codes, determine which block of code would be executed. Explain your result.

**Case 1:** Assuming  $M$  and  $N$  are signed 8-bit numbers.

```
if (M < N) {  
    Block1  
} else {  
    Block2  
}
```

**Case 2:** Same as Case 1, but assuming that  $N$  and  $M$  are unsigned 8-bit numbers.

**Part 2.** Repeat Part 1, for the following numbers and cases.

Given 8-bit numbers:  $M = 01100110$     $N = 10010100$

3. Determine the values of the four condition codes (N,C,V,Z) for  $M - N$ . (To be used in both cases of step 4 – do not repeat calculation of  $M - N$  for each.)
4. For each of the following two cases, from the above condition codes, determine which block of code would be executed. Explain your result.

**Case 3:** Assuming  $M$  and  $N$  are signed 8-bit numbers.

```
if (M >= N) {  
    Block1  
} else {  
    Block2  
}
```

**Case 4:** Same as Case 3, but assuming that  $M$  and  $N$  are unsigned 8-bit numbers.