

ELEC 2220 Homework #3
Due Friday, May 28

2's Complement Arithmetic and "Flags"

Given the following decimal numbers:

$$\begin{aligned}A &= 105 \\B &= 57 \\C &= -95 \\D &= -76\end{aligned}$$

Using 8-bit two's complement arithmetic, perform the following six calculations as they would be done on an 8-bit microprocessor. Recall that subtraction is performed by negating the second operand and adding, i.e. all operations are performed with an adder circuit.

1. A+B
2. A-B
3. A+C
4. A-C
5. C+D
6. C-D

For each calculation, show the 8-bit result (and check that it corresponds to the correct decimal value), and also show the state (1 or 0) of each of the following "condition codes":

Z = result zero
N = result negative
C = carry out of the most significant bit
V = signed overflow

For example: $5 - 10 = 00000101 - 00001010$
 $= 00000101 + 11110110$
 $= 11111011$
 $= -00000101$
 $= -5$

N = 1 (result negative)
Z = 0 (result not zero)
C = 1 (carry out of MSB of adder)
V = 0 (no signed overflow)