

Name: KEY

Id#

ICS 233, Term 072

Computer Architecture & Assembly Language

Quiz# 2

Date: Wednesday, March 5, 2008

Q1. Consider an 8-bit register that has the binary number 10010110. Determine the decimal value of the number if it represents:

- (i) An unsigned number.

$$128+16+4+2=150$$

- (ii) A signed number in sign-magnitude representation.

$$=-(16+4+2)=-22$$

- (iii) A signed number in 1's complement representation.

$$\begin{aligned} \text{1's complement of } 10010110 &= 01101001=(64+32+8+1)=+105 \\ \text{Thus, } 10010110 &\text{ represents } -105 \end{aligned}$$

- (iv) A signed number in 2's complement representation.

$$\begin{aligned} \text{2's complement of } 10010110 &= 01101010=(64+32+8+2)=+106 \\ \text{Thus, } 10010110 &\text{ represents } -106 \end{aligned}$$

Q2. Perform the following arithmetic operations assuming that numbers are represented using **8-bit 2's complement** representation. Indicate in your answer when an overflow occurs.

- (i) FF + FF

$$= FE$$

There is no overflow as we are adding two negative numbers and we got a negative number.

(ii) $FE - 80$

$= FE + 2\text{'s comp. of } 80 = FE + 80 = 7E$

There is overflow as we are adding two negative numbers and we got a positive.

Q3. Fill the blanks in the following questions:

- (i) Assuming unsigned number representation, $(F1)_{16}$ represents the decimal number $= 15 \times 16 + 1 = 241$.
- (ii) The decimal number 1020 is represented in binary as 1111111100.
- (iii) The binary number 01100011 represents character c, and uses an even parity bit. Note that the ASCII code of character **A** is 41H and that of character **a** is 61H.
- (iv) Assuming **4-bit 2's complement** representation, the smallest (negative) number is 1000 in binary and -8 in decimal and the largest (positive) number is 0111 in binary and +7 in decimal.