

Name:

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COE 301/ICS 233, Term 171

Computer Architecture & Assembly Language

Quiz# 3 Solution

Date: Tuesday, Nov. 7, 2017

Q1. [4 Points] Given that **Multiplicand=1001** and **Multiplier=1011** are signed 2's complement numbers, show the **signed** multiplication of **Multiplicand** by **Multiplier**. The result of the multiplication should be an 8-bit **signed** number in HI and LO registers. Show the steps of your work.

Iteration		Multiplicand	Sign	Product = HI,LO
0	Initialize	1001		0000 1011
1	LO[0] = 1 => ADD		1	1001 1011
	Shift Product = (HI, LO) right 1 bit	1001		1100 1101
2	LO[0] = 1 => ADD		1	0101 1101
	Shift Product = (HI, LO) right 1 bit	1001		1010 1110
3	LO[0] = 0 => Do nothing		1	1010 1110
	Shift Product = (HI, LO) right 1 bit	1001		1101 0111
4	LO[0] = 1 => SUB (ADD 2's compl)	0111	0	0100 0111
	Shift Product = (HI, LO) right 1 bit			0010 0011

Q2. [6 Points] Given that **Dividend=0111** and **Divisor=1101** are signed 2's complement numbers, show the **signed** division of **Dividend** by **Divisor**. The result of division should be stored in the Remainder and Quotient registers. Show the steps of your work, and show the final result.

Since the Divisor is negative, we take its 2's complement \Rightarrow Divisor = 0011

Sign of Quotient = **negative**, Sign of Remainder = **positive**

Iteration		Remainder (HI)	Quotient (LO)	Divisor	Difference
0	Initialize	0000	0111	0011	
1	1: SLL, Difference	0000	1110	0011	1101
	2: Diff < 0 => Do Nothing	0000	1110	0011	
2	1: SLL, Difference	0001	1100	0011	1110
	2: Diff < 0 => Do Nothing	0001	1100	0011	
3	1: SLL, Difference	0011	1000	0011	0000
	2: Rem = Diff, set lsb Quotient	0000	1001	0011	
4	1: SLL, Difference	0001	0010	0011	1110
	2: Diff < 0 => Do Nothing	0001	0010	0011	

Quotient = **1110**

Remainder = **0001**