Name: Id#

COE 301/ICS 233, Term 161

Computer Architecture & Assembly Language

Quiz# 2 Solution

Date: Tuesday, Nov. 8, 2016

## **Q1.** Given that **Multiplicand=1010** and **Multiplier=1011,** using **signed multiplication** hardware, 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.

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| --- | --- | --- | --- | --- |
| **Iteration** | | **Multiplicand** | **Sign** | **Product = HI,LO** |
| 0 | Initialize (LO = Multiplier) | 1010 |  | 0000 101**1** |
| 1 | LO[0] = 1 => ADD |  | 1 | 1010 1011 |
| Shift Product = (HI, LO) right 1 bit | 1010 |  | 1101 010**1** |
| 2 | LO[0] = 1 => ADD |  | 1 | 0111 0101 |
| Shift Product = (HI, LO) right 1 bit | 1010 |  | 1011 101**0** |
| 3 | LO[0] = 0 => Do nothing |  | 1 | 1011 1010 |
| Shift Product = (HI, LO) right 1 bit | 1010 |  | 1101 110**1** |
| 4 | LO[0] = 1 => SUB |  | 0 | 0011 1101 |
| Shift Product = (HI, LO) right 1 bit |  |  | **0001 1110** |

## **Q2.** Given that **Dividend=1011** and **Divisor=0010**, Using the **unsigned division** hardware, show the **unsigned** division of **Dividend** by **Divisor**. The result of division should be stored in the Remainder and Quotient registers. Show the steps of your work.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Iteration** | | **Remainder (HI)** | **Quotient (LO)** | **Divisor** | **Difference** |
| 0 | Initialize | 0000 | 1011 | 0010 |  |
| 1 | 1: SLL, Difference | 0001 | 0110 | 0010 | 1111 |
| 2: Diff < 0 => Do Nothing | 0001 | 0110 | 0010 |  |
| 2 | 1: SLL, Difference | 0010 | 1100 | 0010 | 0000 |
| 2: Rem = Diff, set lsb Quotient | 0000 | 110**1** | 0010 |  |
| 3 | 1: SLL, Difference | 0001 | 1010 | 0010 | 1111 |
| 2: Diff < 0 => Do Nothing | 0001 | 1010 | 0010 |  |
| 4 | 1: SLL, Difference | 0011 | 0100 | 0010 | 0001 |
| 2: Rem = Diff, set lsb Quotient | **0001** | **0101** | 0010 |  |