

# Assignment 3

Due Date : March 29, 2021 (day)

Name : 易 翔  
Student ID : 11912013  
Score : \_\_\_\_\_

**Problem 1 (3.9) Score:** \_\_\_\_\_

**Solution:**  $151_{(10)} = 0\text{-}1001\text{-}0111_{(2)} = 1001\text{-}0111_{(\text{signed 2's complement})} = -105$   
 $214_{(10)} = 0\text{-}1101\text{-}0110_{(2)} = 1101\text{-}0110_{(\text{signed 2's complement})} = -42$   
 $-105 + (-42) = -147$

However, consider the answer is out of range, so the answer become  $-128$  because the range of the signed-8-bit number is  $-128 \sim 127$ .  $\square$

**Problem 2 (3.10) Score:** \_\_\_\_\_

**Solution:**  $151_{(10)} = 0\text{-}1001\text{-}0111_{(2)} = 1001\text{-}0111_{(\text{signed 2's complement})} = -105$   
 $214_{(10)} = 0\text{-}1101\text{-}0110_{(2)} = 1101\text{-}0110_{(\text{signed 2's complement})} = -42$   
 $-105 - (-42) = -63$   $\square$

**Problem 3 (3.11) Score:** \_\_\_\_\_

**Solution:**  $151_{(10)} = 1001\text{-}0111_{(2)}$   
 $214_{(10)} = 1101\text{-}0110_{(2)}$   
 $151 + 214 = 365$

However, consider the answer is out of range, so the answer become  $256$  because the range of the unsigned-8-bit number is  $0 \sim 256$ .  $\square$

**Problem 4 (3.13) Score:** \_\_\_\_\_

Step	Action	Multiplicand	Product/Multiplier
0	Initial values	0110_0010	0000_0000_0001_0010
1	No operation	0110_0010	0000_0000_0001_0010
	Right shift Product	0110_0010	0000_0000_0000_1001
2	Product += Mcand	0110_0010	0110_0010_0000_1001
	Right shift Product	0110_0010	0011_0001_0000_0100
3	No operation	0110_0010	0011_0001_0000_0100
	Right shift Product	0110_0010	0001_1000_1000_0010
4	No operation	0110_0010	0001_1000_1000_0010
	Right shift Product	0110_0010	0000_1100_0100_0001
5	Product += Mcand	0110_0010	0110_1110_0100_0001
	Right shift Product	0110_0010	0011_0111_0010_0000
6	No operation	0110_0010	0011_0111_0010_0000
	Right shift Product	0110_0010	0001_1011_1001_0000
7	No operation	0110_0010	0001_1011_1001_0000
	Right shift Product	0110_0010	0000_1101_1100_1000
8	No operation	0110_0010	0000_1101_1100_1000
	Right shift Product	0110_0010	0000_0110_1110_0100

**Solution:** The answer is  $0000\text{-}0110\text{-}1110\text{-}0100_{(\text{binary})} = 1764$ . REcheck that  $62_{(\text{hex})} \times 12_{(\text{hex})} = 98 \times 18 = 1764$ . Then get the answer.  $\square$

**Problem 5 (3.16) Score:** \_\_\_\_\_

**Solution:** It may pass three ( $\log_2 8$ ) level of adders. And for each level of adders it may take 4 units of time. So the answer is  $3 \times 4 = 12$  time units.  $\square$

**Problem 6 (3.18) Score:** \_\_\_\_\_

**Solution:** 1. 将寄存器中减去除数寄存器中的内容，将结果放在余数寄存器中；

2. 测试余数

- a. 余数  $\geq 0$ , 商寄存器左移, 最低位设为1;
- b. 余数  $< 0$ , 通过给余数寄存器加上除数寄存器的内容来恢复原值, 结果放在余数寄存器。商同样左移, 最低位设为0.

3. 除数寄存器右移一位。

Then we obtain the answer from the table following: The quotient is  $3_{\text{hex}}$ , and the remainder is  $11_{\text{hex}}$ .  $\square$

Step	Action	Quotient	Divisor	Remainder
0	Initial values	0000_0000	0010_0001_0000_0000	0000_0000_0111_0100
1	1.	0000_0000	0010_0001_0000_0000	1101_1111_0111_0100
	2b.	0000_0000	0010_0001_0000_0000	0000_0000_0111_0100
	3.	0000_0000	0001_0000_1000_0000	0000_0000_0111_0100
2	1.	0000_0000	0001_0000_1000_0000	1110_1111_1111_0100
	2b.	0000_0000	0001_0000_1000_0000	0000_0000_0111_0100
	3.	0000_0000	0000_1000_0100_0000	0000_0000_0111_0100
3	1.	0000_0000	0000_1000_0100_0000	1111_1000_0011_0100
	2b.	0000_0000	0000_1000_0100_0000	0000_0000_0111_0100
	3.	0000_0000	0000_0100_0010_0000	0000_0000_0111_0100
4	1.	0000_0000	0000_0100_0010_0000	1111_1100_0101_0100
	2b.	0000_0000	0000_0100_0010_0000	0000_0000_0111_0100
	3.	0000_0000	0000_0010_0001_0000	0000_0000_0111_0100
5	1.	0000_0000	0000_0010_0001_0000	1111_1110_0110_0100
	2b.	0000_0000	0000_0010_0001_0000	0000_0000_0111_0100
	3.	0000_0000	0000_0001_0000_1000	0000_0000_0111_0100
6	1.	0000_0000	0000_0001_0000_1000	1111_1111_0110_1100
	2b.	0000_0000	0000_0001_0000_1000	0000_0000_0111_0100
	3.	0000_0000	0000_0000_1000_0100	0000_0000_0111_0100
7	1.	0000_0000	0000_0000_1000_0100	1111_1111_1111_0000
	2b.	0000_0000	0000_0000_1000_0100	0000_0000_0111_0100
	3.	0000_0000	0000_0000_0100_0010	0000_0000_0111_0100
8	1.	0000_0000	0000_0000_0100_0010	0000_0000_0011_0010
	2a.	0000_0001	0000_0000_0100_0010	0000_0000_0011_0010
	3.	0000_0001	0000_0000_0010_0001	0000_0000_0011_0010
9	1.	0000_0001	0000_0000_0010_0001	0000_0000_0001_0001
	2a.	0000_0011	0000_0000_0010_0001	0000_0000_0001_0001
	3.	0000_0011	0000_0000_0001_0000	0000_0000_0001_0001