課程: Computer Organization,
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Chapter Exam

Chapter 3 Arithmetic for Computers

2019/05/14

*Please write the answer on your answer sheet

1. The following table shows pairs of decimal numbers.

A	B
2	126

(1) Assume A and B are signed 8-bit decimal integers. Calculate A + B. The result is also 8 bits. Is there overflow, underflow, or neither? Why? **(10%)**

(2) Assume A and B are signed 8-bit decimal integers. Calculate A - B. The result is also 8 bits. Is there overflow, underflow, or neither? Why? **(10%)**

2. Please write the answer with format：

S	Exponent	Fraction
1 bits	8 bits	23 bits

(1) What's the IEEE754 representation of the numbers $\frac{1}{4}$ and **4** ,if there is no exponent bias .

(20%)

(2) What's the IEEE754 representation of the numbers $\frac{1}{4}$ and **4** ,if there is a exponent bias **127** .

(20%)

3. IEEE Std 754 is a standard for floating point number representation. It is widely used in the field of computer science. What's the result of the following equations by using IEEE Std 754 single-precision floating point number representation (exponent bias is **127**)? **(20%)**

Please write the answer with format：

S	Exponent	Fraction
1 bits	8 bits	23 bits

(1) $(0.75 - 0.5) + 1.0 \times 2^{-25}$

(2) $0.75 - (0.5 + 1.0 \times 2^{-25})$

4. Let's look in more detail at multiplication. We will use the numbers in the following table

A	B
100001 bin	010011 bin

the hardware described in Figure 1 to calculate the product of two unsigned 6-bits binary numbers A and B. Complete the contents of each register on each step list on the following table. **(20%)**

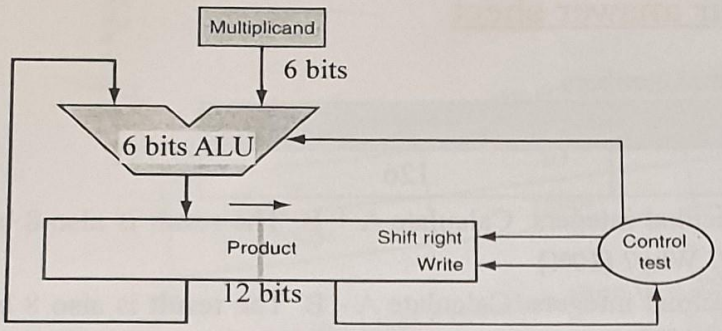

Figure 1 An improved version of the multiplication hardware

100001
× 010011

100001
100001
100001
000000
000000
001001100011

step	Action	Multiplicand	Product
0	Initial value	100 001	(1)
1	Prod = Prod + Mcand		(2)
	Shift right Product	100 001	(3)
2	Prod = Prod + Mcand		
	Shift right Product	100 001	
3	lsb = 0, no op		
	Shift right Product	100 001	(4)
4	lsb = 0, no op		
	Shift right Product	100 001	
5	Prod = Prod + Mcand		
	Shift right Product	100 001	
6	lsb = 0, no op		
	Shift right Product	100 001	(5)

a b c d e f
10 11 12 13 14 15

5. What "decimal number" does the following bit pattern represent: 0xC1B40000 If it is a floating-point number using the IEEE 754 standard(32 bit, exponent bias is **127**)? **(10%)**