Computer Organization
Reference Solution
HW3

3.9 $-105-42=-128\ (-147)$

3.10 $-105+42=-63$

3.11 $151+214=255\ (365)$

3.13 62×12

$(62)_{16}=(0110\_0010)_2$

$(12)_{16}=(0001\_0010)_2$

Iteration	Step	$(12)_{16}$ Multiplier	$(62)_{16}$ Multiplicand	Product
0	Initial values	0000_0000_0001_0010	0000_0000_0110_0010	0000_0000_0000_0000
1	1: 0 → no operation	0000_0000_0001_0010	0000_0000_0110_0010	0000_0000_0000_0000
	2: Shift left Multiplicand	0000_0000_0001_0010	0000_0000_1100_0100	0000_0000_0000_0000
	3: Shift right Multiplier	0000_0000_0000_1001	0000_0000_1100_0100	0000_0000_0000_0000
2	1: 1 → Prod = Prod + Mcand	0000_0000_0000_1001	0000_0000_1100_0100	0000_0000_0000_0000 + 0000_0000_1100_0100 0000_0000_1100_0100
	2: Shift left Multiplicand	0000_0000_0000_1001	0000_0001_1000_1000	0000_0000_1100_0100
	3: Shift right Multiplier	0000_0000_0000_0100	0000_0001_1000_1000	0000_0000_1100_0100
3	1: 0 → no operation	0000_0000_0000_0100	0000_0001_1000_1000	0000_0000_1100_0100
	2: Shift left Multiplicand	0000_0000_0000_0100	0000_0011_0001_0000	0000_0000_1100_0100
	3: Shift right Multiplier	0000_0000_0000_0010	0000_0011_0001_0000	0000_0000_1100_0100
4	1: 0 → no operation	0000_0000_0000_0010	0000_0011_0001_0000	0000_0000_1100_0100
	2: Shift left Multiplicand	0000_0000_0000_0010	0000_0110_0010_0000	0000_0000_1100_0100
	3: Shift right Multiplier	0000_0000_0000_0001	0000_0110_0010_0000	0000_0000_1100_0100
5	1: 1 → Prod = Prod + Mcand	0000_0000_0000_0001	0000_0110_0010_0000	0000_0000_1100_0100 + 0000_0110_0010_0000 0000_0110_1110_0100
	2: Shift left Multiplicand	0000_0000_0000_0001	0000_1100_0100_0000	0000_0110_1110_0100
	3: Shift right Multiplier	0000_0000_0000_0000	0000_1100_0100_0000	0000_0110_1110_0100
6~8	1: 0 → no operation 2: Shift left Multiplicand 3: Shift right Multiplier	剩下的怎麼移，LSB都是0	省略	0000_0110_1110_0100

得$(06E4)_{16}$

$=(1764)_{10}$

3.19.

送分

3.22

0×0C000000 = 0000 1100 0000 0000 0000 0000 0000 0000

= 0 0001 1000 0000 0000 0000 0000 0000 000

sign is positive

exp = 0×18 = 24 − 127 = −103

there is a hidden 1

mantissa = 0

answer = 1.0×2^{-103}

3.23 $63.25 \times 10^0 = 111111.01 \times 2^0$

normalize, move binary point 5 to the left

1.1111101×2^5

sign = positive, exp = 127+5=132

Final bit pattern: 0 1000 0100 1111 1010 0000 0000 0000 000

= 0100 0010 0111 1101 0000 0000 0000 0000 = 0x427D0000

3.27 $-1.5625 \times 10^{-1} = -.15625 \times 10^0$

$= -.00101 \times 2^0$

move the binary point 3 to the right, $= -1.01 \times 2^{-3}$

exponent = −3 = −3+15 = 12, fraction = −.0100000000

answer: 1011000100000000

3.32 $(3.984375 \times 10^{-1} + 3.4375 \times 10^{-1}) + 1.771 \times 10^{3})$

$3.984375 \times 10^{-1} = 1.1001100000 \times 2^{-2}$

$3.4375 \times 10^{-1} = 1.0110000000 \times 2^{-2}$

$1.771 \times 10^{3} = 1771 = 1.1011101011 \times 2^{10}$

shift binary point of smaller left 12 so exponents match

```
(A)          1.1001100000
(B)        + 1.0110000000
           -------------
           10.1111100000 Normalize,
(A+B)       1.0111110000 × 2^-1
(C)        +1.1011101011
(A+B)        .0000000000 10 111110000 Guard = 1,
                         Round = 0, Sticky = 1
          ---------------
(A+B)+C  +1.1011101011 10 1 Round up
```

$(A+B)+C = 1.1011101100 \times 2^{10} = 0110101011101100 = 1772$