1.   1.4 [1] Name one characteristic of natural languages that prevents them from being used as programming languages.

简答题 (2 分)   2 分

> Natural languages usually express different meanings due to different contexts, moods, and users, and programming languages require an accurate and specific information transmission, so that the CPU can perform calculations and obtain results; at the same time, natural languages due to different word orders, Different vocabulary can express the same nature of meaning, and it will also make mistakes in programming applications.

2.   1.10 [1] Name three characteristics of algorithms. Briefly explain each of these three characteristics.

简答题 (2 分)   2 分

> Definiteness : each step is precisely stated
> Effective computability: each step can be carried out by a computer
> finiteness: the procedure terminates after finite steps

3.   1.16 [1] Name at least three things specified by an ISA.

简答题 (2 分)   2 分

> 1. data type
> 2. addressing modes
> 3. opcode
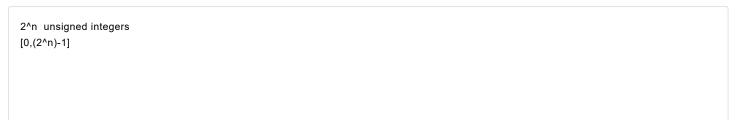> 4. function3 / 5 (maybe?)
> 5. Immediate (maybe?)

4.   1.18 [4] How many ISAs are normally implemented by a single microarchitecture? Conversely, how many microarchitectures could exist for a single ISA?

简答题 (2 分)   2 分

> only one
> uncertain number

5.   2.4 Given *n* bits, how many unsigned integers can be represented with the *n* bits? What is the range of these integers?

2^n unsigned integers
[0,(2^n)-1]

6.　2.8 a. What is the largest positive number one can represent in an eight-bit 2's complement code? Write your result in binary and decimal.

b. What is the greatest magnitude negative number one can represent in an eight-bit 2's complement code? Write your result in binary and decimal.

c. What is the largest positive number one can represent in n-bit 2's complement code?

d. What is the greatest magnitude negative number one can represent in n-bit 2's complement code?

简答题 (4 分)　　2 分

1. 0111 1111 'b　127'd
2. 1000 0000 'b -128'd
3. (2^n)-1
4. the range of n - bit 2's complement is [-2^n , (2^n)-1]
   so the greatest magnitude negative number is -2^n.

教师评语:
n包含符号位

7.　2.14 Add the following bit patterns. Leave your results in binary form.

a. 1011 + 0001

b. 0000 + 1010

c. 1100 + 0011

d. 0101 + 0110

e. 1111 + 0001

简答题 (5 分)　　5 分

1100
1010
1111
1011
0000 (overflow true 10000)

8. 2.20 The following binary numbers are four-bit 2's complement binary numbers. Which of the following operations generate overflow? Justify your answer by translating the operands and results into decimal.

    a. 1100 + 0011

    b. 1100 + 0100

    c. 0111 + 0001

    d. 1000 − 0001

    e. 0111 + 1001

简答题 (5 分)   5 分

1. not overflow
2. not overflow
3. overflow 0111 + 0001 = 1000 ; 7+1 = -8
4. overflow 1000 - 0001 = 0111;   -8 - 1 =7
5. not overflow

9. 2.34 Compute the following:

    a. NOT(1011) OR NOT(1100)

    b. NOT(1000 AND (1100 OR 0101))

    c. NOT(NOT(1101))

    d. (0110 OR 0000) AND 1111

简答题 (4 分)   4 分

0100 || 0011 = 0111
~(1101 && 1000) = 0111
~(~1101) = 1101 (~~x=x)
(0110 || 0000) && 1111 = 0110

10. 2.40 Write the decimal equivalents for these IEEE floating point numbers.

    a. 0 10000000 00000000000000000000000

    b. 1 10000011 00010000000000000000000

    c. 0 11111111 00000000000000000000000

    d. 1 10000000 10010000000000000000000

简答题 (4 分)   4 分

1. (+) 2.0
2. (-)17.0
3. (+)inf (2^128)
4. (-) 3.125

11. 2.48 Convert the following decimal numbers to hexadecimal representations of 2's complement numbers.

a. 256

b. 111

c. 123,456,789

d. −44

简答题 (4 分)　　3 分

1. 256'd = 0001 0000 0000'b
   its complement numbers is 0001 0000 0000'b = 100'h
2. 111'd = 0000 0110 1111'b
   its complement numbers is 0000 0110 1111'b = 06F'h
3. 123456789'd = 0111 0101 1011 1100 1101 0001 0101'b
   its complement numbers is 0111 0101 1011 1100 1101 0001 0101'b = 75BCD15'h
4. -44'd = 1010 1100'b
   its complement numbers is 1101 0011'b = D3'h

教师评语:
取反后要+1