3rd Edition

1.2 1.4 1.10 1.16 1.18

2.4 2.8 2.17 2.20 2.34

1.2

Can a higher-level programming language instruct a computer to compute more than a lower-level programming language?

answer:

No, because all computer languages ,no matter higher-level or lower-level , all will be finally converted to the same language - the machine code . And the different may be the code's length or the implementation's differ. But There NO difference in functional uses, or say the things that lower-programming language can Compute is the same as that of higher-level programming language.

1.4

Name one characteristic of natural languages that prevents them from being used as programming languages

answer:

Ambiguity, that is, there may be multiple ways to understand the same sentence, which cannot be run on a deterministic machine.

for example :

Lucy insisted on a talk with the manager herself;

1.It is the **manager herself** that Lucy wants to talk to

2.It is the **Lucy herself** that wants to talk to the manager

1.10

Name three characteristics of algorithms. Briefly explain each of these three characteristics.

answer:

definiteness to describe the notion that each step is precisely stated.

effective computability to describe the notion that each step canbecarriedoutbyacomputer..

finiteness to describe the notion that the procedure terminates.

1.16

Name at least three things specified by an ISA:

answer:

1.**Instruction Set**: The ISA defines the set of insructions that a computer can execute.

2.**Data Types**: The ISA defines the data types that the computer can operate on

3.**Addressing Modes**:The ISA specifies the addresssing modes that the computer supports calculates the memory address of operands.

1.18

How many ISAs are normally implemented by a single microarchitecture? Conversely, how many microarchitectures could exist for a single ISA?

answer:

a single microarchitecture is typically designed to implement **a specific ISA**,

multiple microarchitectures can exist for a single ISA

2.4

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

answer:

for each bit it can be 0 or 1,and that's for n bit ,so we can have 2^n different unsigned integers.

and We count the from zero ,so the range is $0\ to\ 2^n - 1$

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?

answer:

a:

Binary : 0111 1111

Decimal: +127

b:

Binary: 1000 0000

Decimal: -128

c:

Decimal: $2^{n-1}-1$

First bit should be zero and the following n-1 bits are all one.

d:

Decimal: -2^{n-1}

First bit should be one and the following n-1 bits are all zero.

2.17

Add the following 2's complement binary numbers. Also express the answer in decimal.
a. 01 + 1011
b. 11 + 01010101
c. 0101 + 110
d. 01 + 10

answer:

a:

0001

1011

1100

Decimal expression: 1-5=-4

b:

11111111

01010101

01010100

Decimal expression: -1+85=84

c:

0101

1110

0011

Decimal expression:5-2=3

d:

01

10

11

Decimal expression:1-2=-1

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 d. 1000 − 0001
b. 1100 + 0100 e. 0111 + 1001
c. 0111 + 0001

answer:

a:

1100

0011

1111

No overflow

Decimal expression: -4+3=-1

b:

1100

0100

0000

NO overflow

Decimal expression:-4+4=0

c:

0111

0001

1000

has overflow

Decimal expression:7+1=8 which is out of range (for 4 bits 2's complements code the largest integer is 7)but it is -8

d:

1000-0001

=

1000+1111

1000

1111

0111

has overflow

Decimal expression:-8-1=-9 which is out of range (for 4 bits 2's complements code the largest interger is -8)but it is 7

e:

0111

1001

0000

No overflow

Decimal expression:7-7=0

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

answer:

a:

NOT(1011) = 0100

NOT(1100) = 0011

0100 OR

0011=

0111

b:

1100 OR

0101=

1101

1000 AND

1101=

1000

NOT(1000)=

0111

c:

NOT(NOT(1101)) = 1101

double NOT is just itself

NOT(1101) = 0010

NOT(0010) = **1101**

d:

0110 OR

0000 =

0110

0110 AND

1111 =

0110