

## Ficha Sistemas de Numeração

### 1. binário → decimal

$$101.01_{(2)} = 1 \times 2^2 + 0 \times 2^1 + 1 \times 2^0 + 0 \times 2^{-1} + 1 \times 2^{-2}$$

$$= 4 + 0 + 1 + \frac{1}{2} + \frac{1}{4} = 5 + \frac{3}{4} = \frac{20}{4} + \frac{3}{4} = \frac{23}{4} = 5.75_{(10)}$$

### 2. octal → decimal

$$234.5_{(8)} = 2 \times 8^2 + 3 \times 8^1 + 4 \times 8^0 + 5 \times 8^{-1}$$

$$= 2 \times 64 + 24 + 4 + \frac{5}{8} = 128 + 28 + \frac{5}{8} = 152,625_{(10)}$$

### 3. hexadecimal → decimal

$$A3.3_{(16)} = 10 \times 16^1 + 3 \times 16^0 + 3 \times 16^{-1} = 160 + 3 + \frac{3}{16} = 163 + \frac{3}{16} = 163,1875_{(10)}$$

### 4. decimal → binário

123   2	$0,662 \times 2 = \textcircled{1},324$
03 61   2	$0,324 \times 2 = \textcircled{0},648$
① 01 30   2	$0,648 \times 2 = \textcircled{1},296$
↖ ① 10 15   2	$0,296 \times 2 = \textcircled{0},592$
① ① 7   2	$0,592 \times 2 = \textcircled{1},182$
① 3   2	$0,182 \times 2 = \textcircled{0},368$
① 1   2	$0,368 \times 2 = \textcircled{0},736$
① 0	

$$123_{(10)} = 1111011_{(2)}$$

$$0,662_{(10)} = 1010100_{(2)}$$

$$\text{Assim, } 123,662_{(10)} = 111101,1010100$$

### decimal → octal

123   8	$0,662 \times 8 = \textcircled{5},296$
43 15   8	$0,296 \times 8 = \textcircled{2},368$
③ ⑦ 1   8	$0,368 \times 8 = \textcircled{2},944$
① 0	

$$123_{(10)} = 371_{(8)}$$

$$0,662_{(10)} = 0,522_{(8)}$$

$$\text{Assim, } 123,662_{(10)} = 371,522_{(8)}$$

### decimal → hexadecimal

123   16	$0,662 \times 16 = \textcircled{10},592$	$123_{(10)} = 7B_{(16)}$
⑪ 7   16	$0,592 \times 16 = \textcircled{9},472$	$0,662_{(10)} = A92_{(16)}$
B ⑦ 0	$0,472 \times 16 = \textcircled{2},832$	Assim,

$$123,662_{(10)} = 7B,A92_{(16)}$$

5. binário  $\rightarrow$  octal

$$\underbrace{1001010011010}_{(2)}, \underbrace{11101011}_{(2)} = 11232,726_{(8)}$$

1 1 2 3 2 7 2 6

binário  $\rightarrow$  hexadecimal

$$\underbrace{1001010011010}_{(2)}, \underbrace{11101011}_{(2)} = 129A,EB_{(16)}$$

1 2 9 A E B

6. hexadecimal  $\rightarrow$  octal  $\rightarrow$  necessita de conversão intermédia

hexadecimal  $\rightarrow$  binário

$$ABC1,FF8_{(16)} = 1010\ 1011\ 1100\ 0001,1111\ 1110\ 1000_{(2)}$$

binário  $\rightarrow$  octal

$$\underbrace{1010\ 1011\ 1100\ 0001}_{(2)}, \underbrace{1111\ 1110\ 1000}_{(2)} = 125701,7250_{(8)}$$

1 2 5 7 0 1 7 2 5 0

7. octal  $\rightarrow$  binário

$$72_{(8)} = 111\ 010_{(2)}$$

binário  $\rightarrow$  hexadecimal

$$\underbrace{111\ 010}_{(2)} = 3A_{(16)}$$

8. a) base 5  $\rightarrow$  decimal

$$23,4_{(5)} = 2 \times 5^1 + 3 \times 5^0 + 3 \times 4^{-1} = 10 + 3 + \frac{3}{4} = 13 + \frac{3}{4} = 13,75_{(10)}$$

b) base 11  $\rightarrow$  decimal

$$1A3_{(11)} =$$

c) base 9  $\rightarrow$  decimal

$$375_{(9)} = 3 \times 9^2 + 7 \times 9^1 + 5 \times 9^0 = 243 + 63 + 5 = 311_{(10)}$$



## Ficha Sistemas de Numeração

11. binário puro:  $10001000_{(2)}$   
positivo em cod. comp. de 1:  $010001000_{(2)}$   
negativo em cod. comp. de 1:  $101110111_{(2)}$

12. binário puro:  $10000001_{(2)}$   
positivo em cod. comp. de 2:  $010000001_{(2)}$   
negativo em cod. comp. de 2:  $101111111_{(2)}$

### 13. decimal $\rightarrow$ binário

a) 32 12

$$12 \quad 16 \mid 2$$

$$\textcircled{0} \quad \textcircled{0} \quad 8 \mid 2$$

$$\textcircled{0} \quad 4 \mid 2$$

$$\textcircled{0} \quad 2 \mid 2$$

$$\textcircled{0} \quad 1 \mid 2$$

$$\textcircled{1} \quad 0$$

$$32_{(10)} = 100000_{(2)}$$

$$+ 32_{(10)} = 00100000_{(2)}$$



em Representação de sinal  
e valor absoluto 8 bits

### b) decimal $\rightarrow$ binário

$$12 \mid 2$$

$$\textcircled{0} \quad 6 \mid 2$$

$$\textcircled{0} \quad 3 \mid 2$$

$$\textcircled{1} \quad 1 \mid 2$$

$$\textcircled{1} \quad 0$$

$$12_{(10)} = 1100_{(2)}$$

$$- 12_{(10)} = 00001100_{(2)}$$



em Representação de sinal e valor  
absoluto 8 bits

14.

### a) decimal $\rightarrow$ binário em cod. comp. de 2

$$135 \mid 2$$

$$15 \quad 67 \mid 2$$

$$\textcircled{1} \quad 7 \quad 33 \mid 2$$

$$\textcircled{1} \quad 13 \quad 16 \mid 2$$

$$\textcircled{1} \quad \textcircled{0} \quad 8 \mid 2$$

$$\textcircled{0} \quad 4 \mid 2$$

$$\textcircled{0} \quad 2 \mid 2$$

$$\textcircled{0} \quad 1 \mid 2$$

$$\textcircled{1} \quad 0$$

$$135_{(10)} = 10000111_{(2)}$$

$\rightarrow$  binário puro

b) decimal  $\rightarrow$  binário em cod. comp. 2

$$63 \mid 2$$

$$3 \quad 31 \mid 2$$

$$\textcircled{1} \quad 11 \quad 15 \mid 2$$

$$\textcircled{1} \quad \textcircled{1} \quad 7 \mid 2$$

$$\textcircled{1} \quad 3 \mid 2$$

$$\textcircled{1} \quad 1 \mid 2$$

$$\textcircled{1} \quad 0$$

$$63_{(10)} = 111111_{(2)}$$

$$-63_{(10)} = 10000001_{(2)} \text{ em C.C.2}$$

15. a) hexadecimal  $\rightarrow$  binário

$$8000 \text{ H} = \textcircled{1}000 \ 0000 \ 0000 \ 0000_{(2)}$$

$\rightarrow$  número negativo em cod. comp. de 2 c/ 16 bits

binário em cod. comp. de 2  $\rightarrow$  decimal

$$-1000 \ 0000 \ 0000 \ 0000_{(2)} = -1 \times 2^{16} + 0 = -32768_{(10)}$$

$$\text{b) } 100 \text{ H} = \textcircled{0}000 \ 0001 \ 0000 \ 0000_{(2)}$$

$\rightarrow$  positivo em cod. comp. de 2 c/ 16 bits

$$0000 \ 0001 \ 0000 \ 0000_{(2)} = 0 + 1 \times 2^8 + 0 = 256_{(10)}$$

$$\text{c) } 7FFF \text{ H} = \textcircled{0}111 \ 1111 \ 1111 \ 1111_{(2)}$$

$\rightarrow$  positivo em cod. comp. de 2 c/ 16 bits

$$\begin{aligned} 0111 \ 1111 \ 1111 \ 1111_{(2)} &= 0 + 2^{14} + 2^{13} + 2^{12} + 2^{11} + 2^{10} + 2^9 + 2^8 + 2^7 + \\ &\quad + 2^6 + 2^5 + 2^4 + 2^3 + 2^2 + 2^1 + 2^0 = 32767_{(10)} \end{aligned}$$

$$\text{d) } 0FFF \text{ H} = \textcircled{0}000 \ 1111 \ 1111 \ 1111_{(2)}$$

$\rightarrow$  positivo em cod. comp. de 2 c/ 16 bits

$$0000 \ 1111 \ 1111 \ 1111_{(2)} = 0 + 2^{11} + 2^{10} + 2^9 + 2^8 + 2^7 + 2^6 + 2^5 + 2^4 + 2^3 + 2^2 + 2^1 + 2^0 = 4095_{(10)}$$

$$\text{e) } FFFF \text{ H} = 1111 \ 1111 \ 1111 \ 1111_{(2)}$$

$\rightarrow$  negativo em cod. comp. de 2 c/ 16 bits

$$-0000 \ 0000 \ 0000 \ 0001_{(2)} = -2^0 = -1$$



## Ficha Sistemas de Numeração

16. a)  $80H = 1000\ 0000_{(2)}$   
↳ negativo em cod. comp. de 2  
 $1000\ 0000_{(2)} =$   
 $= -0000\ 0000\ 1000\ 0000_{(2)}$   
 $= 1111\ 1111\ 1000\ 0000$  em cod. comp. de 2 c/ 16 bits  
 $= FF80H$

b)  $28H = 0010\ 1000_{(2)}$   
↳ positivo em cod. comp. de 2  
 $0010\ 1000_{(2)} =$   
 $= 0000\ 0000\ 0010\ 1000$  em cod. comp. de 2 c/ 16 bits  
 $= 0028H$

c)  $9AH = 1001\ 1010_{(2)}$   
↳ negativo em cod. comp. de 2  
 $1001\ 1010_{(2)} =$   
 $= -0000\ 0000\ 1001\ 1010_{(2)}$   
 $= 1111\ 1111\ 0110\ 0110$  em cod. comp. de 2 c/ 16 bits  $= FF66H$

d)  $7FH = 0111\ 1111_{(2)}$   
↳ positivo em cod. comp. de 2  
 $0111\ 1111_{(2)} =$   
 $= 0000\ 0000\ 0111\ 1111$  em cod. comp. de 2 c/ 16 bits  $= 00F7H$

e)  $1020H = 0001\ 0000\ 0010\ 0000_{(2)}$   
↳ positivo em cod. comp. de 2 c/ 16 bits

f)  $8088H = 1000\ 0000\ 0010\ 0000_{(2)}$   
↳ negativo em cod. comp. de 2  
 $1000\ 0000\ 0010\ 0000_{(2)} =$   
 $= -1000\ 0000\ 0010\ 0000_{(2)}$   
 $= 0111\ 1111\ 1110\ 0000$  em cod. comp. de 2 c/ 16 bits  
 $= -7F78H$

17. a)  $0040H = 0000\ 0000\ 0100\ 0000_{(2)}$

↳ positivo em cod. comp. de 2

$0000\ 0000\ 0100\ 0000_{(2)}$

$= 0100\ 0000$  em cod. comp. de 2 c/ 8 bits  $= 40H$

b)  $1078H = 0000\ 0001\ 0111\ 1000_{(2)}$

↳ positivo em cod. comp. de 2

↳ não é possível converter

c)  $FFFF67H = 1111\ 1111\ 1111\ 1111\ 0110\ 0111_{(2)}$

↳ negativo em cod. comp. de 2

$1111\ 1111\ 1111\ 1111\ 0110\ 0111_{(2)} =$

$= -0000\ 0000\ 0000\ 0000\ 1001\ 1001_{(2)}$

$= -1001\ 1001_{(2)}$

$= 0110\ 0111$  em cod. comp. de 2 c/ 8 bits  $= 67H$

d)  $FFFF85H = 1111\ 1111\ 1111\ 1111\ 1000\ 0101_{(2)}$

↳ negativo em cod. comp. de 2

$1111\ 1111\ 1111\ 1111\ 1000\ 0101_{(2)} =$

$= -0000\ 0000\ 0000\ 0000\ 0111\ 1011_{(2)}$

$= -0111\ 1011$

$= 1000\ 0101$  em cod. comp. de 2 c/ 8 bits  $= 85H$

e)  $000067H = 0000\ 0000\ 0000\ 0000\ 0110\ 0111_{(2)}$

↳ positivo em cod. comp. de 2

$0000\ 0000\ 0000\ 0000\ 0110\ 0111_{(2)} =$

$= 0110\ 0111$  em cod. comp. de 2 c/ 8 bits  $= 67H$

18. a)  $10\dot{0}\dot{1},\dot{1}\dot{1}$

$+ 100,11$

$1110,10$

b)  $1000,\dot{1}$

$- 0,11$

$1000,11$

c)  $10\dot{1}\dot{1},\dot{0}\dot{1}$

$- 11,11$

$1001,10$



# Ficha Sistemas de Numeração

19.  $32_{(10)} = 100000_{(2)}$   $27_{(10)} = 11011_{(2)}$   
 $+ 32_{(10)} = 00100000_{(2)}$   $+ 27_{(10)} = 00011011_{(2)}$   
 $- 32_{(10)} = 11100000_{(2)}$   $- 27_{(10)} = 11100101_{(2)}$

a)  $\begin{array}{r} \text{1} \\ 00100000 = 32_{(10)} \\ + 11100101 = -27_{(10)} \\ \hline 10000101 = +5_{(10)} \end{array}$   
 não há transbordamento  
 resultado positivo

b)  $\begin{array}{r} 0 \\ 00011011 = 27 \\ + 11100000 = +32 \\ \hline 011111101 = -5 \end{array}$   
 não há transbordamento  
 resultado negativo

20. a)  $\begin{array}{r} 0111 \\ 00101101 = +27_{(10)} \\ + 00011110 = +32_{(10)} \\ \hline 010001011 = +75_{(10)} \end{array}$   
 $= +(2^6 + 2^3 + 2^1 + 2^0) = +(64 + 8 + 2 + 1) = +75_{(10)}$

b)  $\begin{array}{r} 1 \\ 11100101 = -27_{(10)} \\ + 11110110 = +32_{(10)} \\ \hline 11101011 = -37_{(10)} \end{array}$   
 $= -(00100101) = -(2^5 + 2^2 + 2^0) = -37_{(10)}$

21. a)  $\begin{array}{r} 1A_H \\ + 31_H \\ \hline 4B_H \end{array}$  b)  $\begin{array}{r} 6AF_H \\ + A13_H \\ \hline H \end{array}$  c)  $\begin{array}{r} 1E.F_H \\ + 2.FF_H \\ \hline H \end{array}$

d)  $\begin{array}{r} 10_H \\ - 3_H \\ \hline 0D_H \end{array}$  e)  $\begin{array}{r} F8D3_H \\ - EAG1_H \\ \hline 0E72_H \end{array}$

22. a)  $9_{(10)} = 1001_{(2)} = 1,001 \times 2^3 \rightarrow \text{expoente real}$   
 bit sinal = 0  
 expoente real = 3  
 expoente codificado = expoente real + 127 = 3 + 127  
 $= 130_{(10)} = 10000010_{(2)}$   
 significando =  $1,00100000_{(2)}$   
 Mantissa

Norma IEEE754 =  $0 \ 10000010 \ 00100000_H$   
 bit sinal      expoente codificado      Mantissa

$$b) -5/32 = -5 \times 1/32 = -5 \times 2^{-5} = -101 \times 2^{-1}$$

$101 \times 2^{-1} \rightarrow$  não se pode aplicar a norma porque não tem virgula;  
então:  $101 \times 2^{-1} = 1,01 \times 2^{-2}$

$$\text{bit sinal} = 0$$

$$\text{exponente real} = -3$$

$$\text{exponente codificado} = -3 + 127 = 124 = 0111\,1100_{(2)}$$

$$\text{significando: } 1, \underbrace{010}_{\text{Mantissa}} 0$$

$$\text{Norma IEEE754} = 1011\,1110\,0010 \underbrace{(x_{16})0}_{\text{Mantissa}} = \text{BE200000 H}$$

$$23. \quad a) \text{ C2F4 0000 H} = 1100\,0010\,1100\,1000\,0 \underbrace{(x_{16})0}_{(2)}$$

$$\text{bit sinal} = 1$$

$$\text{exponente real} = 6$$

$$\text{exponente codificado} = 1000\,0101 = 133_{(10)}$$

$$\text{significando} = 1,110\,0100\,1000\,0 \underbrace{(x_{16})0}_{(2)}$$

$$\text{Número decimal} = 1,1100\,1001 \times 2^6 = 1110010,01 = -114,25_{(10)}$$

$$b) \text{ 3FB8 0000 H} = 0011\,1111\,1000\,1000\,0 \underbrace{(x_{16})0}_{(2)}$$

$$\text{bit sinal} = 0$$

$$\text{exponente real} = 127 - 127 = 0$$

$$\text{exponente codificado} = 0111\,1111_{(2)} = 127_{(10)}$$

$$\text{significando} = 1,0001000\,0 \underbrace{(x_{16})0}_{(2)}$$

$$\text{Número decimal} = 1,0001 \times 2^0 = 1,0625_{(10)}$$