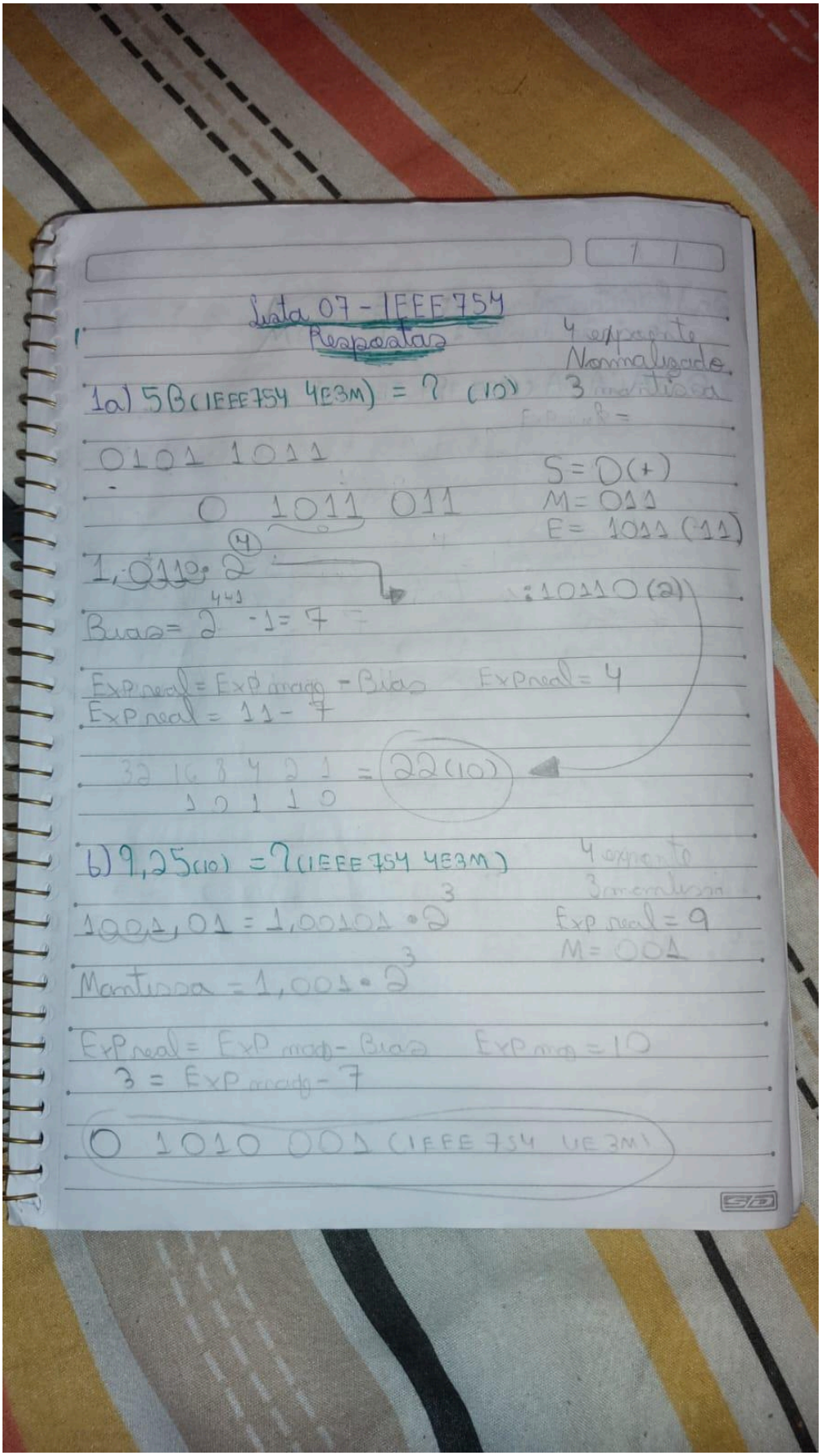
Nome: Gabriel Henrique Vieira de Oliveira
Data: 23/06/2024
Matéria: Arquitetura de Computadores II - Exercício prático 07

RESPOSTAS



2a) Precisão simples: 8 E 23M
Precisão dupla: 11 E 52M

803ACABA (IEEE 754 8E 23M)

1 000 0000 | 011 1010 1100 1010 1011 1010
S | E | M

S = 1 (-)
N normalizada

Bias = 127

M = 0,011 1010 1100 1010 1011 1010
x
2^{-126}

Exp real = 1 - 127 = -126

*1,1010 1100 1010 1011 1010 $\cdot 2^{-129}$ =

-5.399183e-39

b) 803ACABA (IEEE 754 - 11 E 52M)

1	0000 0000 011	1010 1100 1010 1011 1010 + 32 zeros
S	E	M

S = 1 (-)

Bias = $2^{10} - 1 = 1023$

Exp real = Exp reg - bias

Exp real = 3 - 1023 = -1020

M = 1,1010 1100 1010 1011 1010 $\cdot 2^{-1020} =$

3a) 14.125(10) = ? (IEEE 754 - 8E 23M)

1110.001

S = 0 (+)

Mantissa: 1,10111001 1101 · 2^13 ← leading bit

Bias = 2^(8-1) - 1 = 127

Exp real = Exp mag - bias Exp mag = 140

13 = Exp mag - 127

0 | 10001100 | 10111001101000000000

S E M

b) -58.375(10) = ? (IEEE 754 - 8E 23M)

111010.011 · 2^15 = Mantissa

S = 1 (-)

Bias = 127

Exp mag = 15 + 127 = 142

1 | 1000 1110 | 1100 1011 0110 1110 0000

S E Mantissa

4a) 13E → decimal (Normal) 8E 23M

0 | 1000 0001 | 011 0000 0000 0000 0000 0000
S | E | M

Mantissa = 1,011 (sem leading)

$\times 2^2$

Bias = 127

Exp real = Exp maquina - Bias

Exp real = 129 - 127 = 2

$1,011 \cdot 2^2 = 101,1 = 5,5_{(10)}$

b)

1 | 1000 0001 | 0001 (sem leading)
S | E | M

S = 1 (-)

Normal

Mantissa: $1,0001 \cdot 2^2$

100,01 = -4,25(10)

Bias = 127

Exp real = 129 - 127

Exp real = 2

/ /

5a) 7F7FF800 (IEEE 754 8E 23M)

0111 1111 0111 1111 1111 1000 0000 0000

0	1111 1110	11111111111000 0000
S	E	M

S = 0 (+)

Bias = 127

Mantissa = $1,11111111111111 \cdot 2^{127}$

ExP real = ExP charge - Bias ; ExP real = 127

ExP real = 254 - 127

b) D57F0000 (1BEE754 se sem)

1	101 0101	0	111 1111 0000 0000 0000 0000
S	F		M

S = 1 (-)

Bias = 127

$M = 1,1111111 \cdot 2^{43}$

Exp real = 170 - 127 = 43

c) 5F7FF800

0	101 1111	0	111 1111 1111 1000 0000 0000
S	F		M

S = 0 (+)

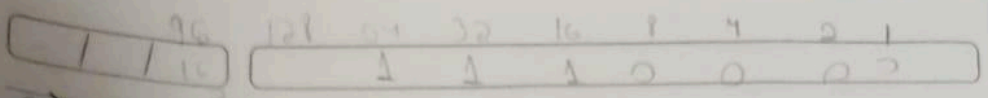
Bias = 127

$M = 1,11111111111 \cdot 2^{63}$

Exp real = 190 - 127

Exp real = 63

ORDEM CRESCENTE: B < C < A



6) MULT: $112 \cdot 0,224 = 25,088$

1º) 112: 1110000

$M = 1,110 \cdot 2^{6}$

$Bias = 2^{4-1} - 1 = 7$

S = 0 (+)
M = 110
4E, 3M

ExP real = ExP modg - Bias

$6 = ExP\ modg - 7$

ExP modg = 13

0	1101	110 =
S	E	M

S = 0 (+)
Normal

$M = 1,110 \cdot 2^{6} = 1110 \cdot 2^{3} =$

$13 \cdot 8 = 104$

Bias = 7

ExP real = 13 - 7

112 - 104 = 8

ExP real = 6

* Erro absoluto: 8

* Erro relativo: $\frac{8}{112} = 0,0714 = 7,14\%$

2) 0,224 : 0,001110 =

$1,110 \cdot 2^{-3}$

Bias = 7

Exp real = Exp mago - Bias

-3 = Exp mago - 7

Exp mago = 4

Exp +
→ diminui
← aumenta

S = 0 (+)
M = 110
E = 0100

Exp -
→ aumenta
← diminui

0	0100	110
S	E	M

S = (+)
Normalizado
Bias = 7

$1,110 \cdot 2^{-3} = 1110 \cdot 2^{-6}$

Exp real = 4 - 7

Exp real = -3

$14 \cdot \frac{1}{64} = 0,21875$ (a1)

*Erro absoluto: 0,224 - 0,21875 = 0,00525

*Erro relativo: $\frac{0,00525}{0,224} = 2,34\%$

3º) ORIGINAL = 112 · 0,224 = 25,088

ALTERADO = 104 · 0,21875 = 22,75

22,75(10) = 10110,11 4E, 3M

$1,011011 \cdot 2^{4}$ S = 0 (+)

M = 011

E = 1011

Bias = 7

Exp real = Exp marg − Bias

4 = Exp marg − 7

Exp marg = 11

0	1011	011
S	E	M

S = 0 (+)

Normalizada

Bias = 7

$1,011 \cdot 2^{4} = 1011 \cdot 2^{1} = 11 \cdot 2 = 22_{(10)}$

Exp real = 11 − 7 = 4

*Erro absoluto: 22,75 − 22 = 0,75

*Erro relativo: $\frac{0,75}{22,75} = 3,29\%$

ERRO ABSOLUTO TOTAL → 25,088 − 22 = 3,088

ERRO REL. TOTAL → $\frac{3,088}{25,088} = 12,30\%$

→ Somando: ORIGINAL = 112 + 0,224 = 112,224
ALTERADO = 104 + 0,21875

104,21875 (10) = 1,101000,00111 (2)

$1,101 \cdot 2^{6}$

Bias = 7

G = EXP mag − 7
EXP mag = 13

4 E
3 M
S = 0 (+)
M = 101
E = 1101

0	1101	101
S	E	M

S = 0 (+)
Normalizada
Bias = 7

13 − 7 = 6

$1,101 \cdot 2^{6}$

$1,101 \cdot 2^{6} = 1101 \cdot 2^{3} = 13 \cdot 8 = 104_{(10)}$

* Erro absoluto: 104,21875 − 104 = 0,21875

* Erro relativo: $\frac{0,21875}{104,21875} = 2,09\%$

ERRO ABS. TOTAL → 8,224

ERRO REL. TOTAL → $\frac{8,224}{112,224} = 7,32\%$

/ /

3F 4M

7) MULT: 112 · 0,224 = 25,088

1º) 112: 1110000

1,1100 · 2^6

Bias = 2^(3-1) - 1 = 4 - 1 = 3

Bias = 3

Te = ExPmag - 3

ExPmag = 9 → 1001(2)

0	100	1100
S	E	M

S = 0 (+)
M = 1100
E 100
3 bits do expoente, ou seja, valor mínimo → 111(2)

S = 0 (+)
Normalizada
Bias = 3

1,1100 · 2^1 = 11,1 → 3,5(10)

Bias = 3

ExPreal = 4 - 3 → 1

*Erro absoluto: 112 - 3,5 = 108,5(10)

*Erro relativo: 108,5 / 112 = 96,8 %

2²) 0,224 : 0,0001110 = 1,1100 · 2^-3

Bias = 3

-3 = Exp mod - 3
Exp mod = 0

S = 0 (+)
M = 1100
E = 000

S	E	M
0	000	1100

S = 0 (+)
Normalizado
Bias = 3
E = 000
M = 1000

Exp real = 1 - Bias = -2
3

leading bit -2
0,1100 · 2 → 1100 · 2^-6 =

12 · 1 / 64 = 0,1875

*Erro absoluto: 0,224 - 0,1875 = 0,0365

*Erro relativo: 0,0365 / 0,224 = 16,29 %

3F 4M

3-) ORIGINAL: 25,088
ALTERADO: 3,5 · 0,1875 = 0,65625

0,65625: 0,10101

$1,0101 \cdot 2^{-1}$

S = 0 (+)
M = 0101
E = 010

Bias = 3

-1 = ExPmodo - 3
ExPmodo = 2 ou 010(2)

0	010	0101
S	E	M

S = 0(+)
Normalizado
Bias = 3

$1,2101 \cdot 2^{-1}$

ExPreal = 2 - 3 = -1 → 10101 · 1/32 = 21/32

0,65625

*Erro absoluto: 0
*Erro relativo: 0

ERRO ABS. TOTAL → 25,088 - 0,65625 = 24,43175

ERRO REL. TOTAL → 24,43175 / 25,088 = 97,387%

Somando: ORIGINAL = 112,224 3E
ALTERADO = 3,6875 4M

3,6875 = 11,1011 (2)

1,11011 · 2^-1

Bias = 3

-1 = ExP maquina -3
ExP real = 2

S=0(+) M=1101 E=010

S	E	M
0	010	1101

S=0(+)
Normalizado
Bias = 3

1,1101 · 2^-1 =
11101 · 2^-5 = 29 · 1/32 =)

ExP real = 2-3

0,90625 (10)

*Erro absoluto: 3,6875 - 0,90625 = 2,78125

*Erro relativo = 75,42%

ERRO ABS. TOTAL → 112,224 - 0,90625 =)
111,31775

ERRO REL. TOTAL → 111,31775 / 112,224

99,19%