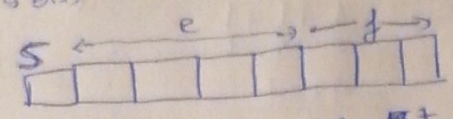
SC (exame #5) José Vasconcelos, a100763

3.28)

a) 8 bits

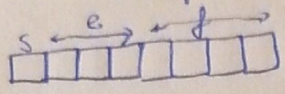
F1:



$V = (-1)^s \times (1+f) \times 2^{e-bias}$

bias: $2^{k-1} - 1 = 2^{4-1} - 1 = 8 - 1 = 7$

F2:



$V = (-1)^s \times (1+f) \times 2^{e-3}$

bias: $2^{3-1} - 1 = 4 - 1 = 3$

b)

i) subnormal (mais pequeno) e positivo ($s=0$)

F1: $s = 0$

$e = 0000_2$

$f = 001_2$

$0\ 0000\ 001_2 = 1.001_2 \times 2^{-7}$

$= 1 \times 1 \times 2^{-3} \times 2^{-7}$

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

$= \frac{1}{2^{10}} = \frac{1}{512}$

F2: $s = 0$

$e = 000_2$

$f = 001_2$

$0\ 000\ 001_2 = 1 \times 2^{-3} \times 2^{1-3}$

$= 2^{-6} = \frac{1}{64}$

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ii)

F1: D=0

$V = (-1)^0 \times \frac{7}{8} \times 2^{1-7} = \frac{7}{8} \times 2^{-6} = \frac{7}{512}$

$f = 111_2 = 2^{-1} + 2^{-2} + 2^{-3} = \frac{1}{2} + \frac{1}{4} + \frac{1}{8}$

$e = 0000_2$

$= \frac{4+2+1}{8}$

$= \frac{7}{8}$

F2: D=0

$V = (-1)^0 \times \frac{15}{16} \times 2^{1-1}$

$f = 1111_2 = 2^{-1} + 2^{-2} + 2^{-3} + 2^{-4} = \frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \frac{1}{16}$

$= \frac{15}{16} \times \frac{1}{2} = \frac{15}{64}$

$e = 0000_2$

$= \frac{7}{8} + \frac{1}{16} = \frac{14+1}{16} = \frac{15}{16}$

iii)

F1: D=0

$V = (-1)^0 \times \left(\frac{1}{8}\right) \times 2^{1-7}$

$f = 001_2 = \frac{1}{8}$

$= \frac{1}{64}$

$e = 0001_2$

F2: D=0

$V = (-1)^0 \times 1 \times 2^{1-3}$

$f = 0000_2 = 0$

$= \frac{1}{4}$

$e = 001_2$

iv) F1: D=0

$V = (-1)^D \times (1+f) \times 2^{e - bia}$

$f = 000_2$

$e = 111_2$

bias: $7_{10} = 111_2$

7 | 2
1 3 | 2
1 1 | 2
1 0

F2: D=0

bias: 3

$f = 0000_2$

$e = 011_2$

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v)

$s = 0$

F_1: $f = 111_2 = \frac{7}{8}$

$e = 1110_2$

$= 2^3 + 2^2 + 2^1$

$= 8 + 4 + 2$

$= 14$

$V = (-1)^0 \times \frac{15}{8} \times 2^{14-7}$

$= 240_{10}$

F_2: $s = 0$

$f = 1111_2 = \frac{7}{8} + \frac{1}{16} = \frac{15}{16}$

$e = 110_2$

$= 6_2$

$V = (-1)^0 \times \frac{31}{16} \times 2^{6-3}$

$= 15{,}5$

c) $\boxed{F_1}$ i) $\boxed{1}\boxed{0110}\boxed{011}_2 = (-1)^1 \times \left(1 + \frac{3}{8}\right) \times 2^{6-7}$

$= -\frac{11}{16}_{10}$

$s = 1$

$f = 2^{-2} + 2^{-3} = \frac{1}{4} + \frac{1}{8} = \frac{3}{8}$

$e = 110_2 = 2^2 + 2^1$

$= 6$

ii) $\boxed{0}\boxed{1111}\boxed{010}_2 = \cancel{(-1)^0 \times \frac{1}{4} \times 2^{1-7}}$

$= NaN \quad (f \neq 000_2)$

$s = 0$

$f = 2^{-2} = \frac{1}{4}$

$\cancel{e = 8 + 4 + 2 + 1}$

$\cancel{= 15}$

→ número especial

iii) $1\ 0010\ 001_2$

normal

$s = 1$

$f = 001_2 = \frac{1}{8}$

$e = 2$

$V = (-1)^1 \times \left(1 + \frac{1}{8}\right) \times 2^{2-7}$

$= -\frac{9}{256}$

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iv) 0 0000 011$_2$

subnormal

$v = (-1)^0 \times \frac{3}{8} \times 2^{1-7}$

$= \frac{3}{512}$

$s = 0$

$f = \frac{1}{4} + \frac{1}{8} = \frac{3}{8}$

$e =$

v) 1 1000 001$_2$

$v = (-1)^1 \times \left(\frac{9}{8}\right) \times 2^{8-7}$

$= -\frac{9}{4}\,10$

$s = 1$

$f = \frac{1}{8}$

$e = 8$

d) i) $-111.01_3 = -\left(3^2 + 3^1 + 3^0 + 3^{-2}\right)_{10}$

$= -\left(9 + 3 + 1 + \frac{1}{9}\right)_{10} = -B.1111_{10}$

$= -1101.0001_2$

13 | 2
1 6 | 2
0 3 | 2
1 1 | 2
1 0

$s = 1$

$f = 001_2$

$e = 1011_2$
1010_2

2^{e-7}

10 | 2
0 5 | 2
1 2 | 2
0 1 | 2
1 0

$(-1) \times (1 + 2^{-3}) \times 2^{e-7} = -13.1111$

$\Rightarrow -\frac{9}{8} \times 2^{e-7} = -13.1111$

$\Rightarrow 2^{e-7} = 11.65431$

1010_2

$\Rightarrow e - 7 = \log_2(11.65431)$

$\Rightarrow e = 10.543_{10}$

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$13_{10} = 1101_2 = 1.101 \times 2^3$

$(1_2 + 0.5 + 0.25) \times 2^3$

d) i) $-111.01_2 = -13.(1)_{10}$

$= \boxed{1}\ \boxed{1010}\ \boxed{101^5}$

expoente: $3 = e - bias$

$\Leftrightarrow e = -3 - 7 \Leftrightarrow e = -10 \Leftrightarrow e = 10$

$= 1010_2$

ii) 128_{10}

$128 = 2^7 = 10000000.2$

$= 1.0000000 \times 2^7$

$= 1.0 \times 2^7$

$= \boxed{0}\ \boxed{1110}\ \boxed{000}$

$7 = e - bias \Leftrightarrow e = 14$

$= 1110_2$

14|2
0 7|2
1 3|2
1 1|2
0
1 1

iii) $111.01_{10} = 1101111.\ldots_2$

$= 1.1011111 \times 2^6$

$\simeq 1.110 \times 2^6$

111|2
1 55|2
1 27|2
1 13|2
1 6|2
0 3|2
1 1|2
1 0

$\boxed{0}\ \boxed{1101}\ \boxed{110}$

$6 = e - 7$

$\Leftrightarrow e = 13$

$= 1101_2$

13|2
1 6|2
0 3|2
1 1|2
1 0

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iv) $-18C_{16} = \boxed{1}\ \boxed{1111}\ \boxed{100}$ vale capital

$18C_{16} = 0001\ 1000\ 1100_2$

1.100×2^8

$8 = e - 7$

$\Leftrightarrow e = 15$

$15 \lfloor 2$
$1\ 7 \lfloor 2$
$1\ 3 \lfloor 2$
$1\ 1 \lfloor 2$
$1\ 0$

$e \to 12$

$12 \lfloor 2$
$0\ 6 \lfloor 2$
$0\ 3 \lfloor 2$
$1\ 1 \lfloor 2$
$1\ 0$

v) $0.005_8 = 0.000\,000.\ 101_2$

$= 1.01 \times 2^{-7}$

$\boxed{0}\ \boxed{0000}\ \boxed{101}$

submanual

$5 \lfloor 2$
$1\ 2 \lfloor 2$
$0\ 1 \lfloor 2$
$1\ 0$

$-7 = e - 7$

$\Leftrightarrow e = 0$

e) $0\ 0110\ 011 = 0\ \boxed{111}\ \boxed{0110}$

F1 F2

$V = (-1)^0 \times 1 + \left(\frac{1}{4} + \frac{1}{8}\right) \times 2^{5-7}$

$= \cancel{44}_{10}$

$44 \lfloor 2$
$0\ 22 \lfloor 2$
$0\ 11 \lfloor 2$
$1\ 5 \lfloor 2$
$1\ 2 \lfloor 2$
$0\ 1 \lfloor 2$
$1\ 0$

$= 101100_2$

$= 1.0110 \times 2^5$

$\cancel{5 = e - 3}$

$\cancel{\Leftrightarrow e = 8}$

$\cancel{= 1000_2 \simeq 111_2}$