32 BIT

1) $n \in \mathbb{R}$ in virgola mobile $\longrightarrow$ $s = 1$ bit ; $e = 8$ bit ; $m = 23$ bit

$s = 1$; $e = 1000\,111$; $m = 110100\ldots\ldots 00$

$e = 135$ $\quad$ so che $N = (-1)^{s} \cdot 2^{(e-127)} \cdot 1.m$

$-1 \cdot 2^{8} \cdot 1.11011$

1.0000000 ← spostò di 8 cifre a dx la virgola

$-1 \cdot 111011000$ aggiunti

$-1 \cdot 472 \to -472$

2 Esercizio

Convertire i seguenti numeri decimali in virgola mobile in singola precisione secondo lo standard IEEE 754:

1. -23.375_{10}
2. -127.25_{10}
3. $+131.5_{10}$
4. -300.25_{10}
5. -3.6_{10}

1) $- \Rightarrow s = 1$ $\quad$ shift 4 bit $\longrightarrow$ $127 + 4 = 131 = e$

$23.375 = 10111.011 \to 1.0111011$ $\longrightarrow$ $m = 0111011\,0\ldots 0$

$.375 \times 2 = 0.75 = 0$

$0.75 \times 2 = 1.5 : 1$

$0.5 \times 2 - 1 = 1$

diventa l' HIDDEN BIT

2) -127.25_{10} $\quad$ $127 + 6 = 133 = e$

1 $\quad$ $1111111.01 \to 1.111111\,01 \times 2^{6}$

m = 1111101 | e = 1000101 | s = 1

3) 131.5 s = 0

$\rightarrow$ 10000011.1 = 1.0000011 $\times 2^7$ $\rightarrow$ e = 127+7 = 134

$\rightarrow$ m = 00000111 | e = 10000110 | s = 0

4) −300.25

s = 1

100101100.01 => 1.0010110001 $\times 2^8$ $\rightarrow$ e = 135

256 32 8 4

s = 1 ; e = 10000111 ; m = 0010110001

5) 3.6 $\rightarrow$ 11.1001.... ciclico $\rightarrow$

0.6 × 2 = 1.2   1
0.2 × 2 = 0.4   0
0.4 × 2 = 0.8   0
0.8 × 2 = 1.6   1
0.6 . . — — -

$\rightarrow$ 1.11001 1001 . . . . . $\times 2^1$ $\rightarrow$ e = 128 = 10000000

6) 1 | 01111101 | 00100 0000000000000000000

s = −

e = 0111 1101 $\rightarrow$ 125 − 127 = −2

ABBIAMO MESSO L'HIDDEN BIT

m = 00100000... $\rightarrow$ 1.00100.. — $\cdot 2^{-2}$

$\downarrow$

0.1001 $\rightarrow$ 0.28125

9) 0 | 10000111 | 0001010101000 . . . .

$\downarrow$

$S = +$

$e = 10000111 \rightarrow 135 \rightarrow 2^n \rightarrow n = 135 - 127 = 8$

$m = 1.0001010101000 \ldots \cdot 2^8$

100010101.01000

$+ \quad 277 \quad .25$

$0,10100$

$2^{-1} \quad 2^{-3}$

$\frac{1}{2} + \frac{1}{8} \rightarrow 0.5 + 0.125$

8) 1 | 10000110 | 00000001101000

$S = -$

$e: 10000110 \rightarrow 134 - 127 = 7$

$m: 1.000000001101 \times 2^7 \rightarrow 10000001,10100$

$- \quad 129.625$

ASSORBIMENTO: $T + \overline{T}V = T + V$

LOGICA

$$\overline{(A \text{ OR } B)} = \overline{A} \text{ AND } \overline{B}$$

$$\overline{(A B)} = \overline{A} + \overline{B}$$

1.	X+0 = X	2.	X.1 = X	
3.	X+1 = 1	4.	X.0 = 0	
5.	X+X =X	6.	X.X = X	
7.	X+X' =1	8.	X.X' = 0	
9.	X'' = X			
10.	X+Y = Y + X	11.	XY = YX	Proprietà commutativa
12.	X+(Y+Z) = (X+Y)+Z	13.	X(YZ) = (XY)Z	Proprietà associativa
14.	X(Y+Z) = XY+XZ	15.	X+YZ = (X+Y)(X+Z)	Proprietà distributiva
16.	(X+Y)'=X'Y'	17.	(XY)'=X'+Y'	Teorema di DeMorgon

1) $\overline{(\overline{B} \text{ AND } B)} \text{ OR } A \text{ AND } B$

$\downarrow$

$B \text{ OR } \overline{B} \text{ OR } \underbrace{A \text{ AND } B}$

$\underbrace{B \text{ OR } \overline{B}}, \text{ OR } \cancel{A \text{ AND } B}$

TAUTOLOGIA

$\Downarrow$

VERO

2) $\underbrace{(B+\overline{B})} \cdot \overline{(\overline{B}+\overline{\overline{B}})}$

$\downarrow$

Tautologia $= \overline{B} + B$

$(B+\overline{B}) \text{ AND } \overline{(\overline{B}+B)} \rightarrow$ FALSO SEMPRE

Vero sempre — falso sempre

3) $B + \overline{(A+B+\overline{(AB)})} \rightarrow$ D. Morgan

$B + \overline{(A+B+\overline{A}+\overline{B})}$

$B + \overline{(\underbrace{A+\overline{A}}_{S.V.} + \underbrace{B+\overline{B}}_{S.V.})}$

$B +$ contraddizione $\rightarrow$ l'or dipende da B

0

---

1) $\overline{A} \cdot (A+B) + \overline{C} + BC$

$\underbrace{\cancel{\overline{A}A}}_{0} + \overline{A}B + \underbrace{\overline{C} + BC} \rightarrow$ Assorbimento

$\downarrow$

$\overline{A}B + B + \overline{C}$

$\hookrightarrow B(\underbrace{\overline{A}+1}_{1}) + \overline{C}$

$B + \overline{C}$

2) $\overline{\underbrace{A + A\overline{B}} + CD}$

$\overline{A(\underbrace{\overline{B}+1}_{1}) + CD} \rightarrow$ RACCOLGO

$\overline{A + CD} \rightarrow$ DE MORGAN

$\overline{A} \cdot \overline{CD}$

$\overline{A} \cdot (\overline{C} + \overline{D})$

3) $\overline{\overline{(A+B)}C}$ DM

$\overline{\overline{A}\,\overline{B}C}$ DM

$A+B+\overline{C}$

4) $\overline{C}(\overline{B}+AB)$ $\rightarrow$ $T=\overline{B} \rightarrow T+\overline{T}V = T+V$

$\downarrow$

$\overline{C}(\overline{B}+A) \rightarrow \overline{C}\overline{B} + A\overline{C}$

$\overline{Y} = \bar{A}\bar{B}\bar{C} + A\bar{B}\bar{C} + \bar{A}B\bar{C} + AB\bar{C}$

$\stackrel{!}{=} \bar{C}(\bar{A}\bar{B} + A\bar{B} + \bar{A}B + AB)$

$\bar{C}(\bar{A}(\underset{1}{\cancel{\bar{B}+B}}) + A(\underset{1}{\cancel{B+\bar{B}}}))$

$\bar{C}(\underset{1}{\cancel{\bar{A}+A}}) = \bar{C}$

$\overline{\overline{AB} + C\bar{D}}$

$\overline{\bar{A} + \bar{B} + C\bar{D}}$ DM

$AB(\bar{C} + D)$ DM

$AB\bar{C} + ABD$

$A(B+C) + \bar{B}(A+C)$

$AB + AC + \bar{B}A + \bar{B}C$

$A(\underset{1}{\cancel{B+\bar{B}}}) + AC + \bar{B}C$

$A + AC + \bar{B}C$

$A(\cancel{1+C}) + \bar{B}C$

$A + \bar{B}C$

$A(B+C) + \overline{A + \bar{C}}$ DM

$AB + AC + \bar{A}C$

$C(\underset{1}{\cancel{\bar{A}+A}}) + AB$

$C + AB$

$AB + \overline{AC} + A\bar{B}C(AB+C)$

$AB + \overline{AC} + \underset{0}{\cancel{AAB\bar{B}C}} + A\bar{B}CC$

$AB + \overline{AC} + A\bar{B}C\cancel{C}$

$A(\underline{B + \bar{B}C}) + \overline{AC}$

ASSORBIMENTO

$A(B+C) + \overline{AC} \to$

$AB + \underset{1}{\cancel{AC + \overline{AC}}} \to AB + 1 = 1$

$(A+B)(A+\bar{B})$

$\cancel{A}A + A\bar{B} + AB + \underset{0}{\cancel{B\bar{B}}}$

$A + A\bar{B} + AB$

$A + A(\underset{1}{\cancel{B+\bar{B}}}) \to A$

DIFFICILE

$$AB\overline{C} + BC + \overline{A}\,\overline{B}C$$

$$\hookrightarrow 1 \cdot BC$$

$$AB\overline{C} + (A+\overline{A})BC + \overline{A}\,\overline{B}C$$

$$AB\overline{C} + ABC + \overline{A}BC + \overline{A}\,\overline{B}C$$

$$AB\underbrace{\cancel{(\overline{C}+C)}}_{1} + \overline{A}BC + \overline{A}\,\overline{B}C$$

$$AB + \overline{A}C\underbrace{\cancel{(B+\overline{B})}}_{1} = AB + \overline{A}C$$