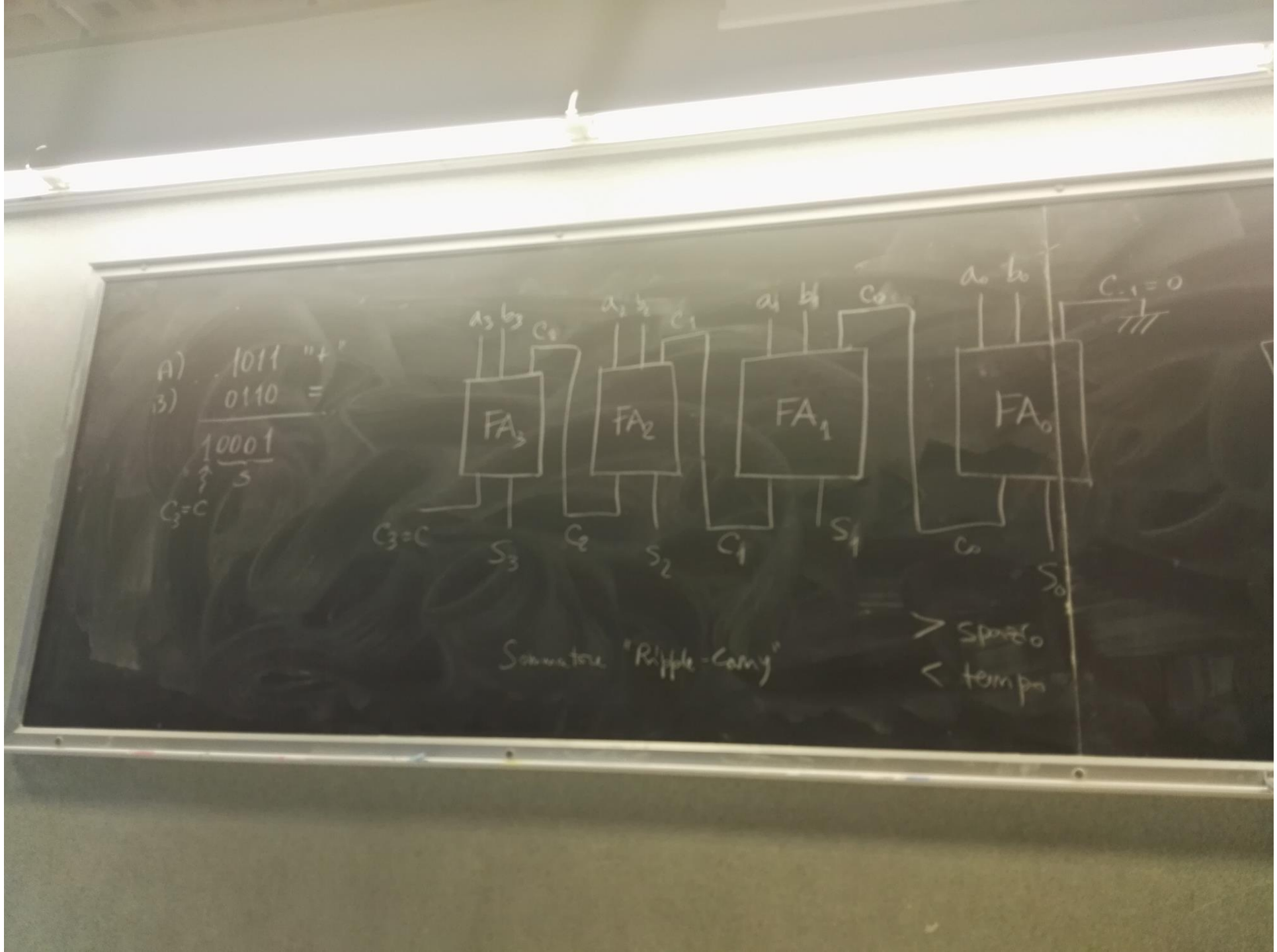
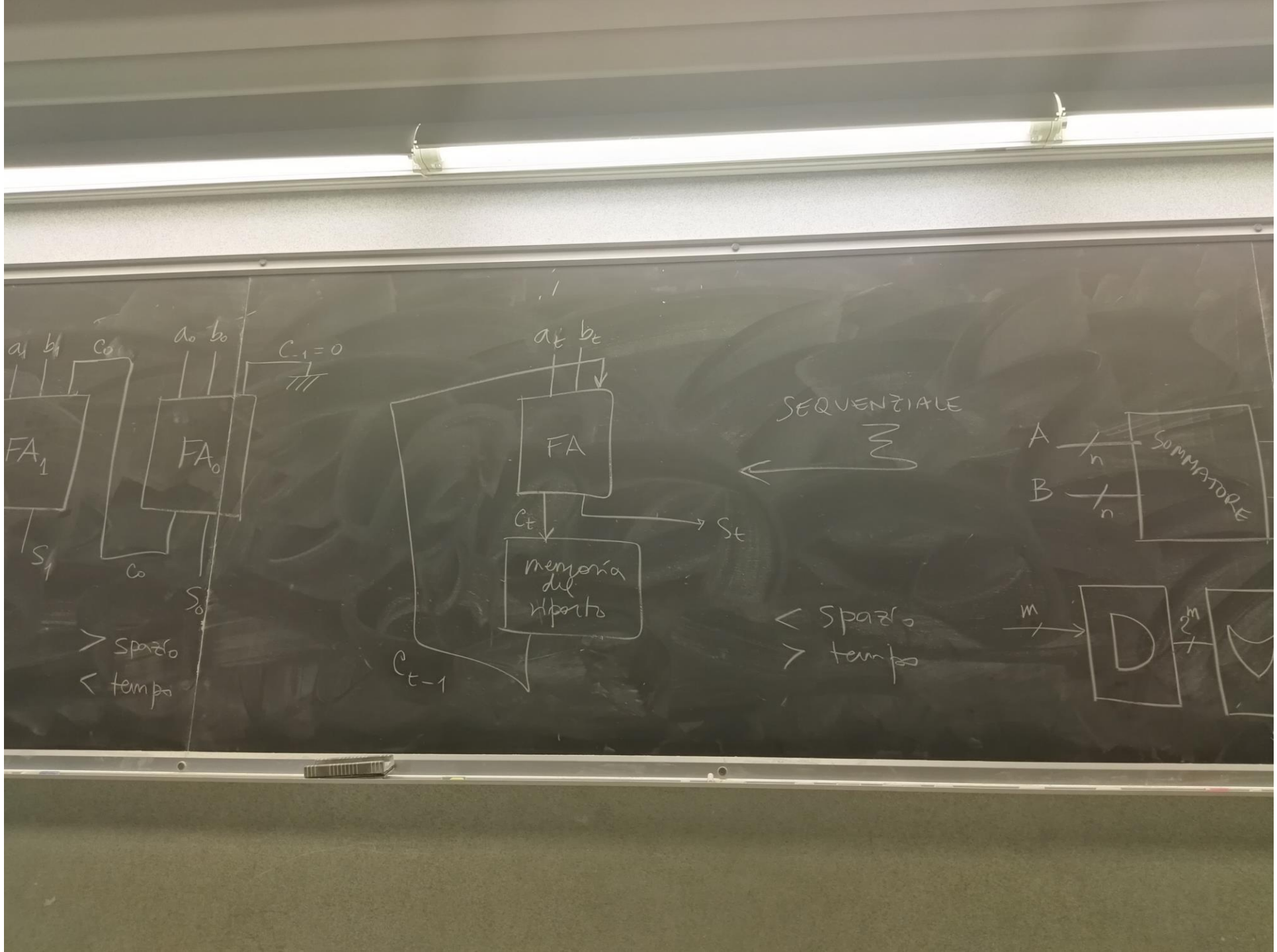
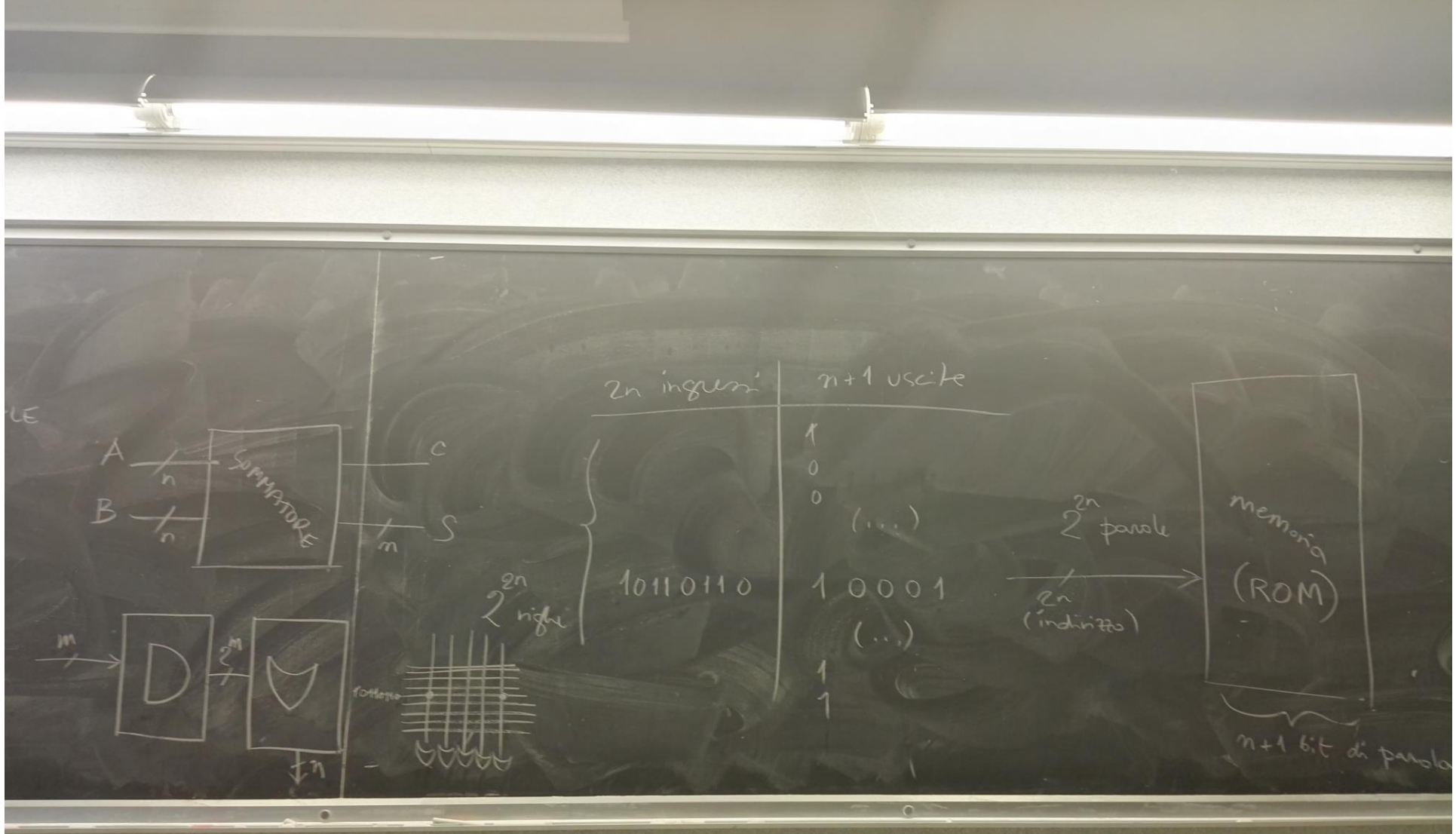
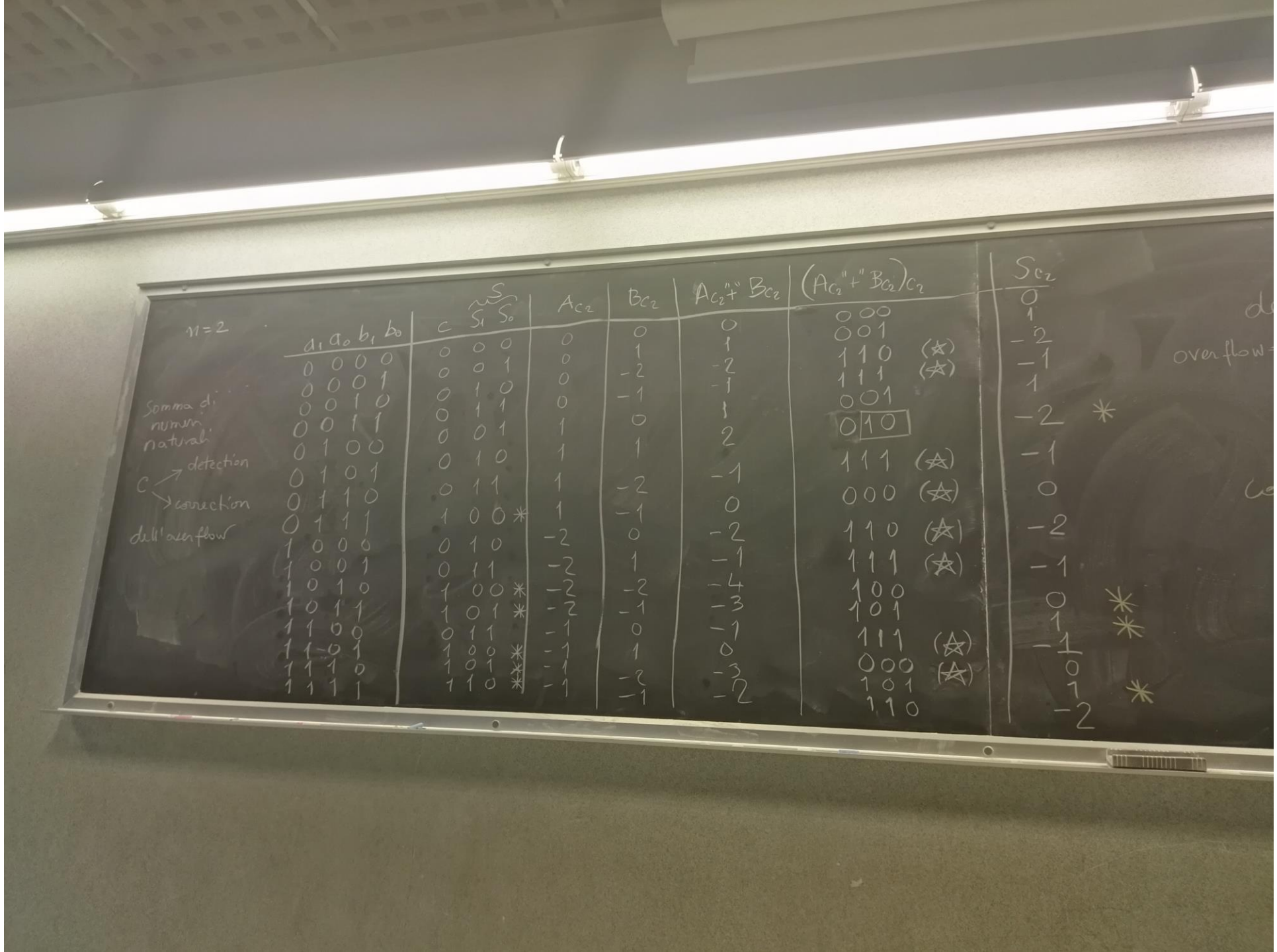
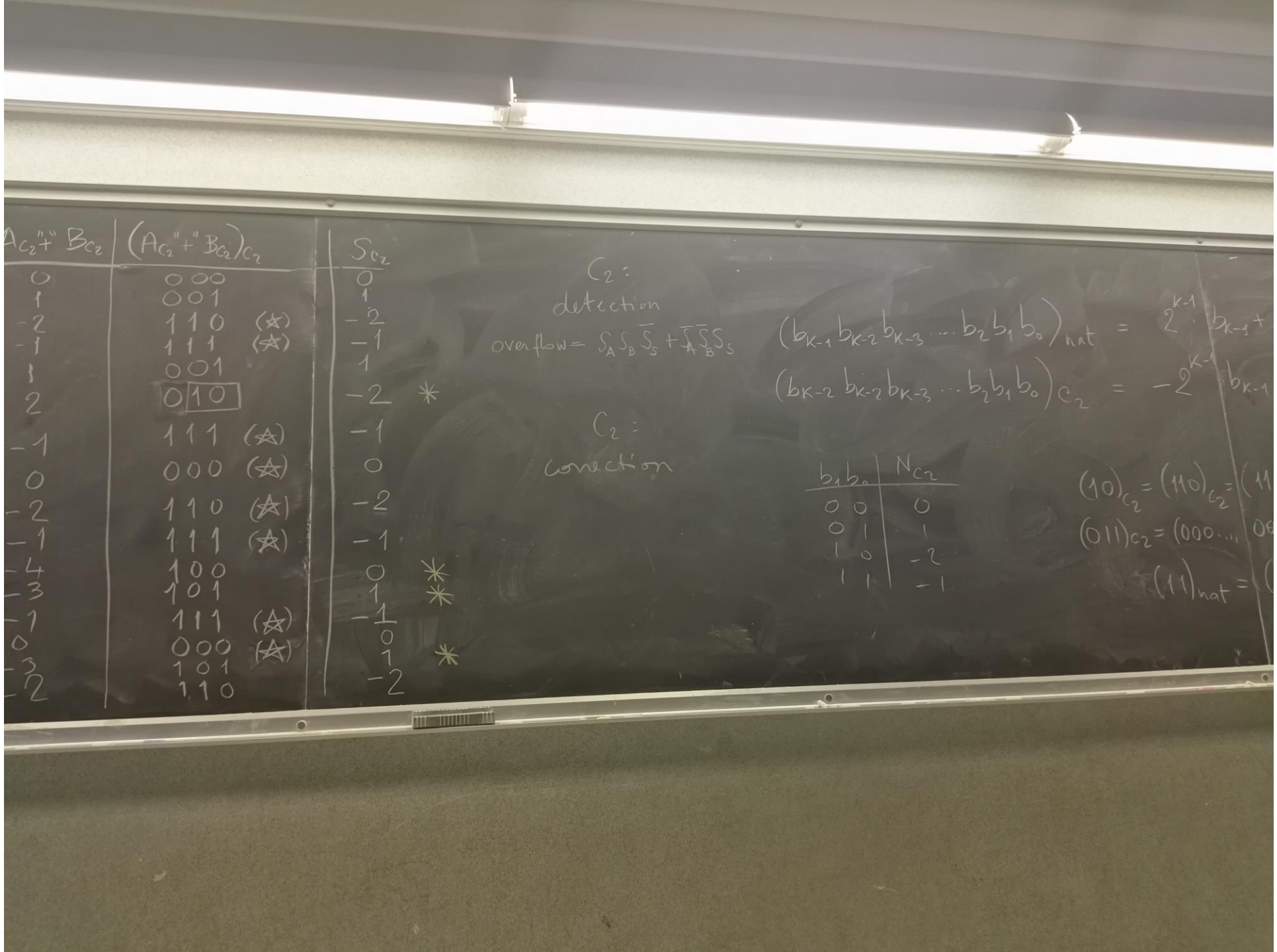

A) 1011 "t"
B) 0110 =
10001
3
$C_3 = C$
a_3 b_3 c_3
a_2 b_2 c_2
a_1 b_1 c_1
a_0 b_0
$c_{-1} = 0$
FA_3
FA_2
FA_1
FA_0
$C_3 = C$
S_3
C_2
S_2
C_1
S_1
C_0
S_0
Sommatore "Ripple-Carry"
> spreco
< tempo


a_1 b_1 c_0
a_0 b_0
$c_{-1} = 0$
FA_1
FA_0
S_1
c_0
S_0
> spazio
< tempo
a_t b_t
FA
c_t
S_t
memoria del riporto
c_{t-1}
SEQUENZIALE
< spazio
> tempo
A
B
n
SOMMATORE
m
D
2^m


A
B
n
n
SOMMATORE
C
S
n
m
D
2^m
n
2n ingressi
n+1 uscite
1
0
0
(...)
10110110
10001
(...)
1
1
2^2n parole
2n
(indirizzo)
memoria
(ROM)
n+1 bit di parola
2^2n righe
fotodiodo


n = 2
Somma di numeri naturali
C → detection
→ correction
dell'overflow
$a_1\ a_0\ b_1\ b_0$
C $\overbrace{S_1\ S_0}^{S}$
A_{C_2}
B_{C_2}
A_{C_2} "+" B_{C_2}
$(A_{C_2}$ "+" $B_{C_2})_{C_2}$
S_{C_2}
overflow


A_{C_2} "+" B_{C_2}
$(A_{C_2}$ "+" $B_{C_2})_{C_2}$
S_{C_2}
0 000 0
1 001 1
-2 110 (☆) -2
-1 111 (☆) -1
1 001 1
2 010 -2 *
-1 111 (☆) -1
0 000 (☆) 0
-2 110 (☆) -2
-1 111 (☆) -1
-4 100 0 *
-3 101 1 *
-1 111 (☆) -1
0 000 (☆) 0
-3 101 1 *
-2 110 -2
C_2 : detection
overflow = $S_A S_B \overline{S_S} + \overline{S_A}\,\overline{S_B} S_S$
C_2 : corection
$(b_{K-1} b_{K-2} b_{K-3} \cdots b_2 b_1 b_0)_{nat} = 2^{K-1} \cdot b_{K-1} +$
$(b_{K-2} b_{K-2} b_{K-3} \cdots b_2 b_1 b_0)_{C_2} = -2^{K-1} \cdot b_{K-1}$
$b_1 b_0$ | N_{C_2}
0 0 | 0
0 1 | 1
1 0 | -2
1 1 | -1
$(10)_{C_2} = (110)_{C_2} = (11$
$(011)_{C_2} = (000\ldots$ 0
$(11)_{nat} = ($

$b_{K-3} \cdots b_2 b_1 b_0)_{nat} = 2^{K-1} \cdot b_{K-1} + \cdots$

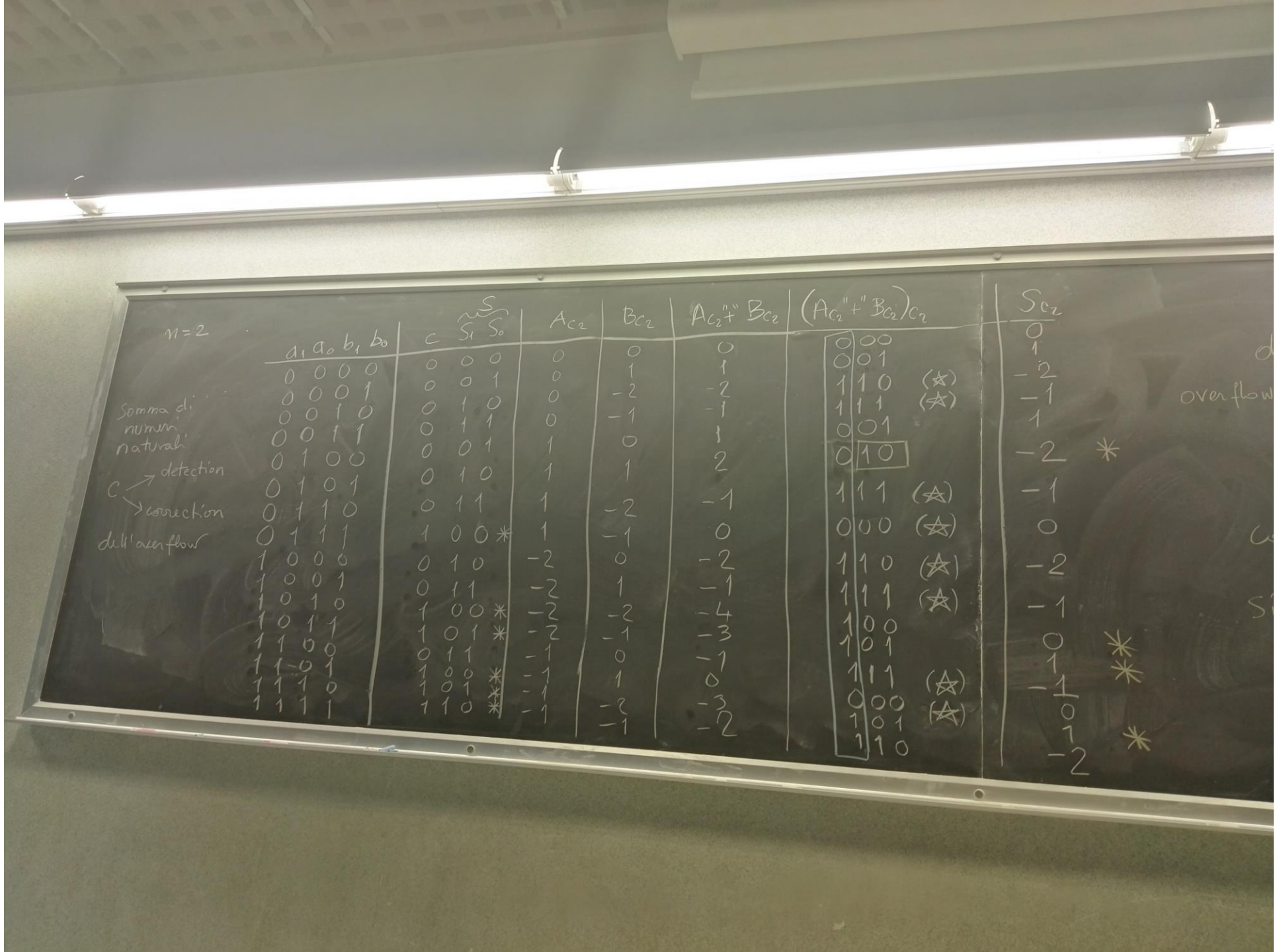
$k-3 \cdots b_2 b_1 b_0)_{C_2} = -2^{K-1} \cdot b_{K-1} + (b_{K-2} b_{K-3} \cdots b_2 b_1 b_0)_{nat}$

$(10)_{C_2} = (110)_{C_2} = (1110)_{C_2} = \cdots = (1 \cdots 10)_{C_2}$

$(011)_{C_2} = (000\ldots 00011)_{C_2}$

$(11)_{nat} = (0000 \cdots 000011)_{nat}$ "ultimi sono di segno"

$b_2 b_1 b_0$	N_{nat}	N_{C_2}
000	0	0
001	1	1
010	2	2
011	3	3
100	4	-4
101	5	-3
110	6	-2
111	7	-1


n = 2
Somma di numeri naturali
c → detection
c → correction
dell'overflow
$a_1 a_0 b_1 b_0$
c $S_1 S_0$
A_{C_2}
B_{C_2}
A_{C_2} "+" B_{C_2}
$(A_{C_2}$ "+" $B_{C_2})c_2$
S_{C_2}
overflow

$/_{C_2}/C_2$	S_{C_2}
	0
	1
(☆)	−2
(☆)	−1
	1
	−2 *
(☆)	−1
(☆)	0
(☆)	−2
(☆)	−1
	0 *
	1 *
☆)	−1
☆)	0
	1 *
	−2

C_2 : detection

$overflow = S_A S_B \overline{S_S} + \overline{S_A}\,\overline{S_B} S_S$ ($n=2$: $overflow = a_1 b_1 \overline{s_1} + \overline{a_1}\,\overline{b_1} s_1$)

C_2 : correction

$Sign = \overline{overflow} \cdot S_S + overflow \cdot \overline{S_S}$

$= overflow \oplus S_S$

($n=2$: $Sign = overflow \oplus s_1 = a_1 b_1 + a_1 s_1 + b_1 s_1$)

signed comparisons

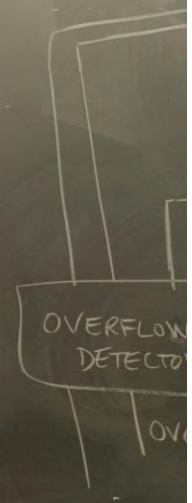
$A = B \Leftrightarrow Z = 1$

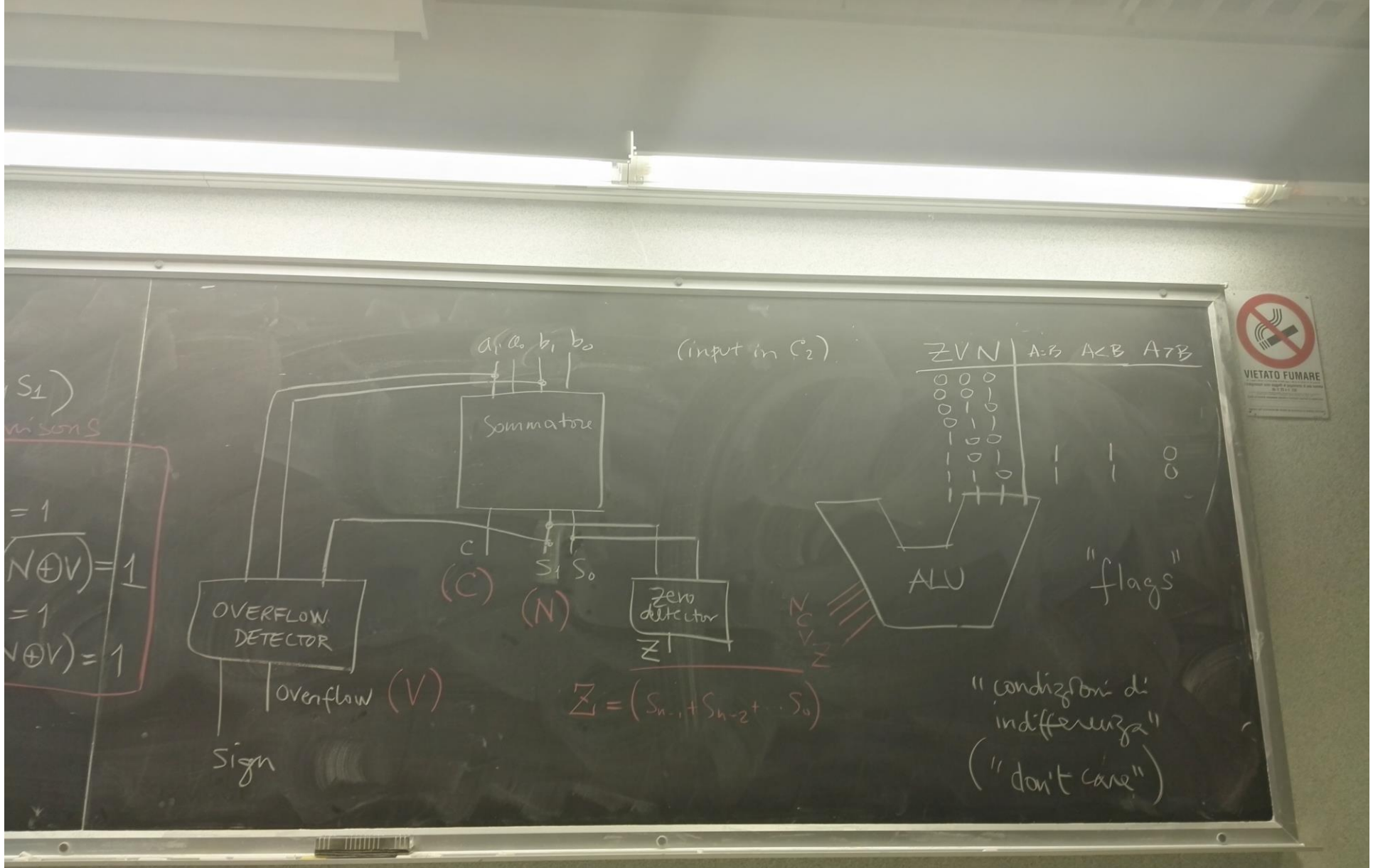
$A < B \Leftrightarrow N \oplus V = 1$

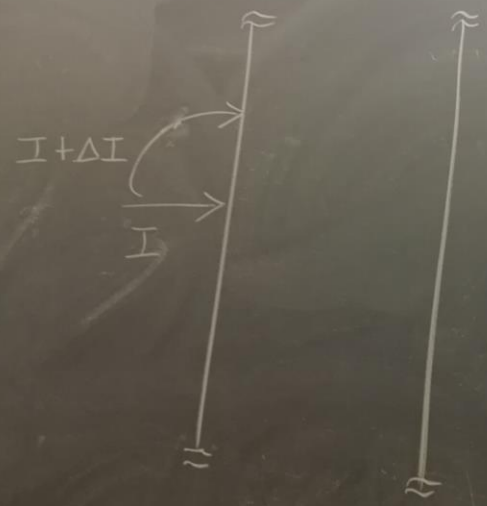
$A > B \Leftrightarrow \overline{Z} \cdot \overline{(N \oplus V)} = 1$

$A \geq B \Leftrightarrow \overline{N \oplus V} = 1$

$A \leq B \Leftrightarrow Z + (N \oplus V) = 1$




a_1 a_0 b_1 b_0
(input in C_2)
Sommatore
C
S_1 S_0
(C)
(N)
OVERFLOW DETECTOR
Zero detector
Z
Overflow (V)
Sign
$Z = (S_{n-1} + S_{n-2} + \dots S_0)$
N C V Z
ALU
Z V N
A=B A<B A>B
1 1 0
"flags"
"condizioni di indifferenza"
("don't care")
VIETATO FUMARE



$I = 81h \quad (= \underbrace{1000}_{8}\ \underbrace{0001}_{1})_{nat}$

$\Delta I = 9h \quad (= 1001)_{C_2}$ CE

01000 0001
11111 1001