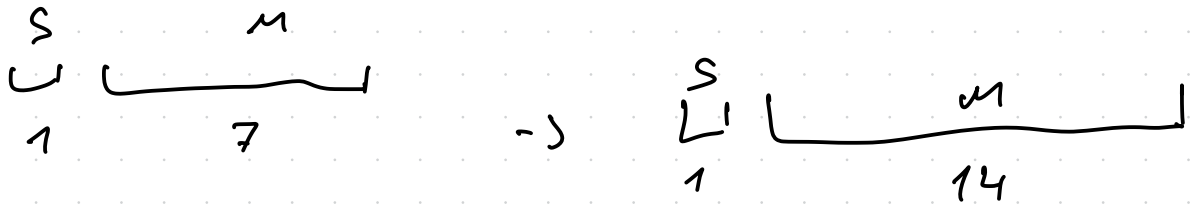
Chapter 1: Comp. Arithmetic

01 

02 

$0.5270 = 0.5270$

$527 = 0527$ ⇒

$X = -211$

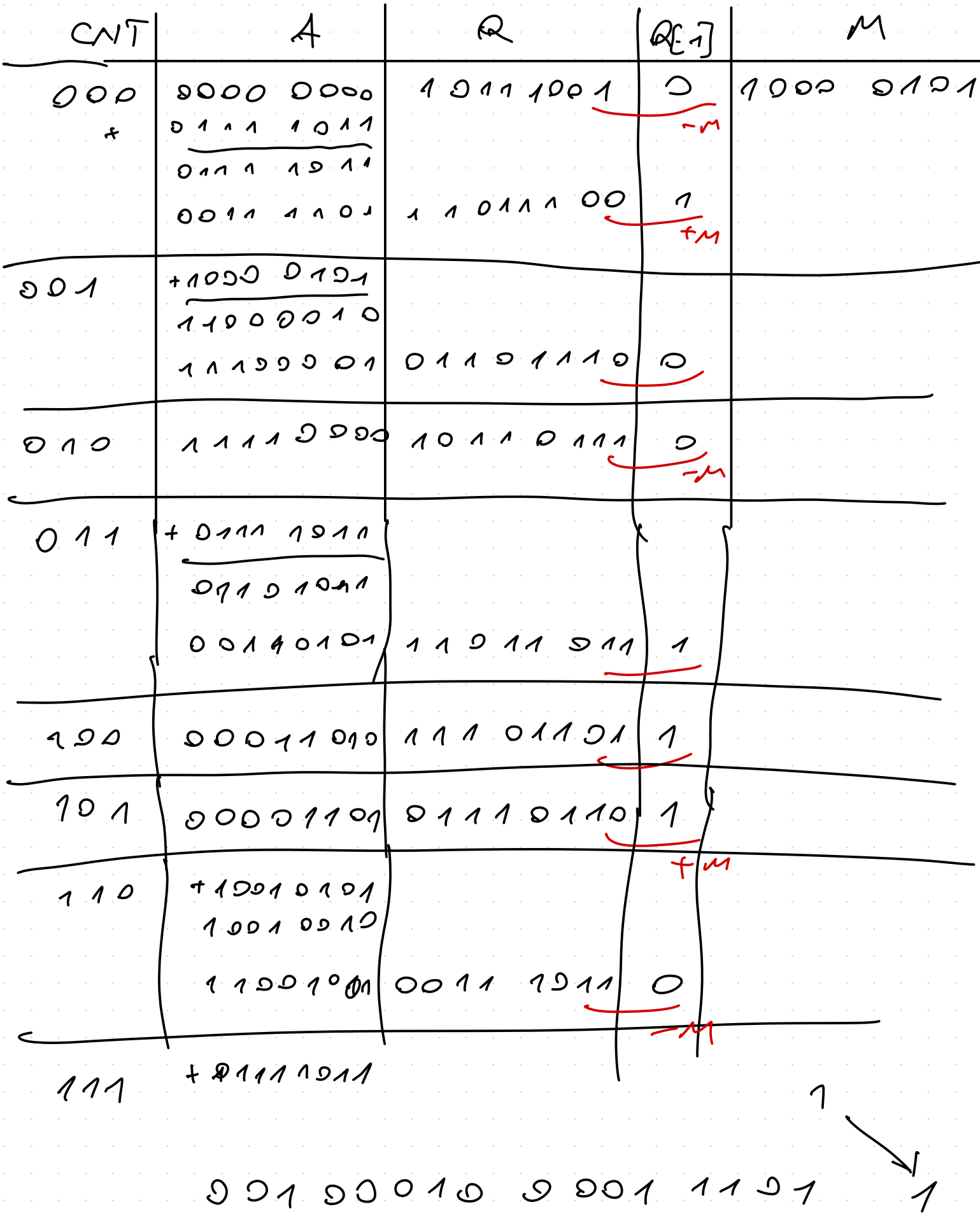
$Y = -71$

$X_{SM} = 11111019_{SM}$

$Y_{C_2} = 10000101_{C_2}$

$Y_{SM} = 11000111_{SM}$

$Y_{C_2} = 10111001_{C_2}$


CNT
A
Q
Q[-1]
M
-M
+M
-M
+M
-M

Chapter 1 Computer Arithmetic

$0.527 = 0.5270$
$\neq 0.0527$

$527 = 0527$
$\neq 5270$

01 | S | M | (1 | 7)

02 | S | M | (1 | 7)

| S | M | (1 | 14)

$X = -123$

$Y = -71$

$123 - 64 = 59 - 32 = 27 - 16 = 11$

$71 - 64 = 7$

$X = 1\,1111011_{SM}$
$= 1\,0000101_{C_2}$

$Y = 1\,1000111_{SM}$
$= 1\,0111001_{C_2}$

$Y^* = \bar{1}\,1\,0\,0\,\bar{1}\,0\,1\,\bar{1}$

$-M = 0111\ 1011$

1024
2048
4096
8192 $= 2^{13}$

$Q[0]\,Q[-1]$	OP
0 0	0
0 1	1
1 0	1
1 1	0

$X = -\frac{123}{128} = -\frac{123}{2^7}$

$Y = -\frac{71}{128} = -\frac{71}{2^7}$

$P = +\frac{123 \times 71}{2^{14}}$

X.XXX XXXX XXXX XXXX

COUNT	A	Q	Q[-1]	M
000	0000 0000	1011 1001	0	1000 0101
+	0111 1011		-M	
	0111 1011			
	0011 1101	1101 1100	1	
			+M	
001	+1000 0101			
	1100 0010			
	1110 0001	0110 1110	0	
010	1111 0000	1011 0111	0	-M
011	+0111 1011			
	0110 1011			
	0011 0101	1101 1011	1	
100	0001 1010	1110 1101	1	
101	0000 1101	0111 0110	1	
110	+1000 0101			+M
	1001 0010			
	1100 1001	0011 1011	0	
111	+0111 1011			-M
	0100 0100			
	0010 0010	0011 1011	0	
		0001 1101	1	

1.2. Modified Booth's Alg.

$X = 10000001$ → Robertson → 2 op- (mode 1)

$X^* = \bar{1}\,0000\,0\bar{1}$; 0

$X = 1111\,0111\,|_0$ → 7 op. pt. Robertson

$X^* = 000\bar{1}\,100\bar{1}$ → 3 op. pt Booth

$X = 0101\,0101$; 0 → 4 op Rob.

$X^* = 1\bar{1}1\bar{1}\,1\bar{1}1\bar{1}$

X_i : bit current

Run of 0s

1s

X_{i+1} X_i ~~X_{i-1}~~ ↑

Run

x_{i+n}	x_i	R	Q_p	R^* (next)
0	0	0	0	0
0	0	1	1	0
0	1	0	1	0
0	1	1	0	1
1	0	0	0	0
1	0	1	1	1
1	1	0	1	1
1	1	1	0	1

X : 1 0 0 0 0 0 0 1

X^{**} : 1 0 0 0 0 0 0 1

R : 1 0 0 0 0 0 0 0

X = 0 | 0 1 0 1 0 1 0 1 |

X^{**} = 0 1 0 1 0 1 0 1 |

R 0 0 0 0 0 0 0 0 | 0

X 1 | 1 1 1 1 1 1 1 1 |

X^{**} 0 1 0 1 1 0 0 1 |

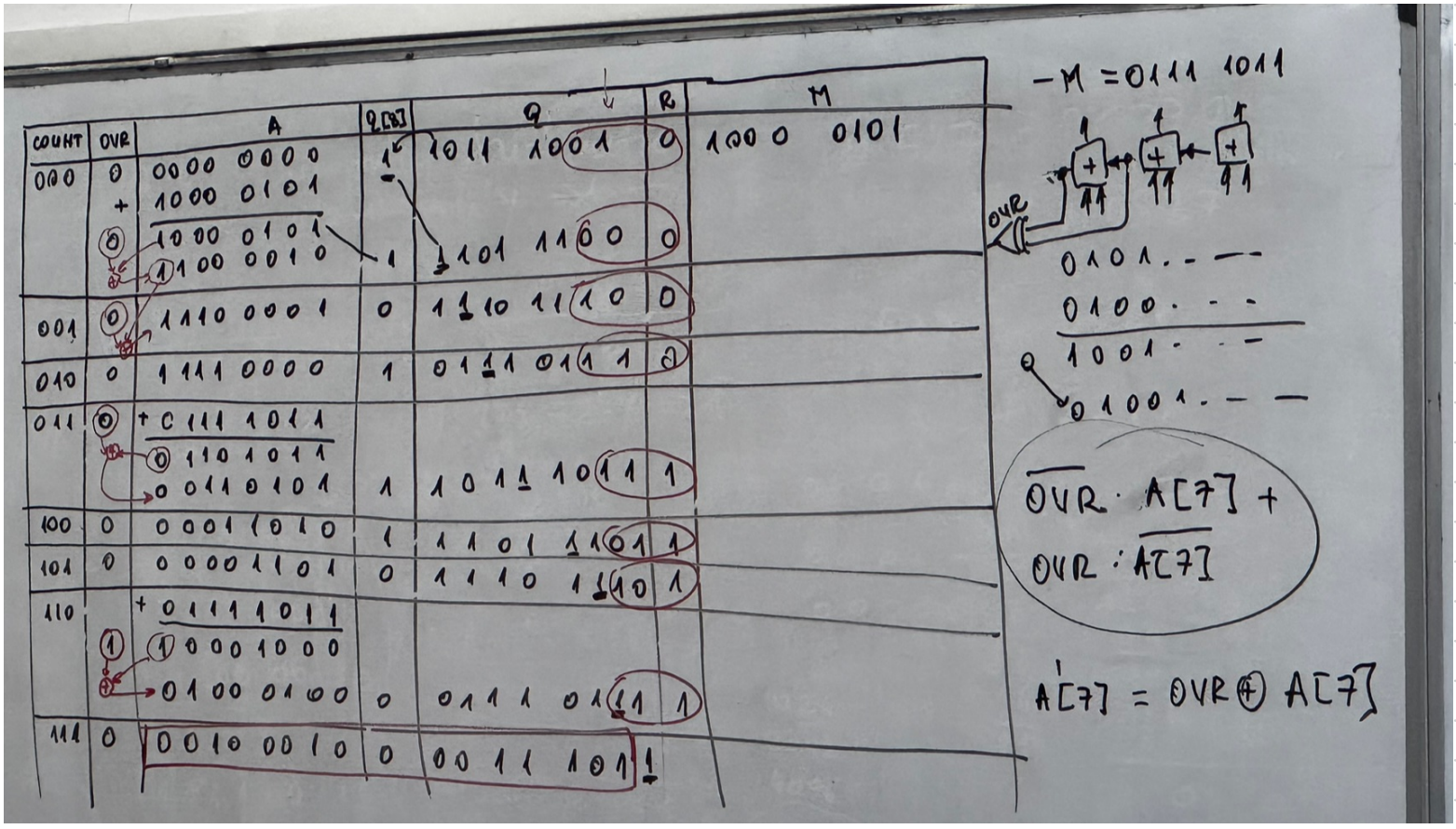
R 0 0 0 0 1 1 1 1 | 0

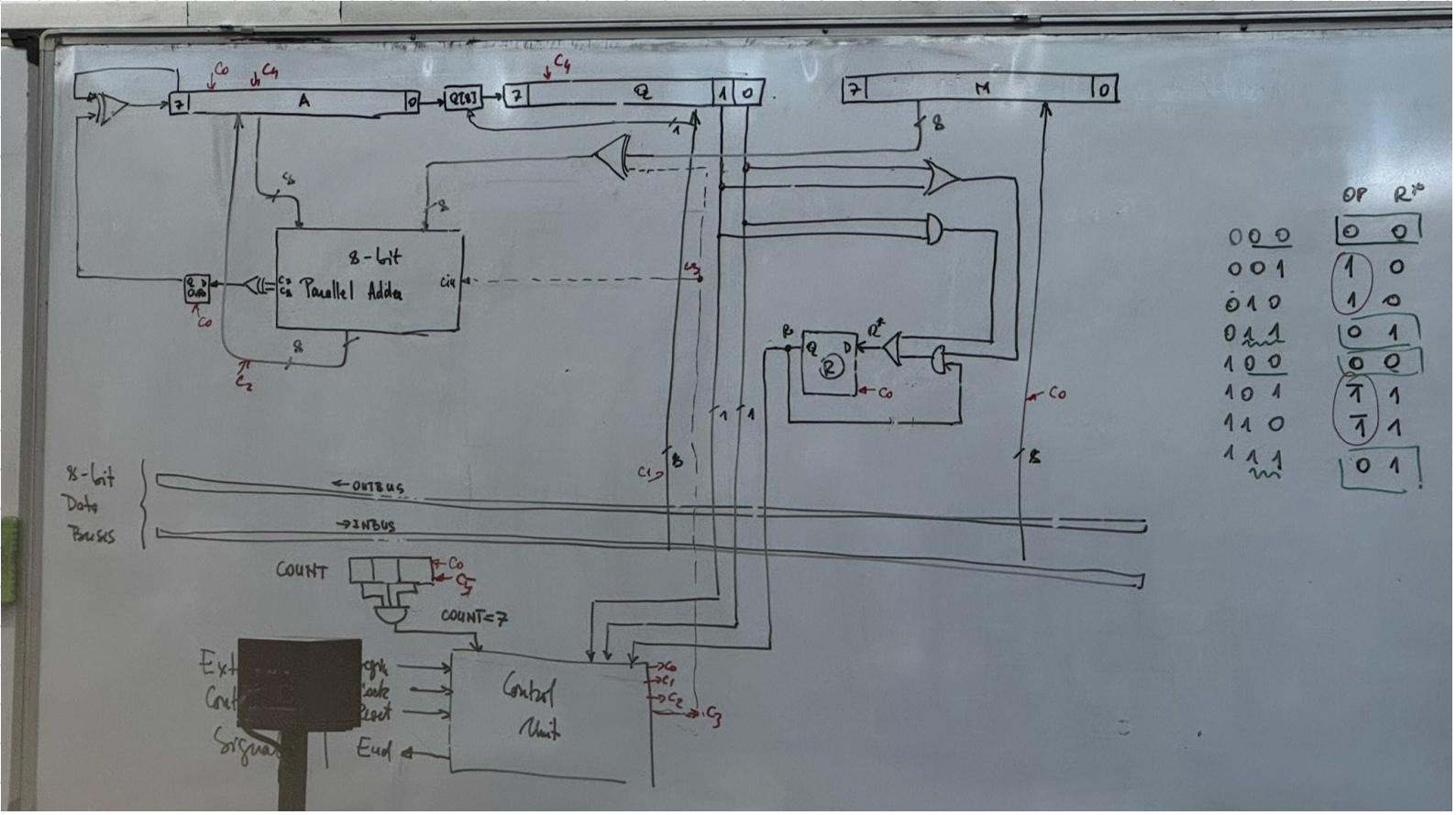
Posibilitatea de overflow

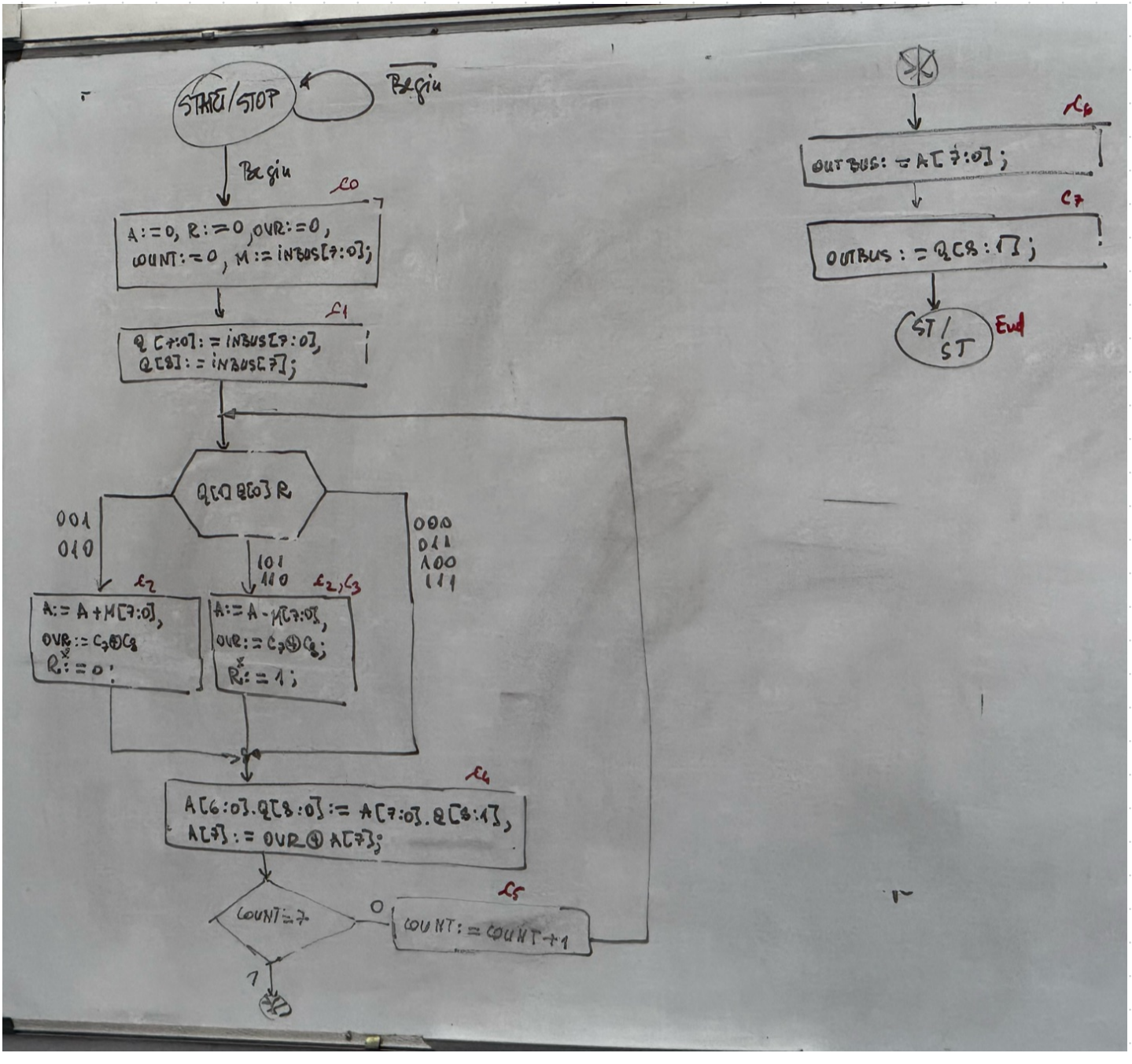
$$R^* = x_{i+1}\,x_i + x_{i+1}\,R + x_i\,R$$

$$A[7]' = \overline{OVR}\cdot A[7] + OVR\cdot\overline{A[7]}$$

$$= OVR \oplus A[7]$$




A
Q
M
8-bit Parallel Adder
OUTBUS
INBUS
COUNT
COUNT=7
Control Unit
End
OP
8-bit Data Buses


START/STOP
Begin
A:=0, R:=0, OVR:=0, COUNT:=0, M:=INBUS[7:0];
Q[7:0]:=INBUS[7:0], Q[8]:=INBUS[7];
Q[1] Q[0] R
001 010
101 110
000 011 100 111
A:=A+M[7:0], OVR:=C7⊕C8, R:=0;
A:=A-M[7:0], OVR:=C7⊕C8, R:=1;
A[6:0].Q[8:0]:=A[7:0].Q[8:1], A[7]:=OVR⊕A[7];
COUNT=7
COUNT:=COUNT+1
OUTBUS:=A[7:0];
OUTBUS:=Q[8:1];
ST/ST
End