

DIGITALE

28/10 - 30/10      LAB - GRUPPO 1      < MAX 22

04/11 - 06/11      LAB - GRUPPO 2      < MAX 22

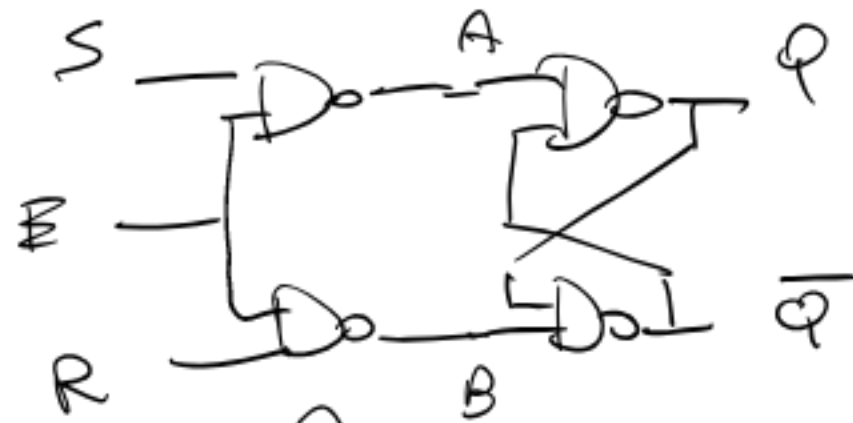
F3 - LAB. ELETTRONICA

ESPERIENZA



2) CONTATORE ASINCRONO MODULO - 16  
 ↳ REGISTRO

CIRCUIT MEMORIA



S	R	A	B	$Q_n$	$Q_{n-1}$
1	1	0	0	<del>1</del>	N.P.
1	0	0	1	1	← SET
0	1	1	0	0	← RESET
0	0	1	1	$Q_{n-1}$	$Q_{n-1}$

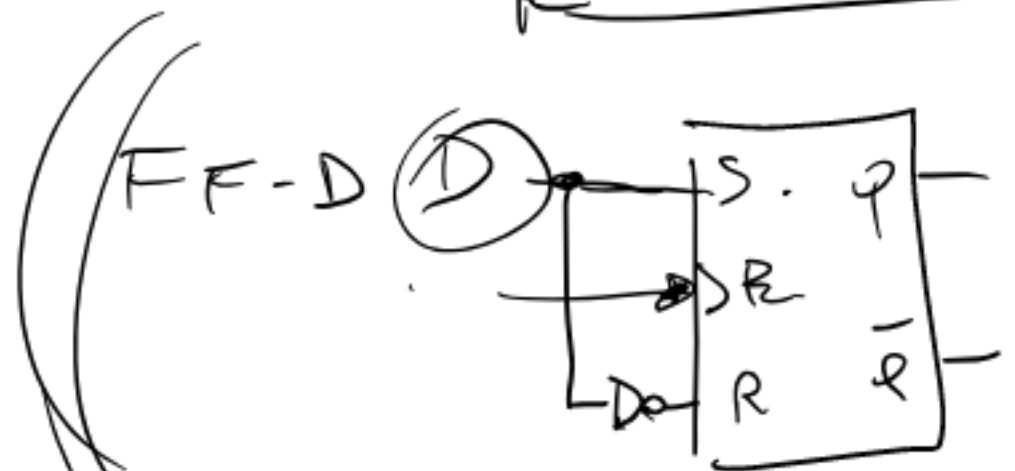
ABILITAZIONE

~~AND~~

NAND → FF-SR  
 NOR → FF-SR

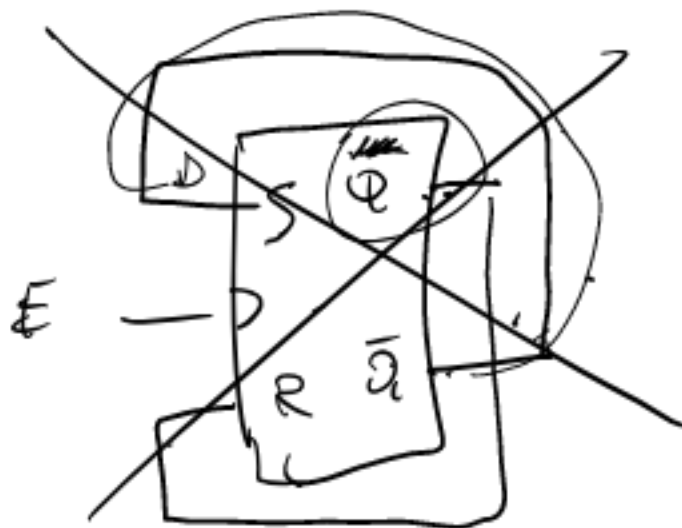


TRASPARENTE



D : SET / RESET

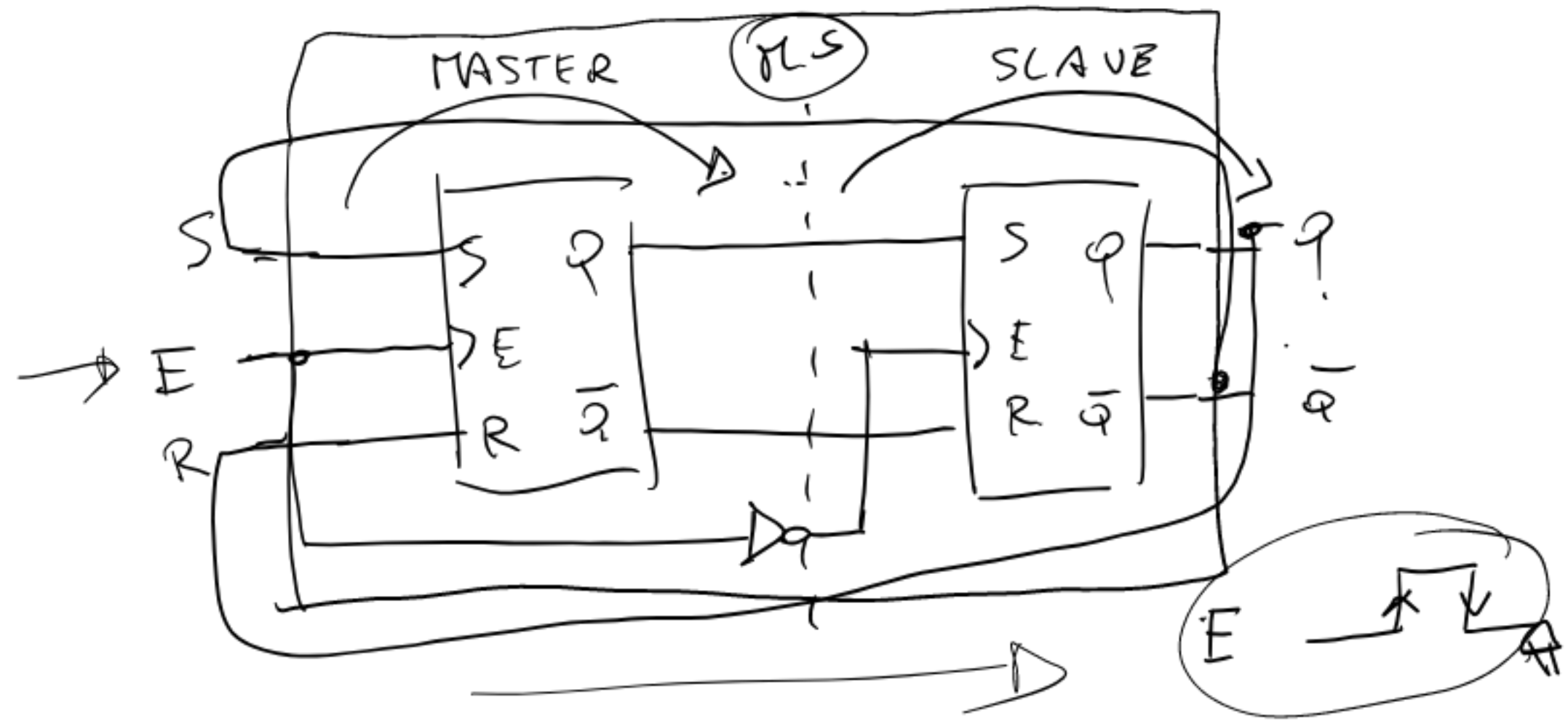
E : ABILITAZIONE / MEM.



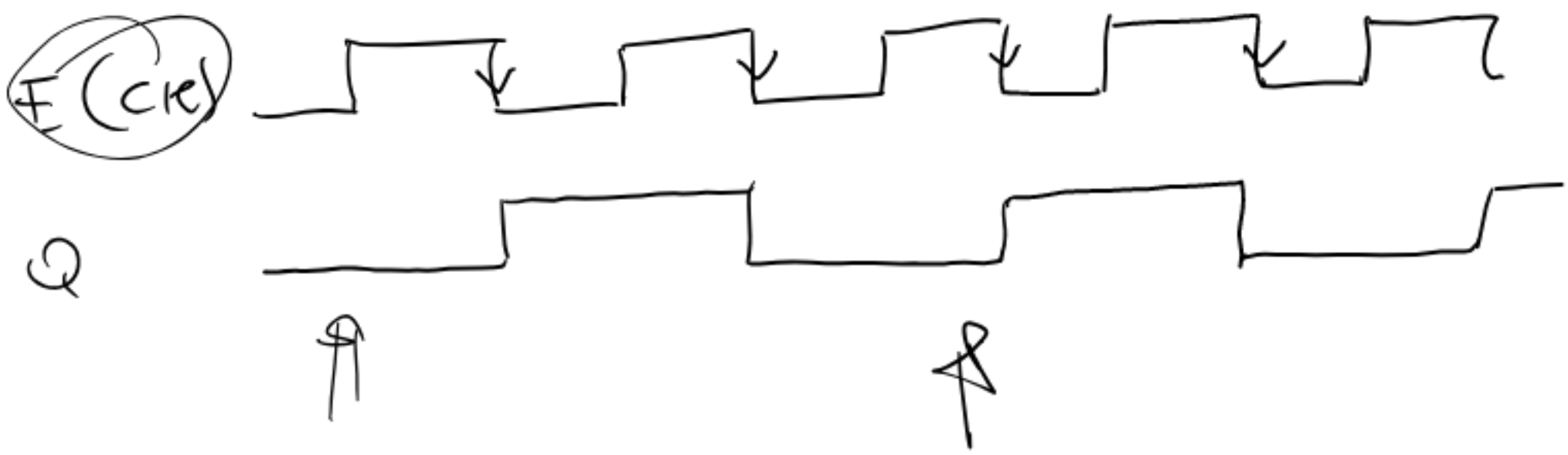
Q

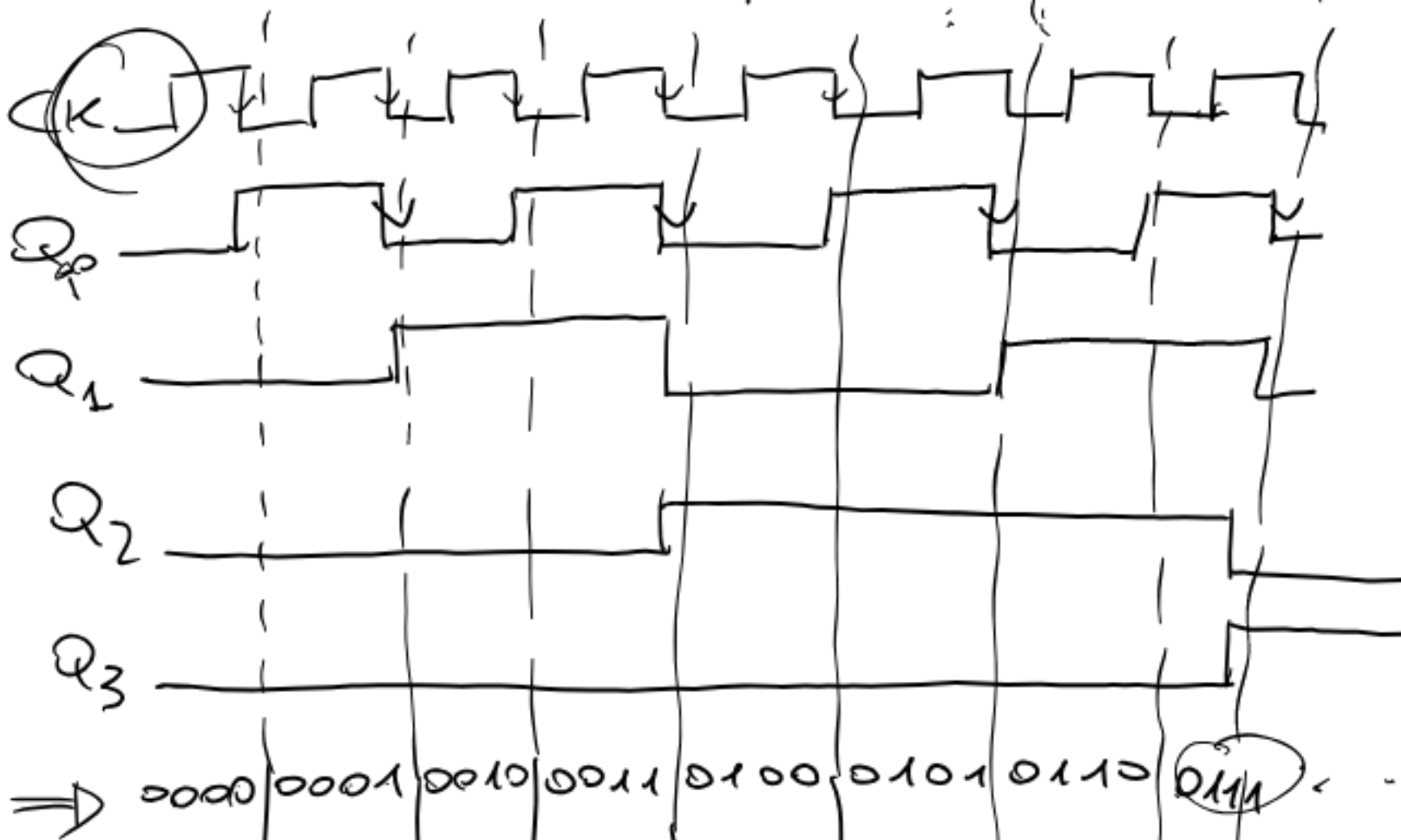
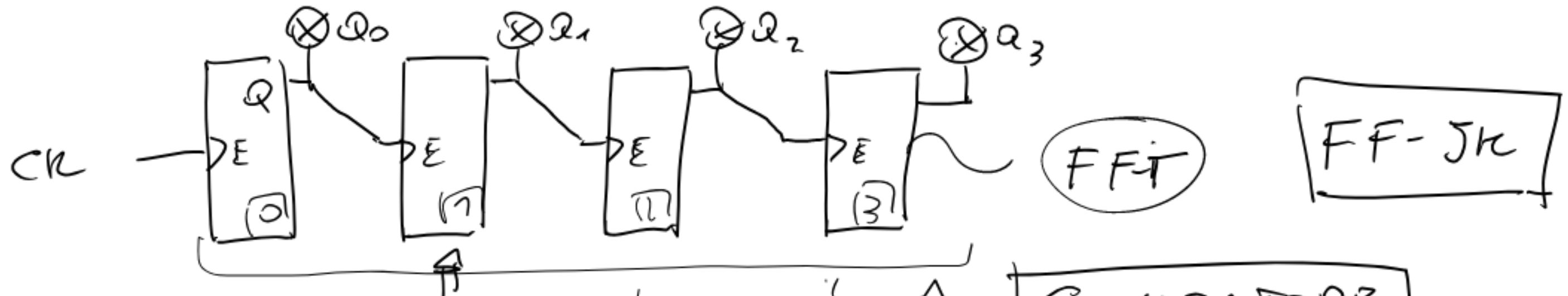
~~TRASPARENTE~~  
~~FF-TOGGLE~~





SOLD MS





CONTADOR

COUNTER  
MODULO - 16

- 8-BIT
- 16-BIT
- 32-BIT
- 64-BIT

0000 | 0001 | 0010 | 0011 | 0100 | 0101 | 0110 | 0111

DEC 10 | 11 | 12 | 13 | 14 | 15 → 0

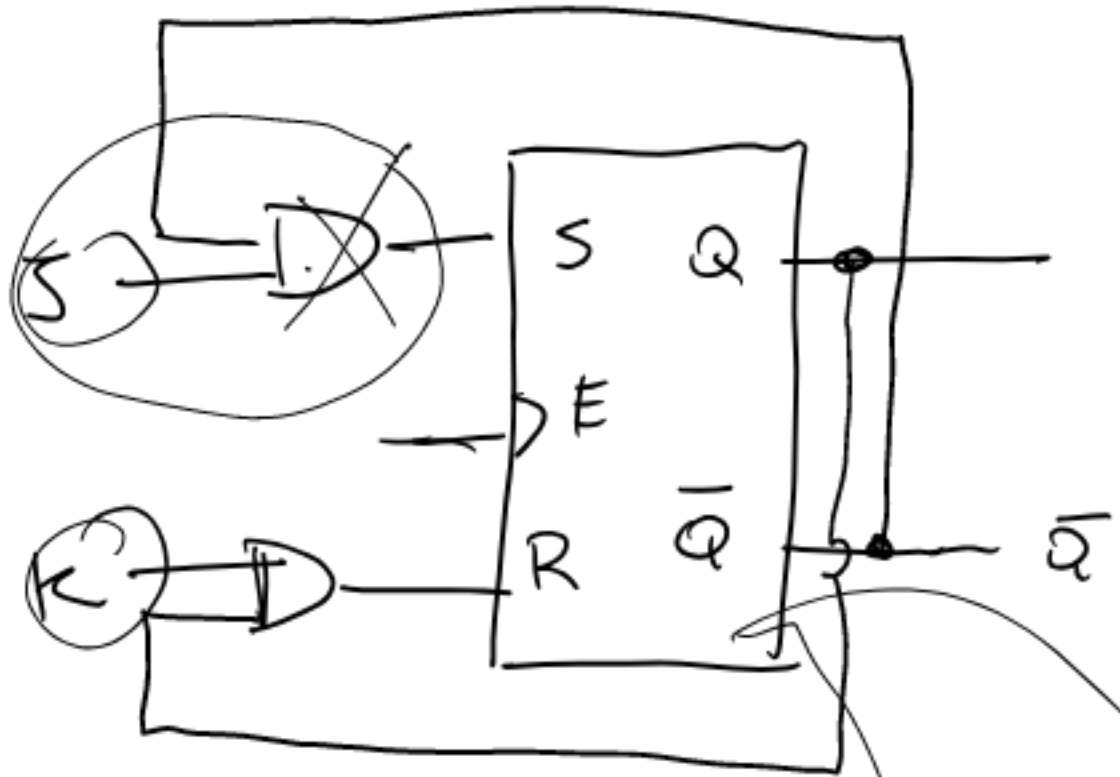
Q<sub>3</sub> Q<sub>2</sub> Q<sub>1</sub> Q<sub>0</sub> | A B C D E F

Hex  
4 BIT

# FF-JK

## MASTER-SLAVE

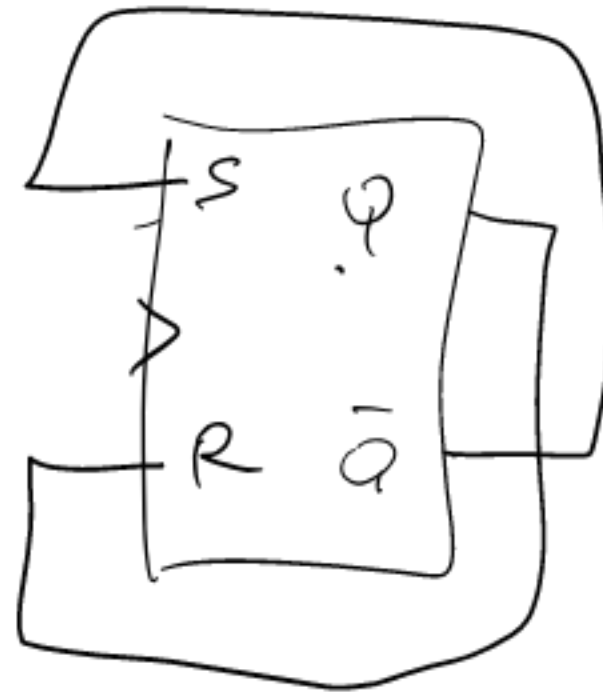
(5)



J	K	$S = J\bar{Q}$	$R = KQ$	$Q_n$	$\bar{Q}_n$
0	0	0	0	MEM.	MEM.
0	1	0	0	0	1
1	0	1	0	1	0
1	1	$\bar{Q}$	$Q$	$\bar{Q}_{n-1}$	$Q_{n-1}$

$Q = 0$  MEM  
 $Q = 1$  RESET  
 $\bar{Q} = 0$  MEM  
 $\bar{Q} = 1$  SET  
 $Q_{n-1}$  TOGGLE

E	S	R	Q	$\bar{Q}$
1	0	0	MEM	MEM
1	0	1	RESET (0 1)	RESET (0 1)
1	1	0	SET (1 0)	SET (1 0)
1	1	1	N.P.	N.P.

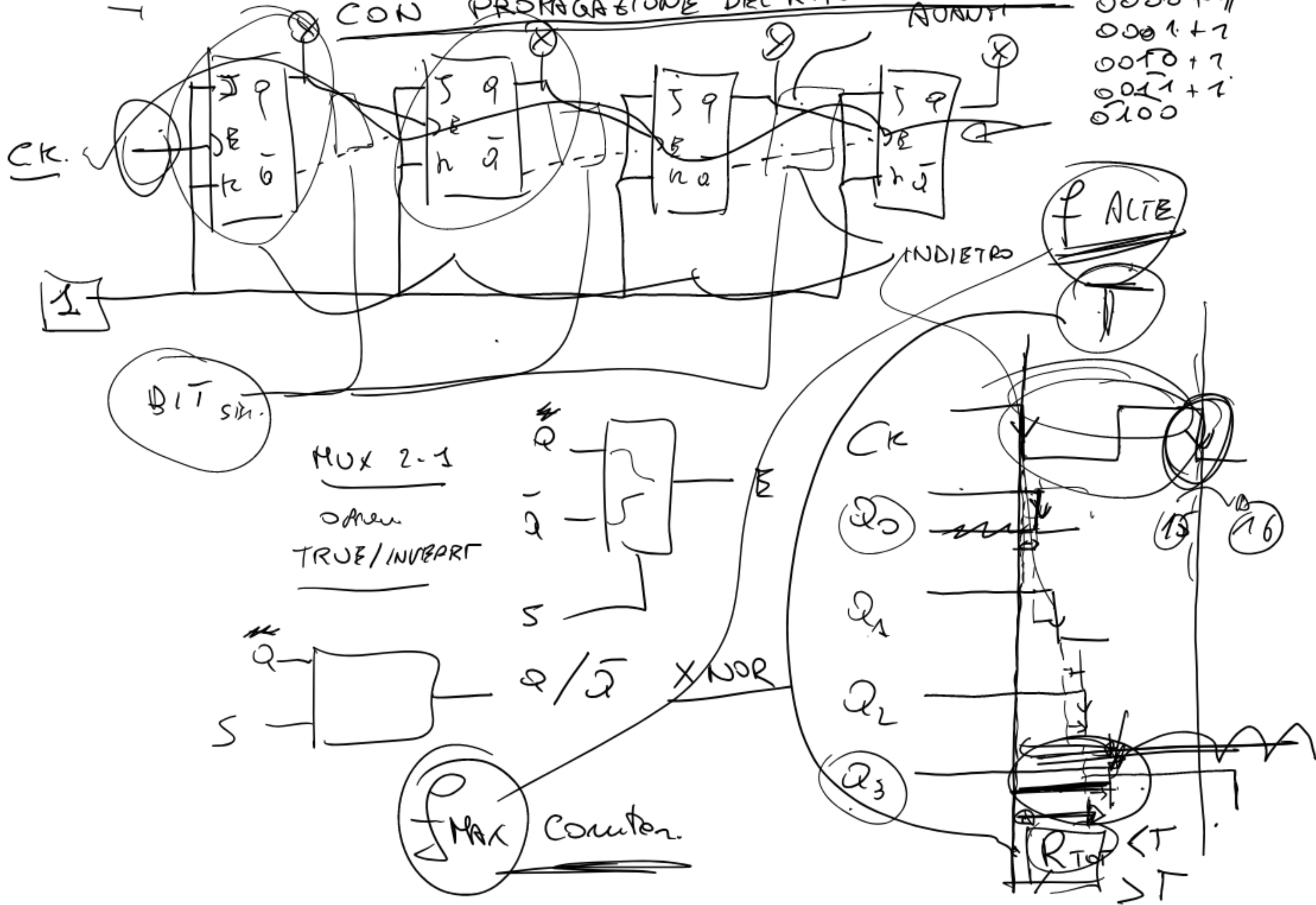


J	K	Q	$\bar{Q}$
0	0	MEM	MEM
0	1	RESET	RESET
1	0	SET	SET
1	1	TOGGLE	TOGGLE

# CONTATORE - MODULO - 16

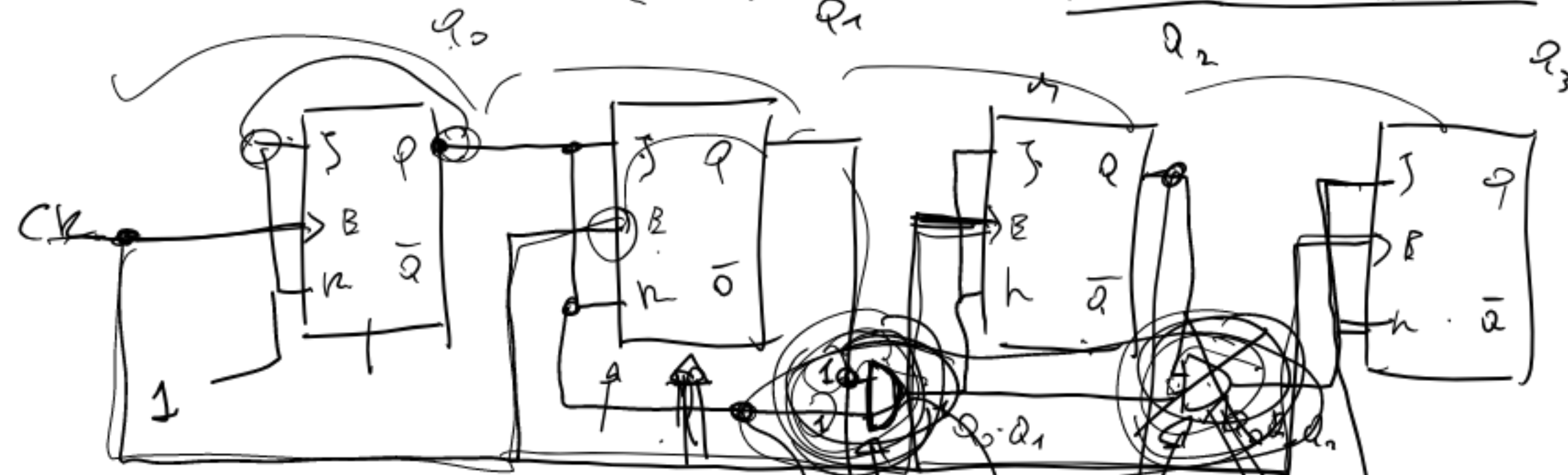
6

CON PROPAGAZIONE DEL RITORNO IN SERIE



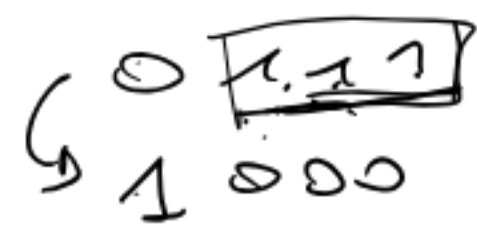
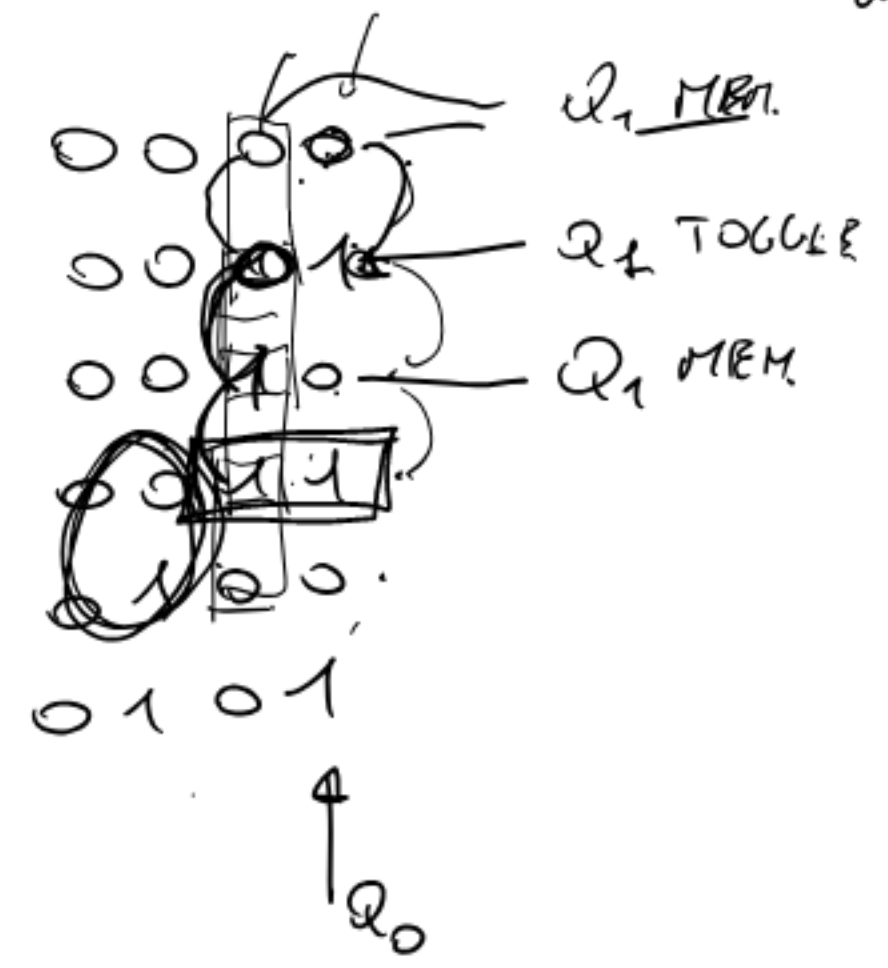
- 0000 + 1
- 0001 + 1
- 0010 + 1
- 0011 + 1
- 0100

COWI.  $Q_1$  ~~PARAN~~ RIPORTO ~~PARABOLICO~~

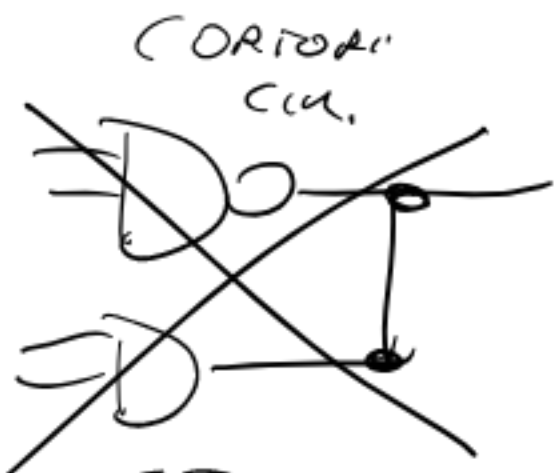
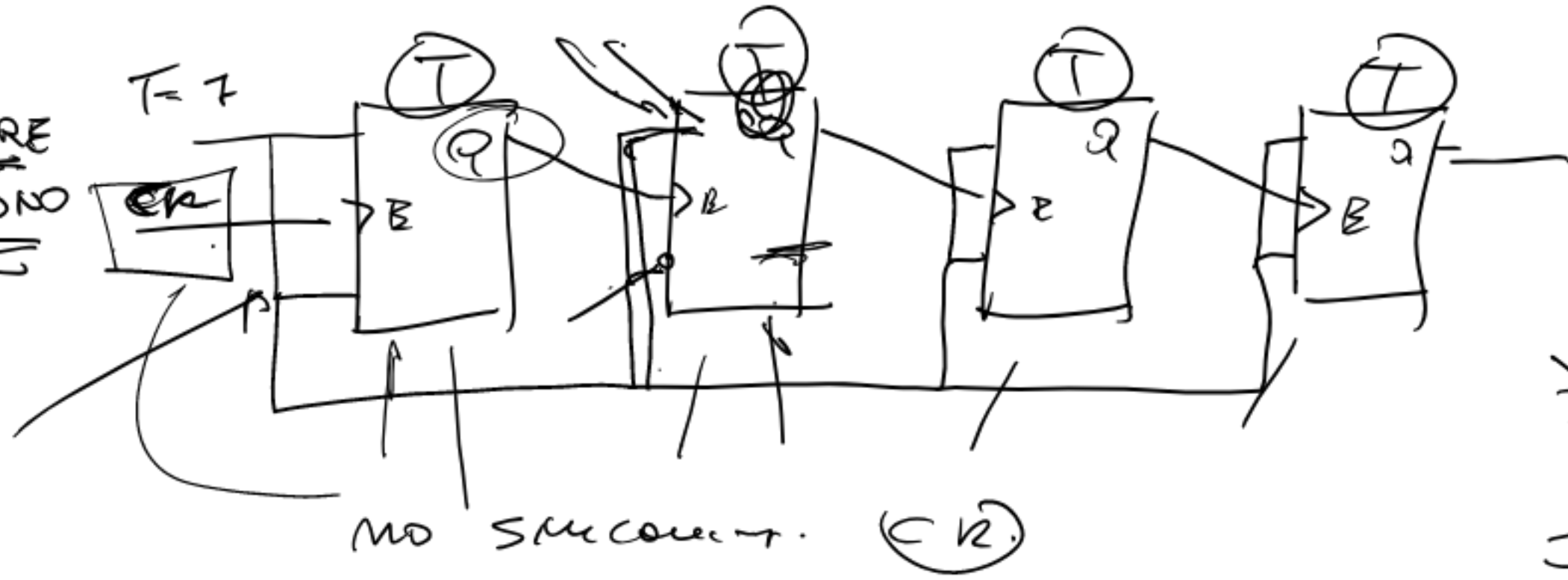


BY

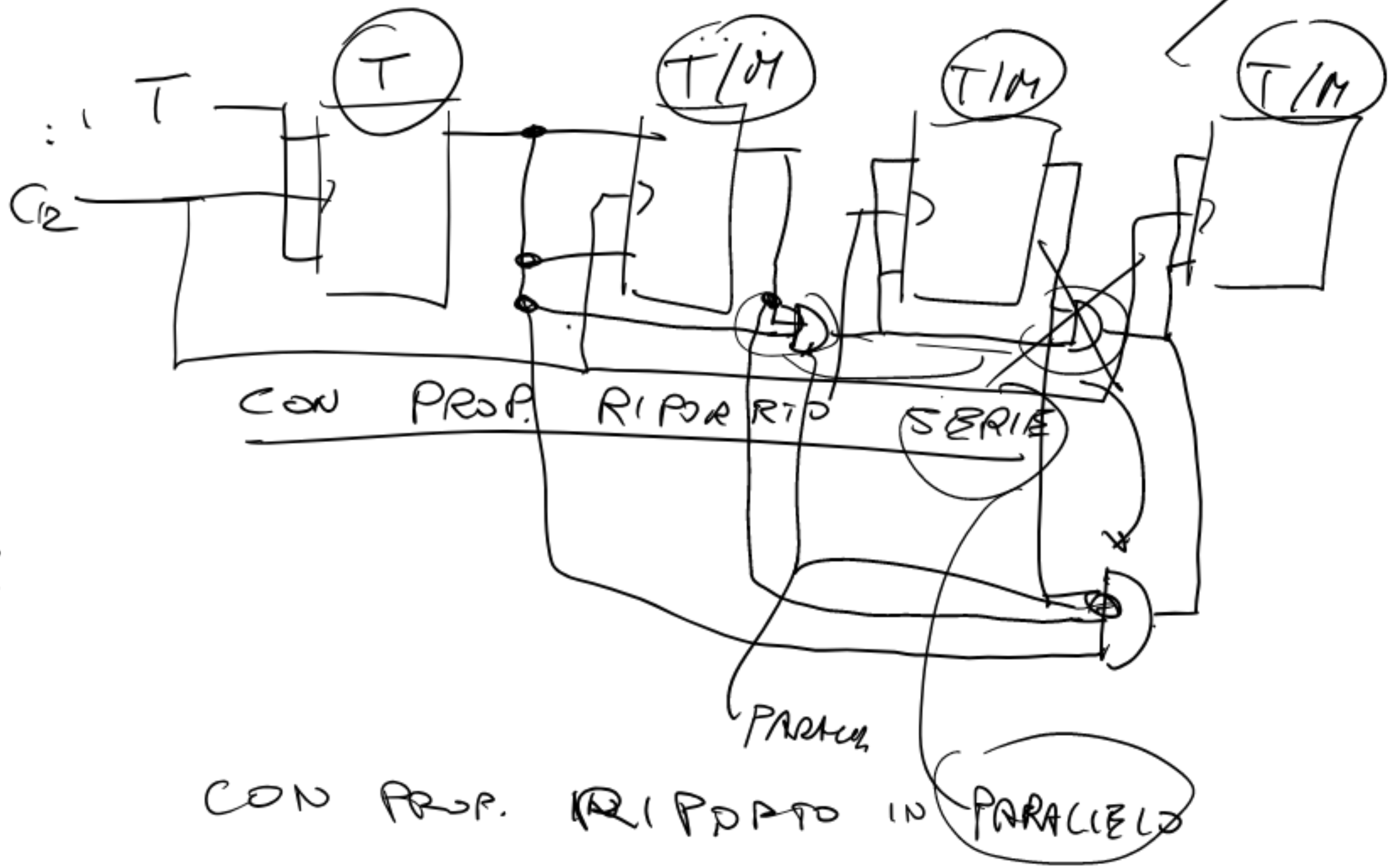
$Q_0$  TOGGLE



CONTATORE ASINCRONO



CONTATORE SINCRONO



CONTATORE SINCRONO

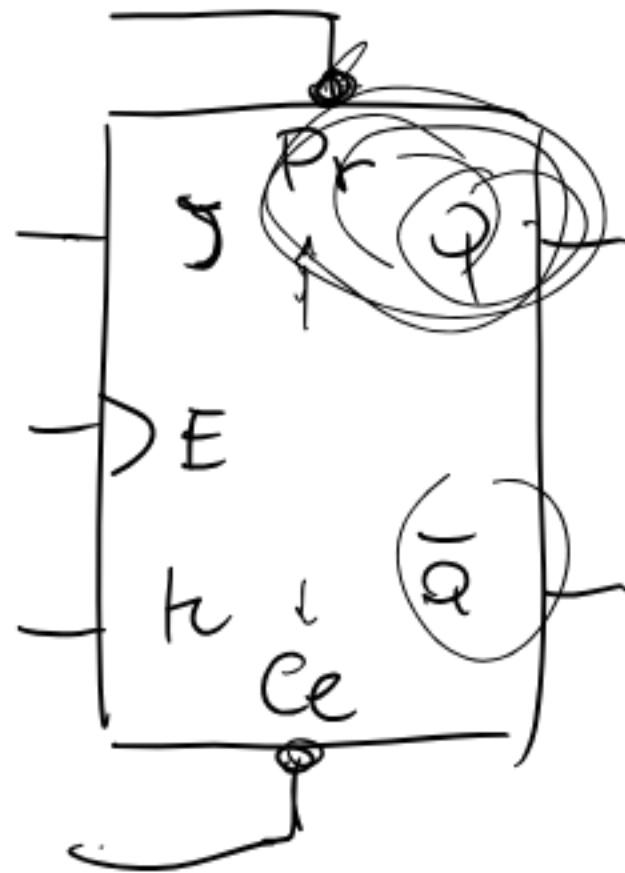
CON PROP. RIPARTITO IN PARALLELO



FF - 5K

( NAND 3 INPUT )

9



J, K VAR SINCRONE

( E )  $\rightarrow$   $\rightarrow$  Q control

Pr, Ce VAR ASINCRONE

$\rightarrow$  Q  $\bar{Q}$  independiente de Ck.

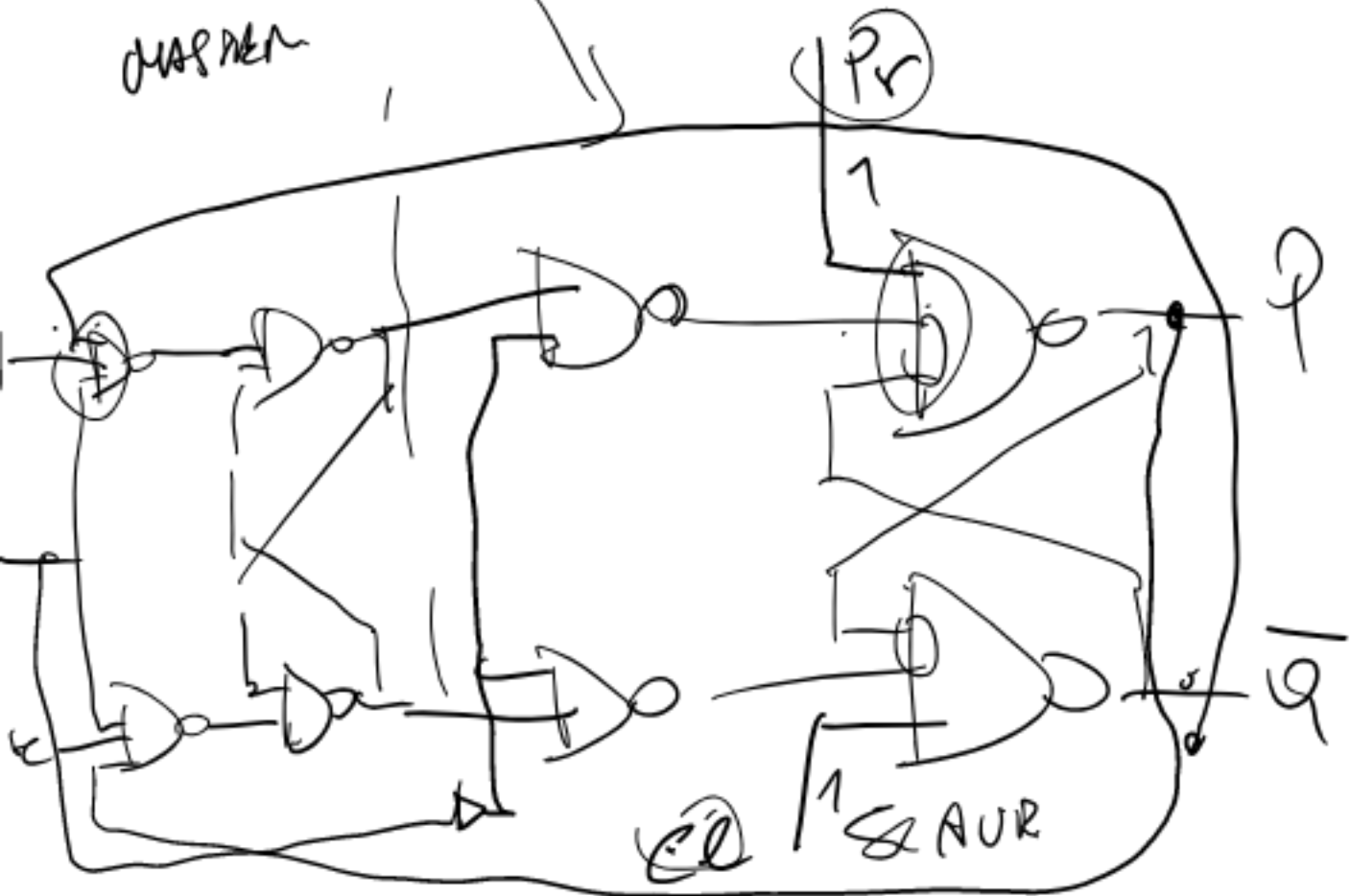
Pr	Ce	Q	$\bar{Q}$
0	0	TAU. JK	
1	0	1	0
0	1	0	1
1	1	N.P. ?	

PRESET

~~PRESET~~

CLEAR

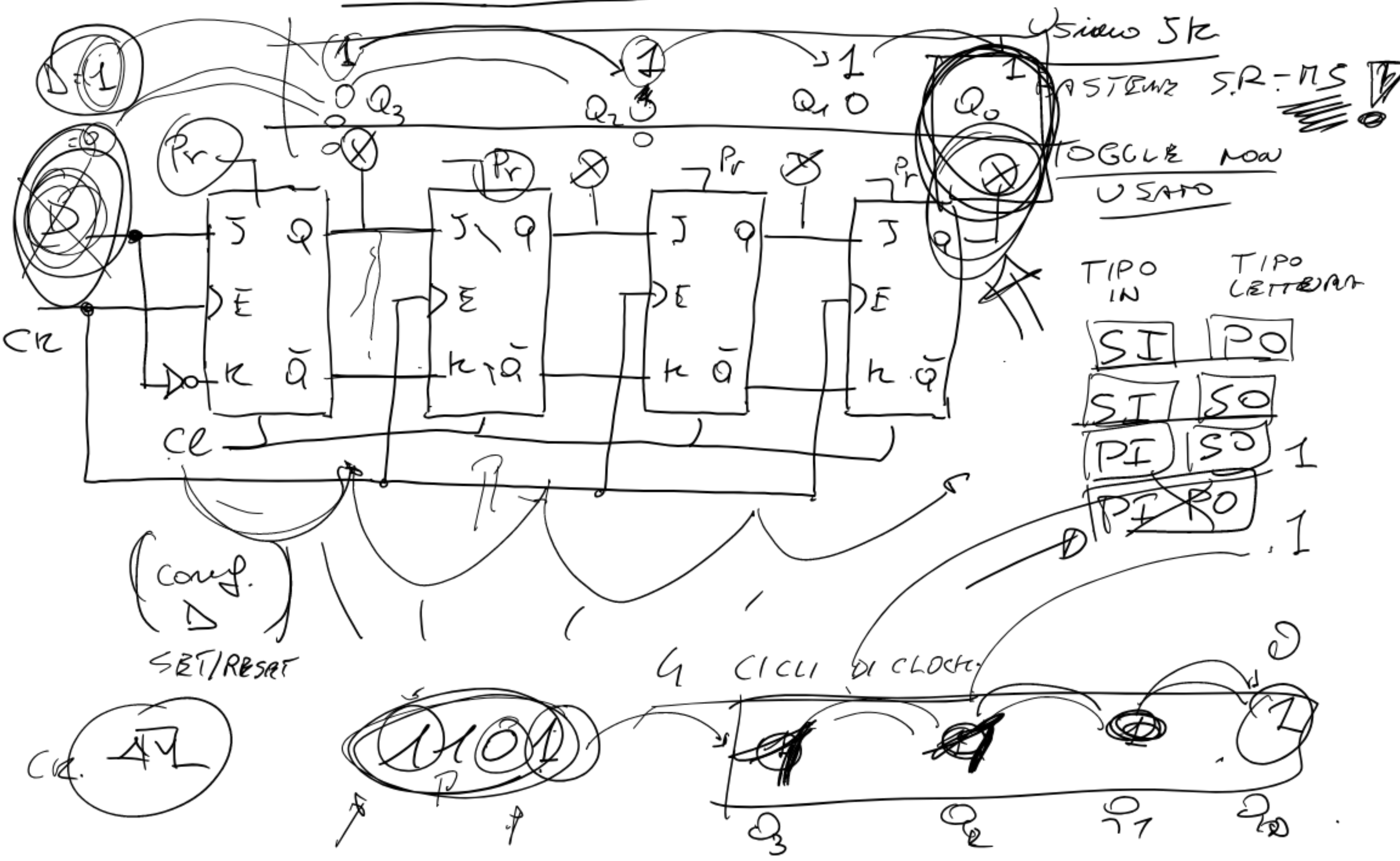
CHARN



10  $\Omega$  AUR

( ? )  $\rightarrow$

# REGISTRI A SCORRIMENTO (SHIFT REGISTER)



Usando 5 IC  
 SISTEMA S.R. - MS  
 TOGGLE NOW  
 USATO

TIPO IN	TIPO LETTERA
SI	PO
SI	SO
PI	SO
PI	PO

(comp.)  
 SET/RESET

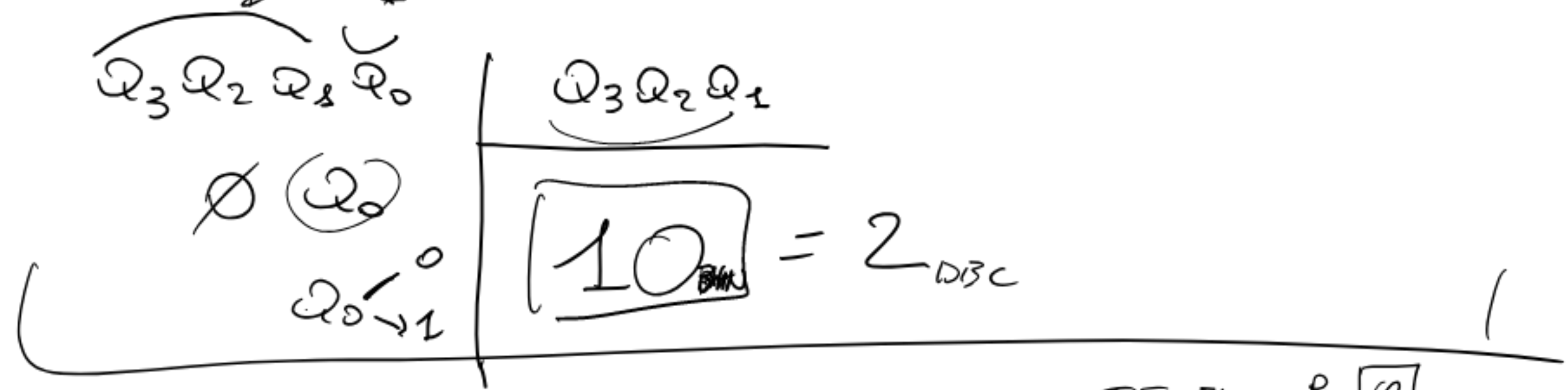
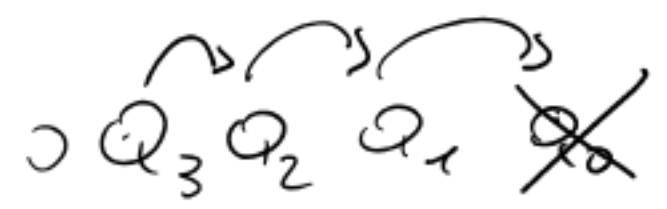
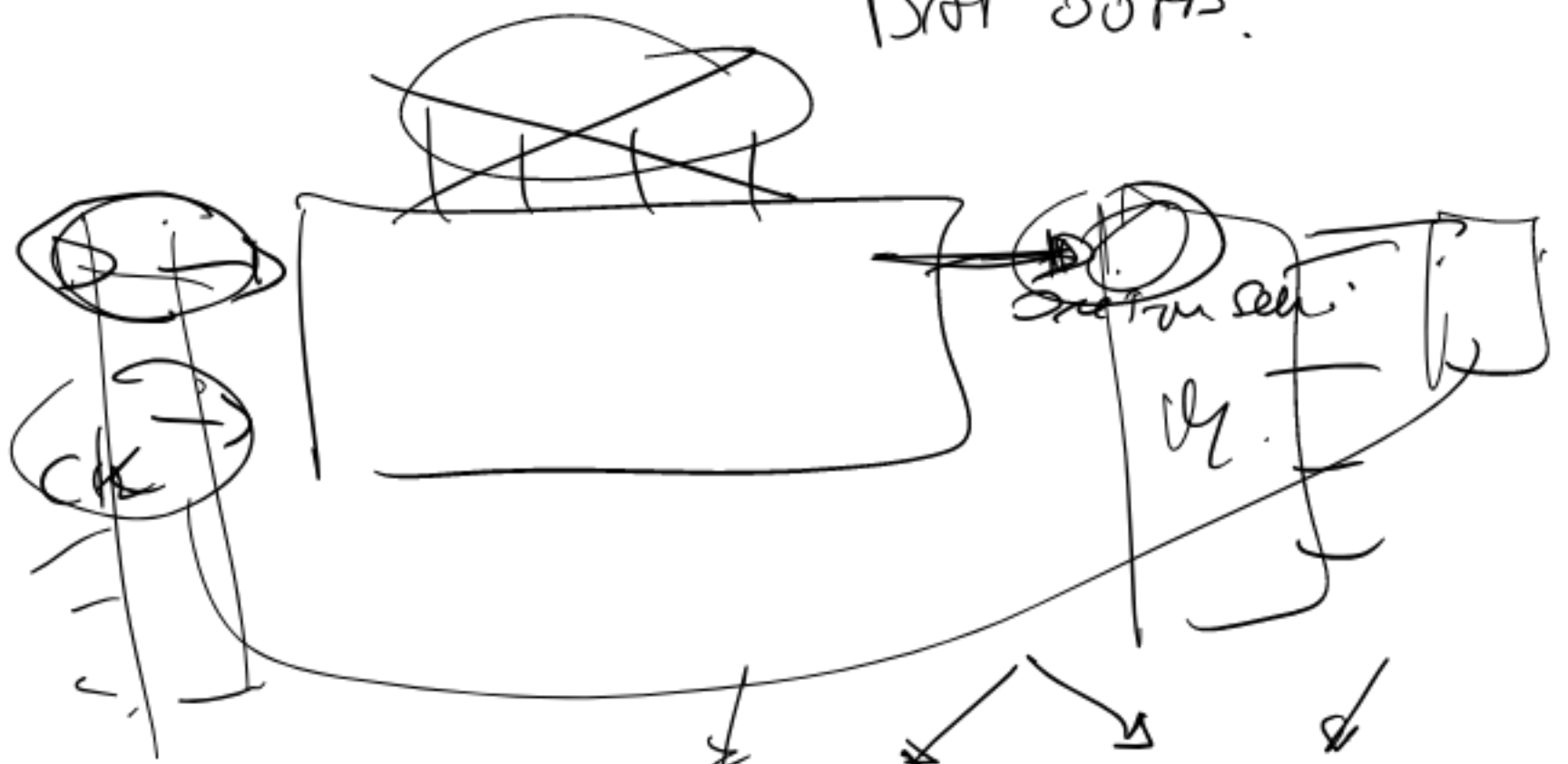
4 CICLI DI CLOCKS

CK.  $\overline{A}$

1101

Q3 Q2 Q1 Q0

DATA OUT



CONTAINO- ASINCRONAO

FF-5K Pr 10

Q-15

