1) 4 adet 4x1 Mux ve 4 JK FF gereklidir.

a) JK Flip flopunda girişin tersini almak için

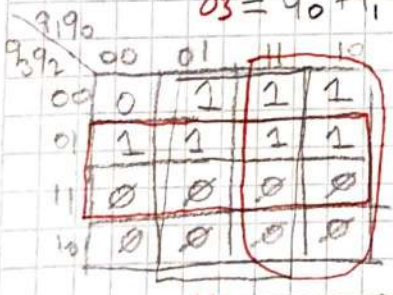
J ve K ucuna 1 vermeliyiz.

b) 2'e tümleyeni bulmak için durum tablosu çıkaralım.

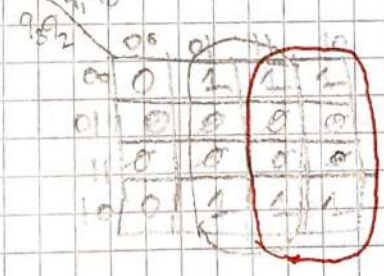
q_3	q_2	q_1	q_0	Q_3	Q_2	Q_1	Q_0	D_3	K_3	D_2	K_2	J_1	K_1	J_0	K_0
0	0	0	0	0	0	0	0	0	Ø	0	Ø	0	Ø	0	Ø
0	0	0	1	1	1	1	1	1	Ø	1	Ø	1	Ø	Ø	0
0	0	1	0	1	1	1	0	1	Ø	1	Ø	Ø	0	0	Ø
0	0	1	1	1	1	0	1	1	Ø	1	Ø	Ø	1	Ø	0
0	1	0	0	1	1	0	0	1	Ø	Ø	0	0	Ø	0	Ø
0	1	0	1	1	0	1	1	1	Ø	Ø	1	1	Ø	Ø	0
0	1	1	0	1	0	1	0	1	Ø	Ø	1	Ø	0	0	Ø
0	1	1	1	1	0	0	1	1	Ø	Ø	1	Ø	1	Ø	0
1	0	0	0	1	0	0	0	Ø	0	0	Ø	0	Ø	0	Ø
1	0	0	1	0	1	1	1	Ø	1	1	Ø	1	Ø	Ø	0
1	0	1	0	0	1	1	0	Ø	1	1	Ø	Ø	0	0	Ø
1	0	1	1	0	1	0	1	Ø	1	1	Ø	Ø	1	Ø	0
1	1	0	0	0	1	0	0	Ø	1	Ø	0	0	Ø	0	Ø
1	1	0	1	0	0	1	1	Ø	1	Ø	1	1	Ø	Ø	0
1	1	1	0	0	0	1	0	Ø	1	Ø	1	0	Ø	0	Ø
1	1	1	1	0	0	0	1	Ø	1	Ø	1	0	1	Ø	0

$q_3q_2q_1q_0$'a bağlı $D_3, K_3, D_2, K_2, J_1, K_1, J_0$ ve K_0 çıkış fonksiyonlarını oluşturmamız lazım.

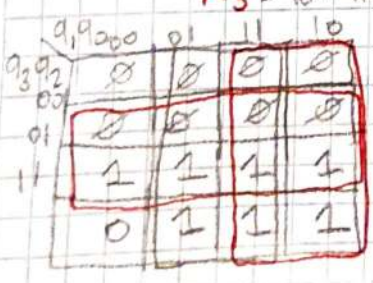
$D_3 = q_0 + q_1 + q_2$



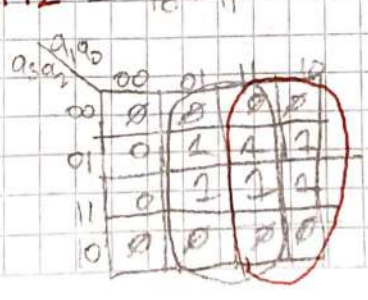
$D_2 = q_0 \cdot q_1$



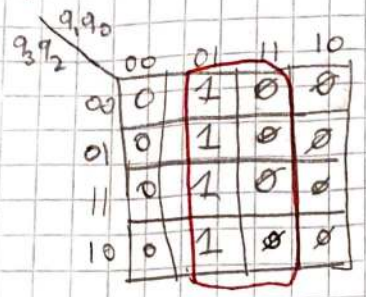
$K_3 = q_0 + q_1 + q_2$



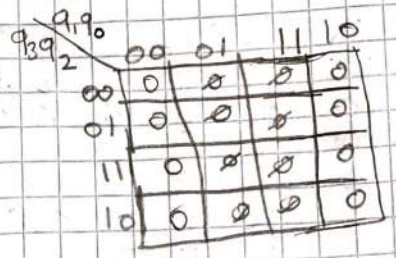
$K_2 = q_0 + q_1$



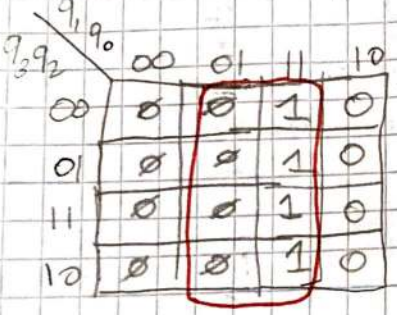
$J_1 = q_0$



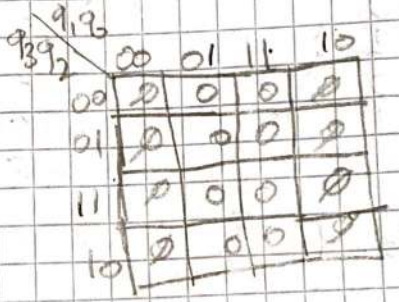
$J_0 = 0$



$K_1 = q_0$



$K_0 = 0$



C) Paralel yükleme için

D_i	q	Q	J	K
0	0	0	0	ø
0	1	0	1	ø
1	0	1	ø	1
1	1	1	ø	0

$J = D_i \oplus q$

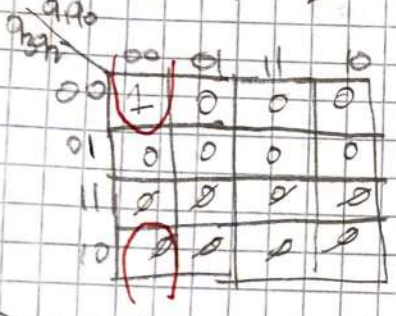
$K = D_i \oplus q$

D) Azatmada durum tablosu çıkartılır.

q_3	q_2	q_1	q_0	Q_3	Q_2	Q_1	Q_0	J_3	K_3	J_2	K_2	J_1	K_1	J_0	K_0
0	0	0	0	1	1	1	1	1	Ø	1	Ø	1	Ø	1	Ø
0	0	0	1	0	0	0	0	0	Ø	0	Ø	0	Ø	Ø	1
0	0	1	0	0	0	0	1	0	Ø	0	Ø	Ø	1	1	Ø
0	0	1	1	0	0	1	0	0	Ø	0	Ø	Ø	0	Ø	1
0	1	0	0	0	0	1	1	0	Ø	0	Ø	0	Ø	1	Ø
0	1	0	1	0	1	0	0	0	Ø	0	Ø	Ø	1	Ø	1
0	1	1	0	0	1	0	1	0	Ø	0	Ø	Ø	0	Ø	1
0	1	1	1	0	1	1	0	0	Ø	0	Ø	Ø	0	1	Ø
1	0	0	0	1	1	1	1	1	Ø	1	Ø	1	Ø	1	Ø
1	0	0	1	0	0	0	0	0	Ø	0	Ø	Ø	1	Ø	1
1	0	1	0	0	0	0	1	0	Ø	0	Ø	Ø	0	Ø	1
1	0	1	1	0	0	1	0	0	Ø	0	Ø	Ø	0	1	Ø
1	1	0	0	0	0	1	1	0	Ø	0	Ø	0	Ø	Ø	1
1	1	0	1	0	1	0	0	0	Ø	0	Ø	Ø	1	Ø	1
1	1	1	0	0	1	0	1	0	Ø	0	Ø	Ø	0	Ø	1
1	1	1	1	0	1	1	0	0	Ø	0	Ø	Ø	0	1	Ø
1	1	1	1	1	1	1	1	1	Ø	1	Ø	1	Ø	1	Ø

$J_3 = q_0' \cdot \bar{q}_1 \cdot \bar{q}_2$

$K_3 = q_0' \cdot \bar{q}_1 \cdot \bar{q}_2$

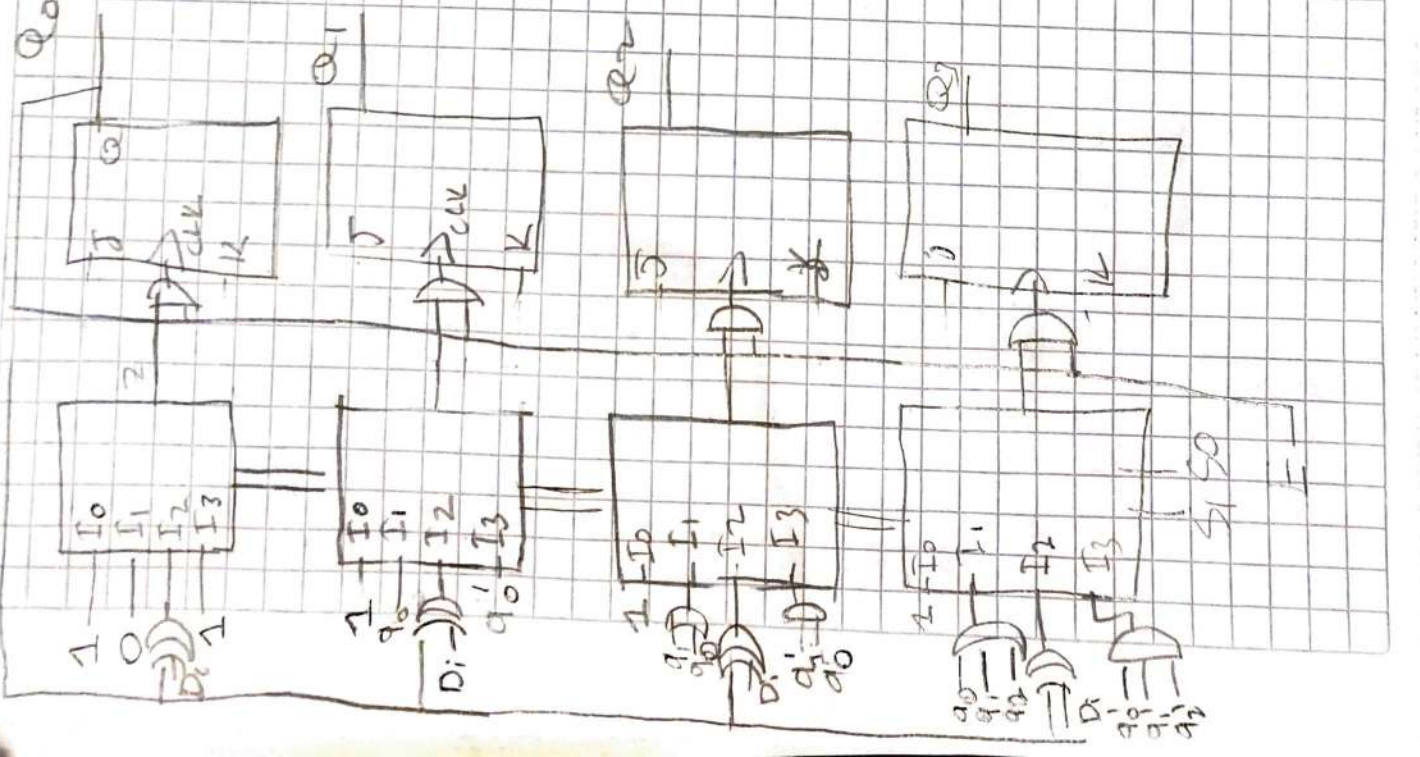


$J_2 = \bar{q}_0 \cdot \bar{q}_1$ $\quad K_2 = \bar{q}_0 \cdot \bar{q}_1$

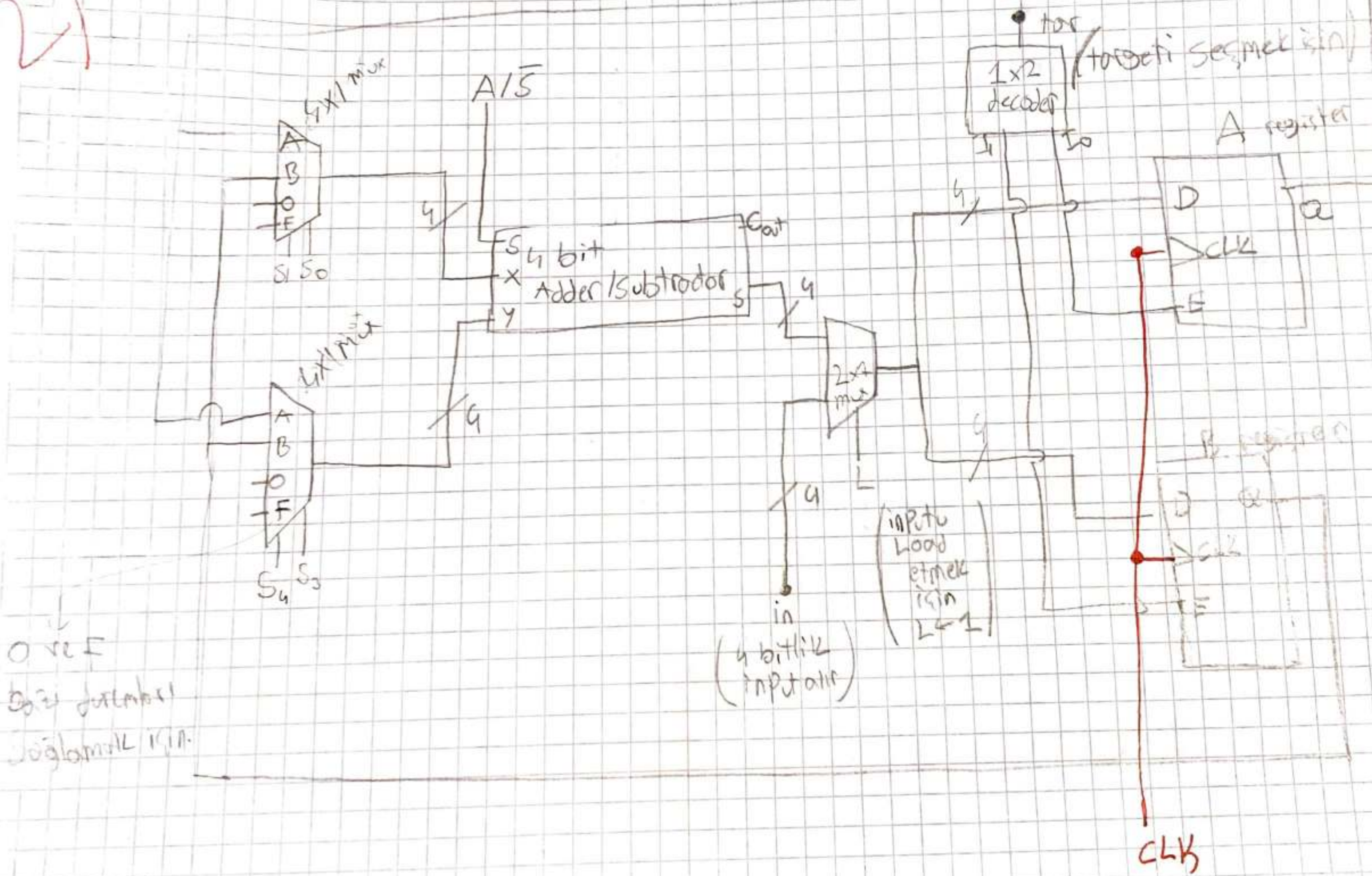
$J_1 = \bar{q}_0$ $\quad K_1 = \bar{q}_0$

$J_0 = 1$ $\quad K_0 = 1$

Devrenin son hali



2)


4x1 mux
A
B
O
F
S1 S0
A/S̄
4 bit Adder/Subtractor
S
X
Y
Cout
4
4x1 mux
S4 S3
2x1 mux
L
in
(4 bitlik inputalır)
(inputu Load etmek için L←1)
tar
1x2 decoder
(targeti seçmek için)
I1 I0
A register
D
Q
CLK
E
B register
CLK
0 ve F
bazı durumları
sağlamak için.

~~Dersler~~

tar ← con

input girilir L ucu 1 verilir ve tar ucuna istenilen registerin degeri verilir.

L=1, tar=0, ↑, A/S=∅

tar ← src

L=0, tar=∅, S1=0, S0=∅ (istenilen src seçilir)

↑

tar ← A+B

L=0, tar=∅, S1S0=00, S4S3=01, A/S=1, ↑

tar ← A-B

L=0, tar=∅, S1S0=00, S4S3=01, A/S=0

tar ← B-A

L=0, tar=∅, S1S0=01, S4S3=00, A/S=0, ↑

tar ← src+1

L=0, tar=∅, S1S0=00 (src), S4S3=10 (0), A/S=0, ↑

tar ← src-1

L=0, tar=∅, S1S0=00 (src), S4S3=11 (-1), A/S=1, ↑

tar ← $\overline{src}$

L=0, tar=∅, S1S0=11 (-1), S4S3=01 (src), A/S=0, ↑

tar ← $\overline{src}$+1

L=0, tar=∅, S1S0=10 (0), S4S3=01 (src), A/S=0, ↓