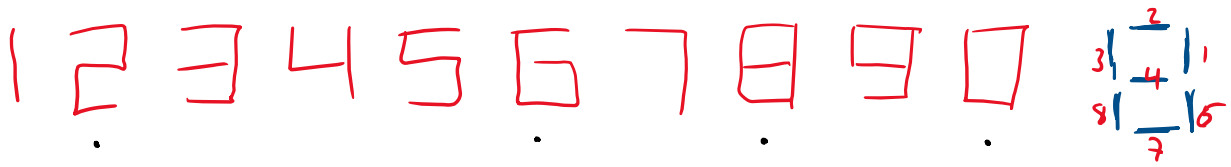
D flip floplarıyla oluşturulan 7 segmentli saat devresi tabloları ve denklemleri

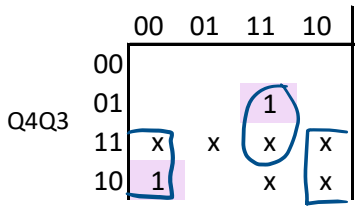
Bu projede 00:00:00 ile 23:59:59 arasında sayan bir saat devresi oluşturulmuştur.
Devrenin denklemleri aşağıdadır.

MOD 10 SAYACI TABLOSU

	önceki				sonraki				Flip flop (D)				7 segmentli led girişleri						
	Q4	Q3	Q2	Q1	Q4+	Q3+	Q2+	Q1+	D4	D3	D2	D1	L8	L7	L6	L4	L3	L2	L1
0	0	0	0	0	0	0	0	1	0	0	0	1	1	1	1	0	1	1	1
1	0	0	0	1	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1
2	0	0	1	0	0	0	1	1	0	0	1	1	1	1	0	1	0	1	1
3	0	0	1	1	0	1	0	0	0	1	0	0	0	1	1	1	0	1	1
4	0	1	0	0	0	1	0	1	0	1	0	1	0	0	1	1	1	0	1
5	0	1	0	1	0	1	1	0	0	1	1	0	0	1	1	1	1	1	0
6	0	1	1	0	0	1	1	1	0	1	1	1	1	1	1	1	1	1	0
7	0	1	1	1	1	0	0	0	1	0	0	0	0	0	1	0	0	1	1
8	1	0	0	0	1	0	0	1	1	0	0	1	1	1	1	1	1	1	1
9	1	0	0	1	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
10	1	0	1	0	x	x	x	x	x	x	x	x							
11	1	0	1	1	x	x	x	x	x	x	x	x							
12	1	1	0	0	x	x	x	x	x	x	x	x							
13	1	1	0	1	x	x	x	x	x	x	x	x							
14	1	1	1	0	x	x	x	x	x	x	x	x							
15	1	1	1	1	x	x	x	x	x	x	x	x							

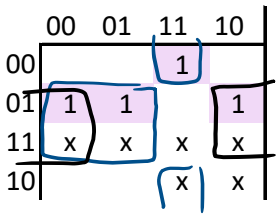


D4



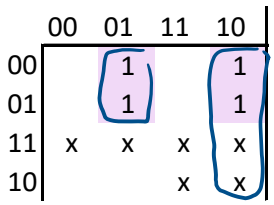
$D4 = Q4 \cdot Q1' + Q3 \cdot Q1 Q2$

D3



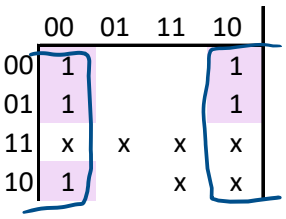
$D3 = Q3 Q2' + Q3 Q1' + Q3' Q1 Q2$

D2



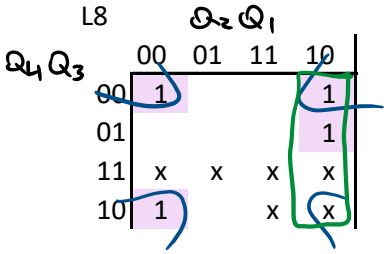
$D2 = Q2 Q1' + Q4' Q1 Q2'$

D1



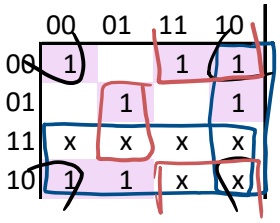
$D1 = Q1'$

L8



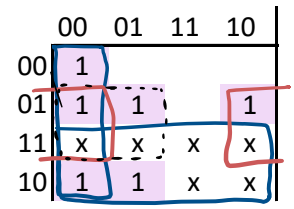
$L8 = Q_2 \cdot Q_1' + Q_3' Q_1'$

L7



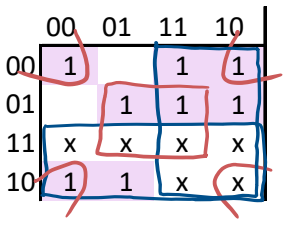
$L7 = Q_4 + Q_2 \cdot Q_1' + Q_3' \cdot Q_2 + Q_3' Q_1' + Q3 \cdot Q2' \cdot Q1$

L3



$L3 = Q4 + Q1' Q2' + Q1' Q3 + Q_3 \cdot Q_2'$

L2



$L2 = Q4 + Q2 + Q3 \cdot Q1 + Q3' Q1'$

L6

	00	01	11	10
00	1	1	1	
01	1	1	1	1
11	x	x	x	x
10	1	1	x	x

$L6 = Q_3 + Q_2' + Q_1'$

L4

	00	01	11	10
00			1	1
01	1	1		1
11	x	x	x	x
10	1	1	x	x

$L4 = Q_4 + Q_3' Q_2 + Q_3 Q_2' + Q_2 \cdot Q_1'$

L1

	00	01	11	10
00	1	1	1	1
01	1		1	
11	x	x	x	x
10	1	1	x	x

$L1 = Q3' + Q1'Q2' + Q1 Q2$

MOD 6 SAYACI

	önceki			sonraki			Flip flop (D)			7 segmentli led girişleri						
	Q7	Q6	Q5	Q7+	Q6+	Q5+	D7	D6	D5	L8	L7	L6	L4	L3	L2	L1
0	0	0	0	0	0	1	0	0	1	1	1	1	0	1	1	1
1	0	0	1	0	1	0	0	1	0	0	0	1	0	0	0	1
2	0	1	0	0	1	1	0	1	1	1	1	0	1	0	1	1
3	0	1	1	1	0	0	1	0	0	0	1	1	1	0	1	1
4	1	0	0	1	0	1	1	0	1	0	0	1	1	1	0	1
5	1	0	1	0	0	0	0	0	0	0	1	1	1	1	1	0
6	1	1	0	x	x	x	x	x	x	x	x	x	x	x	x	x
7	1	1	1	x	x	x	x	x	x	x	x	x	x	x	x	x

D7

Q_3 \ Q_2Q_1	00	01	11	10
0			1	
1	1		x	x

$D7 = Q_2Q_1 + Q_3 \cdot Q_1'$

D6

Q_3 \ Q_2Q_1	00	01	11	10
0		1		1
1			x	x

$D6 = Q_2 \cdot Q_1' + Q_3'Q_2'Q_1$

D5

	00	01	11	10
0	1			1
1	1		x	x

$D5 = Q_1'$

L8

Q_3 \ Q_2Q_1	00	01	11	10
0	1			1
1			x	x

$L8 = Q_3' Q_1'$

L7

Q_3 \ Q_2Q_1	00	01	11	10
0	1		1	1
1		1	x	x

$L7 = Q_2 + Q_1 \cdot Q_3 + Q_3' \cdot Q_1'$

L6

	00	01	11	10
0	1	1	1	
1	1	1	x	x

$L6 = Q_2' + Q_1$

L3

	00	01	11	10
0	1			
1	1	1	x	x

$L3 = Q_3 + Q_2'Q_1'$

L2

	00	01	11	10
0	1		1	1
1		1	x	x

$L2 = Q_2 + Q_3 \cdot Q_1 + Q_3' \cdot Q_1'$

L1

	00	01	11	10
0	1	1	1	1
1	1		x	x

$L1 = Q_3' + Q_2 + Q_1'$

L4

	00	01	11	10
0			1	1
1	1	1	x	x

$L4 = Q_3 + Q_2$

MOD 2 SAYACI

	önceki		sonraki		Flip flop		7 segmentli led girişleri						
	Q12	Q11	Q12+	Q11+	D12	D11	L8	L7	L6	L4	L3	L2	L1
0	0	0	0	1	0	1	1	1	1	0	1	1	1
1	0	1	1	0	1	0	0	0	1	0	0	0	1
2	1	0	0	0	0	0	1	1	0	1	0	1	1
3	1	1	x	x	x	x	x	x	x	x	x	x	x

$D12 = Q11$

$D11 = Q11' \cdot Q12'$

$L8 = Q11'$

$L7 = Q11'$

$L6 = Q12'$

$L4 = Q12$

$L3 = Q12' \cdot Q11'$

$L2 = Q11'$

$L1 = 1$