JK FF

$X = J$, $Y = K$

$V = Q$, $W = \bar{Q}$

$Q_{n+1} = J\bar{Q}_n + \bar{K} Q_n$

$JK \, Q_n \bar{Q}_n = 0$

J	K	Q_n	Q_{n+1}
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	0

$\Rightarrow$

J	K	Q_{n+1}
0	0	Q_n
0	1	0
1	0	1
1	1	$\bar{Q}_n$

$Q_n \to Q_{n+1}$		J	K
0	0	0	ϕ
0	1	1	ϕ
1	0	ϕ	1
1	1	ϕ	0

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D FF

$X = Y = 1$

$W = \bar{V} = D$

$Q_{n+1} = D + \bar{D} Q_n = D$

$\boxed{Q_{n+1} = D}$

D	Q_n	Q_{n+1}
0	0	0
0	1	0
1	0	1
1	1	1

D	Q_{n+1}
0	0
1	1

$Q_n \to Q_{n+1}$		D
0	0	0
0	1	1
1	0	0
1	1	1

T FF

$J = K = T$

$Q_{n+1} = T\bar{Q}_n + \bar{T} Q_n$

$Q_{n+1} = T \oplus Q_n$

No Constraint

T	Q_n	Q_{n+1}
0	0	0
0	1	1
1	0	1
1	1	0

T	Q_{n+1}
0	Q_n
1	$\bar{Q}_n$

$Q_n \to Q_{n+1}$		T
0	0	0
0	1	1
1	0	1
1	1	0

1

FLIP-FLOP CONVERSION FROM ONE TYPE TO ANOTHER TYPE
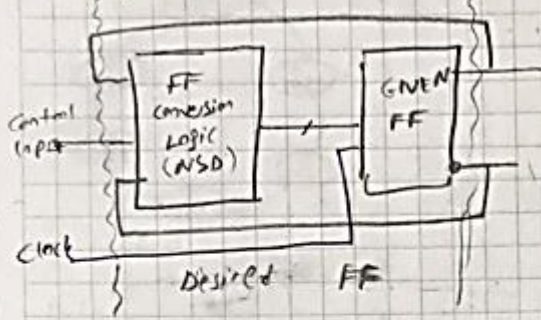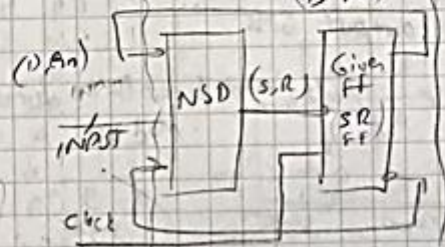
Control input → FF conversion Logic (NSD) → GIVEN FF

Clock

Desired FF

2) RS flip-flop'undan D flip-flop'u elde edelim

a) RS → D
b) D → T

Desired FF (D FF)

(D,An) → NSD (S,R) → Given FF S R FF

INPUT

Clock

D	Q_n	Q_{n+1}		S	R
0	0	0	0	0	φ
1	0	1	0	0	1
2	1	0	1	1	0
3	1	1	1	φ	0

→ K-Map → S = D
R = $\bar{D}$

D FF

NSD
D
Clock → S Q
C
R $\bar{Q}$

b) -

T	Q_n	Q_{n+1}		D
0	0	0	0	0
1	0	1	1	1
2	1	0	1	1
3	1	1	0	0

K-Map D = T ⊕ Q_n

T → NSD → D Q / D FF / $\bar{Q}$

Clock

T → NSD → D Q / C (D FF) / $\bar{Q}$

Clock

OSOW

> sayıcı la   Dejenere olmuş
~ ~ lineler dir.

COUNTERS

Clock
Set
Clear

NSD — FF
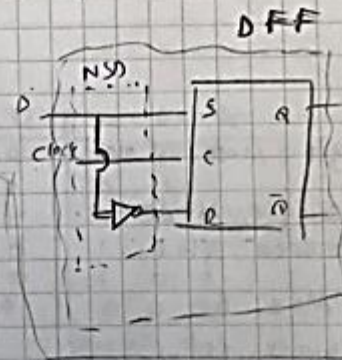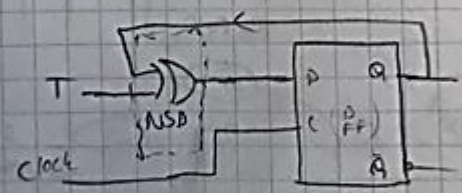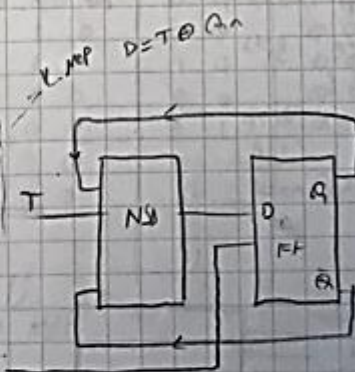
5 criteria — Sayıcıları tasarladıkları rayıt
erteler: 5 kriter var
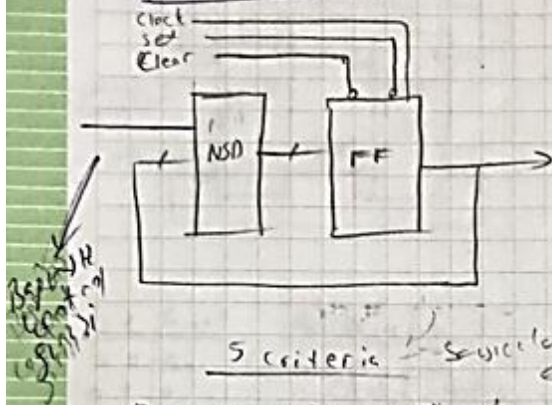
1) Single Mode, Multimode

2) Number of output bits

3) Modulo Number. Mod7 —> tekrarlı durum sayısı
   , Mod 10
   0 dan 6'ya   0 - 9'a
   kadar   sayar
   sayar

4) Code sequence

5) Synchronous - Asyncronous

---

genelde   sayıcıla da
kullanıla flip-floplar
Asenkron   girişli flip flop
la dır.
           yani
           preset ve
           Clear'
           üzterina
           Sahiptirler.

Single Mode Counter Design

• Single Mode   • Single Mode
• Three Bits   • Three Bits
• Mod 6   • Mod 6
• Binary code counter • Unit Distance code
• Syncronous   • Synchronous

State Diagram

$B_A B_B B_C$

000
001
010
011
100
101

Binary code

Clear
Set
Clock

$B_A B_B B_C$

3

$Q_A Q_B Q_C$
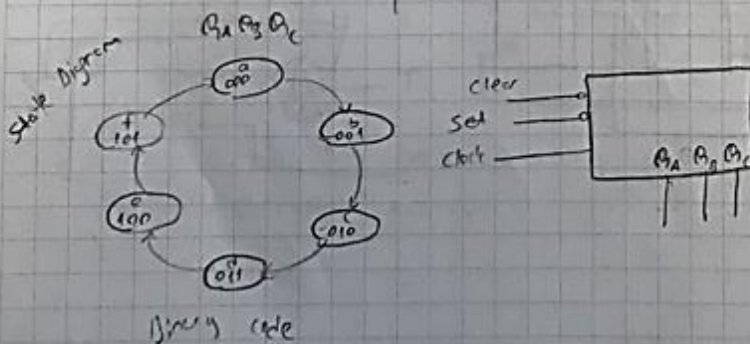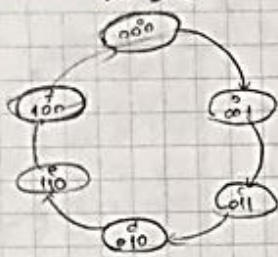
Unit Distance Code.

	An Bn Cn	An+1 Bn+1 Cn+1
0	0 0 0 0	0 0 1
1	b 0 0 1	0 1 1
3	c 0 1 1	0 1 0
2	d 0 1 0	1 1 0
6	e 1 1 0	1 0 0
4	f 1 0 0	0 0 0
5	ø 1 0 1	ø ø ø
7	ø 1 1 1	ø ø ø

once FF 'lar secept'?

D, JK, ile descr laye li

$A_n B_n C_n$ NAND JK FF

	An Bn Cn	An+1 Bn+1 Cn+1	JA KA	JB KB	JC KC	DA DB DC
0	a 0 0 0	0 0 1	0 ø	0 ø	1 ø	0 0 1
1	b 0 0 1	0 1 1	0 ø	1 ø	ø 0	0 1 1
3	c 0 1 1	0 1 0	0 ø	ø 0	ø 1	0 ? 0
2	d 0 1 0	1 1 0	1 ø	ø 0	0 ø	1 1 0
6	e 1 1 0	1 0 0	ø 0	ø 1	0 ø	1 0 0
4	f 1 0 0	0 0 0	ø 1	0 ø	0 ø	0 0 0
5	ø 1 0 1	ø ø ø	ø	ø	ø	ø
7	ø 1 1 1	ø ø ø				

K MAP

$D_A = B_n C_n$

$D_B = \bar{A}_n B_n + C_n$

$D_C = \bar{A}_n \bar{B}_n$

$J_A = B_n \bar{C}_n$ $K_A = \bar{B}_n$

$J_B = C_n$ $K_B = A_n$

$J_C = \bar{A}_n \bar{B}_n$ $K_C = B_n$

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