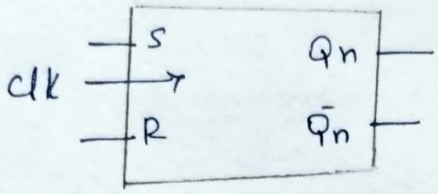
(1)

Set / Reset

SR Flip Flop:

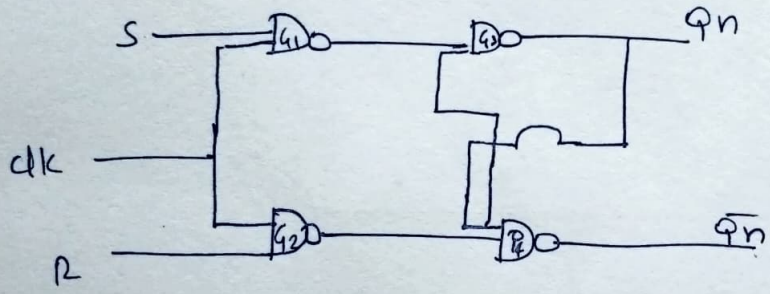


S & R = I/P

Qn+1 / Qn → Qn → Present state

Qn → Qn-1 → Previous state.

C.D.



T.T.

S	R	Qn	$\bar{Q}n$
0	0	Qn	$\bar{Q}n$
0	1	0	1
1	0	1	0
1	1	X	X

T.T
clk
↑
↑
↑
↑

Characteristics table:

CT

S	R	Previous q_{n-1}	next state q_n
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	x
1	1	1	x

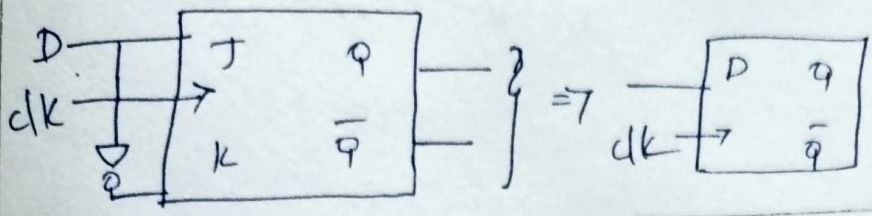
CEQ

$$q_n = S\bar{R} + \bar{R}q_{n-1}$$

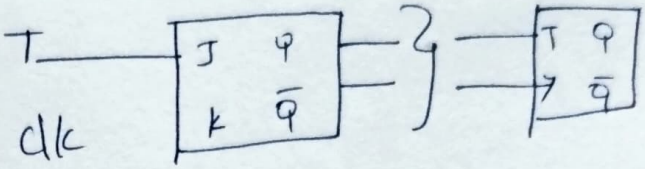
Excitation table ET

Previous st q_{n-1}	nxt st q_n	S	R
0	0	0	X
0	1	1	0
1	0	0	1
1	1	X	0.

D.F.F



T.FF



T.T

D	Qn
0	0
1	1

T.T

T	Qn
0	Qn-1
1	$\bar{Q}$n-1

→ Previous state

→ Complement of Previous state.

C.T

D	Qn-1	Qn
0	0	0
0	1	0
1	0	1
1	1	1

C.T

T	Qn-1	Qn
0	0	0
0	1	1
1	0	1
1	1	0

$\bar{T}$ Qn-1 + T $\bar{Q}$n-1 } T ⊕ Qn-1

E.T

Qn-1	Q	D
0	0	0
0	1	1
1	0	0
1	1	1

E.T

Q_{n-1}	Q	T
0	0	0
0	1	1
1	0	1
1	1	0

Conversion of clk

SR - JK

↓ ↓

Source Desitination

Step-3

- T.T
- k.map
- Circuit Diagram.

Source → Exiciation

Destination → T.T
excitation

Q_{n-1}	Q_n	S	R
0	0	0	x
0	1	1	0
1	0	0	1
1	1	x	0

T.T

J	K	Q_n
0	0	Q_{n-1}
0	1	0
1	0	1
1	1	$\bar{Q}_{n-1}$

T.T

J	K	Q_{n-1}	Q_n	S	R
0	0	0	0	0	x
0	0	1	1	x	0
0	1	0	0	0	x
0	1	1	0	0	1
1	0	0	1	1	0
1	0	1	1	x	0
1	1	0	1	1	0
1	1	1	0	0	1

Step:2 kmap.

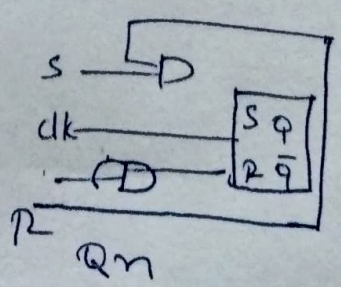
$S \rightarrow J\bar{Q}_{n-1}$

$R \rightarrow K\bar{Q}_n$

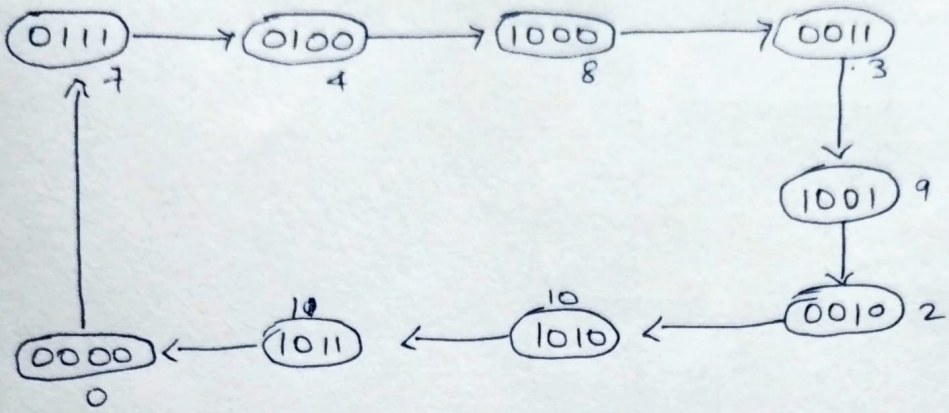
$S = J\bar{Q}_{n-1}$

$R = KQ_{n-1}$

Step3 C.D



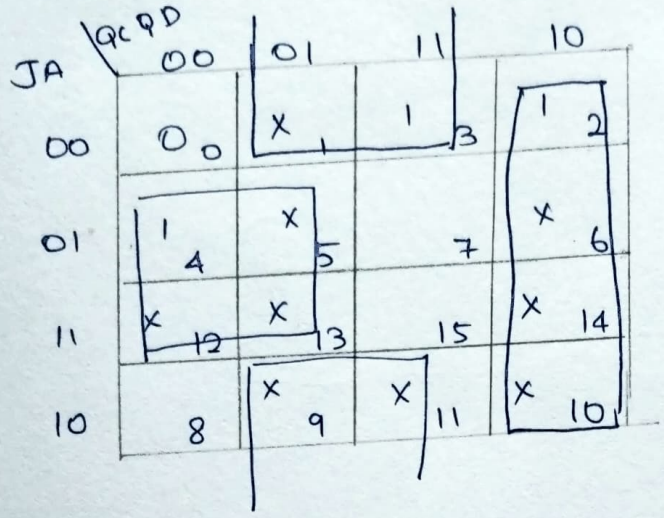
Design a counter to count 7, 4, 8, 3, 9, 2, 10, 11, 0, 7 using (use JK flip-Flop).



Q_{n-1}	Q_n	J	K
0	0	0	x
0	1	1	x
1	0	x	1
1	1	x	0

	Previous	Next state	$J_A K_A$	$J_B K_B$	$J_C K_C$	$J_D K_D$
7	0111	0100	0x	x0	x1	x1
4	0100	1000	1x	x1	0x	0x
8	1000	0011	x1	0x	1x	1x
3	0011	1001	1x	0x	x1	x0
9	1001	0010	x1	0x	1x	x1
2	0010	1010	1x	0x	x0	0x
10	1010	1011	x0	0x	x0	1x
11	1011	0000	x1	0x	x1	x1
0	0000	0111	0x	1x	1x	1x

Kmap:



$$J_A = Q_B \overline{Q_C} + Q_D \overline{Q_B} + Q_C \overline{Q_D}$$