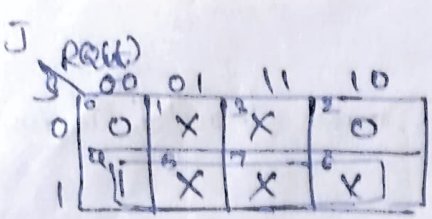
Conversion of Flip-flops

→ To convert one type of flip-flop into another type, we have to obtain the expressions for the inputs of the existing flip-flop in terms of the inputs of the required flip-flop and the present state variables of the existing flip-flop and implement them.

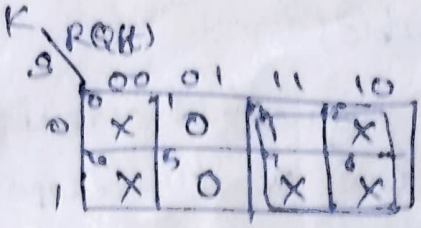
JK flip-flop to SR flip-flop

External Inputs		Present State	Next State	Flip-flop Inputs	
S	R	Q(t)	Q(t+1)	J	K
0	0	0	0	0	X
0	0	1	1	X	0
0	1	0	0	0	X
0	1	1	0	X	1
1	0	0	1	1	X
1	0	1	1	X	0

Conversion table

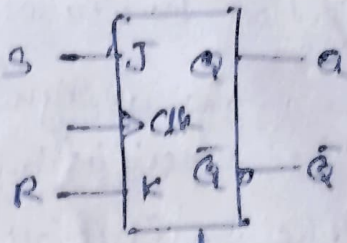


$J = S$



$K = R$

K-maps for J and K

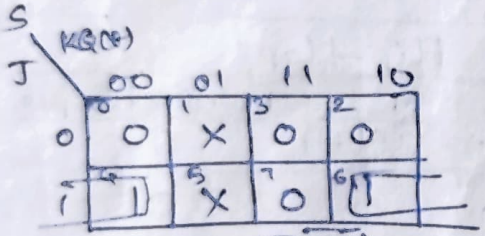


Logic diagram

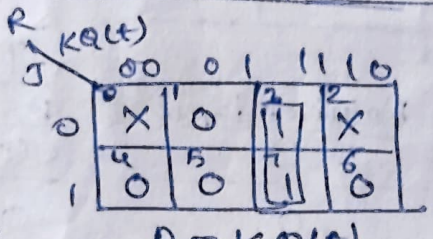
SR Flip-flop to JK Flip-flop

External Inputs		Present State	Next State	Flip-flop Inputs	
J	K	Q(t)	Q(t+1)	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

Conversion table

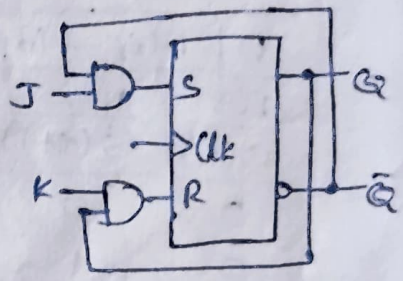


$S = JQ(t)$



$R = KQ(t)$

K-maps for S and R

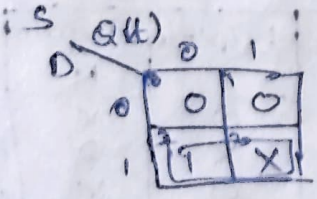


Logic diagram

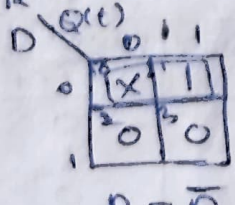
SR Flip-flop to D Flip-flop

External Inputs	Present State	Next State	Flip-flop Inputs	
D	Q(t)	Q(t+1)	S	R
0	0	0	0	X
0	1	0	0	1
1	0	1	1	0
1	1	1	X	0

Conversion table

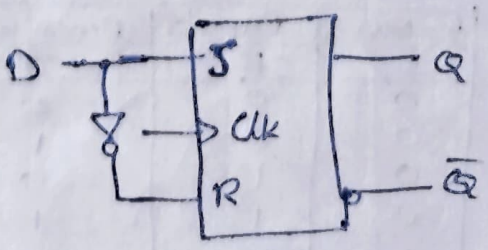


$S = D$



$R = \bar{D}$

K-maps for S and R

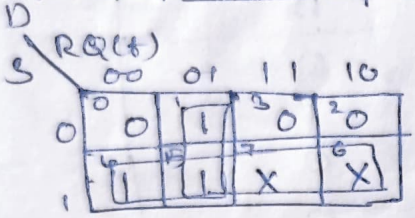


Logic diagram

D Flip-flop to SR Flip-flop

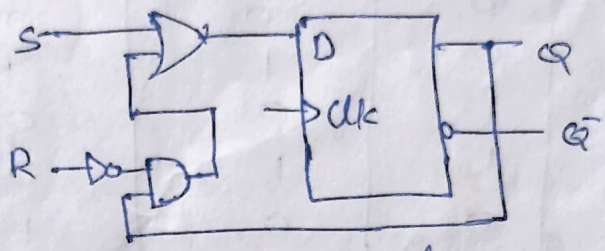
External Inputs		Present State	Next State	Flip-flop Input
S	R	Q(t)	Q(t+1)	D
0	0	0	0	0
0	0	1	1	1
0	1	0	0	0
0	1	1	0	0
1	0	0	1	1
1	0	1	1	1

Conversion table



$D = S + \bar{R}Q(t)$

K-map for D

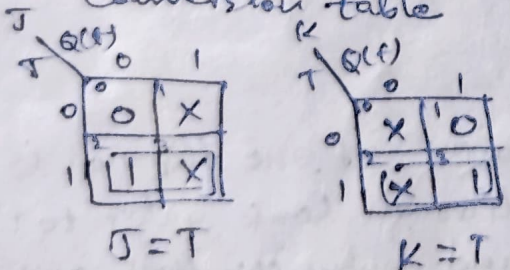


Logic diagram

JK Flip-flop to T Flip-flop

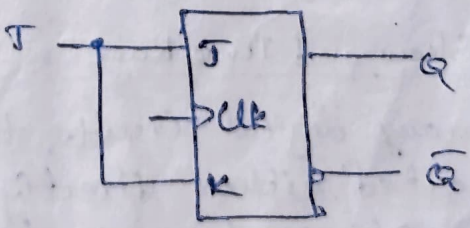
External Input	Present State	Next State	Flip-flop Inputs	
T	Q(t)	Q(t+1)	J	K
0	0	0	0	X
0	1	1	X	0
1	0	1	1	X
1	1	0	X	1

Conversion table



$J = T$ $\quad K = T$

K-maps for J and K

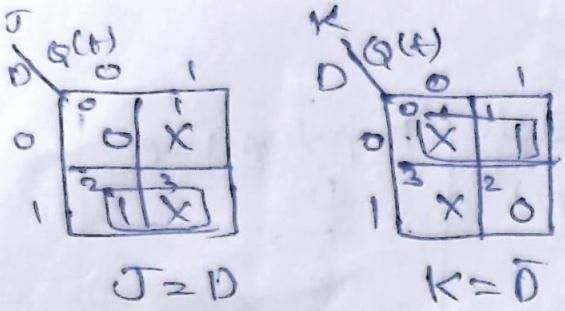


Logic digram

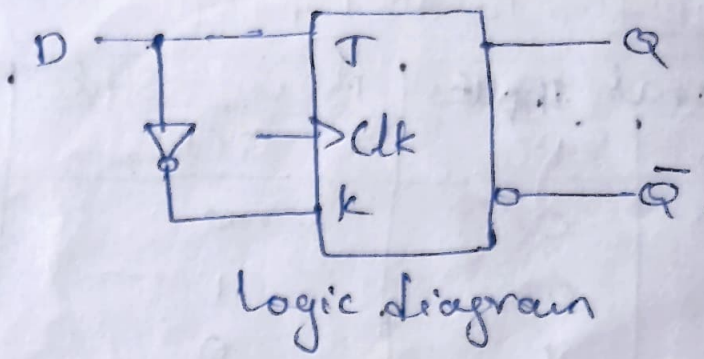
JK Flip-flop to D Flip-flop

External Inputs	Present State	Next State	Flip-flop Inputs	
D	Q(t)	Q(t+1)	J	K
0	0	0	0	X
0	1	0	X	1
1	0	1	1	X
1	1	1	X	0

Conversion table



K-maps for J and K

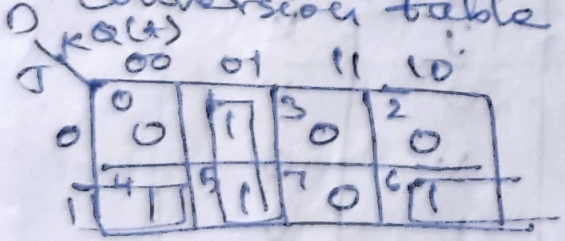


Logic diagram

D- Flip-flop to JK Flip-flop

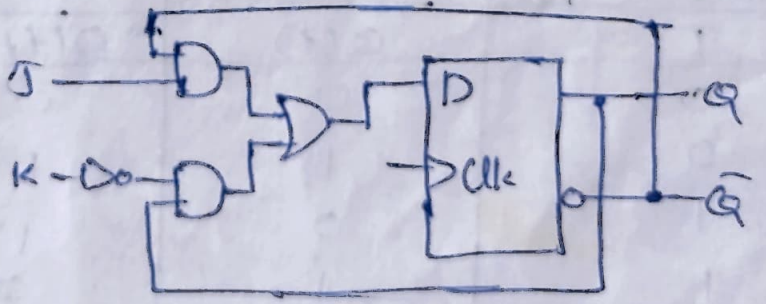
External Inputs		Present State	Next State	Flip-flop Input
J	K	Q(t)	Q(t+1)	D
0	0	0	0	0
0	0	1	1	1
0	1	0	0	0
0	1	1	0	0
1	0	0	1	1
1	0	1	1	1
1	1	0	1	1
1	1	1	0	0

Conversion table



$D = J\bar{Q}(t) + \bar{K}Q(t)$

K-map for D



Logic diagram