

* Digital Electronics and Logic Design (DELD) - Practical Number - 8

Name :- Kaustubh Shrikant Kabra.

Class :- Second Year Engineering

Div :- A Roll Number :-

Batch :-

Department :- Computer Department

College :- AISSMS's IOIT.

Aim :-

Design and Realization : Flip-Flop conversion.

Title :-

Flip-Flop conversion.

Objective :-

To convert one flip-flop into another type of flip-flop :-

① D - flip flop to T - flip flop.

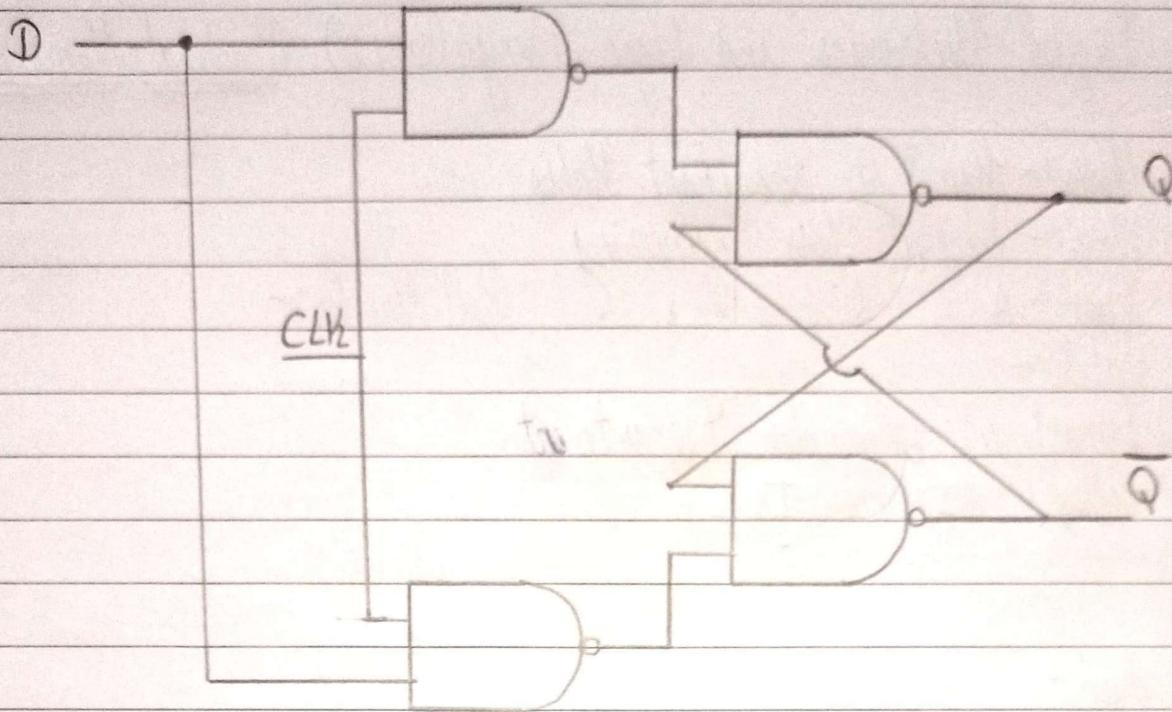
② JK - flip flop to D - flip flop.

Theory :-

D - Flip Flop -

It is a modified Set-Reset flip-flop with addition of an inverter to prevent the S and R input being at same logic level.

D - flip flop is by far the most important of clocked flip flop as it ensures that inputs S and R never equal at same time. It is constructed from a gated SR - flip flop with an inverter added between the S and R input to allow for a single D (input) Data.

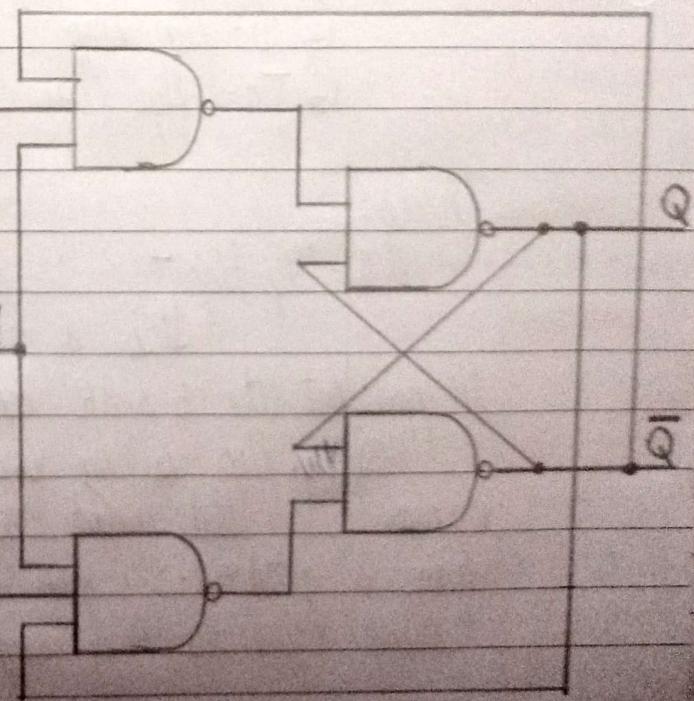


J-K Flip-Flop:-

J-K flip flop is similar to SR flip flop but there is no change in state when J and K input are both Low. J-K flip flop is considered to be a universal flip flop circuit.

J-K flip flop has no invalid or forbidden input states of the SR latch even when S and R are high.

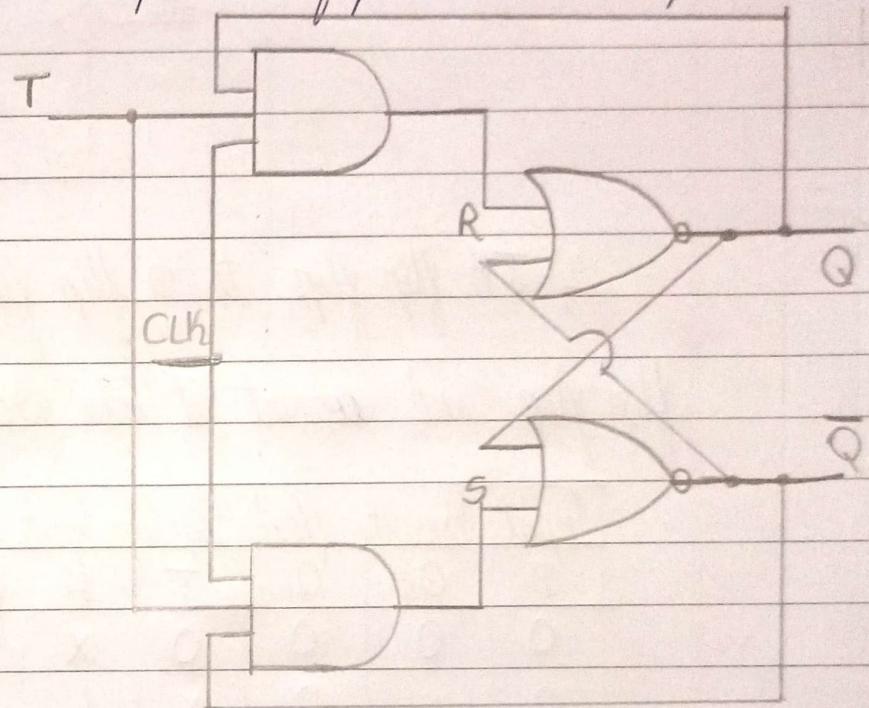
Clock	Input	Output	Description
	J K	Q Q̄	
x	0 0	1 0	{ Memory
x	0 0	0 1	} NC
↓	0 1	1 0	Reset
x	0 1	0 1	
↓	1 0	0 1	Set
x	1 0	1 0	
↓	1 1	0 1	Toggle
↓	1 1	1 0	



T-Flip Flop -

To avoid the intermediate state occurrence in SR flip flop, T flip flop is used. This flip flop work as toggle switch. The next output state is changed with the complement of present state output. This is called toggling.

	Previous			Next	
T	Q	\bar{Q}	\bar{Q}	Q	\bar{Q}
0	0	1	1	0	1
0	1	0	0	1	0
1	0	1	0	1	0
1	1	0	0	0	1



* Conversion :-

1) D flip flop to T flip flop.

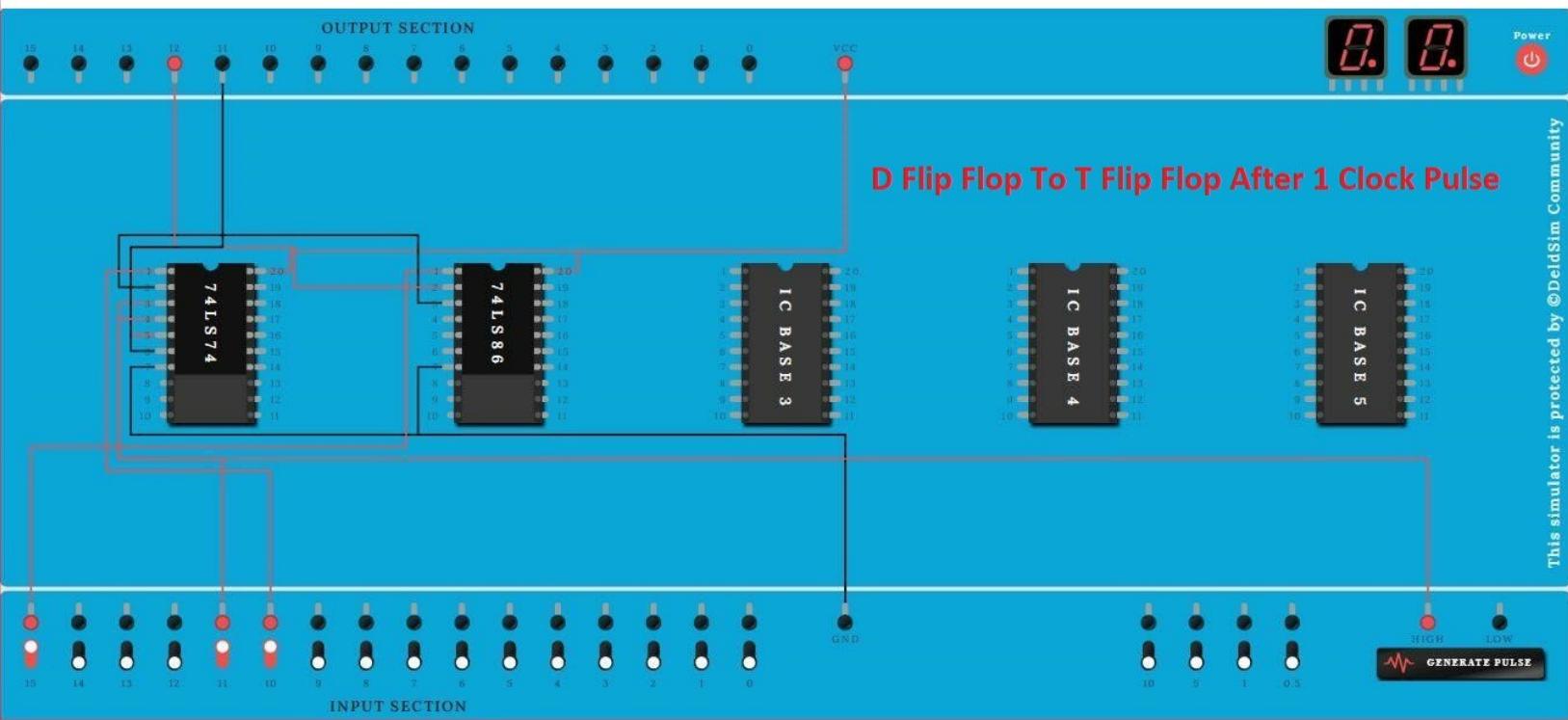
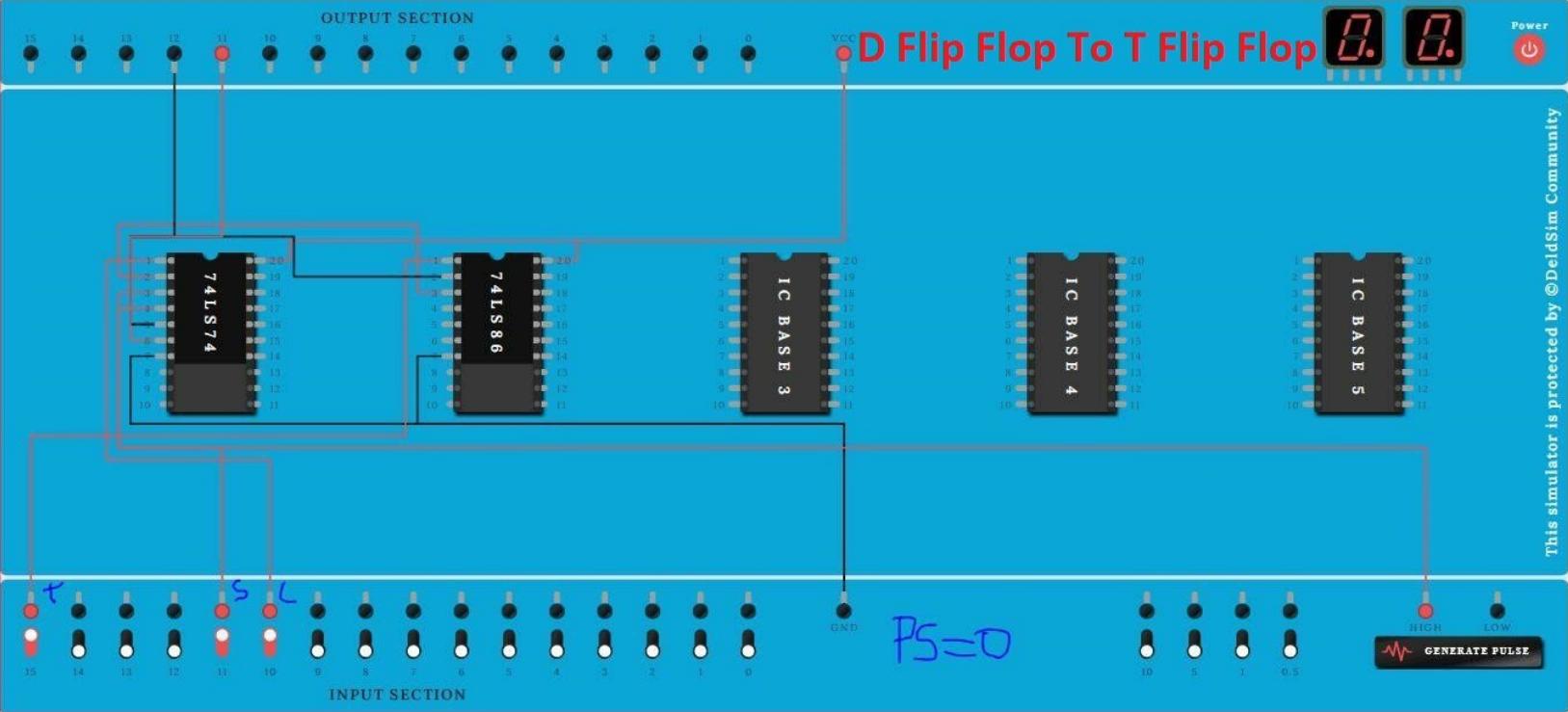
Compare the truth table of both D and T flip flop and make excitation table.

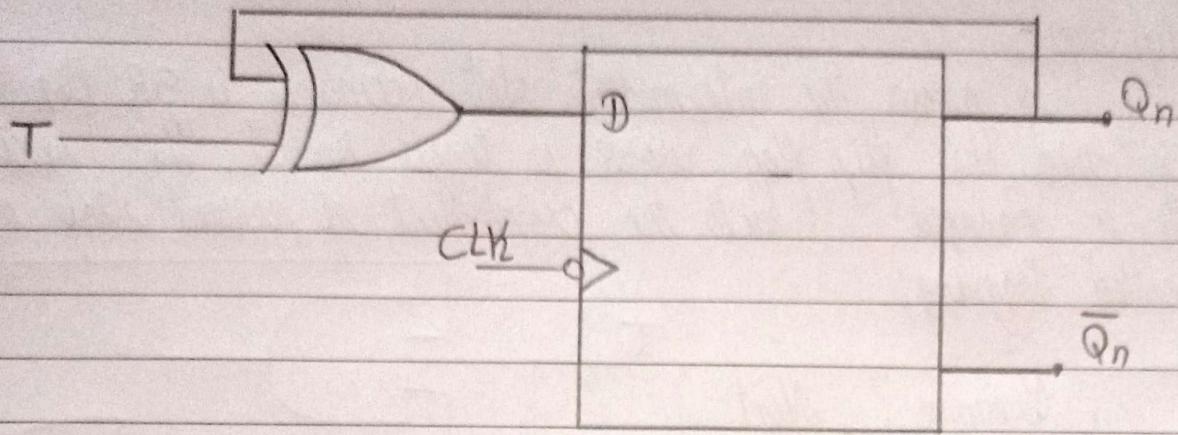
Input	Present S	Next S	FF Input
T	Q_n	Q_{n+1}	D
0	0	0	0
0	1	1	1
1	0	1	1
1	1	0	0

Using K-map for D.

T	Q_n	D	
		0	1
0	0	0	1
0	1	1	0

$$D = \overline{T}Q_n + T\overline{Q_n} = T \oplus Q_n$$

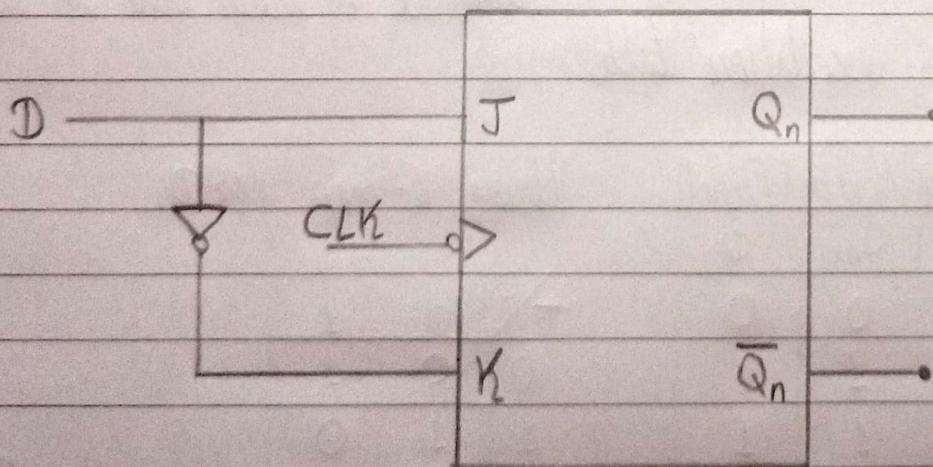


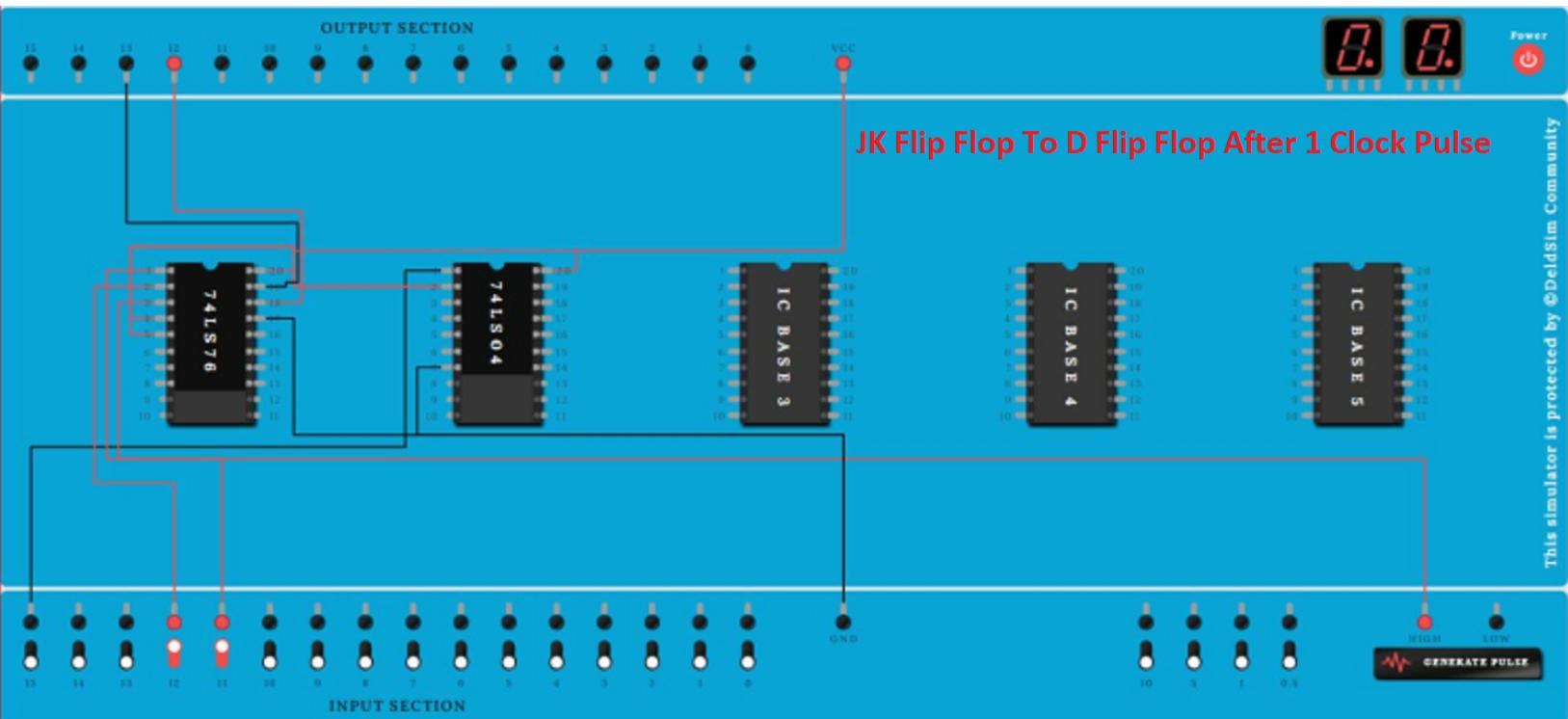
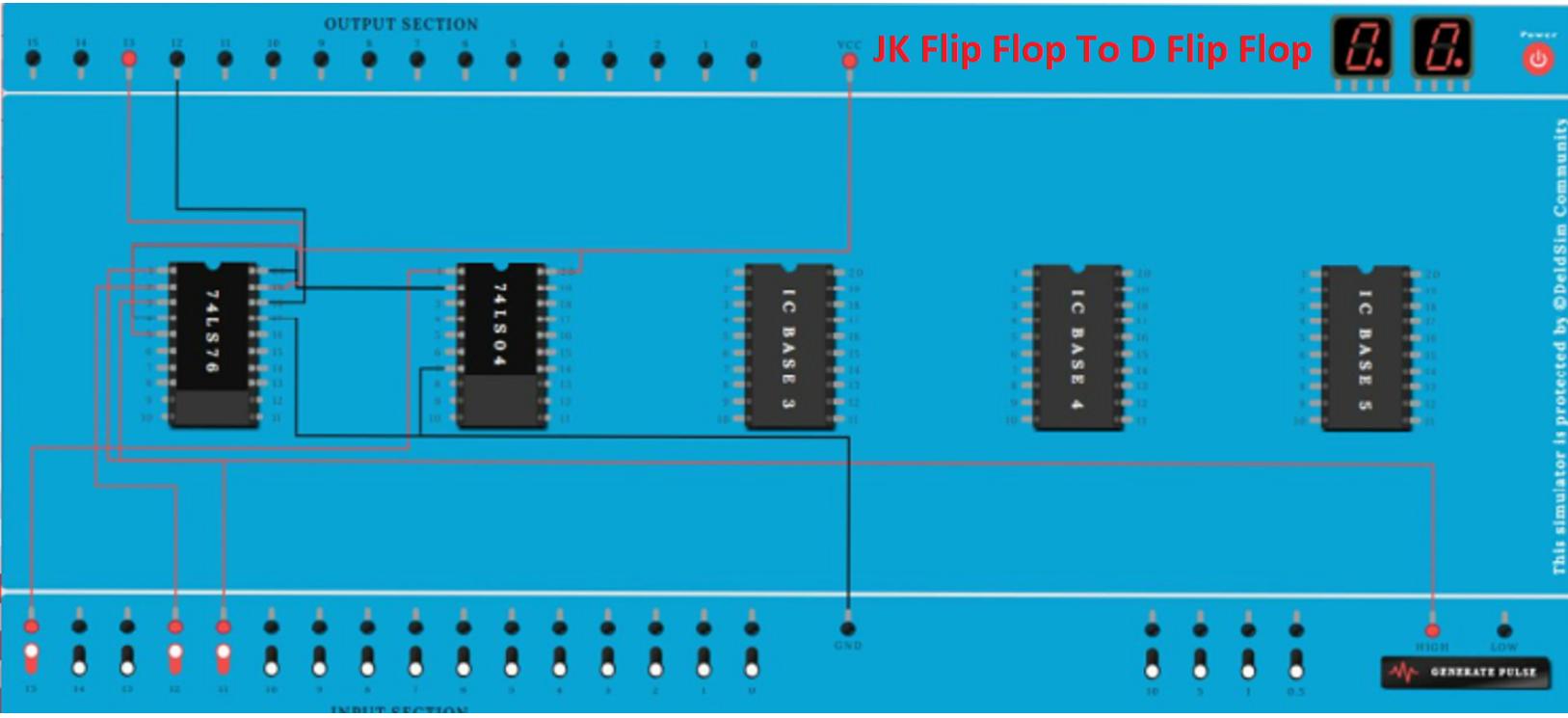


2) JK flip flop to D flip flop -
compare the truth table of both
flip flop and convert it into excitation table.

Input Present Next Flip Flop Input					Using K map for expression of JK.										
D	Q _n	Q _{n+1}	J	K	for J		D	Q _n	0	1	for K		Q _n	0	1
0	0	0	0	X			0	0	X		0	X	1		
0	1	0	X	1			1	1	X		1	X	0		
1	0	1	1	X											
1	1	1	X	0											

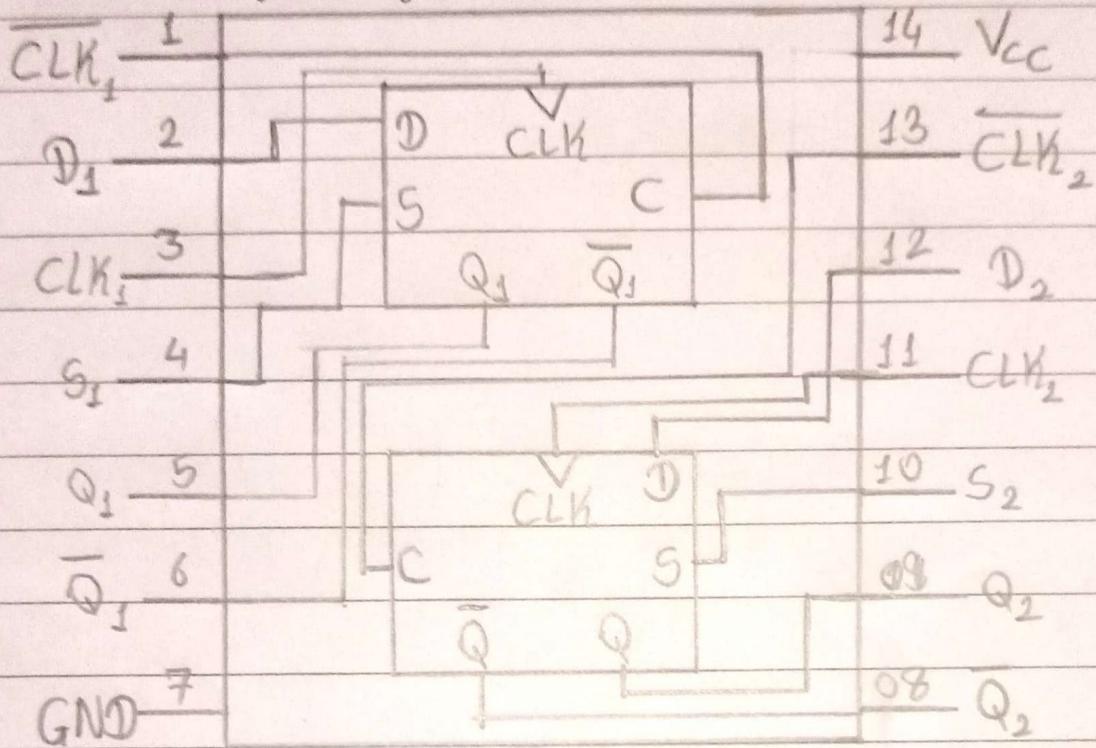
$J = \bar{D}$ $K = \bar{D}$





IC's Used -

① Dual Positive Edge triggered IC 7474 (D flip flop) -



Conclusion:-

Hence, we have successfully converted the flip flop from one type to another type.