

Kathmandu University
Department of Electrical and Electronics Engineering
Digital logic laboratory experiments

Experiment: Verifying the characteristics table of different flip-flops, D, JK.. Synthesize T flip-flop using D and JK flip-flop.

Components required:

IC 7473	Bread board	Resister (1K Ω)
IC 7476	Light emitting diode (LED)	

Theory

D flip-flop: The basic building blocks of combinational logic circuits are gates. The basic building blocks of sequential logic circuits are flip flops. Flip flops are devices that use a clock. Each flip flop can store one bit of information.

D flip-flop characteristic table and diagram

D	Q(t+1)	Operation
0	0	Reset
1	1	Set

The D flip flop has two possible values. When **D = 0**, the flip flop does a reset. A reset means that the output, **Q** is set to 0. When **D = 1**, the flip flop does a set, which means the output **Q** is set to 1.

Procedure:

1. Connect the IC as per the given circuit diagram on the bread board.
2. Apply +5V as logic 1 input and ground as logic 0 input.
3. Check outputs using LED.
4. Tabulate the observations

\Observation table of D flip flop

SN	D	Q(t)	Q(t+1)
1			
2			
3			
4			

T flip flop:

T flip flop has two possible values. When $T = 0$, the flip flop does a hold. A hold means that the output, Q is kept the same as it was before the clock edge. When $T = 1$, the flip flop does a toggle, which means the output Q is negated after the clock edge, compared to the value before the clock edge.

T flip-flop characteristic table

T	Q(t+1)	Operation
0	0	No change
1	Q'(t)	Toggle

T flip-flop Observation table

SN	T	Q(t)	Q(t+1)
1			
2			
3			
4			

JK flip flop:

JK flip flop is a universal flip-flop. It has no undefined states. It is always edge triggered. A JK flip flop has two control inputs, J and K. When **JK = 00**, the flip flop holds. When **JK = 01**, the flip flop resets. When **JK = 10**, the flip flop sets. When **JK = 11**, the flip flop toggles.

JK flip-flop characteristic table

J	K	Q(t+1)	Operation
0	0	Q(t)	No change
0	1	0	Reset
1	0	1	Set
1	1	Q'(t)	Complement

Observation table for JK flip-flop

SN	J	K	Q(t)	Q(t+1)
1				
2				
3				
4				
5				
6				
7				
8				

