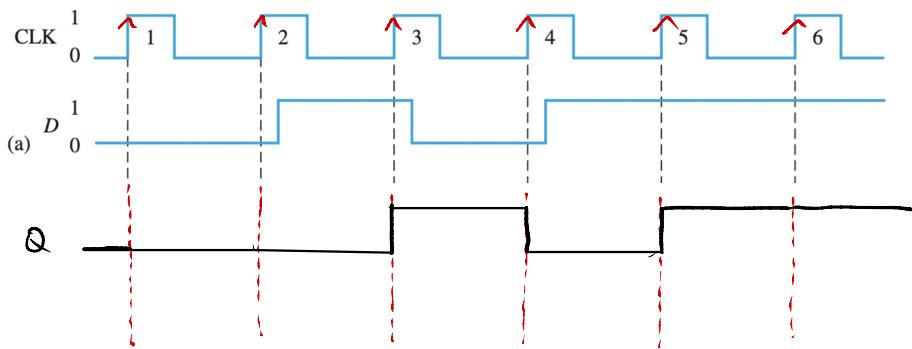
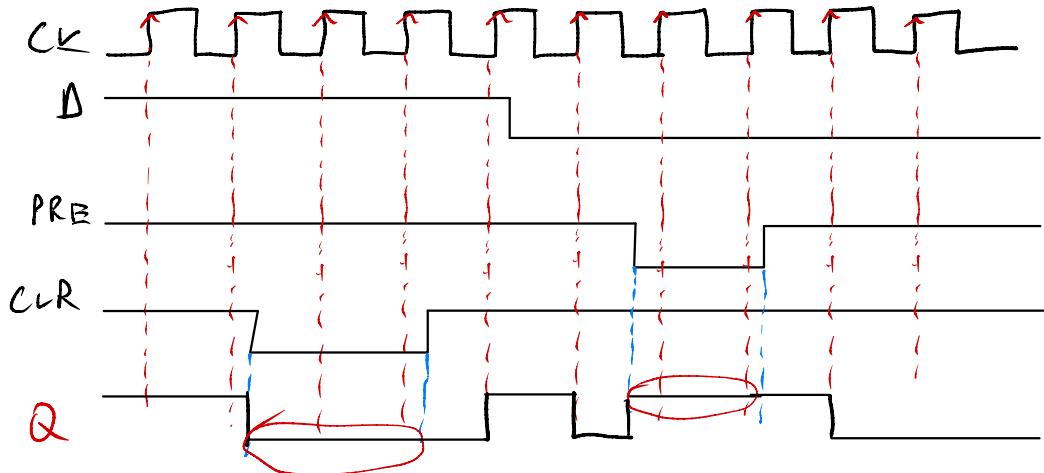
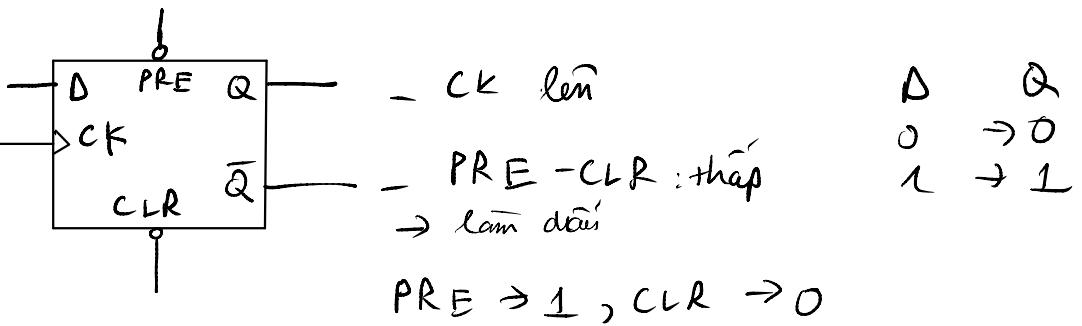
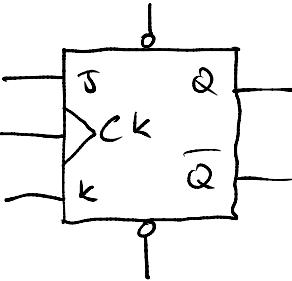


## Flip Flop D :



# Flip-Flop JK | J=K



CK mức cao

PRE	Q
CLR	0

PRE-CLR:  $\rightarrow$  tích cực  
mức thấp, nén và trống

$$+ J = K = 0 \rightarrow \text{Giả}$$

$$J = K = 1 \rightarrow \text{Đổi} + \text{trạng thái}$$

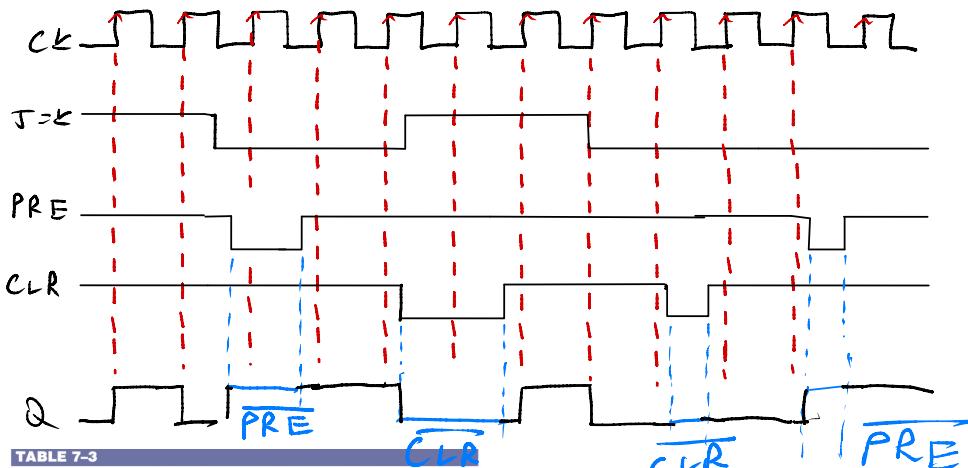


TABLE 7-3

Truth table for a positive edge-triggered J-K flip-flop.

Inputs			Outputs		Comments
J	K	CLK	Q	$\bar{Q}$	
0	0	↑	$Q_0$	$\bar{Q}_0$	No change
0	1	↑	0	1	RESET
1	0	↑	1	0	SET
1	1	↑	$\bar{Q}_0$	$Q_0$	Toggle

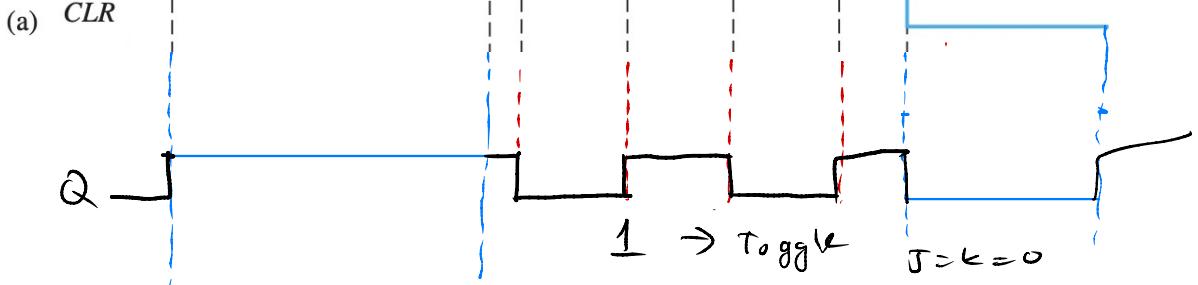
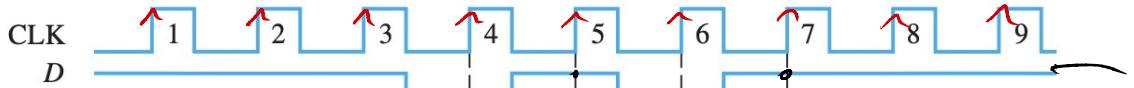
↑ = clock transition LOW TO HIGH

$Q_0$  = output level prior to clock transition

Tại thời điểm  $\overline{\text{CLR}}$ , tích cực ( $= 0$ ), thì bắt chấp ngõ vào còn lại, ngõ ra bằng 0

$\overline{\text{PRE}}$	$\overline{\text{CLR}}$	J	K	Ngõ ra Q
0	0	X	X	đứng
0	1	X	X	1
1	0	X	X	0
1	1	0	0	đổi
1	1	0	1	0
1	1	1	0	1
1	1	1	1	đảo

Tại thời điểm  $\overline{\text{PRE}}$ , tích cực ( $= 0$ ), thì bắt chấp ngõ vào còn lại, ngõ ra bằng 1



Pin 1 (1CLK)

Pin 2 (1J)

Pin 3 (1K)

Pin 4 ( $1\overline{PRE}$ )

(a) Pin 15 ( $1\overline{CLR}$ )

$J$	$K$	$Q$
0	0	Giữ
0	1	0
1	1	Đổi
1	0	1

(1Q)

## KEY TERMS

*Key terms and other bold terms in the chapter are defined in the end-of-book glossary.*

**Astable** Having no stable state. An astable multivibrator oscillates between two quasi-stable states.

**Bistable** Having two stable states. Flip-flops and latches are bistable multivibrators.

**Clear** An asynchronous input used to reset a flip-flop (make the  $Q$  output 0).

**Clock** The triggering input of a flip-flop.

**D flip-flop** A type of bistable multivibrator in which the output assumes the state of the  $D$  input on the triggering edge of a clock pulse.

**Edge-triggered flip-flop** A type of flip-flop in which the data are entered and appear on the output on the same clock edge.

**Hold time** The time interval required for the control levels to remain on the inputs to a flip-flop after the triggering edge of the clock in order to reliably activate the device.

**J-K flip-flop** A type of flip-flop that can operate in the SET, RESET, no-change, and toggle modes.

**Latch** A bistable digital circuit used for storing a bit.

**Monostable** Having only one stable state. A monostable multivibrator, commonly called a *one-shot*, produces a single pulse in response to a triggering input.

**One-shot** A monostable multivibrator.

**Power dissipation** The amount of power required by a circuit.

**Preset** An asynchronous input used to set a flip-flop (make the  $Q$  output 1).

**Propagation delay time** The interval of time required after an input signal has been applied for the resulting output change to occur.

**RESET** The state of a flip-flop or latch when the output is 0; the action of producing a RESET state.

**SET** The state of a flip-flop or latch when the output is 1; the action of producing a SET state.

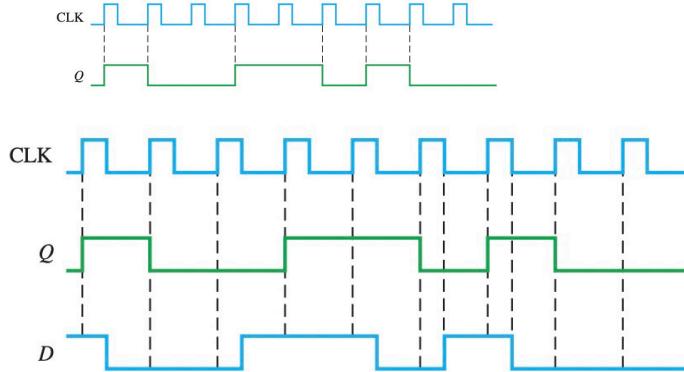
**Set-up time** The time interval required for the control levels to be on the inputs to a digital circuit, such as a flip-flop, prior to the triggering edge of a clock pulse.

**Synchronous** Having a fixed time relationship.

**Timer** A circuit that can be used as a one-shot or as an oscillator.

**Toggle** The action of a flip-flop when it changes state on each clock pulse.

9. The  $Q$  output of an edge-triggered D flip-flop is shown in relation to the clock signal in Figure 7-78. Determine the input waveform on the D input that is required to produce this output if the flip-flop is a positive edge-triggered type.



15. For a negative edge-triggered J-K flip-flop with the inputs in Figure 7-84, develop the  $Q$  output waveform relative to the clock. Assume that  $Q$  is initially LOW.

