JK flip-flop (DGTL_jkff_1.sqproj)

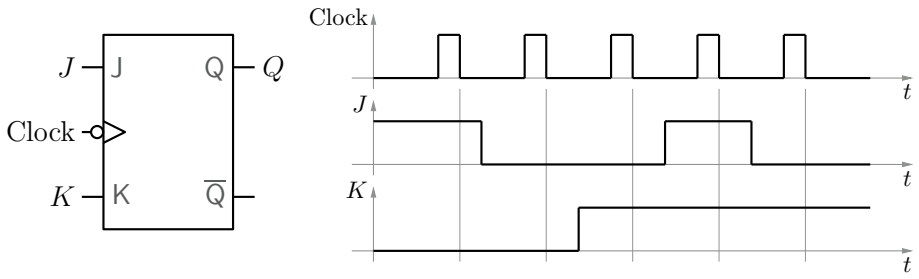

Figure 1: JK flip-flop example.

Question: The input signals applied to a negative edge-triggered JK flip-flop are shown in Fig. 1. Plot Q versus time, assuming Q to be 0 initially.

Solution:

The transition table for a negative edge-triggered JK flip-flop is given below.

Clock	J	K	Q_{n+1}
$\downarrow$	0	0	Q_n
$\downarrow$	0	1	0
$\downarrow$	1	0	1
$\downarrow$	1	1	$\overline{Q}_n$

The next state of the flip-flop (i.e., the state after the active edge) is determined by the J and K values *just before* that active edge. Just before each active edge (i.e., t_1^-, t_2^-, etc. in Fig. 2), we find the J and K values and use those together with the JK flip-flop transition table to obtain the next state (at t_k^+). Proceeding in this manner, we obtain the following table.

k	t_k^-			$Q(t_k^+)$
	J	K	Q	
1	1	0	0	1
2	0	0	1	1
3	0	1	1	0
4	1	1	0	1
5	0	1	1	0

Using the above table, we can draw the Q waveform, as shown in Fig. 2.

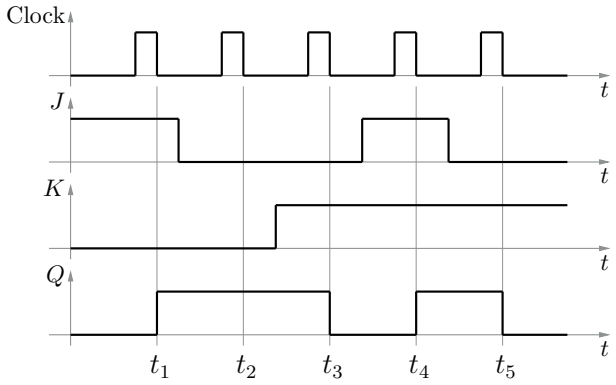

Figure 2: Waveforms for the JK flip-flop example of Fig. 1.

SequelApp Exercises: The input signals applied to a negative edge-triggered JK flip-flop are shown in Fig. 3. Plot Q versus time, assuming Q to be `0` initially.

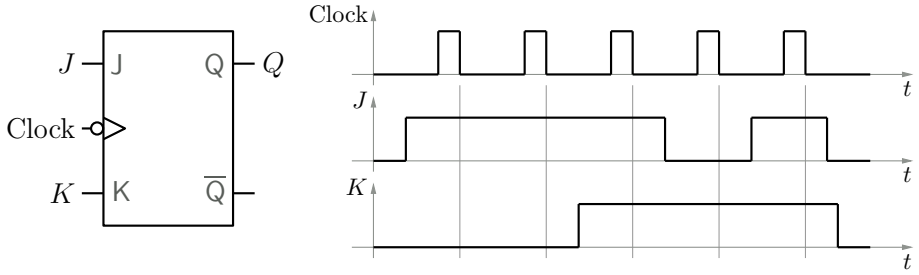

Figure 3: JK flip-flop example.

Verify your answers using SequelApp.