

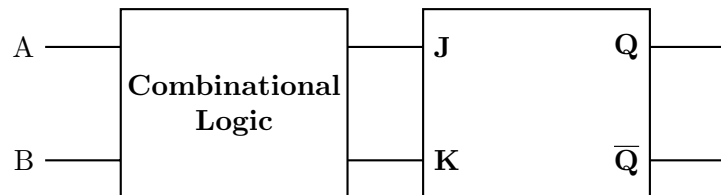
Assignment 12

ESC 201

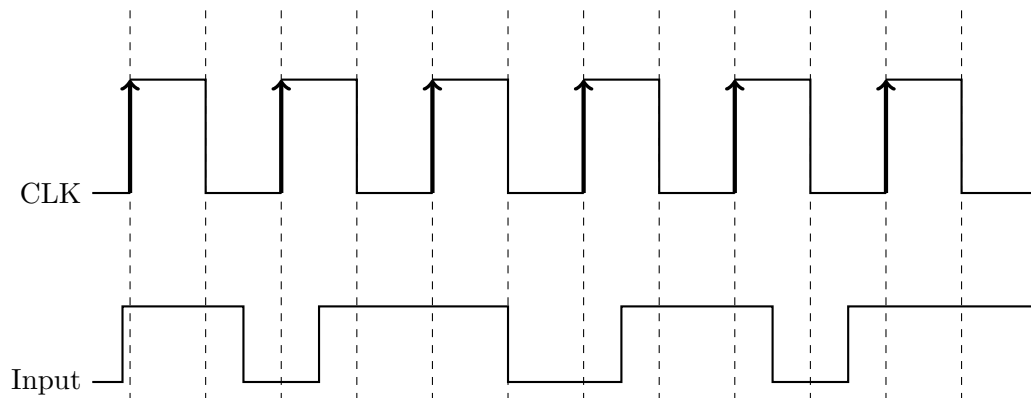
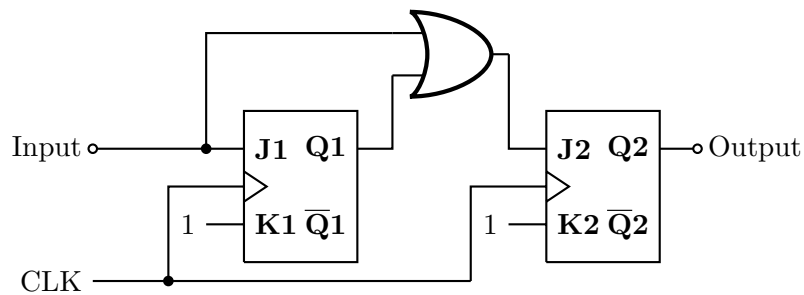
Basic

1. Give a circuit realization of the combinational logic block shown below to obtain the following truth table. Use any 2-input gates.

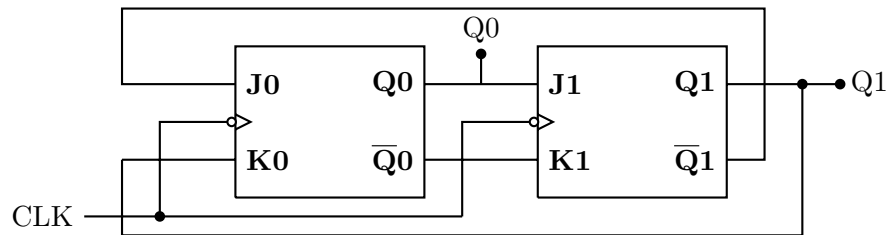
A	B	Q
0	0	$\overline{Q_n}$
0	1	1
1	0	Q_n
1	1	0



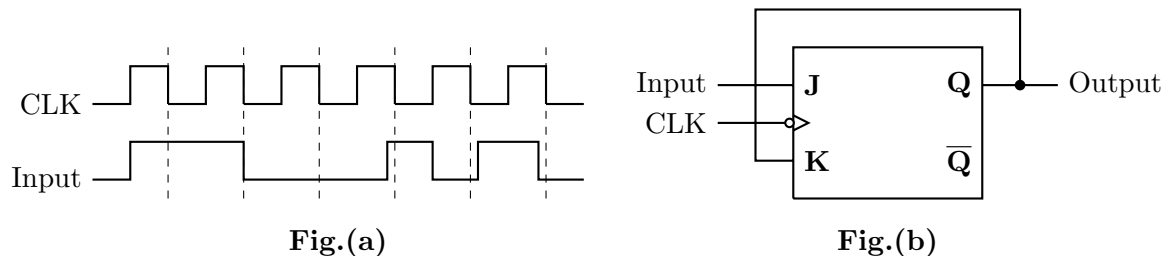
2. Write the characteristic table of JK flip flop. The input waveform is shown below for the given circuit containing J-K flip flop. Draw the corresponding output waveform. Assume that all devices have no delay and $Q_2=0$ initially.



3. If initially $Q_0 = Q_1 = 0$, find the logic states of Q_0 and Q_1 immediately after 777^{th} clock pulse.

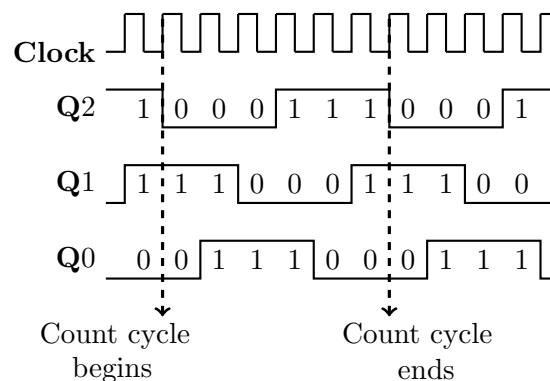


4. The waveform of the clock as shown in **Fig.(a)** excites the circuit shown in **Fig.(b)**. Sketch the output waveform.



Advanced

5. A sequential circuit has two JK flip-flops with outputs Q_1 , Q_2 and one input X . The circuit is described by the following flip-flop input equations: $J_1 = J_2 = X$, $K_1 = \overline{Q_2}$ and $K_2 = Q_1$. Derive the next state equations for the circuit and draw the state transition table.
6. A sequential circuit contains two flip-flops T_1 and T_2 . The circuit has no external inputs. The only external outputs are the values of current state (Q_1 and Q_2). The flip-flop inputs are connected as : $T_1 = Q_1 + Q_2$ and $T_2 = \overline{Q_1} + Q_2$. What function does the circuit perform?
7. Design a sequential circuit with two D flip-flops A and B and one input x such that when $x=0$, the state of the circuit remains the same. When $x=1$, the circuit goes through the state transitions from 00 to 01, to 11, to 10 and back to 00, and repeats.
8. Design a **synchronous** counter with three **positive edge triggered JK** flip flops using K-maps for the three pair of inputs $J_2 K_2$; $J_1 K_1$ and $J_0 K_0$ to produce three phase waveforms at the output of the three flip flops Q_2 , Q_1 and Q_0 respectively as shown. (States which do not arise should be treated as ‘**dont care**’ conditions).



9. Design a **3- bit synchronous counter** which counts 0,3,6,1,4,7,2,5,0,3,... using **JK** flip flops.