Review3 Questions.

① Explain the basic operation of a bistable element.

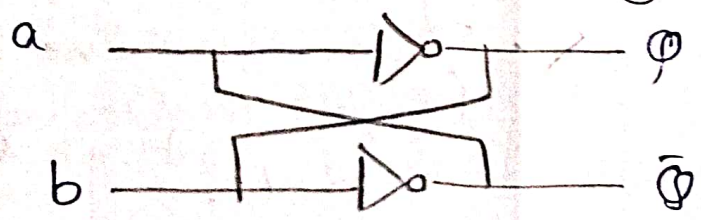
⇒ Bistable elements are used as binary memory cells to store a logic '0' or '1' state. It is a type of sequential circuit that can hold its state until a new input signal is received, causing the state to change. It is also called as "one bit memory cell".

The bistable element is a digital circuit with two inputs and one output that has two stable states.

state 1 : $Q = 0$ & $\bar{Q} = 1$

state 2 : $Q = 1$ & $\bar{Q} = 0$

The basic bistable element is formed by cross-coupling two NOT gate.



When power on, $a = 0$, $b = 1$ then the output $Q = 1$, $\bar{Q} = 0$ stable state '1',

when power on, $a = 1$, $b = 0$, then the output $Q = 0$, $\bar{Q} = 1$ stable state '0'.

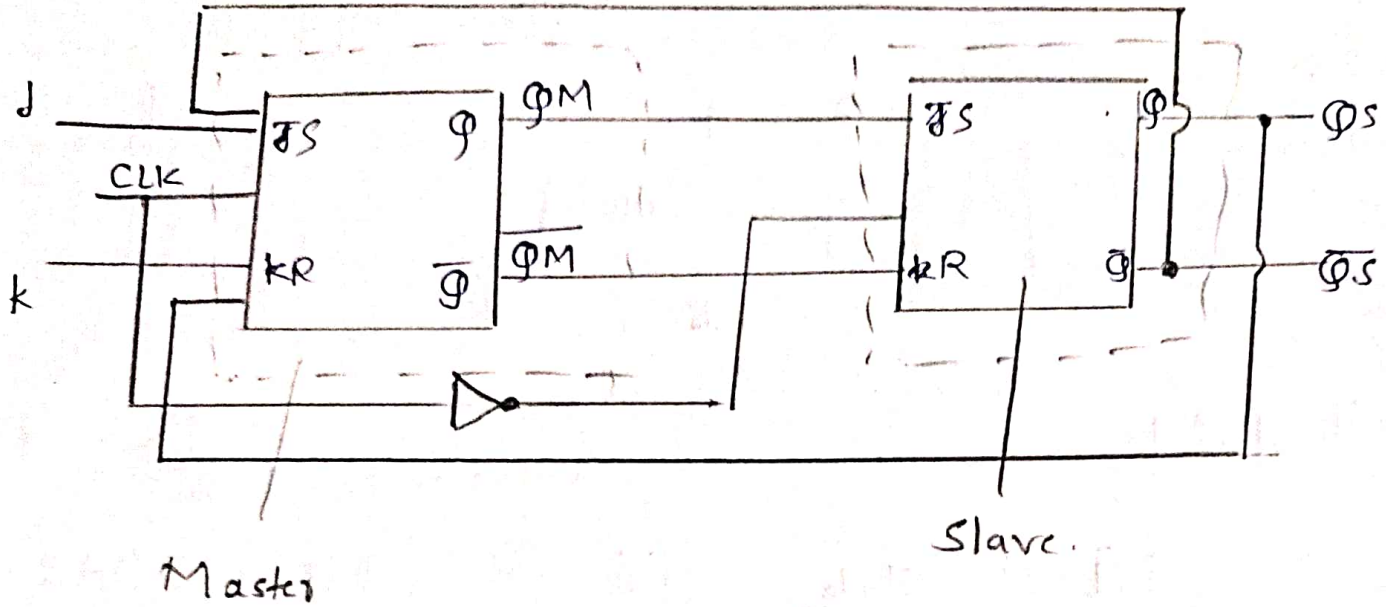
JK Flip flop using Master slave JK Flip flop?

③ Write the difference between latch & Flip flop.

⇒

Latch	Flip Flop
① Latches do not require clock signal.	Flip-flops have clock signal.
② A latch is an asynchronous device	A flip-flop is a synchronous device.
③ Latches are transparent devices i.e., they are enabled, the output changes immediately if the input changes	A transition from low to high or high to low of the clock signal will cause the flip flop to either change its output or retained in depending on the input signal.
④ A latch is a level sensitive device. (Level triggering is involved).	A flipflop is an edge sensitive device (Edge triggering is involved).
⑤ The operation of a latch is faster as they do not have to wait for clock signal.	Flip flop are comparatively slower than latches due to clock signal.

④ How do you overcome the limitations of JK Flip flop using Master slave JK Flip flop?



Truth table.

J	K	Q(t)	Q(t+1)
0	0	Q(t)	NC
0	1	0	Reset
1	0	1	Set
1	1	$\overline{Q(t)}$	Toggle.

Characterstic equation

JK \ Q(t)	0	1	
00	0_0	1_1	$\overline{K}Q(t)$
01	0_2	0_3	
11	1_6	0_7	$J\overline{Q(t)}$
10	1_4	1_5	

$$Q(t+1) = J\overline{Q(t)} + \overline{K}Q(t)$$

Charackrstic table

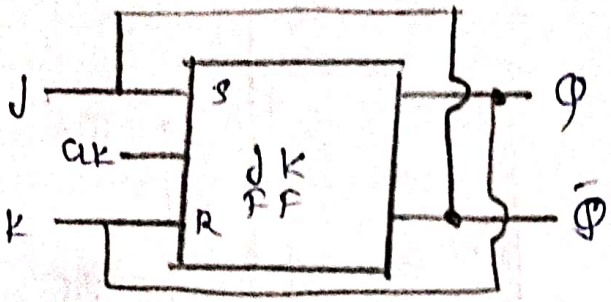
J	K	Q(t)	Q(t+1)
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	0

Exciatation table

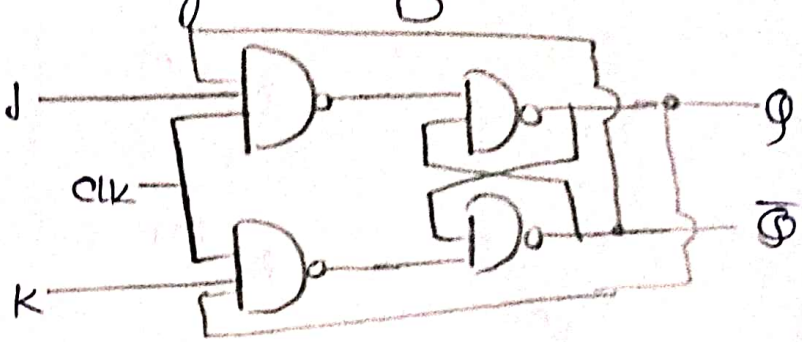
Q(t)	Q(t+1)	J	K
0	0	0	X
0	1	1	X
1	0	X	1
1	1	X	0

⑤ Derive characteristic equation for JK flip flop

⇒ Block diagram



Logic diagram.



Truth table.

J	K	Q(t+1)	State
0	0	Q(t)	NC
0	1	0	Reset
1	0	1	Set
1	1	$\bar{Q}(t)$	Toggle

Characterstic table.

J	K	Q(t)	Q(t+1)
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	1
1	1	0	0

Characterstic equation.

JK \ Q(t)	0	1
00	0_0	1_1
01	0_2	0_3
11	1_6	0_7
10	1_4	1_5

$\bar{K}Q(t)$

$J\bar{Q}(t)$

$$Q(t+1) = J\bar{Q}(t) + \bar{K}Q(t)$$