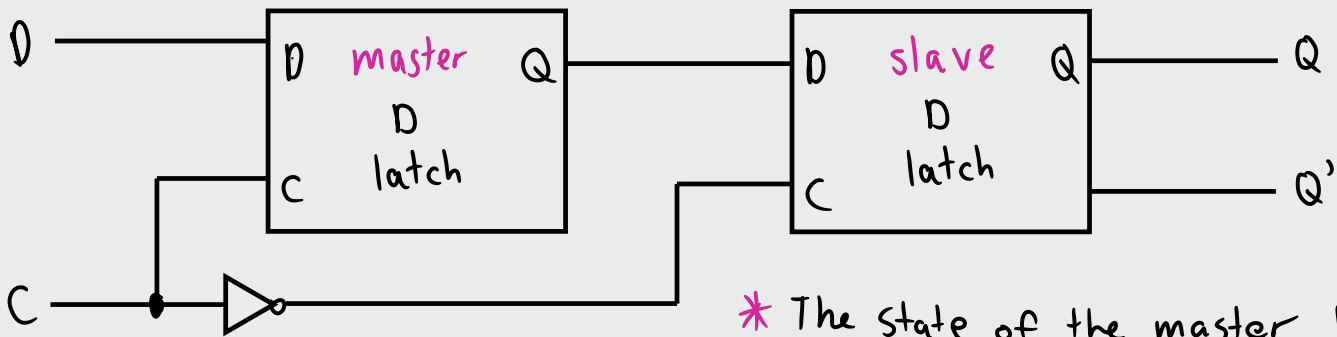


flip flop A

flip flop B

Each f/f must change state instantly at the same time, otherwise we might end up at the wrong state

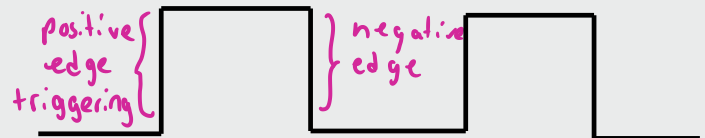
We can use a master-slave approach to make sure that changes propagate instantly.



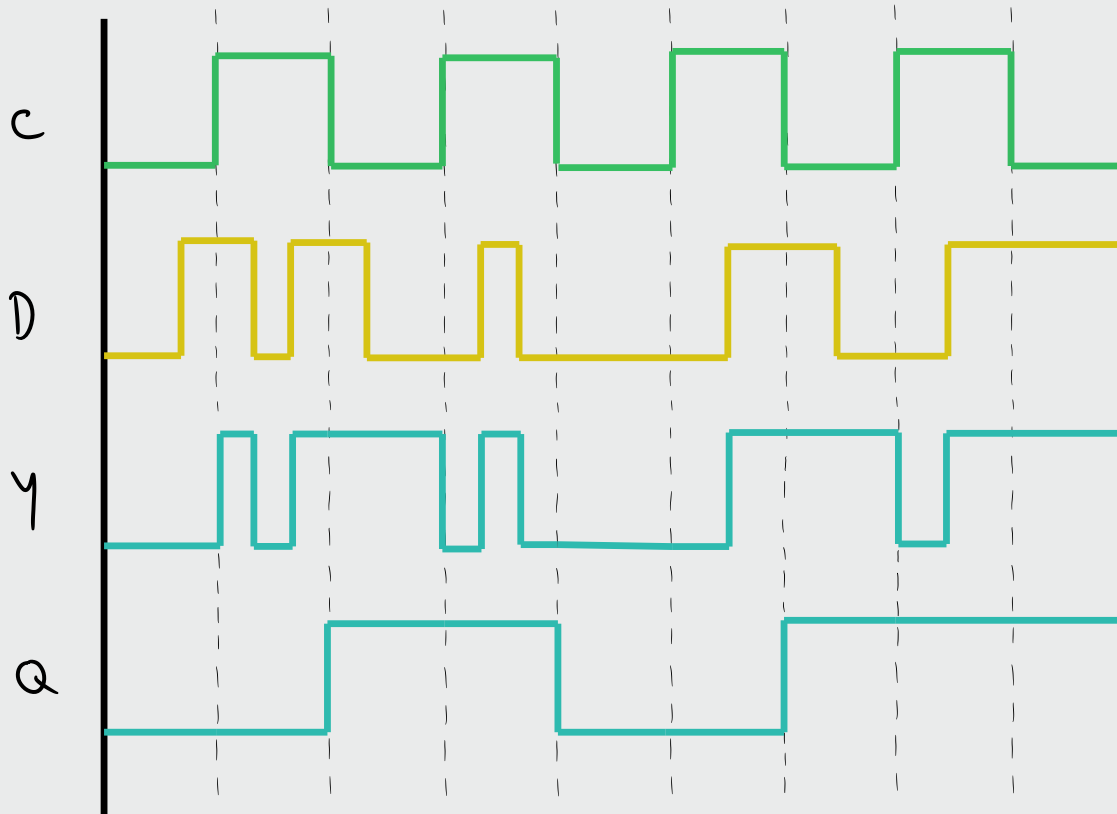
\* The state of the master becomes the input of the slave

The clock behaves as such:

clock = 1	clock = 0
if D is 0,1,1,0,1,0,1	0,1,1,0,1,0,1
y becomes 0,1,1,0,1,0,1	1,1,1,1,1,1,1
Q: 0,1,1,0,1,0,1	1...
(no change)	



When D and C are 1 the state of the master becomes 1.  
the only way to change the value of the circuit (master) is for C to change from 1 to 0 (negative edge)



Y : output of the master f/f

Q : output of the slave f/f

Behavior of Y:

When clock is 1, Y is a copy of the input D

When clock is 0, Y doesn't change

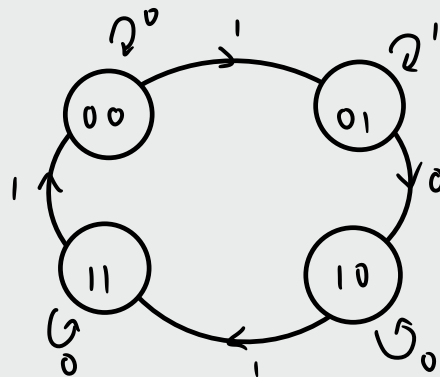
Behavior of Q:

When clock is 0, Q is a copy of Y

When clock is 1, Q doesn't change

Problem statement: Design the clocked sequential circuit for the below specification using JK flip flops.

$0 \rightarrow 1$  by a 1  
 $1 \rightarrow 2$  by a 0  
 $2 \rightarrow 3$  by a 1  
 $3 \rightarrow 0$  by a 1



JK Excitation Table

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

(b) JK

Present State $Q(t)$		Input $X$	Next State $Q(t+1)$		f/f inputs			
A	B		A	B	$J_A$	$K_A$	$J_B$	$K_B$
0	0	0	0	0	0	X	0	X
0	0	1	0	1	0	X	1	X
0	1	0	1	0	1	X	X	1
0	1	1	0	1	0	X	X	0
1	0	0	1	0	X	0	0	X
1	0	1	1	1	X	0	1	X
1	1	0	1	1	X	0	X	0
1	1	1	0	0	X	1	X	1

$J_A$

A	$BX$			
	00	01	11	10
0				1
1	X	X	X	X

$J_A = BX'$

$K_A$

A	$BX$			
	00	01	11	10
0	X	X	X	X
1			1	

$K_A = BX$

$J_B$

A	$BX$			
	00	01	11	10
0				
1				

$K_B$

A	$BX$			
	00	01	11	10
0				
1				

K maps

$$J_A = Bx' \quad K_A = Bx$$

